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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Engineering Economic Model for Fish Protein Concentration Processes

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J.W. GENTRY, M.B. HALE, and J.M. MARCHELLO

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Engineering Economic Model For Fish Protein Concentration Processes

By

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I. ABSTRACT

A process engineering economic model for fish protein concentration processes has been developed. The model predicts the construction and operating costs for fish meal plants and for plants producing fish protein concentrate (FPC) by: isopropyl alcohol extraction, biological, and press cake-isopropyl alcohol extraction.

Typical process flow sheets and a computer program were developed to be used in the design and cost computations. The model provides for each process to be studied both internally and externally in comparison with alternate processes. The program and model were prepared in such a way that changes and updating may be accomplished quite readily as new information becomes available. This report contains directions for users and descriptions of the processes. A listing of the computer program and example calculations for each process are presented in the Appendix to guide the user and to illustrate the nature of the model output.

While the model does develop construction, operating, and production aspects of the processes, it does not deal with the economics of selling the products and the resulting profit and return on investment. Problems of allocation of costs and marketing arrangements are not covered in this report, but must be considered in the final decisions relating to a complete evaluation of alternatives.

II. INTRODUCTION

Fish protein concentrate (FPC) production holds substantial promise of helping to meet the growing food and dietary requirements for the world's human population. It appears that several of the processes now being developed will be successful in making FPC available on a competitive basis with other sources of protein (1, 2). To provide for the orderly and rapid development of these processes it is necessary to continually review the internal steps of each process and to compare processes on a common basis.

The objective of this study was to develop a process cost and design model which can predict construction and operating costs for a wide range of FPC process conditions. The model was to handle a number of the FPC processes, operated singly or in conjunction with associated operations such as fish meal manufacture. This approach of making predesign computer estimates (3, 4) is becoming a common tool of management in process industry research and development.

A. Engineering Economic Model

The model consists primarily of a digital computer program which determines the size and cost of major items of equipment for each process and then estimates the costs. The model is constructed so that new information

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at the bench scale, pilot plant, and demonstration plant levels can be easily incorporated to keep the program current with the available knowledge about each process.

Typical process flow sheets were developed with suitable options for each of the processes. These were used along with the available information on the process to prepare the material and energy balance portions of the program. Changes in flow sheets, types of equipment, processing sequences, and operating conditions, may be made following the internal program changes procedures.

From the material and energy calculations, the major items of equipment are sized and their cost estimated through built-in design and cost information. The program then determines the operating and manufacturing costs subject to the input data and internal assumptions of the model.

Two important features of the program are the built-in consistency of estimates for different processes and the continuity of estimates during the several stages of development of a given process. The uniformity of estimates results primarily from the use of a common set of equipment cost subroutines and a common set of assumptions regarding such cost items as indirect costs, land, engineering, etc. Since input data include the cost of labor, plant size, and cost indices, the program is useful in many broad-based studies of FPC production in different parts of the world at the present and in the future.

The model provides for each FPC process to be studied both internally and externally in comparison with alternate processes. Internal costs identify areas needing further research and development. The ability to estimate costs for a number of processes for a wide range of input conditions provides the broad comparison type information needed to guide a variety of research and development projects. The engineering economic model contains five process plant programs: fish meal; biological; isopropyl alcohol extraction; press cake-biological; and press cake-isopropyl alcohol extraction. Process descriptions and flow sheets are presented in the next chapter.

Fish meal processing is a common operation and there are many such plants throughout the world. Fish meal is used for animal feed while

the other processes make products for human consumption. It was included to provide a basis for comparison and because frequently intermediate meal products are a starting point for the FPC processes. The other processes are viable candidates for commercial manufacture of FPC.

B. Cost Estimation

In the development and use of the model it is important to have accurate cost information. Equipment and capital cost data were obtained from a number of recent publications. These figures were compared and reviewed for consistency and accuracy. In several instances costs were adjusted to meet the actual experience of individuals knowledgeable in the field of marine protein manufacturing. Finally all costs were adjusted to the base of early 1970.

The adjustment of cost data from the past several years to an early 1970 value was made using the Marshall and Stevens Equipment Cost Index which is published in the periodical *Chemical Engineering*. The M & S Equipment Cost Index is based on a value of 100 in the year of 1926. The early 1970 base value of 297.5 is used for equipment costs in this report.

Adjustment in costs from one year to another is accomplished by multiplying the known cost by the ratio of the index values at the two years involved to obtain the desired cost. The choice of the M & S Index over several other indices that are available was based on the fact that the components used in the M & S Index are more nearly those present in FPC plants, and the general observation that all the indices have been moving at about the same rate in recent years.

Use of these indices over more than a few years leads to considerable uncertainty and is not recommended. It is hoped that users of the model will continually update the data from the best sources available and not resort to changing the cost index alone. Equipment is continually being developed and many specific items do not follow the average trends.

There is a wide variation in costs at any given time. This is due in part to the inventory and backlog situation of the individual manufacturers and suppliers. The best cost information is a written quotation for a specific item

to be purchased during a given period. In a number of instances, particularly for the IPA-Extraction process (17), quotes on equipment were available and were used in adjusting the literature data. Essentially the same thing was done, through discussions with experienced persons, for the typical fish meal process.

The capital cost estimating procedure of Guthrie (6) was used in developing the process engineering economic model. A module technique is employed in which cost elements having similar characteristics and relationships are grouped together. This grouping is discussed in the program output section. Published equipment cost information was obtained from a number of sources (6, 7, 8, 9, 10, 12, 13, 14, and 15). The cost data were fit to appropriate equations and are contained in the cost subroutine. This portion of the computer program and procedures for changing the data are discussed later in the report.

Costs of chemicals and raw materials were taken from recent issues of the *Oil, Drug and Paint Reporter* and from actual purchasing experience. Some of these are program input items and can be changed whenever the program is used. The cost of fish is quite varied and depends greatly on local conditions. Fish meal manufacturers often make contractual arrangements with the boat owners whereby the final price paid is dependent upon the income ultimately received from selling the fish meal. This input item will require close attention of the program user. The tradition of the industry of speaking in terms of fish rather than weight can also be a point of confusion. For menhaden, one million fish is taken to be 755,000 pounds of fish.

C. Process Economics

The model develops the construction, operating, and production aspects of each process subject to specific input and internal information. It does not deal with the economics of selling the products and the resulting profits and return on investment.

Each of the processes makes several products and consequently requires the managerial decisions of cost allocation to establish selling prices of products. Marketing, inventory management, product distribution, and sales con-

tracting are important factors in the final decision on commercial operation. The model is intended to provide processing information upon which preliminary deliberations and decisions of the venture risk type can be made.

It is most important in using the model to recognize its limitations. Of the processes in the model only fish meal processing is a commercial operation at present. Even in this case the model attempts only to give representative information for a somewhat typical kind of plant under average conditions in the United States. Several IPA extraction plants for FPC production are under construction. The model IPA process is based on a modified analysis of the National Marine Fisheries Service Experiment and Demonstration Plant at Aberdeen, Washington. In all other instances the processes are in the early pilot plant level of development.

The model is also generally limited to use for plants handling 50 or more tons per day of fish. Modern domestic fish meal plants handle 1,000 or more tons per day and it is expected that FPC plants will be in the range of 100 or more tons per day. There is significant interest in processing FPC on board ships and developing small village industry operations. Use of the model in the 10 to 50 tons per day range will require some modification or at least close attention and judgment about the details of the output.

The model is presently applicable to coastal plants. To place one of these processes on board a ship will require significant changes. Generally space is a limiting factor on board ship and the processes would need to be redesigned for compactness. Special modifications to the ship could be costly, while certain land operation requirements, such as pollution control, might be eliminated, resulting in savings.

Village industry operation, and operation in foreign countries in general, will require a number of changes. The model provides for modern, instrumented, continuously operating plants. Equipment costs are for the United States and, in general, the plants are custom-made large facilities. Smaller plants, in the 10 ton per day sizes, might be mass-produced and thereby benefit from unit cost reduction much like appliances. If the appliance approach is not used on-site fabrication of village level

plant would probably be of the batch type. Such plants would have additional difficulties with quality control. A training program for village plant operators might be necessary to overcome potential health and operating problems.

III. DESCRIPTION OF PROCESS MODELS

A. Fish Meal Process

The diagram of the fish meal plant is given in Figure 1. On the drawing, the streams are labeled. The fish are processed for three products, fish meal, fish oil, and fish solubles (50% water). An option is provided as to whether fish solubles are produced as a product or added to the fish meal.

Fish are unloaded from the boat by fish pumps. A weighing conveyor carries the fish to a storage unit which has a three-day capacity. A bucket conveyor takes fish from storage and drops them into a cooker. Oil is removed from the cooked fish in a continuous screw press.

The press cake leaving the press contains 50% solids. This stream in tons/day is labeled AA(91,2). The press liquor contains the oil and water from the fish and 15% of the total fish protein. It is labeled AA(91,3). The cookers are available in 100 ton/day and 250 ton/day sizes. Similarly two different sizes of screw presses are available. The selection of cookers, presses, and screens is internally handled in the program.

The program then branches to two processing streams. The stream containing most of the oil and water is discussed below. The first input option considered is whether to add the fish solubles streams to the fish meal stream [IPTION(1) = 2], or to market them as separate products, [IPTION(1) = 1].

From the presses, stream AA(91,2) passes through a mixer where the recycled fish solubles may be combined with the main stream. The stream then goes to steam tube drying in which approximately one-half of the weight is evaporated. Antioxidant, corresponding to 0.01 #/# of oil retained in the fish meal, is then added. The meal passes through a

mixer to a storage unit where it is cured for 15 days. The meal is milled prior to bagging.

Stream AA(91,3) is centrifuged. The centrifuge is sized from the flow in gallons/hour. The oil is then polished with hot water (10% of the oil weight of water is used) in a second centrifuge. The dummy variable TONSA is used for this stream at this point in the program. The fish oil product is designated AA(90,5). All hold tanks in the stream have a one-hour holding time. The fish oil storage capacity is 15 days.

The water and soluble protein are conveyed into an acid mix tank where it is mixed with sulfuric acid. This stream TONSW then passes into a triple effect evaporator. The streams TONA and TONC are in tons/hr rather than tons/day. TONA is the inlet stream to the triple effect evaporator. TONC is the stream from the third effect going to the concentrator. The resulting fish solubles stream is 50% protein. It may be marketed as a product AA(90,4) or returned to the mixer and processed as fish meal. The storage capacity for fish solubles is 15 days.

In summary, three products may be produced—fish oil, fish solubles, and fish meal. Also, by an appropriate choice of option the fish solubles may be recycled and processed with the fish meal.

B. Biological Process

In the biological processes the proteins of the fish are partially hydrolyzed with enzymes to permit separation of the oil, bone, and proteinaceous material. The distinguishing feature of the process is large heated and stirred vessels into which the ground fish is fed and in which the digestion takes place. The subroutine handling this process is labeled "Subroutine Biolog"; the flow streams and equipment blocks of this subroutine are identified in Figure 2. In addition to the standard four-card input discussed in Section IVD, "Biolog" requires 5 input items which are entered on a fifth card in E12 format.

1. UNLOADING, STORAGE AND GRINDING

The handling of the fish up to the digester stage includes fish pumps, conveyors with wash

Fig.2 BIOLOGICAL PROCESS

and weighing provisions, and refrigerated brine storage. Storage is an expensive equipment item and a capacity sufficient for 3 days of plant operation is assumed. From the refrigerated redwood bin the fish are taken by means of a bucket elevator to grinders. The ground fish is conveyed to the digesting vats.

2. DIGESTERS

The digesters are stainless steel, jacketed, and stirred vessels. They are sized for 5-hr residence time, with the assumption that each plant needs at least three vessels in order to provide a continuous feed to the equipment processing the digested stream. If a plant capacity exceeds three 10,000 gal. vessels, the number of vessels is increased. The streams feeding into the digesters besides the ground fish are 1) water, 2) enzyme, 3) CaOH, 4) 5N-NaOH, 5) antioxidant, and 6) conc. H_2SO_4 . All of these streams have a separate identification in the AA(90,J) matrix (see Fig. 2); thus if processing conditions at the digester stage should change in the future, these changes can be made in sub-program "Biolog" without unduly affecting the other parts of the program. The program contains the following relationships between the streams:

- a water — equal in weight to ground fish feed.
- b enzyme — added in sufficient quantity to correspond with effectiveness (program input).
- c CaOH — 0.84% of the weight of the ground fish feed.
- d 5N-NaOH — 4.3% of the weight of the ground fish feed.
- e Antioxidant — 0.01% of the (oil & ash & protein) of the fish feed.
- f conc. H_2SO_4 — 1.9% of the ground fish feed (added after hydrolysis).

Digestion itself is a 5-hr batch process, but since at least 3 digesting vats are used per plant, the streams after the digesters are continuous. The digested fish slurry is fed by gravity into vibrating screens (one screen per digesting vat) for removal of bones and scales. The screened liquid is pumped to a self-cleaning disk centrifuge for separation of undigested solids and oil from the aqueous stream.

3. BONE FEED STREAM

The bone feed stream consists of the bones and scales removed from the vibrating screens (moisture content 50%) and the sludge discharged from the desludger centrifuge (moisture content 76%). The bone feed stream is conveyed into a stream tube dryer where the moisture content is reduced to 10%. The dry bone feed is sent to a hammer mill and then bagged. The final product stream [AA(90,3)] identified as "bone feed" is 40% protein, 22% oil, and 28% ash.

4. OIL STREAM

Approximately 75% of the lipid content of fatty fish is removed in the oil discharge from the disk centrifuges. Most of the balance of lipids is adsorbed on the undigested solids and removed in the sludge discharge. The oil stream from the centrifuges is pumped into intermediary storage tanks (with a maximum storage of one hour). About 10% additional hot water is added to the oil and the mixture is fed to "Sharples" type polishing centrifuges in which the water including solvated solids and blood are removed. The product fish oil can be stored up to 15 days and is sold in bulk.

5. DISSOLVED SOLIDS

Less than 1% of the total fish lipids are contained in the aqueous main stream discharge from the disk centrifuge. This stream is pumped to a wiped film evaporator in which the stream moisture content is reduced to 50%. This evaporator output stream is called "fish paste." Depending on the input option, all or part of it is either packaged in cans or fed into a spray dryer where the moisture content is further reduced to 5%. The exit stream from the spray dryer is bagged as the "dry concentrate" product. The fish paste product is 41% protein, 0.3% oil, and 8.3% ash. The dry concentrate is 79% protein, 0.5% oil, and 16% ash.

C. Press Cake-Biological Process

This process (Figure 3) is similar to the Biological process. The differences are that be-

Fig. 3 PRESS CAKE - BIOLOGICAL PROCESS

fore being fed to the digestion vats the fish are cooked and pressed as in the Fish Meal Process. The separation of oil and stick water takes place before rather than after the digestion stage. Process description: a) Input (besides the standard input) is the same as for the Biological process, except that in this case the enzyme which is added to the digester is based on 100 lb. of cooked and pressed fish (referred to as press cake) rather than on raw ground fish; b) Unloading and storage processes include fish pumps, conveyors with wash and weighing provisions, and refrigerated brine storage for up to 3 days of plant operation. The stored fish is lifted by bucket elevators into steam cookers. The fish are cooked and pass into screw presses where the moisture content of the "press cake" is reduced to 60%.

The press liquor is screened and pumped from a hold tank to a centrifuge for oil separation and "foots" removed by screening are recycled to the press. The separated oil is polished with hot water in a second liquid-liquid centrifuge, as in the Biological process, and pumped to bulk storage.

The aqueous "stickwater" stream from the first centrifuge contains both soluble and insoluble solids. It is added to the press cake in the digesting vats along with additional water to form a press cake slurry for enzymatic hydrolysis. For hydrolysis with the alkaline enzyme the pH is adjusted with 5N NaOH at 2.2% of the weight of raw fish feed.

After a 4-hr hydrolysis the slurry is passed through a vibrating screen. Bones and scales with a 50% moisture content are conveyed from the screen to a stream tube dryer where the moisture content is reduced to 10%. The dry bone meal is sent to a hammer mill and then bagged.

The screened hydrolysate is concentrated to a fish paste containing 50% solids in a wiped film evaporator. Depending on the input option, all or part of it is either packaged in cans or fed into a spray dryer where the moisture content is further reduced to 5%.

The final products are bone meal (36% protein, 9.7% oil, 47.4% ash), fish paste (39% protein, 6% oil, 5% ash), dry concentrate (75% protein, 11% oil, 9% ash) and fish oil. Insoluble solids are not removed by centrifuga-

tion as in Biological process.

D. IPA Extraction Process

The IPA process is shown in Figure 4. This is a solvent extraction process in which water and lipids are removed using isopropyl alcohol (17). Solvent recovery and recycle is an important part of the process. The first decision variable is whether wet deboning or no deboning is used. In wet deboning the bones are dried, ground in a hammer mill, packaged and sold as bone meal. This option is activated when IPTION(1) is equal to one. If no deboning is desired, no option is specified. In this case, the dried concentrate product will contain both protein concentrate and bone meal.

Unloading and storage processes include fish pumps, conveyors with wash and weighing provisions, and refrigerated brine storage for 3 days of plant operation. The ground fish is pumped to a slurry mix tank where solvent miscella M-2 is added. The solids go through four stages of extraction. They are separated from the miscella between stages by screens and presses.

For the material balance on the extraction vessels the miscella stream are designated STRMM(I) where I is the stage number. The constituent streams of oil, protein, ash, water, and isopropyl alcohol are designated STRM(I, J). Here, however, the index I designates the stream entering the Ith stage or leaving the I + 1 stage. The unit operation of this part of the process is a 4-stage liquid-slurry extraction process in which an azeotrope of isopropyl alcohol and water is used as the extractive solvent. The solvent to fish ratio is 2:1.

1. FISH PROTEIN CONCENTRATE STREAM

The slurry stream leaving the fourth stage of extraction contains the ash, most of the protein, and a small residual amount of oil. This stream enters a series of dryers (dryer, strip-dryer, and conditioner) in order to reduce the moisture of the stream to approximately 8% and to reduce the IPA residual to below 250 ppm. The amount of material leaving the conditioner is designated TASB. The fraction

Fig.4 ISOPROPYL ALCOHOL EXTRACTION PROCESS

of protein retained in the fish protein concentrate is designated as ZA7 and the amount of bone meal in the FPC is ZA8. The original fractions chosen are 0.96 and 0.04 respectively. They can be changed readily without affecting the main body of the program. The finished concentrate and bone meal are then milled and packaged.

2. OIL STREAM

The stream containing the bulk of the oil is the miscella stream leaving the first stage. This stream is acidified (conc. H_2SO_4 at 1.9% of fish feed) and enters an oil-water centrifuge. Approximately one-half of the oil is removed. This oil plus the oil from the still bottoms product, which was centrifuged, are combined into one stream. About 10% hot water is added to this stream before it enters a polishing centrifuge. This oil can be stored up to 15 days and is sold in bulk.

3. SOLVENT RECOVERY

The rest of the oil and solvent from the first oil-water centrifuge is heated prior to the distillation process. The solvent, which is mostly isopropyl alcohol, is distilled in a 25-tray column. SBOT(I) designates the constituent bottoms consisting of isopropyl alcohol, water, oil, and soluble protein. The product at the top of the column is designated STOP(I) and consists of isopropyl alcohol and water. The recovered solvent is then pumped to the storage tank where make-up isopropyl alcohol is added as needed.

4. FISH SOLUBLES

The non-oil portion of the centrifuged column's bottoms is fed to a triple effect evaporator. The product is further concentrated to 50% protein in a concentrator evaporator.

The products stream consists of fish protein concentrate AA(90,7), bone meal AA(90,3) (if wet deboning is specified), fish oil AA(90,5), and fish solubles AA(90,4).

E. Press Cake--IPA Process

The Press Cake-IPA process combines the proved technology of IPA extraction with a pre-processing of the raw fish in order to provide a more concentrated and more easily stored feed. A diagrammatic representation of the process is shown in Figure 5.

1. UNLOADING, STORAGE, AND PRESS CAKE PRODUCTION

The fish is unloaded by means of fish pumps, weighed and washed and stored in refrigerated brine. A storage capacity sufficient to provide 3 days of feed to the press cake production unit is provided. From the brine storage vat the fish is lifted by bucket elevators into steam cookers. The fish is cooked, crushed, and passes into a screw press which reduces its moisture content to 60%. The excess liquid passes through a vibrating screen filter into a hold tank. This liquid is processed separately in order to recover the oil and dissolved solids. The compressed bulk fish, called "press cake," is ground, transported by screw conveyors either into a closed redwood bin for intermediate storage in IPA or directly into the IPA extraction stages. The capacity of the intermediate storage is sufficient to provide a 50-day backlog for the IPA extraction portion of the plant.

2. IPA EXTRACTION

The press cake is turned into the final FPC product through multistage countercurrent IPA extraction. The program is set up in such a way that the number of extraction stages and their individual efficiencies can be changed readily. The standard number of stages is assumed to be four; however, any number up to eight can be specified in the input. If the desired number of stages is *other than four*, that number should be entered in column 40 of the first input card.

After each separation stage a detailed material balance on each component of the input-output streams is performed. The separation efficiencies for each component and each stage can be specified separately. They are stored in the library subprogram LIBRE and can be

Fig. 5 PRESS CAKE ISOPROPYL ALCOHOL EXTRACTION PROCESS

changed readily without modifying the main program.

Consider two sequential stages I and I + 1:

The J index describes the five main components of the stream. The relationship is as follows:

- J = 1 — Oil
- J = 2 — Protein
- J = 3 — Ash
- J = 4 — Water
- J = 5 — IPA

The quantity for each component exiting from stage I + 1 is computed by the following relationship:

$$STM(J, I+1) = STM(J, I) * DATB(I, J)$$

Where: 1-DATB(I, J) is the extraction efficiency for component J in the I + 1 stage. These quantities are thus stored in the readily accessible LIBRE subprogram.

The above definition has to be modified for the case of the IPA content leaving the first extraction stage. The modification is:

$$STM(5, 1) = STM(4, 1) * DATB(1, 5)$$

3. FISH PROTEIN CONCENTRATE STREAM

The slurry stream leaving the final extraction stage contains the ash, most of the protein, and a small residual amount of oil. The stream enters—in sequence—a dryer, a stripper dryer, and a conditioner in which its moisture content is reduced to about 8% and the IPA residual falls below 250 ppm. The solid stream leaving the conditioner is labeled TASB. It is milled, weighed, and packaged.

4. OIL STREAM

The stored liquid from the press cake production process and the still bottoms from the solvent recovery still are fed into a liquid-liquid

centrifuge. Oil separation efficiency is assumed to be 94%. Bottoms containing the dissolved solids are fed into a storage tank in order to be processed through evaporators, the top oil containing fraction is pumped into a polishing "Sharples" type centrifuge. Here 10% volume fraction of hot water is added. The purpose of this centrifugation is to remove entrained blood and remaining solids. The polished oil is fed into final oil storage tanks. A storage capacity sufficient for 15 days production is designed.

5. FISH SOLUBLES

The stream containing dissolved solids from the liquid-liquid oil separation centrifuge is fed into a triple effect evaporator followed by a concentrator. The moisture content is reduced to about 50%, the product is acidified and stored as fish solubles.

6. SOLVENT RECOVERY

The solvent-containing stream is preheated and passed into a 25-tray distillation column. The bottoms of the column pass, as noted, into the liquid-liquid centrifuge of the oil separation stream, the solvent-containing tops go through a charcoal filter and, after addition of requisite amounts of makeup solvent, are recycled to the IPA separation stages.

IV. COMPUTER USER INFORMATION

A. Program Outline

The programs making up the FPC cost analysis code can be divided into three classes.

- 1 Programs handling input and output data and performing calculations which are common to all FPC production processes. This class includes the MAIN program and the subprograms MATER, CAPTOL, and OPERAT.
- 2 The programs describing each of the five separate processes. The main portion of the computations is performed by these programs. The material and energy balances are computed. On the basis of this information and on

built-in decisions regarding equipment sizes (see Section B) the required capacity for the major equipment items are calculated. The six programs in this class and the process which they analyze are:

<i>Program Name</i>	<i>Process</i>
FPCXXI	Fish meal plant
BIOLOG	Biological process
PRESCK	Press cake biological process
XXIPA	Isopropyl alcohol extraction
PRSIPA	Press cake-IPA extraction process

3 The service and information subprograms. These consist of a large number of largely similar subprograms which calculate the cost for individual equipment items and of the library subprogram LIBRE which contains all of the costing data. The costing subroutines are discussed in more detail in Section C. Usually they are named directly by the equipment name and given an equipment capacity return, its cost and the cost breakdown. In some cases similar types of equipment are handled by single subroutines. The list of the equipment subroutines is:

<i>Identification Number</i>	<i>Equipment</i>	<i>Sub-routine Name</i>
6 =	Conical Hopper	Hopper
7 =	Fish Storage	Silo
8 =	Scrubbers	Condens
11 =	Pulveriser	Pulver
17 =	Screw Conveyor	Screw
18 =	Hammer Mill	Hammer
19 =	Drum Dryer	Dryer
20 =	Pan Dryer	Deyerp
21 =	Rotary Vacuum Dryer	Dryerr
27 =	Boiler	Boiler
30 =	Spray Evaporator	Evpspr
31 =	Wiped Film Evaporator	Evpfm
32 =	Forced Circulation Evaporator	Evpfrc
33 =	Vertical Evaporator	Evphor
40 =	Shop Fabricated Tank	Storag
42 =	Pressure Vessel	Vessel

43 =	Distillation Column	Column
49 =	Jacketed Reacting Vessel	Reactr
50 =	Fish Grinder	Grinder
51 =	Vibrating Screen	Screen
52 =	Sharples Centrifuge	Sharp
53 =	Solid Bowl Centrifuge	Bowl
54 =	Vertical Basket Centrifuge	Cntfge
57 =	Free Flowing Solvent Blender	Blendr
65 =	Reciprocal Pumps	Pmprec
66 =	Centrifugal Pumps	Pmpcent
67 =	Shell-Tube Heat Exchangers	Heatex
70 =	Belt Conveyor	Belt
71 =	Bucket Conveyor	Bucket
72 =	Scale	Scale
73 =	Agitator-Propeller	Agitor
74 =	Ball Mill	Balmil
75 =	Bagging Machine	Baggma
78 =	Rotary Drum Filter	Filter
80 =	Overhead Crane	Cranes
81 =	Drag Conveyor	Dragma
85 =	Mechanical Refrigeration	Refrig
99 =	Facilities	Fascil

The library program LIBRE performs no other function besides storing the cost data for all equipment items and those process raw materials which are not given in the input data. These data are made available to all the subroutines by reading the contents of LIBRE into a large common block which is made up of two rectangular matrices and a linear matrix, namely AA (100,20), IA (100,5), and BB (100). The first index of the AA and IA matrix usually refers to the identification number of specific equipment items. The BB matrix contains raw material cost data. Thus LIBRE has to be called just once for each individual cost calculation. This is done from the MAIN program.

Most of the program changes which will be necessary as cost data change or become more accurately known can be done in LIBRE. This is discussed in more detail in Appendix A.

The interrelationship of programs during a typical calculation is shown diagrammatically in Figure 6.

Figure 6

Simplified Flow Diagram for the
FPC Cost Analysis Program

B. Equipment Sizing

This section follows the listing of equipment in subroutine LIBRE. Only those items of equipment about which design decisions had to be made are discussed.

Pulp Presses are 6 feet long and the diameter in inches is calculated by the relation $8(\text{ton-days}/50)^{1/2}$ up to 24.

Screw Presses (for fish meal) are in two sizes with preference for the large one. For 250 ton-days the size is 21 feet long and 16 inches in diameter and for 100 ton-days, or less, the size is 15 feet long and 12 inches in diameter.

Rotary Steam Tube Dryers are sized according to amount of feed based on 2.5 square feet to process one ton-day of material fed per day.

Cookers are based on 0.25 square feet per ton-day of fish.

Boilers are based on 150 psig steam and sized in terms of 1.05 times required steam for the entire process.

Spray Dryers are sized on pounds of water to be evaporated as given in reference 7.

Wiped Film Evaporators are based on $\Delta T = 50^\circ \text{F}$ and $U = 500 \text{ BTU/hr ft}^2 \text{ }^\circ \text{F}$ giving the relation area in square feet equal pounds of water evaporated per hour divided by 25.

Forced Circulation Evaporators are based on $\Delta T = 50^\circ \text{F}$ and $U = 400 \text{ BTU/hr ft}^2 \text{ }^\circ \text{F}$ giving the relation area in square feet equal pounds of water per hour evaporated divided by 20.

Vertical Tube Evaporators are taken as (a) three in series with $\Delta T = 50^\circ \text{F}$ and $U = 400 \text{ BTU/hr ft}^2 \text{ }^\circ \text{F}$ giving the relationship area in square feet equal pounds of water evaporated divided by 20, or (b) the concentrator evaporator which has $\Delta T = 50^\circ \text{F}$ and $U = 500 \text{ BTU/hr ft}^2 \text{ }^\circ \text{F}$ giving the area in

square feet equal to the pounds of water evaporated divided by 25.

Storage Tanks are based on the holding time for the stream involved.

Distillation Columns are prorated from the Experiment-Demonstration Plant (EDP) still design and directly scaled. Stage number is 25, height is 54 feet and reflux ratio is two as they are in the EDP. The diameter of a still cannot be less than 4 feet and increases in 2-foot intervals of diameter (4, 6, 8, etc.).

Reactor Vessels (biological) are sized based on a residence time of 5 hours. The minimum number of vessels for a plant is three. The maximum vessel size is 10,000 gallons.

Fish Grinders are in two sizes for 150 and 75 ton-days with preference for the larger size. Horsepower requirements are based on 40 Hp/3 tons/hr throughout.

Centrifuges are of two types. Solid-liquid (disk-type slimers) having 2000 gallons per hour of throughput, and liquid-liquid (Sharples) having 1000 gallons per hour capacity. In both cases only one size is used and it requires 20 horsepower.

Pumps, both centrifugal and reciprocating, are sized in terms of the product of gallons per minute times the required pressure in psi, generally taken as 30 psi.

Heat Exchangers are of two kinds. Heaters using steam are sized according to area in square feet equals 0.1 times pounds of steam required, ($\Delta T = 20^\circ \text{F}$ and $U = 500 \text{ BTU/hr ft}^2 \text{ }^\circ \text{F}$ and the cooling water rise is 20°F).

Belt Conveyors are taken as 100 feet long. For less than 150 ton-days the width is 36 inches and for greater than 150 ton-days the width is 48 inches.

Bucket Conveyors are based on a lifting height of 20 feet.

Agitators are for two purposes. For slurries the required horsepower is 0.01 times the tank volume in gallons. For waterlike liquids the horsepower is 0.005 times the tank volume in gallons.

Bagging and Packaging Machines are based on bags or cans per minute. 100-pound bags are used for fish meal, 25-pound bags for FPC and other dry products, and 5-gallon cans for paste products.

Refrigeration includes brine recycle pump and heat exchanger and is based on 0.5 tons of refrigeration per ton of fish stored and three days of fish storage.

Brine make-up — This is a unit called a Brinopac, which delivers 50 gal/hr of 100° brine. It is 24 inches in diameter. The price FOB with hopper is \$1,190. This unit is good for any plant up to 300 ton-days. For any larger plant, the unit would cost \$1,880.

Boiler Feed Water Treatment — This includes all the material to purify the boiler feed water, i.e., the water in the make-up tank is deaerated to get rid of dissolved O₂ and CO₂. Ion exchange is used to eliminate Mg and Ca ions. A pH adjustment is also made. The initial unit for boiler feed water treatment for any size is about \$1,000. After that, it costs \$100/month for upkeep.

Buildings are sized at 14 square feet of ground floor per ton-day of fish. Generally buildings are 40 feet high and have several levels depending on operations.

Real Estate is based on 0.0050 acres per ton-day of plant capacity.

Warehouse space is taken as 15 square feet per ton-day for fish meal plants and 3 square feet per ton-day for other plants.

Fish Pumps are reciprocating type. The plants use one fish pump for each 500 ton-days of fish. Smaller plants have one pump.

Dock Facilities are 2,400 square feet for each fish pump.

C. Equipment Subroutine

The material base cost of almost all pieces of equipment are estimated by the equation

$$\text{Base Cost} = a (\text{SIZE})^b \quad (1)$$

The installation cost, labor cost, and incidental costs are determined by

$$\text{Subsidiary Costs} = (\text{Base Cost}) \cdot d^i \quad (2)$$

where d = cost factors in LIBRE, $i = 1, 2, 3, 4$.

The subprogram associated with the fisheries costing programs uses the following variables:

COST (1)	Base Cost
COST (2)	Field Materials Cost
COST (3)	Labor Cost
COST (4)	Indirect Cost
COST (5)	Total Cost
COST (6)	Uncertainty in Cost

The base cost is updated by multiplying the value determined in equation (2) by the Marshall and Stevens index BB (1).

The factors accounting for materials cost, labor cost, indirect cost, and uncertainty cost as well as the constants a and b are stored in program LIBRE.

The factors are:

AA (IX,7)	= Unit Cost (a)
AA (IX,8)	= Exponential in Cost Equation (b)
AA (IX,11)	= Materials Cost Factor
AA (IX,12)	= Direct Cost Factor
AA (IX,13)	= Indirect Cost Factor
AA (IX,14)	= Uncertainty Cost Factor

In a limited number of the subprograms, the factor a depends on a second size variable. In this case the cost is entered directly into the subprogram:

i.e. SCREWR

Furthermore, in some cases, it is desired to have a materials option. Several approaches have been used in the program:

i.e. PMPCNT
STORAG

In subsequent changes it is recommended that the following procedure be used. The material is selected in the program and designated by IA (IX,5)=INTEGER. For example if the equipment is to be constructed of monel then IA (IX,5) = 8: it is not necessary that the integer be associated with the same material for each item of equipment. In the subprogram one has the statements

```
IF (IA (IX,5). EQ. 8) BB (2) = 6.1
COST (1) = COST (1) * BB (2)
```

The second card comes after the computation of the indirect, labor, and materials cost based on the initial base cost.

The factor BB(2) can be entered from the main program (XXIPA, BIOLOG, etc.) as well. In addition a print statement is added to be consistent with the new option.

Usually the sizing equation is adequately represented by one sizing variable. This term is designated AA (IX,17). Occasionally it is necessary to have two variables, in which case the variable is usually AA (IX, 18), although on occasion AA (IX,20) has been used.

To illustrate the costing program we consider a typical subprogram BUCKET, the program for the bucket conveyor.

SUBROUTINE BUCKET*

1. IX + 71
2. Q = AA (IX,7)
3. IF (AA (IX,18). GR. 30. and. AA (IX, 18). LE. 75),
AA (IX,7) = AA (IX,7) + 180
4. IF (AA (IX,18). GR. 75.) AA (IX,7) =
AA (IX,7) + 280.
5. COST (1) = AA (IX,7 * AA (IX,17)
** AA (IX,8) * BB (1)
6. COST (1) = COST (1) * .001

* FORMAT, DIMENSION, PRINT, common statements have been omitted.

7. COST (2) = COST (1) * AA (IX,11)
8. COST (3) = COST (1) * AA (IX,12)
9. COST (4) = COST (1) * AA (IX,13)
10. COST (5) = COST (1) + COST (2) +
COST (3) + COST (4)
11. COST (6) = COST (5) * AA (IX,15)
12. DO 1 I = 1,6
13. 1 COST A (I) = COST A (I) +
COST (I)
14. AA (IX,7) = Q

Statements 2 and 14 are necessary in order that the values in LIBRE remain constant when the subroutine is used repeatedly.

Statements 3 and 4 adjust the value of the constant a [AA (IX,7)] for different values of AA (IX,18) which is the capacity of the conveyor in tons. The size unit AA (IX,17) is the height in feet.

Statements 5 and 6 determine the base cost in thousand dollar groupings. In 7-11 the costs of materials, labor, incidentals, and cost variation as well as total cost are determined.

In statements 12 and 13 the running cost of the plant option (IPA, Biological, etc.) is computed.

If different materials of construction were used then one would add the statement

```
COST (1) = COST (1) * BB (2)
```

between statements 9 and 10.

D. Program Input

The input to the FPC program can be divided into two parts: a) the "standard" input which is common to all of the different processes; b) the "optional" input presented in Section III, which discusses the individual processer; here we shall explain the standard input.

The standard input consists of four cards. The first of these enters integer input data, the remaining three enter input data in the floating point format.

<i>Program Variable</i>	<i>Columns</i>	<i>Description</i>
I. Card 1:	Format: (8I10)	
A. Iz	1-10	Fixes process to be analyzed. 1 = fish meal 2 = IPA 3 — biological 4 = press cake — biological 7 = press cake — IPA extrac- tion
B. Options	11-20	
1. fish meal		
IPTION(1)		1 = solubles are product
IPTION(2)		2 = solubles recycled
2. IPA		1 = wet deboning
IPTION(1)		blank = no deboning
II. Card 2:	Format (3E 12.5)	
tons	1-12	The tons of fish to be processed per day.
BB(1)	13-24	The Marshall-Stevens index tak- ing the 1970 index of 297.5 as one.
BB(50)	25-36	The operating days per year.
III. Card 3:	Format (5E 12.5)	
BB(5)	1-12	Cost of the fish in ¢/lb.
BB(6)	13-24	Cost of electricity in ¢/KWHr.
BB(7)	25-36	Labor and supervisory costs in dollars/hr.
BB(8)	37-48	Depreciation and interest in per- cent per year.
BB(10)	49-60	Fuel cost in dollars per therm.
IV. Card 4:	Format (3E 12.5)	
BB(30)	1-12	Oil composition of the fish in weight percent.
BB(31)	13-24	Protein composition percent.
BB(32)	25-36	Ash composition in percent.
V. (For Biological and Presscake programs only)		
Card 5:	Format (5E 12.5)	
BB(40)	1-12	The effectiveness of the enzyme being used in lbs. of enzyme re- quired per 100 lb. of fish being processed. (For press cake Biological, it is per 100 lb. of press cake being processed.)
BB(41)	13-24	Price of enzyme is \$/lb.

BB(42)	25-36	The percentage of the total dissolved solids stream coming out of the wiped film evaporator (see Figure 2) which is packaged in paste form.
BB(43)	37-48	The effectiveness of the antioxidant being used, in lbs. of antioxidant required per 100 lb. of fish or 100 lb. of press cake.
BB(44)	49-60	Price of antioxidant in \$/lb.

VI. (For Press cake — IPA extraction only)

Card 1:	Format (8I10)	
	40	The number of IPA extraction stages (if different than four) should appear.

E. Program Output

The output of the cost analysis program is presented in seven separate sections:

- 1) Printout of input data.
- 2) Detailed equipment costs.
- 3) Material and energy balance.
- 4) Cost of facilities.
- 5) Capital costs.
- 6) Operating costs.
- 7) Production Cost of FPC.

Each of these sections is printed out in the form of a table. The contents of these tables will now be taken up in turn.

1) *Input Data*.—Identifies the process being analyzed, prints out all of the external input data and operating options.

2) *Detailed Equipment Costs*.—This is the most extensive table of the output. It presents the total cost and the cost breakdown of each major item of equipment required in a given process. Each equipment item is identified, its capacity, capacity units, and major construction material is printed. Following this information the total cost and the cost breakdown for this equipment are given. The cost breakdown uses the scheme of Reference (6) which is identified in the table headings. That is,

the first column labelled "Base Cost" gives the FOB. to manufacturer cost for this type and capacity equipment. This cost is multiplied by the Marshall and Stevens index given in the input data. The methods used computing this cost, the sources of the required internal data and the means for modifying these data are presented in Appendix A.

The subsequent three columns present additional costs which are incurred before the purchased equipment becomes operable.

Column 2, the "Material Costs" includes such diverse items as piping, electrical wiring, equipment base, and heat insulation. Column 3, the "Labor Costs" are the labor costs incurred during installation, and Column 4, the "Indirect Costs", summarizes remaining expenses such as shipping, insurance, construction overhead, and construction engineering costs.

All of these cost items are calculated as factors of the first column. These factors vary with equipment type but not with capacity. For each equipment item they are tabulated in the subprogram LIBRE and are easily accessible for modification.

The fifth column, titled "Module Cost", is a summation of the four previous columns and represents the capital investment required to design, order, ship, and install a given equipment item. Finally, the last column, titled "Range", is an estimate of the reliability of

these cost figures. This estimate is based upon the cost data available at the end of 1969 and summarized in the LIBRE subprogram. As time passes and cost figures are modified, the range estimate should be changed as well.

The information described above is printed out individually for each major piece of equipment even if multiple items of identical type and capacity of equipment are required. The sequence of printing out this information starts with equipment required to unload and store the fish (that is, the first item is always the fish pumps), and after that follows the main process streams. For example, in the fish meal plant analysis the equipment required to process the solids stream is presented first, then come the centrifuges required for oil separation, the evaporators required to concentrate the dissolved solids, and finally equipment items which do not really fit into the process stream, as the boiler, fork lift, or the cost of the instrumentation loops.

3) *Material and Energy Balance.*—This table presents first the overall, then the detailed material and energy balance. In the overall section of the table the total steam, electricity, and cooling water used in the process is given. The fish feed is broken down into the oil, protein, and ash components.

The detailed portion of the table prints out the process stream balances in terms of hourly throughput. The sequence of printout generally follows the process stream flow lines as shown in Figures 1 to 6. Where branches in the process stream occur (for example at the separation of oil and stickwater for the fish meal plant) the balance calculation follows one of the streams to completeness and returns to the branch point to pick up the remaining stream.

4) *Cost of Facilities and Site Development.*—This table summarizes the cost of land, docks, warehouses, and process buildings. The cost breakdown is similar to that described for Table 2. The data used in the calculations are stored in subroutine LIBRE and are printed out for easy reference in the table.

5) *Summary of Fixed Costs.*—This is a summation of total capital costs. It includes

the already detailed costs for equipment and facilities plus provisions for spare parts, engineering of the plant, and contingencies. The latter three are calculated as fractions of the summarized equipment cost.

6) *Operating Costs.*—This table presents the total and detailed plant operating costs on a daily and yearly basis. The quantities of all the materials used in the process and their daily costs are printed out first. This portion of the table contains also such items as electricity, packaging, and labor and supervision man-hours. Under the title "City Water" only the water used in the process which must be of drinking quality is included. The cost of process water (i.e. for scrubbers and condensers) is calculated in terms of the electricity needed to pump it.

The second portion of the table includes items which are calculated as fractions of the total capital or equipment costs. These are depreciation (at a percentage figure given in the input), maintenance, and insurance. The factors used to calculate these costs appear in subroutine OPERAT. Where not supplied in the input, the prices of the process material are stored under the designation BB(I) in subroutine LIBRE.

The third portion of the table summarizes the production rate of various products on a daily and yearly basis.

7) *Production Cost of FPC.*—The last table is entitled "Production Cost of FPC." In this table the following are listed:

- a) by-products of the process
- b) the assumed selling price in cents/pound
- c) the by-products total worth.

Two prices of FPC appear at the end of the printout. The first price is calculated by dividing total operating cost by the FPC produced per year. The second price takes into account the process by-products by subtracting their total worth from the total operating cost before dividing by the FPC produced per year. The calculations and printout take place in the subprogram OPERAT. The assumed selling prices of the by-products are found in LIBRE [BB(66) to BB(68)] and can easily be changed.

APPENDIX

A. Internal Program Changes

A-1. INTERNAL DATA CHANGES

There are several occasions when it may be necessary to update the program. These include the following:

- 1) The estimated cost of an item of equipment is in error
- 2) a new piece of equipment is to be added
- 3) the equipment sizing routine is to be altered
- 4) a new option is to be added to the plant options
- 5) a change in the cost of chemicals.

Most changes, especially of the types 1 and 5, may be made directly in the program LIBRE. Changes in bare cost, incidentals, labor, and materials for the process equipment may be made by substitution of the appropriate cards in LIBRE.

Example 1

The cards in LIBRE for a Rotary Dryer are:

AA (21,7) = 1000.

AA (21,8) = .5

AA (21,11) = .30

AA (21,12) = .30

AA (21,14) = .30

For these values the base cost of a dryer with 400 square feet is estimated to be \$20,000.

The manufacturer's estimates for this equipment were \$30,000, with the installed cost, labor cost, and incidentals estimated correctly.

Solution:

The base cost of the equipment too low. The simplest adjustment is to alter the base cost AA (21,7) to give the correct value. However, an increase of the base cost results in a incidental increase as well. The recommended solution is to substitute for the above cards in LIBRE the new cards.

AA (21,7) = 1500.

AA (21,8) = .50

AA (21,11) = .20

AA (21,12) = .20

AA (21,14) = .20

Example 2

The price of sulfuric acid is 30% more expensive at Plant A than it is at the other plants.

Solution:

The card [AA (100,14) = 1.00] in LIBRE is replaced with AA (100,14) = 1.30.

Occasionally in some items of equipment, such as a screw conveyor, one cannot alter the program by a single change of cards in LIBRE. The reason for this is that the base cost is a function of the diameter of the conveyor, which is an additional input variable to the costing subroutine. In this case it is necessary to alter the costing subroutine itself.

Example 3

The cost of the screw conveyor with a diameter greater than 2" has been found to overestimate the cost by a factor of 12. The labor cost, the incidentals, and the installation costs are correctly estimated. All other estimates are correct.

Here one cannot simply change LIBRE since the modification would appear for other sizes as well. There are many ways of modifying the program; one way would be to add the card to the subroutine SCREWWR.

If (AA (IX,18).GT.12.) AA (IX,7) = .5* AA (IX,7) which states that if the diameter is greater than 12 then the base cost is reduced by 50%.

The addition of a new equipment item requires three changes to the program.

1) First the new subroutine is named and given a previously unassigned index number. The Fortran statement of the program would be closely modeled after existing subroutines. It is strongly recommended that AA (IX,17) be used to designate the principal variable in the costing equation.

2) The variables for the costing equations are added to LIBRE. These should include

AA (IX,7)	Base Cost
AA (IX,8)	EXPONENT
AA (IX,11)	Materials
AA (IX,12)	Labor
AA (IX,13)	Incidentals
AA (IX,15)	Range of COSTS

3) The calling subroutine must be added to the primary subroutines. This calling sequence will include at least a sizing equation and the call statement.

```
AA (IX,17) = SIZE * .01/24
CALL EQUIPM
```

A-2. EQUIPMENT SIZING AND PROCESS CHANGES

The equipment sizing routine is altered by changing statements in the primary subroutines.

Example 4

The area of heat exchangers in square feet was found to be 12% of the water evaporated rather than 10%, for the preheater to the distillation column.

Solution:

The subprogram XXIPA has the statement

```
FF = STEAMS * .1
AA (67,17) = FF
```

These two cards are removed and replaced with

```
AA (67,17) = STEAMS * .12
```

Which not only makes the desired change but increases the efficiency of the program as well.

Major changes in program options must be made in the subprograms. In addition changes must be made in the main program as well. In general, there is no simple way of making these modifications.

Example 5

It is wished to add a costing subprogram for the VIOPIN program.

The procedure is to write a subprogram in Fortran for the VIOPIN program analogous to the program for the IPA process.

In addition changes are required in the program MAIN and the program OPERAT.

The user by referring to the above programs and using the example of the IPA process, can by analogy make the appropriate changes necessary for VIOPIN.

The printout can be modified by substitution of Format cards in the appropriate program.

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17. Ernst, R. C., "FPC: The NMFS Experiment and Demonstration Plant Process," Commercial Fisheries Review, 33(2), 22-28, February, 1971.

C. FORTRAN Listing of Program

The FORTRAN listing of the program appears as Table I.

D. Sample Problems

To illustrate the capabilities of the program a cost study spanning the feasible range of plant sizes was conducted. The plant capacities chosen were 50, 200, and 1,000 tons of fish per day. Fish availability time in each case was 200 days per year. For all processes except the Press cake-IPA this corresponds also to the plant operation time. For the Press cake-IPA process the IPA extraction portion of the plant

can operate for an additional 50 days to process the stored press cake. Fish food composition corresponded to a "lean" species (oil fraction = 0.04) and a "fat" species (oil fraction = 0.12). The price of fish was taken as 1¢/lb. for these examples.

1. SAMPLE OUTPUT

The entire output printout for an IPA process plant having a capacity of 200 tons/day and sized for a "lean" fish feed is presented in the subsequent pages. The number headings identifying the tables are explained in Section IV-E. The detailed equipment printout table, IPA Plant Cost Analysis, (Table II,) can be interpreted by following the process description given in Section III-C.

E. Study Summarization

The output of the study is summarized in Tables III to VI. The first three present data for each of the three plant capacities producing FPC. Table VI summarizes the results of the bench mark fish meal process.

349. Use of abstracts and summaries as communication devices in technical articles. By F. Bruce Sanford. February 1971, iii + 11 pp., 1 fig.

350. Research in fiscal year 1969 at the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C. By the Laboratory staff. November 1970, ii + 49 pp., 21 figs., 17 tables.
351. Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Pascagoula, Mississippi, July 1, 1967 to June 30, 1969. By Harvey R. Bullis, Jr., and John R. Thompson. November 1970. iv + 29 pp., 29 figs., 1 table.
352. Upstream passage of anadromous fish through navigation locks and use of the stream for spawning and nursery habitat, Cape Fear River, N.C., 1962-66. By Paul R. Nichols and Darrell E. Louder. October 1970, iv + 12 pp., 9 figs., 4 tables.
354. Sanitation guidelines for the control of *Salmonella* in the production of fish meal. By E. Spencer Garrett and Richard Hamilton. October 1971, iv + 7 pp., 9 figs. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Price 25 cents. Stock number 0320-0023.
356. Floating laboratory for study of aquatic organisms and their environment. By George R. Snyder, Theodore H. Blahm, and Robert J. McConnell. May 1971, iii + 16 pp., 11 figs.
361. Regional and other related aspects of shellfish consumption — some preliminary findings from the 1969 Consumer Panel Survey. By Morton M. Miller and Darrel A. Nash. June 1971, iv + 18 pp., 19 figs., 3 tables, 10 apps.

Table I.—FORTRAN listing of program.

DEFOR,S MAIN,MAIN
FOR S9A-07/12-11:03 (0,)

MAIN PROGRAM

STORAGE USED: CODE(1) 000407; DATA(0) 000330; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016
0005 BLOCK4 000012

EXTERNAL REFERENCES (BLOCK, NAME)

0006 LIBRE
0007 FPCXX1
0010 XIPA
0011 HILOG
0012 PRESCK
0013 PRSIPA
0014 FASCIL
0015 CAPTOL
0016 OPERAT
0017 NINTR\$
0020 NRDU\$
0021 NIOP\$
0022 NRDC\$
0023 NPRT\$
0024 NSTOP\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000010	100F	0000	000052	1000F	0000	000062	1001F	0000	000072	1002F	0000	000102	1003F		
0000	000041	1007F	0000	000011	101F	0000	000114	1010F	0000	000120	1011F	0000	000132	1012F		
0000	000142	1013F	0000	000154	1014F	0000	000166	1015F	0000	000201	1016F	0000	000213	1017F		
0000	000013	102F	0000	000226	1020F	0000	000233	1021F	0000	000244	1022F	0000	000255	1023F		
0000	000015	103F	0000	000264	1030F	0000	000271	1031F	0000	000277	1032F	0000	000305	1033F		
0000	000313	1034F	0000	000017	1040F	0000	000030	1041F	0000	000004	106G	0001	000002	2L		
0001	000304	200L	0001	000403	999L	0003	000000	AA	0003	R	004704	BB	0000	R	000000	COST
0004	R	000007	COSTA	0003	003720	IA	0005	I	000000	IPITION	0000	I	000005	IV		
0000	I	000004	1W	0000	I	000003	TX	0000	I	000002	TY	0000	I	000000	J	
0000	R	000007	TONS													

00100	1*	C	FPC	PROCESS	COST	ANALYSIS	PROGRAM
00101	2*			COMMON/BLOCK1/AA(100,20),IA(100,5),BB(100)			
00103	3*			COMMON/BLOCK2/ COST(7),COSTA(7)			
00104	4*			COMMON/BLOCK4/ IPITION(10)			
00105	5*	2		DO 1 J = 1,7			
00110	6*			COST(J) = 0.0			
00111	7*	1		COSTA(J) = 0.0			

Table I.-- Continued.

```

00113      8*      CALL LIBRE
00114      9*      READ(5,100,END=999) 17,1Y,IX,IW,IV,IU
00124      10*      FORMAT(8I10)
00125      11*      READ 101,TONS,BR(1),BR(50)
00132      12*      FORMAT(3E12.5)
00133      13*      BB(1) = BR(1)*297./240.
00134      14*      READ 102,BR(5),BR(6),BR(7),BR(8),BR(10)
00143      15*      FORMAT(5E12.5)
00144      16*      READ 103,BR(30),BR(31),BR(32)
00151      17*      FORMAT(3E12.5)
00152      18*      BB(91) = IZ
00153      19*      IPTION(1)=1Y
00154      20*      IF(1Z.EQ.7) IPTION(5)=IW
00156      21*      FORMAT(//44H T4F WET DEBONING OPTION IS APPROPRIATE)
00157      22*      FORMAT(//44H T4F DRY DEBONING OPTION IS APPROPRIATE)
00160      23*      IF(1Z.EQ.1) PRINT 1000
00163      24*      IF(1Z.EQ.2) PRINT 1001
00166      25*      IF(1Z.EQ.3) PRINT 1002
00171      26*      IF(1Z.EQ.4) PRINT 1003
00174      27*      IF(1Z.EQ.7) PRINT 1007
00177      28*      FORMAT(1H1//20X,40H PRESS CAKE IPA PROCESS COST ANALYSIS )
00200      29*      FORMAT(1H1//20X30H FISH MFAL PLANT COST ANALYSIS )
00201      30*      FORMAT(1H1//20X30H IPA PLANT COST ANALYSIS )
00202      31*      FORMAT(1H1//20X35H BIOLOGICAL PROCESS COST ANALYSIS )
00203      32*      FORMAT(1H1//20X44H PRESS CAKE BIOLOGICAL PROCESS COST ANALYSIS )
00204      33*      PRINT 1010
00206      34*      FORMAT(//16H INPUT DATA )
00207      35*      PRINT 1011,TONS
00212      36*      PRINT 1012,BR(1)
00215      37*      PRINT 1013,BR(5)
00220      38*      PRINT 1014,BR(6)
00223      39*      PRINT 1017,BR(10)
00226      40*      PRINT 1015,BR(7)
00231      41*      PRINT 1016,BR(8)
00234      42*      PRINT 1030
00236      43*      BB(33)=100.0-BB(31)-BB(31)-BB(32)
00237      44*      PRINT 1031,BR(30)
00242      45*      PRINT 1032,BR(31)
00245      46*      PRINT 1033,BR(32)
00250      47*      PRINT 1034,BR(33)
00253      48*      FORMAT(//8X31H PLANT SIZE
00254      49*      FORMAT(//8X31H MARSHAL/STEVENS INDEX
00255      50*      FORMAT(//8X31H COST OF FISH
00256      51*      FORMAT(//8X31H ELECTRICITY COSTS
00257      52*      FORMAT(//8X31H LABOR AND SUPV. COSTS
00257      53*      )
00260      54*      1016 FORMAT(//8X31H DEPRECIATION AND INT. CHARGE =F10.2,10H PERCENT )
00261      55*      1017 FORMAT(//8X31H FUEL COST
00261      56*      CERM )
00262      57*      PRINT 1020
00264      58*      PRINT 1023,BR(50)
00267      59*      IF(1Z.NE.1) GO TO 200
00271      60*      IF(1Y.EQ.1) PRINT 1022
00274      61*      IF(1Y.EQ.2) PRINT 1021
00277      62*      200 CONTINUE
00300      63*      1020 FORMAT(//23H OPERATING OPTIONS )
00301      64*      1021 FORMAT(//8X45H SOLUBLE FISH SOLIDS RECYCLED TO MIXER 1Y=2 )

```


Table I.--Continued.

```

00302      65*      1022  FORMAT(/8X45H SOLUPLF FISH SOLIDS REMOVED AS PRODUCT TY=1 )
00303      66*      1023  FORMAT(/8X26H OPERATING DAYS PER YEAR =,F8.0)
00304      67*      1030  FORMAT(/8X18H FISH COMPOSITION )
00305      68*      1031  FORMAT(/13X11H OIL =,F6.2,8H PERCENT)
00306      69*      1032  FORMAT(/13X11H PROTEIN =,F6.2,8H ' ' ' ' )
00307      70*      1033  FORMAT(/13X11H ASH =,F6.2,8H ' ' ' ' )
00310      71*      1034  FORMAT(/13X11H WATER =,F6.2,8H ' ' ' ' )
00311      72*      IPTON(5)=IV
00312      73*      IF(IX.EQ.1) PRINT 1040
00315      74*      IF(IX.EQ.2) PRINT 1041
00320      75*      IF(IZ.EQ. 1) CALL FPCXX1(TONS)
00322      76*      IF(IZ.EQ.2) CALL VXTPA(TONS)
00324      77*      IF(IZ.EQ. 3) CALL RILOG(TONS)
00326      78*      IF(IZ.EQ. 4) CALL PRESCK(TONS)
00330      79*      IF(IZ.EQ.7) CALL PRSIPA(TONS)
00332      80*      CALL FASCIL(TONS)
00333      81*      CALL CAPTOL(TONS)
00334      82*      CALL OPERAT(TONS)
00335      83*      GO TO 2
00336      84*      STOP
00337      85*      999  END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

FOR S FPCXX1 FPCXX1
FOR 59A-07/12-11:03 (0.)

SUBROUTINE FPCXX1 ENTRY POINT 002231

STORAGE USED: CODE(1) 002315; DATA(0) 000600; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 RLOCK4 000012
0004 RLOCK1 005050
0005 RLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0006 PMPREC
0007 RELT
0010 STORAG
0011 PMPCNT
0012 BUCKET
0013 DRYERR
0014 SCREW
0015 SCREFF
0016 BLEND
0017 HAMMER
0020 SCALE
0021 BAGGMA
0022 CNIFGE
0023 SHARP
0024 EVPHOR
0025 ROILER
0026 CONDEN
0027 MATER
0030 NPRTS
0031 NI02\$
0032 NI01\$
0033 NEXP6\$
0034 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000214	1010F	0000	0000A5	1021F	0000	000047	1022F	0000	000203	1034F	0000	000174	1041F	
0000	000215	1060F	0000	000226	1061F	0000	000237	1062F	0000	000250	1063F	0000	000261	1064F	
0000	000272	1065F	0000	000303	1066F	0000	000314	1067F	0000	000325	1068F	0000	000336	1069F	
0000	000347	1070F	0000	000360	1071F	0000	000371	1072F	0000	000413	1073F	0000	000402	1074F	
0001	000027	111G	0001	000111	136G	0001	000146	155G	0000	000220	176G	0000	000103	2000F	
0001	000377	250G	0001	000514	3L	0000	000116	3000F	0001	000602	327G	0001	000530	4L	
0001	001032	422G	0000	000156	4242F	0001	001073	437G	0001	001457	51L	0001	000563	52L	
0001	001663	664G	0004	R	000000	AA	0004	R	004704	BB	0000	R	000000	COST	
0005	R	000007	COSTA	0000	R	000046	FISH	0000	R	000013	G	0000	R	000031	GALL
0000	R	000007	GALLON	0000	R	000010	GALLS	0000	R	000014	HP	0000	R	000000	I
0004	I	003790	IA	0000	000557	INJPF	0003	I	000000	TPTTON	0000	I	000040	J	
0000	I	000021	NA	0000	I	000023	NB	0000	I	000012	NUM	0000	R	000042	PXX

Table I.--Continued.

0000 R 0000044	SCRUB	0000 R 0000043	SOL	0000 R 0000045	CTM	0000 R 000011	SUMHP	0000 R 000015	TANK
0000 R 0000033	TONA	0000 R 0000034	TONB	0000 R 0000035	TONC	0000 R 000037	TOND	0000 R 000006	TONSA
0000 R 0000020	TONSB	0000 R 0000022	TONSC	0000 R 0000030	TONSCW	0000 R 000025	TONST	0000 R 000036	XLOOPS
0000 R 0000017	XNUM	0000 R 0000021	Z1	0000 R 0000032	Z2	0000 R 000004	Z3	0000 R 000005	Z4
0000 R 000001	Z6	0000 R 0000027	Z7						
SUBROUTINE FPCXX1(TONS)									
1*	C	FISH MEAL PRODUCTION							
2*	C								
3*	C								
4*	C								
5*		COMMON/BLOCK4/ IP(TON(10)							
6*		COMMON/BLOCK1/AA(100,20).IA(100,5).BB(100)							
7*		COMMON/BLOCK2/ COST(7).COST(7)							
8*		BB(3)=1.							
9*		BB(2)=1.							
10*		DO 10 I=30,33							
11*	10	BB(1) = BB(1)*0.01							
12*		BB(33) = 1.-BB(30)-BB(31)-BB(32)							
13*		AA(91,2) = (BB(31)*.85) + BB(32)) * TONS*2.							
14*		AA(91,3) = (1.2*TONS)-AA(91,2)							
15*		Z6 = TONS*(BB(31)*.15)/AA(91,3)							
16*		Z1=AA(91,3)/TONS							
17*		Z2=AA(91,2)*.5/AA(91,3)							
18*		Z3=TONS * BR(30)/(AA(91,3)+(1.5*AA(91,2)))							
19*		Z4=AA(91,2)/TONS							
20*	1022	FORMAT(/ 25H PAYLOADER AND FORK LIFT , 10X ,15H							
21*	1	,F10.3,30X,F10.3)							
22*	1021	FORMAT(/ 25H CONTROL INSTRUMENTATION , 10X ,15H							
23*	1	,F10.3,30X,F10.3)							
24*		PRINT 2000							
25*	2006	FORMAT(1H1//55H DETAILED EQUIPMENT COSTS (ALL COSTS IN 1000.0 DOL							
26*		CLARS))							
27*		PRINT 3000							
28*	3306	FORMAT (/11H EQUIPMENT TYPE,10X10H CAPACITY,12X0H MATERIAL,							
29*		C60H BASE MATERIALS LABOR INDIRECT MODULE							
30*		C0X60H COST COSTS COSTS COST							
31*		DO 1 I=1,7							
32*		COSTA(I)=0.							
33*		COST(I)=0.							
34*	1	CONTINUE							
35*	C	UNLOADING AND STORAGE OF FISH							
36*	C								
37*	C								
38*		TONSA=TONS*2000./R*.33							
39*		GALLON= TONSA/(24.*60.)							
40*		GALS =GALLON*1.3							
41*		SUMHP= 0.							
42*		IA(65,1) = 0							
43*		IA(65,2) = 1.0							
44*		AA(65,17) = GALS*15							
45*		NUM = TONS/600. +1							
46*		DO 143 I=1,NUM							
47*		SUMHP=SUMHP+(AA(65,17)*.001*1.5)							
48*	143	CALL PMPREC							
0000 R 0000160									

Table I.-- Continued.

```

49* IA(65,2) = 0.0
50* IF (TONSA.LT.30000.) G=(30000./(24.*60.))*15.
51* IF (TONSA.GE.30000.) G=(450000./(24.*60.))*15.
52* IF (TONS.LE.150.) AA(70,1A)= 3F.
53* IF (TONS.GT.150.) AA(70,1A)= 4F.
54* AA(70,17)=100.
55* CALL BELT
56* DO 81 I=1,2
57* AA(40,17)=TONS*32.05*3.
58* IA(40,1)=0
59* IA(40,2)=2
60* CALL STORAG
61* IA(40,2)=0
81 CONTINUE
62* AA(66,17)=30.*30.*TONS/(24.*60.)
63* CALL PMPCNT
64* HP=.001*AA(66,17)
65* SUMHP=HP+SUMHP
66* TANK=240.*TONS*1.
67* IA(40,1)=2
68* AA(40,17)=TANK
69* AA(40,18)=1.0
70* CALL STORAG
71* TONSA=TONS*.8*2000./(8.3*16.)
72* TONSA=TONSA*71/.8
73* HPOWER=.01*TONSA
74* NUM=(HPOWER/20.)*1.
75* XNUM=NUM
76* TONSB=TONS/24.
77* AA(71,18)= TONSB
78* AA(71,17)= 20.
79* CALL BUCKET
80*
81* C FISH COOKERS AND SCREW PRESS
82* C
83* BR(2) = 0.67
84* IA(21,5)= 2
85* AA(21,17) = 0.25*TONS
86* CALL DRYER
87* IA(21,5) = 0
88* IF (TONS.GT.300.) NA=(TONS/250.)*1.
89* IF (TONS.LE.300.) NA=(TONS/100.)*1.
90* C PUMP TO PRESS
91* AA(66,17)=(AA(01,3)+AA(01,2))*2000.*30./(16.*60.*8.33)
92* IA(66,1)=0
93* CALL PMPCNT
94* HP=.001*AA(66,17)
95* SUMHP=SUMHP+HP
96* DO 2 I= 1,NA
97* IA(17,5)=3
98* BR(2)=1.1
99* IF (TONS.GT.300.) AA(17,17) = 21.
100* IF (TONS.GT.300.) AA(17,18) = 16.
101* IF (TONS.LE.300.) AA(17,18) = 12.
102* IF (TONS.LE.300.) AA(17,17) = 15.
103* CALL SCREW
104* C PUMP FROM PRESS TO SCREEN
105*

```


Table I.--Continued.

```

00265 106* AA(66,17)=AA(91,3)*2000.*30./(16.*60.*8.33)
00266 107* IA(66,1)=0
00267 108* CALL PMPCNT
00270 109* HP=.001*AA(66,17)
00271 110* SUMHP=SUMHP+HP
00272 111* IF(TONS.GT.300.) AA(51,17)=5.0
00274 112* IF(TONS.LE.300.) AA(51,17)=2.0
00276 113* CALL SCREEN
00277 114* 2 CONTINUE
00301 115* TONSS=TONS*74
00302 116* IF(IPTION(1),F0.2) TONSS=TONSS + (TONS*Z1*2.*76)
00304 117* IF(TONSS.GT.300.) GO TO 3
00306 118* NR=(TONSS/100.)+1
00307 119* AA(21,17)=100.*3.8
00310 120* GO TO 4
00311 121* 3 NB=(TONSS/250.)+1.
00312 122* AA(21,17)=250.*3.8
00313 123* 4 CONTINUE
00313 124* C FISH MEAL STREAM
00313 125* C
00313 126* C
00314 127* IF(IPTION(1),F0.1) GO TO 52
00314 128* C PUMP FROM PRESS TO MIXER
00316 129* AA(66,17)=AA(91,2)*2000.*30./(16.*60.*8.33)
00317 130* IA(66,1)=0
00320 131* CALL PMPCNT
00321 132* HP=.001*AA(66,17)
00322 133* SUMHP=SUMHP+HP
00323 134* AA(57,17)=(AA(91,2)+TONS*71*76*2.)*2000./62.4
00324 135* CALL BLEND
00325 136* 52 CONTINUE
00326 137* DO 5 I=1,NB
00331 138* IA(21,5)=3
00332 139* CALL DRYERR
00333 140* 5 CONTINUE
00333 141* C PUMP TO DRYER
00335 142* AA(66,17)=TONSS*2000.*30./(16.*60.*8.33)
00336 143* IA(66,1)=0
00337 144* CALL PMPCNT
00340 145* HP=.001*AA(66,17)
00341 146* SUMHP=SUMHP+HP
00342 147* AA(91,18)=10.
00343 148* AA(81,17)=TONSS* 0.33
00344 149* BULK= 15. * TONSS
00345 150* TONST =(TONS*Z4*.5) + (TONS*Z4*.5* Z3)
00346 151* AA(99,18)= TONSS- TONST
00347 152* IF(IPTION(1),F0.2) AA(99,18)=AA(99,18) + (TONS*Z1*Z6)
00351 153* AA(99,18)=AA(99,18)*2000./16.
00352 154* IF(IPTION(1),F0.2) TONST= TONST + (TONS*Z1*76)
00354 155* AA(99,13)= TONS*74*.5*Z3*2000.*.01
00355 156* AA(57,17)=(AA(99,3)+AA(99,13)/2000.)*2000./62.4
00356 157* CALL BLEND
00357 158* AA(99,3)=TONST
00357 159* C PUMP FROM DRYER TO MIXER
00360 160* AA(66,17)=AA(99,3)*2000.*30./(16.*60.*8.33)
00361 161* CALL PMPCNT
00362 162* HP=.001*AA(66,17)

```

Table I.- Continued.

```

00363 163* SUMHP=SUMHP+HP
00364 164* AA(40,17)=(AA(00,3)+AA(90,13)/2000.)*2000./8.33*15.
00365 165* IA(40,1)=0
00366 166* CALL STORAG
00367 167* C PUMP TO CURING
00368 168* IA(66,1)=0
00370 169* AA(66,17)=AA(40,17)*30./(15.*16.*60.)
00371 170* CALL PMPCNT
00372 171* HP=.001*AA(66,17)
00373 172* SUMHP=SUMHP+HP
00374 173* AA(18,17)=1.30 * TONST/16.
00375 174* CALL HAMMER
00376 175* AA(72,17)=18.
00377 176* CALL SCALE
00400 177* IA(75,1)=0.0
00401 178* IA(75,2)=0.0
00402 179* AA(75,17)=AA(90,3)*20./(60.*16.)
00403 180* CALL BAGGMA
00404 181* AA(75,17)=AA(75,17)*60*16
00405 182* HP=XNUM*20.
00406 183* SUMHP=SUMHP + (.001*HP)
00407 184* AA(54,17)=HP
00407 185* C
00407 186* C FISH OIL STREAM
00407 187* C
00410 188* AA(40,17)=AA(91,3)*2000./(16.*P.33)*1.
00411 189* IA(40,1)=0
00412 190* CALL STORAG
00413 191* AA(66,17)=AA(40,17)*30./60.
00414 192* CALL PMPCNT
00415 193* CALL PMPCNT
00416 194* HP=.001*AA(66,17)
00417 195* SUMHP=SUMHP+HP
00420 196* SUMHP=SUMHP+HP
00421 197* DO 11 I=1,NIM
00424 198* AA(54,17)=20.
00425 199* CALL CNTFGF
00427 200* TONSA= TONSA* 23*1.1
00430 201* HP=.025*TONSA
00431 202* AA(52,17)= HP
00432 203* N1=(HP/20.) +1.
00433 204* HP=20*N1
00434 205* SUMHP= SUMHP+ HP
00435 206* AA(52,17)=20.
00436 207* DO 12 I=1,N1
00441 208* CALL SHARP
00443 209* TONSA=TONS*3.0*.8*.13*2000./8.33
00444 210* TONSA=TONSA*21*23/(.8*.13)
00445 211* Z7=1.-Z3
00446 212* IA(40,1)=2
00447 213* AA(40,17)=TONSA*7./3.
00450 214* AA(40,18)=1.0
00451 215* CALL STORAG
00452 216* IA(66,1)=0
00453 217* AA(66,17)=TONSA*30./(3.*16.*60.)
00454 218* SUMHP= SUMHP +(AA(66,17)*.001)
00455 219* SUMHP= SUMHP +(AA(66,17)*.001)

```

Table I.--Continued.

```

00456 220* AA(66,17)= AA(66,17)*30.
00457 221* CALL PMPCNT
00460 222* CALL PMPCNT
00460 223*
00460 224* C FISH OIL STORAGE (150DAYS)
00460 225* C
00461 226* AA(90,5)=TONS*Z1*Z3
00462 227* AA(40,17)=AA(90,5)*2000./R.33*15.
00463 228* IA(40,1)=0
00464 229* CALL STORAG
00465 230* AA(66,17)=AA(40,17)*30./(60.*15.*16.)
00466 231* CALL PMPCNT
00467 232* HP=.001*AA(66,17)
00470 233* SUMHP=SUMHP+HP
00470 234* C FISH SOLUABLES STREAM
00470 235* C
00470 236* C PUMP TO ACID MIX TANK
00471 237* TONSSW=TONS*71*Z7
00472 238* IA(66,1)=0
00473 239* AA(66,17)=30.*TONSSW*2000./R.33*16.*60.)
00474 240* CALL PMPCNT
00475 241* HP=.001*AA(66,17)
00476 242* SUMHP=SUMHP+HP
00477 243* GALL=TONSSW*.2
00500 244* GALL= TONSSW*.01
00501 245* IA(40,1)=2
00502 246* AA(40,17)= GALL*2000./R.33)
00503 247* AA(40,18)=1.0
00504 248* CALL STORAG
00505 249* IA(40,1)=2
00506 250* AA(40,18)=1.0
00507 251* AA(40,17)= GALL*2000./R.33)
00511 253* CALL STORAG
00512 254* GALL=TONSSW*2000./R.33*16.)
00513 255* AA(66,17)=GALL*30./60.
00514 256* SUMHP= SUMHP +AA(66,17)*.001)
00515 257* SUMHP= SUMHP +AA(66,17)*.001)
00516 258* IA(66,1)=0
00517 259* CALL PMPCNT
00520 260* CALL PMPCNT
00521 261* TONA=TONS*.87*.8*2000.*.001/(R.33* 1.82)
00522 262* TONA=TONS*Z7*Z1/(.87*.8)
00523 263* AA(90,14)= TONS*Z7*71*.001
00524 264* AA(40,17)= TONA* 70.0
00525 265* IA(40,1)= 1.0
00526 266* IA(40,2)= 1.0
00527 267* CALL STORAG
00530 268* IA(40,1)= 0.0
00531 269* IA(40,2)= 0.0
00532 270* TONB= TONA/(16.*60.)
00533 271* AA(66,17)= 30.*TONB
00534 272* IA(66,1)= 2
00535 273* CALL PMPCNT
00536 274* SUMHP=SUMHP+AA(66,17)*.001)
00537 275* IA(66,1)=0.0
00540 276* TONA= TONS*.80*0.87* 2000./16.
      TONA=TONA*Z1*77/(.8*.87)

```

Table I.--Continued.

```

nn541 277* AA(33,17) = TONA / 20.
nn542 278* CALL EVPHOR
nn543 279* CALL EVPHOR
nn544 280* CALL EVPHOR
nn545 281* TONC = TONA*.06/(.87*.3)
nn546 282* TONC=TONC*Z6*.87/(Z7*.06)
nn547 283* C PUMP TO CONCENTRATOR
nn550 284* AA(66,17)=TONC*2000.*30./(8.33*60.)
nn551 285* IA(66,1)=0
nn552 286* CALL PMPCNT
nn553 287* HP=.001*AA(66,17)
nn554 288* SUMHP=SUMHP+HP
nn555 289* AA(33,17)=TONC/25.
nn556 290* CALL EVPHOR
nn557 291* AA(90,4)=TONS*Z1*Z6*.2*.1.
nn558 292* AA(40,17)=AA(90,4)*2000./(8.33*16.)*1.
nn559 293* IA(40,1)=0
nn560 294* CALL STORAG
nn561 295* AA(66,17)=30.*AA(40,17)/60.
nn562 296* CALL PMPCNT
nn563 297* HP=.001*AA(66,17)
nn564 298* SUMHP=SUMHP+HP
nn565 299* SUMHP=SUMHP+HP
nn566 300* IF(IPTION(1).EQ.2) GO TO 51
nn567 301* C CONDENSED FISH SOLUBLES STORAGE (15 DAYS)
nn570 302* C
nn571 303* C
nn572 304* AA(40,17)=AA(90,4)*2000./8.33*15.
nn573 305* IA(40,1)=0
nn574 306* CALL STORAG
nn575 307* C
nn576 308* 51 CONTINUE
nn577 309* C
nn578 310* C SUMMATION OF STEAM, WATER, AND ELECTRICITY
nn579 311* C
nn580 312* AA(27,18)= 150.
nn581 313* AA(27,17)= TONS*2.*2000./(3.*16.)
nn582 314* C BOILER WATER TREATMENT
nn583 315* C
nn584 316* COST(5)=1.000
nn585 317* COST(1)=COST(5)
nn586 318* PRINT 4242,COST(1),COST(5)
nn587 319* 4242 EORMAT(725H BOILER WATER TREATMENT , 10X ,15H
nn588 320* 1 ,F10.3,30X,F10.3)
nn589 321* COSTA(1)=COSTA(1)+COST(1)
nn590 322* COSTA(5)=COSTA(5)+COST(5)
nn591 323* C
nn592 324* C EUCL OIL STORAGE
nn593 325* C
nn594 326* IA(40,1)=2
nn595 327* AA(40,17)=TONS*6000./387.*15.
nn596 328* CALL STORAG
nn597 329* AA(66,17)=30.*AA(40,17)/(15.*60.)
nn598 330* CALL PMPCNT
nn599 331* HP=.001*AA(66,17)
nn600 332* SUMHP=SUMHP+HP
nn601 333*

```


Table I.-- Continued.

```

00620 334*      CALL BOILER
00621 335*      XLOOPS= 9 + NA +NB
00622 336*      TONDE=TONA/2.4 -TONC/2.4 +(TONC*.4)
00623 337*      AA(91,5) = (TONA-TOND)/(0.6*8.33)
00624 338*      AA(90,17) = (TONC*.4)
00625 339*      AA(90,16) = (TONA-TONC)/2.4
00626 340*      AA(66,17) = 4*(AA(90,16) +AA(90,17)) +1.5*TONS
C
C SEA WATER PUMPS
C
00631 341*      IA(66,1)=1
00632 342*      IA(66,4)=2
00633 343*      CALL PMPCNT
00634 344*      IA(66,1)=0
00635 345*      IA(66,4)=0
00636 346*      SUMHP= SUMHP +(AA(66,17)*.001*1.5)
00637 347*      COST(1)=XLOOPS *AA(100,1)
00638 348*      COST(5)=COST(1)
00639 349*      COSTA(1) = COSTA(1) + COST(1)
00640 350*      COSTA(5)=COSTA(5) + COST(5)
00641 351*      PRINT 1021 COST(1),COST(5)
00642 352*      AA(8,17) = TONS
00643 353*      CALL CONDEN
00644 354*      COST(1)=AA(100,2)
00645 355*      COST(5)=COST(1)
00646 356*      COSTA(1)=COST(1) + COSTA(1)
00647 357*      COSTA(5)=COSTA(5) + COST(5)
00648 358*      PRINT 1022, COST(1),COST(5)
00649 359*      CALL SCALE
00650 360*      CALL SCALE
00651 361*      PRINT 1041,(COSTA(1),J=1,6)
00652 362*      PRINT 1041,((COSTA(J),J=1,6)
00653 363*      1041 FORMAT(/,25H TOTAL COSTS
00654 364*      COSTA(1)=0.02*COSTA(1)
00655 365*      IF(IPTION(1),EQ,2) AA(90,4)=0.
00656 366*      1034 FORMAT(/,40H TOTAL COST OF FEPC PLANT
00657 367*      PRINT 1010
00658 368*      1010 FORMAT(1H1)
00659 369*      HP = TONS*0.00124 +13.6
00660 370*      SUMHP = HP + SUMHP
00661 371*      HP = 40*TONS/3.
00662 372*      SUMHP = HP + SUMHP
00663 373*      AA(90,2)= SUMHP* .7457 * 16.
00664 374*      AA(90,1)= TONS* 6000./387.
00665 375*      AA(100,10)=COSTA(5)
00666 376*      IXX = (16.0*(TONS/50.0)**.31) +0.5
00667 377*      PXX =IXX
00668 378*      AA(90,9) =PXX*10.
00669 379*      AA(90,8) =IXX*8.0
C
C MATERIAL BALANCE INFORMATION PRINTOUT
C
00671 381*      CALL MATER(TONS)
00672 382*      TONS = TONS/16
00673 383*      AA(90,15)= TONS*2000.*.2
00674 384*      PRINT 1060,AA(90,15)
00675 385*      FORMAT(/,8X26H COOKERS, STFAM
00676 386*      1060
00677 387*      ,F8.0,7H LB/HR )
00678 388*
00679 389*
00680 390*

```

Table I.--Continued.

00722	391*	AA(91,3)= AA(91,3)* 2000./16.	
00723	392*	AA(91,2)= AA(91,2)* 2000./16.	
00724	393*	PRINT 1061,AA(91,3)	
00727	394*	PRINT 1062,AA(91,2)	
00732	395*	FORMAT(/8X26H PRESS LIQUOR	,F8.0,7H LB/HR)
00733	396*	FORMAT(/8X26H PRESS CAKE	,F8.0,7H LB/HR)
00734	397*	AA(91,1)= AA(91,3)*77	
00735	398*	PRINT 1063,AA(91,1)	
00740	399*	FORMAT(/8X26H STICK WATER	
00741	400*	AA(90,5) = AA(90,5)*2000.0/16	,F8.0,7H LB/HR)
00742	401*	PRINT 1064, AA(90,5)	
00745	402*	FORMAT(/8X26H FISH OIL	,F8.0,7H LB/HR)
00746	403*	PRINT 1065,AA(90,16)	
00751	404*	FORMAT(/8X26H TRIPLF EVAP. STEAM	,F8.0,7H LB/HR)
00752	405*	AA(91,4)= 0.15*88131)*.01*TONS*2000.0/0.30	
00753	406*	PRINT 1066,AA(91,4)	
00756	407*	FORMAT(/8X26H TRIPLF EVAP. CONCENTRATE	,F8.0,7H LB/HR)
00757	408*	AA(91,5)=AA(90,16)*4.0	
00760	409*	PRINT 1067,AA(91,5)	
00763	410*	FORMAT(/8X26H TRIPLF EVAP. COOLING	,F8.0,7H GAL/HR)
00764	411*	PRINT 1068,AA(90,17)	
00767	412*	FORMAT(/8X26H CONCENTRATOR EVAP. STEAM	,F8.0,7H LB/HR)
00770	413*	AA(91,6) =AA(90,17)*4.0	
00771	414*	PRINT 1069,AA(91,6)	
00774	415*	FORMAT(/8X26H CONC. COOLING WATER	,F8.0,7H GAL/HR)
00775	416*	SOL =AA(90,4)*2000.0/16	
00776	417*	PRINT 1070,SOL	
01001	418*	FORMAT(/8X26H FISH SOLUBILES	,F8.0,7H LB/HR)
01002	419*	AA(90,18)=AA(90,18)/16	
01003	420*	PRINT 1071,AA(90,18)	
01006	421*	FORMAT(/8X26H DRYER STEAM	,F8.0,7H LB/HR)
01007	422*	SCRUB=180*TONS	
01010	423*	PRINT 1072,SCRUB	
01013	424*	FORMAT(/8X26H SCRUBFR WATER	,F8.0,7H GAL/HR)
01014	425*	STM=AA(27,17)-AA(90,18)-AA(90,17)-AA(90,16)	
01015	426*	PRINT 1074,STM	
01020	427*	FORMAT(/8X26H MISCELLANEOUS STEAM	,F8.0,7H LB/HR)
01021	428*	FISH =AA(90,3)*2000.0/16	
01022	429*	PRINT 1073,FISH	
01025	430*	FORMAT(/8X26H FISH MFAL	,F8.0,7H LB/HR)
01026	431*	TONS = TONS*16	
01027	432*	AA(90,5) = AA(90,5)*16.0/2000.0	
01030	433*	AA(91,2)= AA(91,2)*16./2000.	
01031	434*	AA(91,3)= AA(91,3)*16./2000.	
01032	435*	AA(90,13) = AA(90,13) + (AA(90,3)+AA(90,7)+AA(90,20)+AA(90,4))	
01033	436*	AA(90,14)=AA(90,14)*2000.	
01034	437*	RETURN	
01035	438*	END	

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S PRSIPA, PRSIPA
FOR 59A-07/12-11:03 (1,)

SUBROUTINE PRSIPA ENTRY POINT 003537

STORAGE USED: CODE(1) 003617; DATA(0) 001410; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK2 000016
0004 DATA1 000050
0005 BLOCK1 005050
0006 BLOCK4 000012

EXTERNAL REFERENCES (BLOCK, NAME)

0007 PMPREC
0010 BELT
0011 SCALE
0012 STORAG
0013 REFRIG
0014 SILO
0015 RUCKET
0016 DRYERR
0017 SCREWRR
0020 SCRFEN
0021 PMPCNT
0022 GRINDR
0023 REACTR
0024 AGITR
0025 HEATEX
0026 COLUMN
0027 VESSEL
0030 CNFGE
0031 SHARP
0032 EVPHOR
0033 HAMMER
0034 BAGGMA
0035 ROILER
0036 CONDEN
0037 WATER
0040 SORT
0041 NPRTS
0042 NIO2S
0043 NIO1S
0044 NEXP6S
0045 NERR3S

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000453	1003F	0000	000364	1021F	0000	000375	1022F	0000	000443	1041F	0001	000020	1136
0000	000464	1201F	0000	000476	1202F	0000	000510	1203F	0000	000522	1204F	0001	003005	12046
0000	000534	1205F	0000	000546	1206F	0000	000560	1207F	0000	000572	1208F	0000	000617	1209F

Table I.--Continued.

nn01	nn0n25	121G	0000	0006n4	1210F	0000	000632	1211F	0000	000644	1212F	0000	000656	1213F	
nn00	nn0674	1214F	0000	0007n5	1215F	0000	000716	1216F	0000	000727	1217F	0000	000740	1218F	
nn00	nn0751	1219F	0000	000762	1220F	0000	000773	1221F	0000	001004	1222F	0000	001015	1223F	
nn00	nn1n26	1224F	0000	001040	1225F	0000	001052	1226F	0000	001064	1227F	0000	001076	1228F	
nn00	nn1110	1230F	0000	001122	1231F	0000	001134	1232F	0000	001146	1233F	0001	000332	127G	
nn01	nn03210	1330G	0001	003221	1336G	0001	003232	1344G	0001	003243	1352G	0001	003254	1360G	
nn01	nn03265	1366G	0001	nn3276	1374G	0001	nn3307	14n2G	0001	nn3320	1410G	0001	nn3331	1416G	
nn01	nn0144	163G	0001	nn0341	237G	0000	nn0340	300nF	0000	nn0352	3006F	0001	nn0605	323G	
nn01	nn0671	345G	0001	nn07n2	350G	0001	nn0734	361G	0001	nn0735	364G	0001	nn0755	372G	
nn01	nn0760	377G	0000	nn04n7	4242F	0000	nn0425	4243F	0001	nn1145	433G	0001	nn02574	44L	
nn01	nn1226	450G	0001	nn02574	49L	0001	nn1336	507G	0001	nn02273	51L	0001	nn1400	516G	
nn01	nn02417	52L	0001	nn02137	716G	0001	nn02206	734G	0005	R	nn00000	AA	nn001400	516G	
nn00	R	nn0245	ACID	nn05	R	nn047n4	BB	nn03	R	nn00000	COST	0004	R	nn00000	DATR
nn00	R	nn0172	DAYS	nn00	R	nn0173	DAYSr	nn00	R	nn0273	DAZOIL	nn00	R	nn00216	DRYSLD
nn00	R	nn0241	UX	nn00	R	nn02n3	FACT10	nn00	R	nn0211	G	nn00	R	nn00246	GAL
nn00	R	nn0206	GALLON	nn00	R	nn02n7	GALS	nn00	R	nn0171	HOUR	nn00	R	nn00212	HP
nn00	R	nn0276	HWAT	nn00	R	nn0167	I	nn05	I	nn0146	INUP\$	nn00	I	nn00234	TP
nn06	I	nn05n00	IPTION	nn00	I	nn0230	IR	nn00	I	nn0235	IU	nn00	I	nn00337	IXX
nn00	I	nn0224	J	nn00	I	nn0325	K	nn00	I	nn0176	L00PS	nn00	I	nn00214	NA
nn00	I	nn0204	NOREAC	nn00	I	nn0225	NQUIP	nn00	I	nn0210	NUM	nn00	I	nn00242	NUTH
nn00	I	nn0302	NZ	nn00	I	nn0271	N2	nn00	I	nn0266	N3	nn00	I	nn00262	PRDCTA
nn00	R	nn0263	PRDCTB	nn00	R	nn0247	SAA	nn00	R	nn0267	SAB	nn00	R	nn00233	SAG
nn00	R	nn0300	SAQT	nn00	R	nn0141	SBOT	nn00	R	nn0255	SBOTT	nn00	R	nn00274	SBOT
nn00	R	nn0270	SCB	nn00	R	nn0175	SOLL10	nn00	R	nn0177	STEAM	nn00	R	nn00200	STEAMW
nn00	R	nn0250	STEAM1	nn00	R	nn0251	STEAM2	nn00	R	nn0252	STEAM3	nn00	R	nn00306	STEAM6
nn00	R	nn0254	STEAM9	nn00	R	nn00n0	STM	nn00	R	nn0143	STMM	nn00	R	nn00055	STRM
nn00	R	nn0132	STRMM	nn00	R	nn0170	SUMHP	nn00	R	nn0232	TANK	nn00	R	nn00301	TASA
nn00	R	nn0303	TASB	nn00	R	nn03n4	TASC	nn00	R	nn0305	TASD	nn00	R	nn00205	TONSA
nn00	R	nn0213	TONSG	nn00	R	nn0222	TONSX	nn00	R	nn0226	VES	nn00	R	nn00261	WASTE
nn00	R	nn0174	WATAD	nn00	R	nn0264	WATER	nn00	R	nn0202	WAT0IL	nn00	R	nn00236	XIP
nn00	R	nn0237	XIR	nn00	R	nn0243	XIRR	nn00	R	nn0217	XL00P	nn00	R	nn00215	XNA
nn00	R	nn0220	X0IL	nn00	R	nn0221	X50L	nn00	R	nn0326	XXA	nn00	R	nn00330	XXC
nn00	R	nn0331	XXD	nn00	R	nn0332	XXE	nn00	R	nn0333	XXG	nn00	R	nn00335	XXI
nn00	R	nn0336	XXJ	nn00	R	nn0311	YYA	nn00	R	nn0312	YYB	nn00	R	nn00314	YYD
nn00	R	nn0315	YYE	nn00	R	nn0316	YYG	nn00	R	nn0317	YYH	nn00	R	nn00321	YYJ
nn00	R	nn0322	YYK	nn00	R	nn0323	YYL	nn00	R	nn0324	YYM				

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1* SUBROUTINE PRSIPATIONS)
nn101 COMMON/BLOCK2/ COST(7),COSTA(7)
2* COMMON/ DATA1 / DATR(8,5)
nn103 COMMON/BLOCK1/ AA(100,20),IA(100,5),BR(100)
3* COMMON/BLOCK4/ IPTION(10)
nn104 DIMENSION STM(5,0),STRM(5,9),STRMM(9),STMM(9)
nn105 DIMENSION STOP(5),SBOT(5)
nn106 REAL MATRI
nn107 C
nn108 C NORMALIZATION
nn109 C
nn110 DO 1 I=1,7
nn111 COST(I) = 0.
nn112 COSTA(I) = 0.
nn113 DO 2 I=1,20
nn114 AA(90,I)=0.
nn115 AA(91,I)=0.
nn116
nn124

```


Table 1.--Continued.

```

00126      18*
00131      19*
00133      10 BB(I)=BB(I)* 0.01
00134      SUMHP= 0.
00135      HOUR= 24.
00136      DAYS= 30.
00137      AA(72,17)=18.
00140      DAYSR = 3.
00141      WATAU = 0.2
00142      SOLLIO= 2.5
00143      C STEAM IS THE STEAM REQUIRED FOR THE WET DFBONING OPTION
00144      LOOPS=0
00145      STEAM=0.
00146      STEAMW = 0.
00147      DENS = 0.9
00148      WATOIL=2.
00149      FACT10=1.
00150      NOREAC= IPTION(5)
00151      IF(NOREAC.EQ.0) NORFAC = 4
00152
00153      C UNLOADING AND STORAGE OF FISH
00154      C
00155      TONSA = TONS* 2000./8.33
00156      GALLON= TONSA / (HOUR* 60.)
00157      GALS = GALLON * 1.3
00158      IA(65,1) = 0.
00159      IA(65,2) = 1.0
00160      AA(65,17)= GALS * 30.
00161      NUM =(TONS/500.) + 1
00162      DO 143 I=1,NUM
00163      SUMHP= SUMHP +(2.*AA(65,17)*.0015)
00164      143 CALL PMPREC
00165      IA(65,2) = 0.
00166      IF(TONSA.LT.30000.) G = 30000./(24.*60.) * 15.
00167      IF(TONSA.GE.30000.) G = 450000./(24.*60.) * 15.
00168      IF(TONS.LE.150.) AA(70,18) = 36.
00169      IF(TONS.GT.150.) AA(70,18) = 48.
00170      AA(70,17)= 100.
00171      CALL BELT
00172      CALL SCALE
00173      HP=(TONS * 0.00124 ) + 13.6
00174      SUMHP = HP + SUMHP
00175      AA(40,17) = DAYS * TONS
00176      IA(40,1) = 0.
00177      IA(40,2) = 2
00178      CALL STORAG
00179      IA(40,2) = 0
00180      AA(85,17) = 0.5* TONS * DAYSR
00181      IA(85,1) = 30
00182      CALL REFRIG
00183      SUMHP= SUMHP +(4.72*AA(85,17))
00184      IA(7,1) = 1
00185      AA(7,17) = 27.4* TONS
00186      CALL SILO
00187      TONSG = TONS/24.
00188      AA(71,18) = TONSG
00189      AA(71,17) = 20.
00190      CALL BUCKET
00191      74*

```

Table I.--Continued.

00226	75*	HP= TONS * 0.00106		
00227	76*	SUMHP = HP + SUMHP		
00227	77*	C FISH COOKERS AND SCREW PPFSS		
00227	78*	C		
00227	79*	AA(91,16) = WATAD* TONS		
00231	81*	AA(91,10) = TONS + AA(91,16)		
00232	82*	IF(TONS.GT.450) NA= (TONS/250.)+ 1.		
00234	83*	IF(TONS.LE.450) NA= (TONS/100.)+ 1.		
00236	84*	DO 3 I=1,NA		
00241	85*	BR(2)=2.1		
00242	86*	XNA=NA		
00243	87*	IA(21,5) = 4		
00244	88*	AA(21,17)= TONS/XNA		
00245	89*	CALL DRYERR		
00246	90*	IA(17,5) = 3		
00247	91*	BB(2)=2.6		
00250	92*	IF(TONS.GT.450.) AA(17,17)= 21.		
00252	93*	IF(TONS.GT.450.) AA(17,18)= 16.		
00254	94*	IF(TONS.LE.450.) AA(17,18)= 12.		
00256	95*	IF(TONS.LE.450.) AA(17,17)= 15.		
00260	96*	CALL SCREW		
00261	97*	IF(TONS.GT.450) AA(51,17)= 10.		
00263	98*	IF(TONS.LE.450) AA(51,17)= 4.		
00265	99*	CALL SCREEN		
00266	100*	3 CONTINUE		
00270	101*	DRYSLD=(BB(31)+0.85*BB(31))*TONS		
00271	102*	XLIQD= (BB(31)*0.15+ BB(30)+ BB(33))* TONS +AA(91,16)		
00272	103*	XOIL= BB(30) * TONS/XLIQD		
00273	104*	XSOIL= BB(31) * 0.15* TONS/XLIQD		
00274	105*	AA(90,16)= DRYSLD * SOLLIQ		
00275	106*	AA(90,18)=AA(91,10)-AA(90,16)		
00275	107*	C SOLIDS STREAM - AA(90,16)		
00275	108*	C		
00275	109*	TONS=X=TONS		
00276	110*	TONS=AA(90,16)*FACT10		
00277	111*	TONSG = AA(90,16) / HOUR		
00300	112*	AA(7,17) = 50.0* AA(90,16) / (62.4*DENS) * 2000.		
00301	113*	IA(7,1) = 1		
00302	114*	CALL SILO		
00303	115*	AA(66,17) = AA(90,16)*2000./(HOUR*8.33*60.) * 25.		
00304	116*	CALL PMPCNT		
00305	117*	HP= AA(66,17)/25.		
00306	118*	SUMHP = HP+ SUMHP		
00307	119*	CALL PMPCNT		
00310	120*	SUMHP= HP + SUMHP		
00311	121*	IF (TONSG .GT.6) AA(50,17)= 6.		
00312	122*	IF (TONSG .GT.6) NUMZ = (TONSG/6.) + 1.		
00314	123*	IF (TONSG .LE.6) AA(50,17)= 3.		
00316	124*	IF (TONSG .LE.6) NUMZ = (TONSG/3.) + 1.		
00320	125*	DO 720 J= 1,NUMZ		
00322	126*	720 CALL GRINDR		
00325	127*	HP= 40.* TONSG/3.		
00327	128*	SUMHP= HP + SUMHP		
00330	129*	C EXTRACTION VESSEL MATERIAL BALANCE		
00330	130*	C		
00330	131*			

Table I.-- Continued.

```

00330 C 1-OIL 2-PROTEIN 3-ACA 4-WATER 5-IPA NOREAC=NUMBER OF REACTORS
00330 C
00331 NQUIP= NOREAC + 1
00332 STM(1,1) = (SOLLIO-1.)*DRYSLD*XOIL
00333 STM(3,1)=DRYSLD*BR(32)/(HR(32) + (0.85*RB(31)))
00334 STM(2,1)=(DRYSLD-STM(3,1)) + (SOLLIO-1.)*DRYSLD*XSOIL
00335 STM(4,1) = (SOLLIO-1.)*DRYSLD*(1.- XSOIL-XOIL)
00336 STM(5,1) = 0.0
00337 STRM(1,NQUIP)=0.
00338 STRM(2,NQUIP)=0.
00339 STRM(3,NQUIP)=0.
00340 STRM(4,NQUIP) = WATOL*2.804*AA(90,16)/22.264
00341 STRM(5,NQUIP) = STRM(4,NQUIP)*19.46/2.804
00342 DO 121 I=1,NOREAC
00343 DO 121 J=1,5
00344 STM(J,I+1)= STM(J,I)*DATH(I,J)
00345 IF(I.EQ.1.AND.J.FO.5) STM(5,2)= STM(4,1)*DATH(1,5)
00346 121 CONTINUE
00347 DO 122 I=NORFAC,1,-1
00348 DO 122 J=1,5
00349 STRM(J,I)= STRM(J,I+1)- STM(J,I+1)+STM(J,I)
00350 DO 123 I=1,NQUIP
00351 STM(I)=0.
00352 STRMM(I)=0.
00353 DO 123 J=1,5
00354 STRMM(I)=STM(I)+ STM(J,I)
00355 STRMM(I)= STRMM(I) + STRM(J,I)
00356 123 CONTINUE
00357 C REACTOR VESSELS
00358 C
00359 VES= TONS* 70.
00360 AA(49,17) = VES
00361 VESS = TONS* 16.
00362 IR= 1
00363 IF(VES.GT.10000.) IR= (VES/10000.) + 1.
00364 IF(VES.GT.10000.) VFS = 10000.
00365 IRR=1
00366 IF(VES.GT.10000.) IRR=(VES/10000.) + 1.
00367 TANK = 800.* TONS / 50.
00368 AA(40,18)=3.2
00369 AA(41,18)=3.2
00370 AA(40,17)= TANK
00371 CALL STORAG
00372 SAG= STRMM(2) * 2000./(24.*R.*3*60.) *(24./HOUR)
00373 IP=1
00374 IF(SAG.GT.1250.) IP=(SAG/1250.) + 1.
00375 DO 93 IU=1,IP
00376 XIP=IP
00377 AA(66,17) =(SAG/XIP) * 24.
00378 CALL PMPCNT
00379 93 CONTINUE
00380 C MISCELLA TANK
00381 C
00382 IF ( VESS.GT.10000.) VFS= 10000.
00383 XIP=IR
00384 IP=(TONS*60./(50.*144.*XIP)) + 2.
00385 AA(51,17) = IP
00386

```

Table I.-- Continued.

```

00447 189*      DO 41 I =1,IR
00452 190*      LOOP$= LOOPS + 3
00453 191*      AA(49,17) = VFS
00454 192*      CALL REACTR
00455 193*      CALL SCREEN
00456 194*      AA(73,17) = 0.005* VFS
00457 195*      IF(AA(73,17).LT.2.) AA(73,17)=2.
00461 196*      IA(73,5) = 2.
00462 197*      CALL AGITOR
00463 198*      SUMHP = SUMHP + 2.5
00464 199*      XIR=IR
00465 200*      SUMHP= SUMHP+ AA(73,17)
00466 201*      AA(66,17)= TONS* 2000./(HOUR*.33*XIR) * (22./60.)
00467 202*      CALL PMPCNT
00470 203*      ABC= AA(66,17)/22.
00471 204*      IF(ABC.LE.2.) HP= 2.
00473 205*      IF(ABC.GT.2.) HP= ABC
00475 206*      SUMHP= HP + SUMHP
00476 207*      IA(17,5) = 5
00477 208*      DX= SQRT(TONS/50.) * 8. /SQRT(XIP)
00500 209*      AA(17,17) = 6
00501 210*      AA(17,18) = DX
00502 211*      CALL SCREW
00503 212*      41 CONTINUE
00505 213*      NUT=NOREAC - 1
00505 214*      C OTHER REACTION VFSSELS
00505 215*      C
00505 216*      DO 42 J = 1,IRR
00511 218*      XIP=IRR
00512 219*      IP=(TONS*60./(50.*XIP*144.)) + 2.
00513 220*      AA(51,17)=IP
00514 221*      LOOP$= LOOPS + (3*NUTH)
00515 222*      DO 42 I = 1,3
00520 223*      XIRR=IRR
00521 224*      SUMHP=SUMHP + 2.5
00522 225*      AA(66,17)= TONS*2000./(24.*8.33*XIRR)*(22./60.)
00523 226*      CALL PMPCNT
00524 227*      ABC= AA(66,17)/ 22.
00525 228*      IF(ABC.GT.2.) HP=ABC
00527 229*      IF(ABC.LE.2.) HP=2.
00531 230*      SUMHP= SUMHP + HP
00532 231*      AA(49,17)= VFS
00533 232*      CALL REACTR
00534 233*      CALL SCREEN
00535 234*      AA(73,17)= 0.005*VFS
00536 235*      IF(AA(73,17).LT.2.) AA(73,17)= 2.
00540 236*      IA(73,5) = 2
00541 237*      SUMHP = SUMHP + AA(73,17)
00542 238*      CALL AGITOR
00543 239*      DX= SQRT(TONS/50.) * 8. / SQRT(XIP)
00544 240*      AA(17,18)= DX
00545 241*      AA(17,17)= 6.
00546 242*      IA(17,5)= 5
00547 243*      CALL SCREW
00550 244*      42 CONTINUE
00553 245*      TONS=TONSX

```


Table I.-- Continued.

```

nn553 246* C
nn553 247* C MIXING TANK SECTION
nn553 248* C
nn554 249* SACID= STRMM(1)*.001*70.
nn555 250* IA(40,1)= 1
nn556 251* IA(40,2)= 1
nn557 252* AA(40,17)= SACID
nn560 253* CALL STORAG
nn560 254* STORAGE TANK
nn561 255* IA(40,2)= 0
nn562 256* LOOPS=LOOPS+ 2
nn563 257* ACID = STRMM(1) *.001
nn564 258* IA(66,1)= 2
nn565 259* AA(66,17)= 30.*ACID* 2000./ (0.33*60.*HOUR*.8)
nn566 260* CALL PMPCNT
nn566 261* FROM ACID STORAGE TO MIX TANK
nn567 262* GAL=STRMM(1)* 2000./ (8.33
nn570 263* SUMHP= SUMHP + (.0015*AA(66,17))
nn571 264* AA(40,17)= GAL *.01
nn572 265* AA(66,17)= GAL *.01*(HOUR*60.)
nn573 266* IA(66,1)= 0
nn574 267* IA(40,1)= 2
nn575 268* SUMHP= SUMHP + (AA(66,17)*.0015)
nn576 269* CALL PMPCNT
nn576 270* FROM PRESS TO ACID MIX TANK
nn577 271* CALL STORAG
nn577 272* ACID MIX TANK
nn577 273* CALL PMPCNT
nn600 274* C PUMP FROM ACID MIX TANK TO MISCELLA TANK
nn600 275* C
nn600 276* C MISCELLA TANK BEFORE PREHEATER ( 1 HOUR HOLDUP)
nn600 277* C
nn601 278* SAA= 1.001* STRMM(1)
nn602 279* AA(40,17)= SAA*2000./ (HOUR*8.33)
nn603 280* IA(40,1)= 1
nn604 281* CALL STORAG
nn605 282* AA(66,17)= 30. * AA(40,17)
nn606 283* IA(66,1)= 0
nn607 284* CALL PMPCNT
nn610 285* SUMHP = SUMHP + (.0015*AA(66,17))
nn611 286* PRINT 3000
nn613 287* 3000 FORMAT(/50H STORAGE TANK BEFORE PREHEATER
nn613 288* C
nn613 289* C STEAM REQUIREMENTS
nn613 290* C
nn614 291* STEAM1 = AA(90,16)*FACTIN*35./50.
nn615 292* STEAM2 = AA(90,16)*FACTIN*20./50.
nn616 293* STEAM3 = AA(90,16)*FACTIN*20./50.
nn617 294* STEAM4 = AA(90,16)*FACTIN*20./50.
nn620 295* STEAM = STEAM1+STEAM2+STEAM3+STEAM4
nn620 296* PREHEATER FOR DISTILLATION COL UMN
nn621 297* STEAM9= STRMM(1)*1.001 * 2000./HOUR *.1
nn622 298* STEAM= STEAM + STEAM9
nn623 299* AA(67,17)= STEAM *.1
nn624 300* CALL HEATEX
nn624 301* C
nn624 302* C DISTILLATION COLUMN - MATERIAL BALANCE

```

Table I.--Continued.

00624	C	STOP(1) = STRM(5,1) * .90887
00625		STOP(2) = STOP(1) * .1445
00626		SBOT(1) = STRM(5,1) * .00113
00627		SBOT(2) = STRM(4,1) - STOP(2)
00630		SBOT(3) = STRM(1,1) + STRM(1,2) + STRM(1,3) + (.001*STRMM(1))
00631		SBOT = SBOT(1) + SBOT(2) + SBOT(3)
00632	C	DISTILLATION COLUMN
00632	C	REBOILER
00632	C	STEAMR=AA(90,16) * FACT10*10709./50.
00632		AA(67,17) = .1* STEAMR
00633		CALL HEATEX
00634		STEAM= STEAM + STEAMR
00635		TANKA= FACT10* AA(90,16)* 100./50.
00636		TANK ASSOCIATED WITH DISTILLATION COLUMN
00637	C	IA(40,1) = 1
00637		AA(40,17) = TANKA
00640		CALL STORAG
00641		WIDTH= 4.* SORT(AA(90,16)*FACT10/75.)
00642		IE= WIDTH/2
00643		WIDTH= 2*IE
00644		IF(WIDTH.LT.4.001) WIDTH = 4.
00645		AA(43,18) = 24.
00646	C	AA(43,18) = THE TRAY SPACING IN INCHES
00650		AA(43,20)= WIDTH
00651		AA(43,17)= 54.
00652	C	AA(43,17) = THE COLUMN HEIGHT IN FEET
00653		AA(43,1) = .4
00654		CALL COLUMN
00655		IA(42,4)=2
00656		IA(42,2)=1
00657		IA(42,3)=1
00660		AA(42,18)=WIDTH
00661		AA(42,19)=54.
00662		CALL VESSEL
00663		LOOPS = LOOPS+5
00664		WASTE = (.0013*STRM(5,1)) + (.0001*(PRDCTA+PRDCTB))
00665		AA(40,17) = WASTE* 2000./ 8.33 * DAYSR
00666		IA(40,1) = n
00667		CALL STORAG
00670		LOOPS = LOOPS + 1
00670	C	IPA STORAGE TANK(MAKEUP IPA)
00670	C	CONDENSER FOR DISTILLATION COLUMN
00671		WATER = 669.* FACT10* AA(90,16)/ 50.
00672		AA(67,17) = WATER* 8.33 * 60. * .01
00673		CALL HEATEX
00674		AA(66,17) = 1n5. * (AA(90,16)*FACT10/75.) * 20.
00675		CALL PMPCNT
00676		HP= 2.* (AA(90,16)* FACT10/75.)
00677		SUMHP = HP + SUMHP
00677	C	CENTRIFUGE SECTION
00700		MATRL = SBOT + AA(90,16)
00701		OIL = STRM(1,1) + (AA(90,18)*XOIL)
00702		AA(40,17) = MATRL* 2000. / (HOUR*8.33)
00703		IA(40,1) = 1

Table I.--Continued.

```

00704 360*      CALL STORAG
00705 361*      AA(66,17) = 30.* AA(40,17)
00706 362*      IA(66,1) = 0
00707 363*      CALL PMPCNT
00710 364*      SUMHP= SUMHP + 0.0015*AA(66,17)
00711 365*      C  NUMBER OF CENTRIFUGES
00712 366*      HP = MATRL*0.01* 2000./(HOUR*8.33)
00713 367*      N3 = (HP/20.) + 1.
00714 368*      HP = 20*N3
00715 369*      SUMHP = SUMHP + HP
00720 370*      DO 47  I=1,N3
00721 371*      AA(54,17) = 20.
00722 372*      CALL CNTFGE
00723 373*      47  CONTINUE
00724 374*      LOOPS = LOOPS + N3
00725 375*      SAB= OIL * 1.1
00726 376*      SCB= MATRL - OIL
00727 377*      C  SECOND CENTRIFUGE
00730 378*      HP= SAB *0.025* 2000./(HOUR*24.)
00731 379*      N2= (HP/20.) + 1.
00732 380*      HP= N2* 20
00733 381*      SUMHP= SUMHP + HP
00734 382*      DO 46  I=1,N2
00735 383*      AA(52,17) =20.
00736 384*      CALL SHARP
00737 385*      46  CONTINUE
00740 386*      HOT20 = 0.1 * OIL
00741 387*      C  OIL STORAGE
00742 388*      DAZOIL=15.
00743 389*      AA(40,17) =NA70IL*0TL*2000./8.33
00744 390*      IA(40,1) = 0
00745 391*      CALL STORAG
00746 392*      AA(66,17)=AA(40,17)*30./(60.*HOUR*DAZOIL)
00747 393*      IA(66,1)=0.
00750 394*      CALL PMPCNT
00751 395*      CALL PMPCNT
00752 396*      SUMHP=SUMHP + (2.*AA(66,17)*.001)
00753 397*      C
00754 398*      C  DISSOLVED SOLIDS STREAM
00755 399*      C
00756 400*      SBQT = SCB
00757 401*      SBQQT= (STRM(2,1)+(XLIQD*X50L)) * 2.
00758 402*      HWAT= SBQT - SBQQT
00759 403*      IF(HWAT.GE.0.) GO TO 51
00760 404*      PRINT 3006
00761 405*      3006  FORMAT(/50H FISH SOLIDABLES ARE MORE THAN 50 PERCENT PROTEIN )
00762 406*      AA(90,4) = SBQT
00763 407*      GO TO 52
00764 408*      51  CONTINUE
00765 409*      AA(90,4) = SBQQT
00766 410*      TONA=SBQQT/HOUR*2000.
00767 411*      AA(33,17) = TONA/ 20.
00768 412*      CALL EVPHOR
00769 413*      CALL EVPHOR
00770 414*      CALL EVPHOR
00771 415*      SAQT = STPM(2,1)/0.3
00772 416*      IF(SAQT.GE.SBQT) SAQT = SBQT

```

Table I.--Continued.

01000	417*	AA(33,17) = SAQT * 2000. / (HOUR* 25.)	
01001	418*	STEAM = STEAM + (HWT * 2000. / HOUR)	
01002	419*	CALL EVPHOR	
01003	420*	IA(66,1)=0.	
01004	421*	AA(66,17)=30.*SRQOT	*2000./(10.*60.*HOUR)
01005	422*	CALL PMPCNT	
01006	423*	HP=.001*AA(66,17)	
01007	424*	SUMHP=SUMHP + HP	
01007	425*	C	
01007	426*	C	
01007	427*	C	
01010	428*	AA(40,17)=SRQOT	*2000./(10.*1.)*.01
01011	429*	IA(40,1)=2	
01012	430*	CALL STORAG	
01013	431*	IA(40,1)=0	
01013	432*	C	
01013	433*	C	
01013	434*	C	
01014	435*	IA(66,1)=0	
01015	436*	AA(66,17)=30.*AA(40,17)/(60.*HOUR)	
01016	437*	CALL PMPCNT	
01017	438*	HP=.001*AA(66,17)	
01020	439*	SUMHP=SUMHP + HP	
01021	440*	IA(40,1)=2	
01022	441*	AA(40,17)=SRQOT	*2000./10. *15.
01023	442*	CALL STORAG	
01024	443*	IA(40,1)=0.	
01025	444*	52 CONTINUE	
01025	445*	C	
01025	446*	C	
01025	447*	C	
01025	448*	C	
01025	449*	C	
01025	450*	C	
01026	451*	TASAE= STMM(NOREAC+1)/2.	
01027	452*	N7= NOREAC + 1	
01030	453*	TASB= STM(1,N7) + STM(2,N7) + STM(3,N7) + (0.05*STM(4,NZ))	
01030	454*	1 + (STM(5,N7)*1.E-04 * 1.0)	
01031	455*	TASC= STM(4,N7) * .05	
01032	456*	TASD= STM(5,N7) * .0999	
01033	457*	STEAM6 = (TASC + 1.0 * TASD) * 2000. / HOUR	
01034	458*	STEAM= STEAM + STEAM6	
01034	459*	C	
01035	460*	DRYER - CONDITIONFR	
01036	461*	AA(21,17) = 3.8* 16.* TASA/ 24.	
01037	462*	IA(21,5) = 6.	
01040	463*	BB(2) = 0.9	
01041	464*	CALL DRYERR	
01042	465*	BR(2) = 1.0	
01043	466*	IA(21,5) = 7	
01044	467*	CALL DRYERR	
01045	468*	BR(2) = 1.0	
01046	469*	IA(21,5) = 7	
01047	470*	CALL DRYERR	
01050	471*	IA(21,5) = 8	
01051	472*	BB(2) = 1.0	
01052	473*	CALL DRYERR	
		LOOPS = LOOPS + 4	

D

SD

SD

C

Table I.--Continued.

```

01053 474* AA(17,18) = 6.
01054 475* AA(17,17) = 20.
01055 476* IA(17,5) = 1
01056 477* CALL SCREW
01056 478* C CONVEYER FOR MILK
01057 479* IF(17,18) = 1
01061 480* AA(18,17) = (TASB/8.)
01062 481* CALL HAMMER
01063 482* HP = TASB * 2000. * 75. / (HOUR * 700.)
01064 483* SUMHP = SUMHP + HP
01065 484* PRDCTA = STM(2,NOREAC+1) + STM(3,NOREAC+1)
01066 485* PRDCTA = PRDCTA / 0.95
01067 486* PRDCTB = 0.
01070 487* AA(75,17) = PRDCTA * 2000. / (25. * HOUR * 60.)
01071 488* CALL BAGGMA
01072 489* CALL SCALE
01073 490* AA(75,17) = AA(75,17) * HOUR * 60.
01074 491* GO TO 49
01075 492* 44 CONTINUE
01075 493* C
01075 494* C AT THE TIME THIS CODE WAS COMPILED THERE IS NO SATISFACTORY METHOD
01075 495* C OF SEPARATING ASH AND DRY PROTEIN- SPACE IS PROVIDED WHEN THIS
01075 496* C TECHNOLOGY BECOMES AVAILABLE
01075 497* C
01076 498* 49 CONTINUE
01076 499* C BOILER
01077 500* AA(27,18) = 150.
01077 501* AA(27,17) = STFM
01077 502* CALL BOILER
01077 503* IA(49,1) = 2
01077 504* AA(49,17) = STEAM * 1000. * HOUR / (8.33 * 140000.) * 15.
01077 505* CALL STORAG
01077 506* IA(66,1) = 0
01077 507* AA(66,17) = 30. * AA(49,17) / (40. * 15. * HOUR)
01077 508* CALL PMPCNT
01077 509* HP = .001 * AA(66,17)
01077 510* SUMHP = SUMHP
01077 511* C CONTROL LOOPS
01077 512* XLOOPS = LOOPS
01077 513* COST(1) = XLOOPS * AA(100,1)
01077 514* COST(5) = COST(5)
01077 515* COSTA(1) = COSTA(1) + COST(1)
01077 516* COSTA(5) = COSTA(5) + COST(5)
01077 517* PRINT 1021, COST(1), COST(5)
01077 518* C FORK LIFT
01077 519* 1021 FORMAT(25H CONTROL INSTRUMENTATION , 35X, F10.3, 30X, F10.3)
01077 520* COST(1) = AA(100,20)
01077 521* COST(5) = COST(1)
01077 522* COSTA(1) = COSTA(1) + COST(1)
01077 523* COSTA(5) = COSTA(5) + COST(5)
01077 524* PRINT 1022, COST(1), COST(5)
01077 525* AA(8,17) = TONS
01077 526* CALL CONDEN
01077 527* 1022 FORMAT( / 25H PAYLOADER , 10X, 25X, F10.3, 30X, F10.3)
01077 528* C
01077 529* C BOILER WATER TREATMENT
01077 530* C

```

Table I.--Continued.

```

01137 531* COST(5)=1.
01140 532* COST(1)=COST(5)
01141 533* PRINT 4242, COST(1),COST(5)
01145 534* 4242 FORMAT(/25H BOILER WATER TREATMENT , 10X ,15H
01145 535* 1 ,F10.3,F10.3)
01146 536* COSTA(1)=COSTA(1) + COST(1)
01147 537* COSTA(5)=COSTA(5) + COST(5)
01147 538* C SEA WATER PUMPS
01147 539* C
01147 540* C
01150 541* AA(90,10)=WATER*66. + 4.*STEAM
01151 542* AA(66,17) = AA(00,10)*1.2/60.
01152 543* IA(66,1)=1.
01153 544* IA(66,4)=2.
01154 545* CALL PMPCNT
01155 546* IA(66,1)=0
01156 547* IA(66,4)=0
01157 548* HP= .001*AA(66,17)
01160 549* SUMHP=SUMHP + HP
01160 550* C CARBON ADSORBER
01160 551* C
01160 552* C
01161 553* COST(1)=2.
01162 554* COST(5)=COST(1)
01163 555* PRINT 4243, COST(1),COST(5)
01163 556* COSTA(1)=COSTA(1) + COST(1)
01170 557* COSTA(5)=COSTA(5) + COST(5)
01171 558* 4243 FORMAT(/25H CARBON ADSORBER
01171 559* 1 ,F10.3,F10.3)
01171 560* C VENT CONDENSER
01171 561* C
01171 562* C
01172 563* AA(66,17)=20.
01173 564* IA(67,1)=1
01174 565* IA(67,4)= 4
01175 566* CALL HEATEX
01176 567* IA(67,1)=0
01177 568* IA(67,4)=0
01200 569* CALL SCALE
01201 570* CALL SCALE
01202 571* PRINT 1041,(COSTA(J),J=1,6)
01210 572* 1041 FORMAT(/25H TOTAL COSTS
01211 573* AA(90,2) = SUMHP*.7457 * 24.
01212 574* AA(100,10)= COSTA(5)
01213 575* AA(90,1) = STEAM*1000.*24./140000.
01213 576* MATERIAL BALANCE
01214 577* AA(90,3) = PROCTB
01215 578* AA(90,7) = PROCTA
01216 579* AA(90,5)=01
01217 580* AA(90,18)=WASTE
01220 581* AA(90,19)=ACID
01221 582* CALL MATER(TONS)
01222 583* FISH = TONS*2000./24.
01223 584* PRINT 1003 , FISH
01226 585* 1003 FORMAT(/7X27H FISH TO EXTRACTION VESSELS,F8.0,7H LB/HR )
01227 586* YYA=STEAMJ
01230 587* PRINT 1201,YYA

```

Table I.--Continued.

1201	588*	FORMAT(/8X,15H STEAM(STIRRED VESSEL 1)	,F8.0,7H LR/HR)
	589*	YY=STEAM2	
1202	590*	PRINT 1202,YYR	
	591*	FORMAT(/8X,15H STEAM(STIRRED VESSEL 2)	,F8.0,7H LR/HR)
	592*	YY=STEAM3	
1203	593*	PRINT 1203,YYC	
	594*	FORMAT(/8X,15H STEAM(STIRRED VESSEL 3)	,F8.0,7H LR/HR)
	595*	YY=STEAM4	
1204	596*	PRINT 1204,YYD	
	597*	FORMAT(/8X,15H STEAM(STIRRED VESSEL 4)	,F8.0,7H LR/HR)
	598*	YY=STEAM5	
1205	599*	PRINT 1205,YYF	
	600*	FORMAT(/8X,15H STEAM(PREHEATER-DISTILLATION)	,F8.0,7H LR/HR)
	601*	YY=STEAM6	
1206	602*	PRINT 1206,YYG	
	603*	FORMAT(/8X,15H STEAM(REBOTILER)	,F8.0,7H LR/HR)
	604*	YY=STEAM7	
1207	605*	PRINT 1207,YYH	
	606*	FORMAT(/8X,15H STEAM(ROTARY DYER FPC)	,F8.0,7H LR/HR)
	607*	YY=STEAM8	
1208	608*	PRINT 1208,YYI	
	609*	FORMAT(/8X,15H STEAM(ROTARY DYER BONE MEAL	,F8.0,7H LR/HR)
	610*	YY=(STEAM*4.)	
	611*	PRINT 1209,YYJ	
	612*	YY=STEAM9	
1209	613*	PRINT 1210,YYK	
	614*	FORMAT(/8X,15H COOLING WATER DISTILLATION COND.	,F8.0,9H GAL/MIN)
	615*	YY=STEAM10	
1210	616*	FORMAT(/8X,15H COOLING WATER CONDENSER	,F8.0,9H GAL/MIN
	617*	YY=STEAM11	
1211	618*	PRINT 1211,YYL	
	619*	FORMAT(/8X,15H TOTAL STEAM	,F8.0,7H LR/HR)
	620*	YY=STEAM*4.) + WATER	
	621*	PRINT 1212,YYM	
1212	622*	FORMAT(/8X,15H TOTAL WATER	,F8.0,7H LR/HR)
	623*	YY=STEAM12	
1213	624*	PRINT 1213	
	625*	FORMAT(/40X, 9H STREAM 1,7X,9H STREAM 2,7X,9H STREAM 3,7X,9H STR	
	626*	CEAM 4,7X,9H STREAM 5,7)	
	627*	PRINT 1214,(STRM(1,K),K=1,5)	
	628*	PRINT 1215,(STRM(2,K),K=1,5)	
	629*	PRINT 1216,(STRM(3,K),K=1,5)	
	630*	PRINT 1217,(STRM(4,K),K=1,5)	
	631*	PRINT 1218,(STRM(5,K),K=1,5)	
	632*	PRINT 1219,(STRM(6,K),K=1,5)	
	633*	PRINT 1220,(STRM(7,K),K=1,5)	
	634*	PRINT 1221,(STRM(8,K),K=1,5)	
	635*	PRINT 1222,(STRM(9,K),K=1,5)	
	636*	PRINT 1223,(STRM(10,K),K=1,5)	
1214	637*	FORMAT(/10X,20H RAFFINATE OIL	,10X,4(F10.3, AX),F10.3)
1215	638*	FORMAT(/10X,20H RAFFINATE ASH	,10X,4(F10.3, AX),F10.3)
1216	639*	FORMAT(/10X,20H RAFFINATE PROTEIN	,10X,4(F10.3, AX),F10.3)
1217	640*	FORMAT(/10X,20H RAFFINATE WATER	,10X,4(F10.3, AX),F10.3)
1218	641*	FORMAT(/10X,20H RAFFINATE ALCOHOL	,10X,4(F10.3, AX),F10.3)
1219	642*	FORMAT(/10X,20H RAFFINATE OIL	,10X,4(F10.3, AX),F10.3)
1220	643*	FORMAT(/10X,20H EXTRACT ASH	,10X,4(F10.3, AX),F10.3)
1221	644*	FORMAT(/10X,20H EXTRACT PROTEIN	,10X,4(F10.3, AX),F10.3)

Table I.-- Continued.

```

01432 645* 1222 FORMAT(/10X,20H EXTRACT WATER ,10X,4(F10.3, 8X),F10.3)
01433 646* 1223 FORMAT(/10X,20H EXTRACT ALCOHOL ,10X,4(F10.3, 8X),F10.3)
01434 647* XXA= STMM(5)* 2000./24.
01435 648* PRINT 1224, XXA
01440 649* 1224 FORMAT(/8X,15H FLOW FROM EXTRACTION VESSEL 4 ,F8.0,7H LB/HR )
01441 650* XXB= STRMM(1)* 2000./24.
01442 651* 1225 FORMAT(/8X,15H FLOW FROM EXTRACTION VESSEL 1 ,F8.0,7H LB/HR )
01443 652* PRINT 1225, XXB
01446 653* XXC=MATRL*2000./HOUR
01447 654* PRINT 1226,XXC
01452 655* 1226 FORMAT(/8X,15H AQUEOUS STREAM(CENTRIFUGE) ,F8.0,7H LB/HR )
01453 656* XXD=(STOP(1)+STOP(2))*2000./24.
01454 657* PRINT 1227,XXD
01457 658* 1227 FORMAT(/8X,15H TOPS FROM DISTILLATION COLUMN ,F8.0,7H LB/HR )
01460 659* XXE= SROT*2000./24.
01461 660* PRINT 1228,XXE
01464 661* 1228 FORMAT(/8X,15H BOTTOMS FROM DISTILLATION COLUMN ,F8.0,7H LB/HR )
01465 662* XXG= AA(90,5)*2000./24.
01466 663* PRINT 1230,XXG
01471 664* 1230 FORMAT(/8X,15H FISH OIL PRODUCT ,F8.0,7H LB/HR )
01472 665* XXH=AA(90,3)*2000./24.
01473 666* 1231 FORMAT(/8X,15H FISH PROTEIN CONCENTRATE ,F8.0,7H LB/HR )
01474 667* XXI=AA(90,7)*2000./24.
01475 668* PRINT 1232, XXH
01500 669* PRINT 1231, XXI
01503 670* 1232 FORMAT(/8X,15H HOME MEAL CONCENTRATE ,F8.0,7H LB/HR )
01504 671* AA(95,1)=SBQQT
01505 672* XXJ = AA(95,1)* 2000./24.
01506 673* PRINT 1233, XXJ
01511 674* 1233 FORMAT(/8X,15H FISH SOLUBLES ,F8.0,7H LB/HR )
01512 675* IXX=(14.0*(TONS/50.))*31 + 0.5
01513 676* AA(90,8)=IXX**8
01514 677* AA(90,9)=(YYJ+YYK)*24.
01515 678* AA(90,13) = AA(90,13) + (AA(90,3)+AA(90,7)+AA(90,20)+AA(90,4))
01516 679* RETURN
01517 680* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S BIOLOG,BIOLOG
FOR 59A-07/12-11:34 (0,)

SUBROUTINE BIOLOG ENTRY POINT 002306

STORAGE USED: CODE(1) 002350; DATA(0) 000733; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 PMPREC
0006 RELT
0007 STORAG
0010 REFRIG
0011 PMPCNT
0012 SILO
0013 HUCKET
0014 GRINDR
0015 REACTR
0016 AGITR
0017 SCREEN
0020 SCREW
0021 DRYEPR
0022 HAMMER
0023 RAGGMA
0024 SCALE
0025 SHARP
0026 FVPFLM
0027 FVPSPR
0030 HOILER
0031 CONDEN
0032 WATER
0033 NRDC\$
0034 NI02\$
0035 NPRT\$
0036 NI01\$
0037 NEXP6\$
0040 FERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000367	160L	0000	000041	1000F	0000	000050	1001F	0000	000065	1002F	0000	000252	1003F
0000	000263	1604F	0000	000274	1005F	0000	000342	1006F	0000	000353	1007F	0000	000364	1008F
0000	000375	1609F	0001	000564	101L	0000	000406	1010F	0000	000417	1011F	0000	000430	1012F
0000	000441	1613F	0000	000452	1014F	0000	000305	1015F	0000	000463	1016F	0000	000474	1017F
0000	000505	1618F	0000	000516	1019F	0001	000627	1021	0000	000527	1020F	0000	000207	1021F
0000	000225	1622F	0000	000546	1023F	0000	000551	1024F	0001	000712	103L	0000	000316	1033F
0000	000243	1641F	0001	000036	106G	0000	000027	111F	0001	000327	111F	0001	000013	114G
0001	000020	122G	0000	000110	2000F	0001	000134	201G	0000	000113	3000F	0000	000171	4242F

Table I.-- Continued.

0000	000153	4249F	0001	001160	470G	0000	000031	5000F	0001	001234	510G	0001	001730	707G
0001	001757	722G	0003	000000	AA	0000	R 000012	ADDI	0003	R 004704	BB	0000	R 000024	COOI
0004	R 000000	COST	0004	R 000007	COSTA	0000	R 000023	FISH	0000	R 000006	G	0000	R 000002	GALLON
0000	R 000003	GALS	0000	R 000007	HP	0000	I 000000	I	0003	I 003720	IA	0000	000720	INJPS
0000	I 000014	INST	0000	I 000025	TXS	0000	I 000022	J	0000	I 000010	LOOPS	0000	I 000005	NUM
0000	R 000026	PXX	0000	R 000016	SLDS	0000	R 000004	SUMHP	0000	R 000001	TONSA	0000	R 000011	TONSG
0000	R 000015	VOLD	0000	R 000013	VOLT	0000	R 000017	WATER	0000	R 000020	WATEVP	0000	R 000021	XLOOPS
00101	1*		SUBROUTINE RTOLOG(TONS)											
00103	2*		COMMON/BLOCK1/AA(100,20),IA(100,5),BB(100)											
00104	3*		COMMON /BLOCK2/ COST(7),COSTA(7)											
00105	4*		DO 1 I=1,7											
00110	5*		COST(I)=0.0											
00111	6*	1	COSTA(I)=0.0											
00113	7*		DO 2 I=1,20											
00116	8*		AA(90,I)=0.0											
00117	9*	2	AA(91,I)=0.0											
00121	10*		DO 10 I=30,33											
00124	11*	10	BB(I)=BB(I)*0.01											
00126	12*		READ 111, BB(40),BB(41),BB(42),BB(43),BB(44)											
00135	13*	111	FORMAT(5F12.5)											
00136	14*		PRINT 5000											
00140	15*	5000	FORMAT(8X36H ANTI-OXIDANT PRICE AND EFFECTIVENESS)											
00141	16*		PRINT 1001,BR(44),BR(43)											
00145	17*		PRINT 1000											
00147	18*	1000	FORMAT(8X34H ENZYME PRICE AND EFFECTIVENESS)											
00150	19*		PRINT 1001,BR(41),BR(40)											
00154	20*	1001	FORMAT(8X8H PRICE =,F5.2,12H DOLLARS/LR.,F8.3,32H LB REQUIRED PF											
00154	21*		CR 100 LB OF FISH)											
00155	22*		IF(BB(42).GT.0.0) PRINT 1002,BB(42)											
00161	23*	1002	FORMAT(8XFR.2,51H PERCENT OF DISSOLVED PROTEIN PACKAGED AS RCF PA											
00161	24*		CSTE)											
00162	25*		PRINT 2000											
00164	26*	2000	FORMAT(1H1/55H DETAILED EQUIPMENT COSTS (ALL COSTS IN 1000.0 DOL											
00164	27*		CLARS)											
00165	28*		PRINT 3000											
00167	29*	3000	FORMAT(//10H EQUIPMENT TYPE,10X10H CAPACITY,12X0H MATERIAL,											
00167	30*		C60H BASE MATERIALS LABOR INDIRECT MODULE RANGE ,/4											
00167	31*		C0X60H COST COSTS COSTS COST + OR -)											
00167	32*		C UNLOADING AND STORAGE OF FISH											
00167	33*		C											
00170	34*		TONSA=TONS*2000./R.33											
00171	35*		GALLON= TONSA/(24.*60.)											
00172	36*		GALS =GALLON*1.3											
00173	37*		SUMHP= 0.											
00174	38*		IA(65,1)= 0											
00175	39*		IA(65,2)= 1.0											
00176	40*		AA(65,17)= GALS*3.0.											
00177	41*		NUM = TONS/500 + 1											
00200	42*		DO 143 I=1,NUM											
00203	43*	143	CALL PHPREC											
00205	44*		IA(65,2)= 0.0											
00205	45*		SUMHP= SUMHP + (AA(65,17)*.001*1.5)											
00206	46*													

Table I.-- Continued.

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00207 47* SUMHP= SUMHP + (AA(65,17)*.001*1.5)
00210 48* IF (TONSA.LT.30000.) G=(30000.)/(24.*60.)*15.
00212 49* IF (TONSA.GE.30000.) G=(450000.)/(24.*60.)*15.
00214 50* IF (TONS.LE.150.) AA(70,18)= 36.
00216 51* IF (TONS.GT.150.) AA(70,18)= 48.
00220 52* AA(70,17)=100.
00221 53* CALL BELT
00222 54* HP = TONS*.00124 +13.6
00223 55* SUMHP = HP + SUMHP
00224 56* AA(40,17)=30.0*TONS
00225 57* IA(40,1)=0.0
00226 58* IA(40,2)=2
00227 59* CALL STORAG
00230 60* IA(40,2)=0
00231 61* AA(85,17)=0.5*TONS*.3,0
00232 62* IA(85,1) =30
00233 63* CALL REFRIG
00234 64* SUMHP = SUMHP + 4.7*AA(85,17)
00235 65* COST(1)=1.19
00236 66* IF (TONS.GE.300) COST(1)=1.88
00240 67* COST(5)=COST(1)
00241 68* PRINT 4249, COST(1), COST(5)
00245 69* COSTA(1)=COSTA(1)+COST(1)
00246 70* COSTA(5)=COSTA(5)+COST(5)
00247 71* FORMAT(25H BRINE MAKE-UP+SALT STOR., 10X ,15H
00247 72* ,F10.3,3X,F10.3)
00247 73* C PUMP FOR URINE MAKE-UP (RRONZF)
00250 74* IA(66,1)=1
00251 75* AA(66,17)=TONS*.3*.2000./(24.*60.*62.4)*.69*7.75
00252 76* CALL PMPCNT
00253 77* IA(66,1)=0
00254 78* HP=.001*AA(66,17)
00255 79* SUMHP=SUMHP+HP
00256 80* C PUMP FOR WATER INTO BRINE MAKE-UP
00257 81* AA(66,17)=AA(66,17)*.917
00260 82* IA(66,1)=0
00261 83* CALL PMPCNT
00261 84* HP=.001*AA(66,17)
00262 85* SUMHP=SUMHP+HP
00262 86* C FISH STORAGE FOR 3 DAYS
00262 87* C
00263 88* IA(7,1)=1
00264 89* AA(7,17)=3.*TONS*2000.*1.69/62.4
00265 90* CALL SILO
00266 91* LOOPS=0.0
00267 92* LOOPS=LOOPS+.3.
00270 93* CALL SILO
00271 94* TONS=TONS/24.
00272 95* AA(71,18)= TONS
00273 96* AA(71,17)= 20.
00274 97* CALL BUCKET
00275 98* HP = TONS*.00106
00276 99* SUMHP = HP + SUMHP
00276 100* C FISH GRINDING AND DIGESTION
00276 101* C
00276 102* C
00276 103* C

```

Table I.--Continued.

```

104* 10277 IF(TONSG .LT. 3) AA(50,17)=3
105* 10301 IF(TONSG .GT. 6) AA(50,17)=6
106* 10303 IF(AA(50,17) .GT. 0.0) CALL GRINDR
107* 10305 TONSG = TONSG-AA(50,17)
108* 10306 IF(TONSG .GT. 0.2) GO TO 100
109* 10310 HP = 40*TONSG/3
110* 10311 SUMHP=HP+SUMHP
111* 10311 C PUMP AFTER GRINDER
112* 10312 AA(66,17)=30.*TONSG*2000./(24.*60.*8.*33)
113* 10313 IA(66,1)=0
114* 10314 CALL PMPCNT
115* 10315 SUMHP=SUMHP+.001*AA(66,17)
116* 10316 C PUMP BEFORE DIGESTER
117* 10317 CALL PMPCNT
118* 10317 SUMHP=.001*AA(66,17)+SUMHP
119* 10320 AA(40,17) = 2*TONSG*2000./(8.33*24)
120* 10321 IA(40,1) = 1
121* 10322 CALL STORAG
122* 10323 IA(40,1) = 0
123* 10324 AA(90,15)=TONSG*.0004
124* 10325 AA(90,13)=(BR(30)+BR(31)+BR(32))*TONSG*.0001
125* 10326 AA(90,17)=TONSG*.00432
126* 10327 AA(90,14)=TONSG*.0192
127* 10330 AA(90,12)=TONSG*(BR(40)/100.0)
128* 10331 ADDT=0.0
129* 10332 ADDT=AA(90,12)+AA(90,13)+AA(90,15)+AA(90,17)+AA(90,14)
130* 10333 AA(91,1)=ADDT+.2*TONSG
131* 10334 VOLT=AA(91,1)*2000/(8.33*4.8)
132* 10335 AA(51,2) = 2.0
133* 10336 AA(51,17) = 2.0
134* 10337 AA(49,17)=VOLT/3
135* 10340 IF(AA(49,17) .LT. 10000) AA(73,17) = AA(49,17)*0.005
136* 10342 IF(AA(49,17) .LT. 10000) GO TO 101
137* 10344 IF( AA(49,17) .GT. 10000) AA(73,17) = 50.
138* 10346 IF(AA(49,17) .GT. 10000) AA(40,17)=10000
139* 10350 IA(66,17)=30.*AA(40,17)*4.8/(60.*24)
140* 10351 IA(66,1)=0
141* 10352 CALL REACTR
142* 10353 CALL AGITOR
143* 10354 CALL SCREEN
144* 10355 CALL REACTR
145* 10356 CALL AGITOR
146* 10357 CALL SCREEN
147* 10360 CALL REACTR
148* 10361 CALL AGITOR
149* 10362 CALL SCREEN
150* 10363 INST = 3
151* 10364 HP = 3*AA(73,17)
152* 10365 SUMHP = HP + SUMHP
153* 10366 VOLD =VOLT -AA(49,17)*3
154* 10367 IF(VOLD .LT. 500) GO TO 103
155* 10371 IF(VOLD .LT. 10000) AA(40,17)=VOLD
156* 10373 IF(AA(49,17) .LT. 10000) AA(73,17) = AA(49,17)*0.005
157* 10375 IF(VOLD .GT. 10000) AA(40,17)=10000
158* 10377 IF( AA(49,17) .GT. 10000) AA(73,17) = 50.
159* 10401 CALL REACTR
160* 10402 CALL AGITOR

```


Table I.-- Continued.

00403	161*	CALL SCREEN
00404	162*	INST = INST + 1
00405	163*	VOLD = VOLD -AA(40,17)
00406	164*	HP = AA(73,17)
00407	165*	SUMHP = HP + SUMHP
00410	166*	GO TO 102
00411	167*	103 CONTINUE
00411	168*	C BONE FEED STREAM
00411	169*	C
00411	170*	
00412	171*	BB(2)=1.
00413	172*	SLDS=((40./667.)*BB(31))+(110./250.)*BB(32))+(10./500.)*BB(30))
00413	173*	C)*TONS+(125./299.3)*ADD1*(110./250.))
00414	174*	WATER=TONS*(1.+BB(31))+(174.3/299.3)*ANDT
00415	175*	AA(91,10)=((180./667.)*BB(31))+(112./500.)*BB(30))+(50./250.)*B
00415	176*	CB(32))*TONS+(125./299.3)*ADD1*(50./250.))+(1058./7216.5)*WATER)
00416	177*	AA(91,2)=(320./160.)*SLDS
00416	178*	C PUMP FOR SLUDGE FROM CENTRIFUGE
00417	179*	IA(66,1)=0
00420	180*	AA(66,17)=AA(91,10)*30.*2000./(24.*8.33*60.)
00421	181*	CALL PMPCNT
00422	182*	HP=.001*AA(66,17)
00423	183*	SUMHP=HP+SUMHP
00423	184*	C SCREW CONVEYOR
00423	185*	C
00423	186*	
00424	187*	AA(17,18)=6
00424	188*	C FISH OIL STREAM
00424	189*	C
00425	190*	AA(91,3)=AA(91,1)-AA(91,2)
00425	191*	C PUMPS BEFORE AND AFTER HOLD TANK OF FIRST CENTRIFUGE
00426	192*	IA(66,1)=0
00427	193*	AA(17,17)=20
00430	194*	IA(17,5)=1
00431	195*	CALL SCREW
00432	196*	IA(21,5)=3
00433	197*	AA(21,17)=AA(91,2)*2.5
00434	198*	CALL DRYERR
00435	199*	AA(90,3)=(SLDS+AA(91,10))-((1058./7216.5)*WATER))/9
00436	200*	AA(91,12)=AA(91,2)+AA(91,10)-AA(90,3)
00436	201*	C BAGGING MACHINE FOR BONE MEAL
00436	202*	C
00436	203*	
00437	204*	AA(75,17)=AA(90,3)*2000./(24.*60.*25.)
00440	205*	IA(75,2)=0
00441	206*	IA(75,1)=0
00442	207*	AA(18,17)=AA(90,3)/24.
00443	208*	CALL HAMMER
00444	209*	CALL BAGGMA
00445	210*	AA(75,5)=AA(75,17)
00446	211*	AA(72,17) = 18.
00447	212*	CALL SCALE
00447	213*	C
00450	214*	AA(66,17)=AA(91,3)*30.*2000./(24.*33*24.*60.)
00451	215*	CALL PMPCNT
00452	216*	CALL PMPCNT
00453	217*	SUMHP=2.*.001*AA(66,17)+SUMHP

Table I.--Continued.

```

00454 218* AA(72,17)=18.
00455 219* CALL SCALE
00456 220* AA(40,17) = AA(91,3)*2000./ (8.33*24.)
00457 221* IA(40,1) = 1
00460 222* CALL STORAG
00461 223* IA(40,1) = 0
00462 224* AA(91,6) = ((447./667.)*BB(31)) + ((3./500.)*BB(30)) + ((90./250.)*BB(3
00463 225* C21))*TONS + ((125./209.3)*ADNT*(90./250.)) + ((1598./7216.5)*WATER)
00464 226* AA(91,4) = AA(01,3) - AA(91,6) - AA(91,10)
00465 227* HP = 0.01*AA(91,3)*2000.0/(8.33*24.0)
00466 228* SUMHP = HP + SUMHP
00467 229* NUM = HP/20. + 1
00470 230* DO 20 I=1,NIM
00473 231* AA(52,17)=20.
00475 232* CALL SHARP
00476 233* HP = 0.025*AA(91,4)*2000.0/(8.33*24.0)
00477 234* SUMHP = SUMHP + HP
00480 235* 20
00481 236* IA(66,1)=0
00482 237* AA(66,17) = AA(91,4)*2000.*30./ (8.33*24.*60.)
00483 238* CALL PMPCNT
00484 239* CALL PMPCNT
00485 240* SUMHP = 2.*.001*AA(66,17) + SUMHP
00486 241* AA(40,17) = AA(91,4)*2000./ (8.33*24.)
00487 242* CALL STORAG
00488 243* NUM = HP/20. + 1
00489 244* DO 30 I=1,NIM
00490 245* AA(52,17) = 20.0
00491 246* CALL SHARP
00492 247* 30
00493 248* C HOLD TANK FOR FISH OIL
00494 249* C
00495 250* AA(90,5) = TONS*RB(30)*.75
00496 251* AA(40,17) = AA(90,5)*2000./ (8.33*24.)
00497 252* CALL STORAG
00498 253* C FISH OIL STORAGE (15 DAYS)
00499 254* C
00500 255* AA(40,17) = 15.*AA(90,5)*2000./8.33
00501 256* IA(40,1) = 0.0
00502 257* CALL STORAG
00503 258* AA(66,17) = AA(90,5)*.30.0*2000.0/(8.33*24*60)
00504 259* SUMHP = SUMHP + (AA(66,17)*.001)
00505 260* SUMHP = SUMHP + (AA(66,17)*.001)
00506 261* IA(66,1) = 0
00507 262* CALL PMPCNT
00508 263* CALL PMPCNT
00509 264* C DISSOLVED SOLIDS STREAM
00510 265* C
00511 266* C PUMPS BEFORE AND AFTER HOLD TANK
00512 267* C
00513 268* IA(66,1) = 0
00514 269* AA(66,17) = AA(91,6)*2000./ (8.33*24.*60.)*30.
00515 270* CALL PMPCNT
00516 271* CALL PMPCNT
00517 272* SUMHP = SUMHP + 2.*.001*AA(66,17)
00518 273* CALL PMPCNT
00519 274* AA(40,17) = AA(91,6)*2000./ (8.33*24.)

```

Table I.--Continued.

```

00537 275* IA(40,1) = 1
00540 276* CALL STORAG
00541 277* IA(40,1) = 0
00542 278* WATEVP=(5998./7216.5)*WATER-(AA(91,6)-(5998./7216.5)*WATER)
00543 279* AA(91,13)=WATEVP
00544 280* AA(31,17)=AA(91,1)*2000.0/(24*25)
00545 281* CALL EVFELM
00546 282* AA(91,7)=2.*(AA(91,6)-(5998./7216.5)*WATER)
00547 283* AA(90,6)=AA(91,7)*BR(42)*0.01
00550 284* AA(72,17) = 18.
00551 285* CALL SCALE
00551 286*
C
00551 287* C HOLD TANK
00551 288*
C
00551 289* AA(40,17)=AA(91,7)*2000./(18.33*24.)*1.
00552 290* IA(40,1)=1
00553 291* CALL STORAG
00554 292* IA(40,1)=0
00555 293*
C PUMP AFTER WIPE FILM EVAPORATOR
00556 294* IA(66,1)=0
00557 295* AA(66,17)=AA(91,7)*2000.*30./(18.33*24.*60.)
00560 296* CALL PMPCNT
00561 297* HP=.001*AA(66,17)
00562 298* SUMHP=HP+SUMHP
00563 299*
C PUMP BEFORE CANNING MACHTNE
00564 300* AA(66,17)=AA(90,6)*2000.*30./(18.33*24.*60.)
00566 301* IF(BB(42).GT.0.0) CALL PMPCNT
00567 302* HP=.001*AA(66,17)
00570 303* SUMHP=HP+SUMHP
00571 304*
C
00571 305* IA(75,1)=1.0
00572 306* IA(75,2)=2.0
00573 307* IF(BB(42).GT.0.0) CALL RAGGNA
00575 308* IA(75,1) = 0.0
00576 309* AA(75,4)=AA(75,17)
00577 310* AA(75,4)=AA(75,4)*60.*24.
00600 311* IA(75,2)=0.0
00601 312* AA(91,9)=AA(91,7)-AA(90,6)
00601 313*
C PUMP BEFORE SPRAY DRYER
00602 314* AA(66,17)=AA(91,9)*2000.*30./(18.33*60.*24.)
00603 315* CALL PMPCNT
00604 316* HP=.001*AA(66,17)
00605 317* SUMHP=HP+SUMHP
00606 318* AA(90,7)=AA(91,9)/(2.*.95)
00607 319* AA(91,14)=AA(91,9)-AA(90,7)
00610 320* AA(30,17)=AA(91,14)*2000.0/24.0
00611 321* CALL EVSPR
00612 322* AA(72,17) = 18.
00613 323* CALL SCALE
00614 324* IA(75,1)=0.
00615 325* IA(75,2)=0.
00616 326* AA(75,17)=AA(90,7)*2000.0/(24*60*25)
00617 327* IF(BB(42).GT.100) CALL RAGGNA
00621 328* AA(75,17)=AA(75,17)+AA(75,5)
00622 329* AA(75,17)=AA(75,17)*60.*24.
00622 330*
C
00622 331* C SUMMATION OF STEAM,WATER AND FLECTRICITY

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Table I.--Continued.

nn622	332*	C	AA(91,15)=(AA(91,11)+AA(91,12)+AA(91,13)+AA(91,14))*1.05	
nn623	333*		AA(27,17)=AA(91,15)*2000.0/24	
nn624	334*	C	C BOILER WATER TREATMENT	
nn624	335*	C		
nn624	336*	C		
nn624	337*	C		
nn625	338*		COST(5)=1.000	
nn626	339*		COST(1)=COST(5)	
nn627	340*		PRINT 4242,COST(1),COST(5)	
nn633	341*		COSTA(1)=COSTA(1)+COST(1)	
nn634	342*		COSTA(5)=COSTA(5)+COST(5)	
nn635	343*		4242 FORMAT(/25H BOILER WATER TREATMENT , 10X ,15H	
nn635	344*	1	,F10.3,3nX,F10.3)	,10H
nn635	345*	C	C SEA WATER PUMPS	
nn635	346*	C		
nn635	347*	C		
nn636	348*		AA(90,10)=33.1*(AA(91,13)+AA(91,14))*1.2	
nn637	349*		AA(66,17)=AA(90,10)*2000.0/(8.33*24*60*0.066)	
nn640	350*		IA(66,1)=1	
nn641	351*		IA(66,4)=2	
nn642	352*		CALL PMPCNT	
nn643	353*		IA(66,1)=0	
nn644	354*		IA(66,4)=0	
nn645	355*		CALL BOILER	
nn645	356*	C	C FUEL OIL STORAGE (15 DAYS)	
nn645	357*	C		
nn645	358*		IA(40,1)=2	
nn646	359*		AA(40,17)=AA(27,17)/A.33*24*.0112*15.	
nn647	360*		CALL STORAG	
nn650	361*		IA(66,1)=0	
nn652	362*		AA(66,17)=30.*AA(40,17)/(15.*60.*24.)	
nn653	363*		CALL PMPCNT	
nn654	364*		HP=.001*AA(66,17)	
nn655	365*		SUMHP=SUMHP+HP	
nn656	362*		SUMHP = SUMHP+(AA(66,17)*.001*1.5)	
nn657	368*		AA(90,9)=4.*TONS+(174.3/299.3)*ADD+.1*AA(91,4)+.1*AA(91,15)	
nn660	369*		XLOOPS=XLOOPS+10.+3.*TNST	
nn661	370*		COST(1)=XLOOPS *AA(100,1)	
nn662	371*		COST(5)=COST(1)	
nn663	372*		COSTA(1) = COSTA(1) + COST(1)	
nn664	373*		COSTA(5)=COSTA(5) + COST(5)	
nn665	374*		PRINT 1021 COST(1),COST(5)	
nn671	375*		1021 FORMAT(/ 25H CONTROL INSTRUMENTATION , 10X ,15H	
nn671	376*	1	,F10.3,3nX,F10.3)	,10H
nn672	377*		AA(8,17) = TONS	
nn673	378*		CALL CONDEN	
nn674	379*		COST(1)=AA(1n0,2)	
nn675	380*		COST(5)=COST(1)	
nn676	381*		COSTA(1)=COST(1) + COSTA(1)	
nn677	382*		COSTA(5)=COSTA(5) + COST(5)	
nn700	383*		PRINT 1022, COST(1),COST(5)	
nn704	384*		1022 FORMAT(/ 25H PAYLOADER AND FORK LIFT , 10X ,15H	
nn704	385*	1	,F10.3,3nX,F10.3)	,10H
nn705	386*		PRINT 1041,(COSTA(J),J=1.6)	
nn713	387*		1041 FORMAT(/25H TOTAL COSTS	
nn714	388*		COSTA(7)=0.02*COSTA(1)	,35X6F10.3)

Table I.--Continued.

00715	389*	AA(100,10)=COSTA(5)	
00715	390*		
00715	391*	C MATERIAL BALANCE INFORMATION PRINTOUT. ALL STREAMS HERF CONVERTED TO	
00715	392*	C LB/HR	
00716	393*	AA(90,2)=SIMHP*.7457*24.	
00717	394*	AA(90,10)=AA(90,10)/R.33*2000./24.	
00720	395*	CALL WATER(TONS)	
00721	396*	DO 40 I=1,20	
00724	397*	AA(90,I)=AA(90,I)*2000/24	
00725	398*	AA(91,I)=AA(91,I)*2000/24	
00727	399*	FISH=TONS*2000/24	
00730	400*	PRINT 1003,FISH	
00733	401*	FORMAT(/8X26H FISH FEED TO GRINDERS	,F8.0,7H LB/HR)
00734	402*	PRINT 1004,AA(90,12)	
00737	403*	FORMAT(/8X26H ENZYME TO DIGESTERS	,F8.2,7H LB/HR)
00740	404*	PRINT 1005,AA(90,15)	
00743	405*	FORMAT(/8X26H,CAOH TO DIGESTERS	,F8.0,7H LB/HR)
00744	406*	PRINT 1015,AA(90,13)	
00747	407*	FORMAT(/8X26H ANTIOXIDANT TO DIGESTERS	,F8.2,7H LB/HR)
00750	408*	PRINT 1033,AA(90,17)	
00753	409*	FORMAT(/8X26H SN NAOH TO DIGESTERS	,F8.2,7H LB/HR)
00754	410*	PRINT 1111,AA(90,14)	
00757	411*	FORMAT(/8X41H CONCENTRATED SULFURIC ACID TO DIGESTERS	,F8.2,7H LB/HR)
00757	412*	CHR)	
00760	413*	PRINT 1006,AA(91,2)	
00763	414*	FORMAT(/8X26H FEED TO ROTARY DRYER	,F8.0,7H LB/HR)
00764	415*	PRINT 1007,AA(91,12)	
00767	416*	FORMAT(/8X26H ROTARY DRYER STEAM	,F8.0,7H LB/HR)
00770	417*	PRINT 1008,AA(90,3)	
00773	418*	FORMAT(/8X26H BONF FEED	,F8.0,7H LB/HR)
00774	419*	PRINT 1009,AA(91,3)	
00777	420*	FORMAT(/8X26H DIGESTER LIQUOR	,F8.0,7H LB/HR)
01000	421*	PRINT 1010,AA(90,5)	
01003	422*	FORMAT(/8X26H FISH OIL	,F8.0,7H LB/HR)
01004	423*	PRINT 1011,AA(91,6)	
01007	424*	FORMAT(/8X26H FEED TO FILM EVAPORATOR	,F8.0,7H LB/HR)
01010	425*	PRINT 1012,AA(91,13)	
01013	426*	FORMAT(/8X26H FILM EVAPORATOR STEAM	,F8.0,7H LB/HR)
01014	427*	COOL=AA(91,13)*4	
01015	428*	PRINT 1013,COOL	
01020	429*	FORMAT(/8X26H FILM EVAPORATOR COOLING	,F8.0,7H GAL/HR)
01021	430*	PRINT 1014,AA(91,7)	
01024	431*	FORMAT(/8X26H BFC PASTE	,F8.0,7H LB/HR)
01025	432*	AA(90,13)=0.0005*(AA(91,7)+AA(90,3))	
01026	433*	PRINT 1016,AA(90,6)	
01031	434*	FORMAT(/8X26H PACAGED AS BFC PASTE	,F8.0,7H LB/HR)
01032	435*	PRINT 1017,AA(91,9)	
01035	436*	FORMAT(/8X26H FEED TO SPRAY EVAPORATOR	,F8.0,7H LB/HR)
01036	437*	PRINT 1018,AA(91,14)	
01041	438*	FORMAT(/8X26H SPRAY EVAPORATOR STEAM	,F8.0,7H LB/HR)
01042	439*	COOL=4*AA(91,14)	
01043	440*	PRINT 1019,COOL	
01046	441*	FORMAT(/8X26H SPRAY EVAP. COOLING	,F8.0,7H GAL/HR)
01047	442*	PRINT 1020,AA(90,7)	
01052	443*	FORMAT(/8X26H BFC POWDER	,F8.0,7H LB/HR)
01053	444*	AA(91,16)=AA(91,15)+AA(91,13)+AA(91,14)+AA(91,12)	
01054	445*	PRINT 1023,AA(91,16)	

Table I.--Continued.

01057	446*	1023	FORMAT(/8X26H MISCEALANEOUS STEAM	
01060	447*		AA(90,9)=AA(90,9)/8.33	
01061	448*		PRINT 1024 ,AA(90,9)	
01064	449*	1024	FORMAT(/8X26H CITY WATER	
01065	450*		AA(90,1) = AA(27,1)*24*0.0112	
01066	451*		AA(90,2) = SIMHP* .7457 * 24.	
01067	452*		AA(90,3) = AA(90,3)*24/2000	
01070	453*		AA(90,5) = AA(90,5)*24/2000	
01071	454*		AA(90,6) = AA(90,6)*24/2000	
01072	455*		AA(90,7) = AA(90,7)*24/2000	
01073	456*		IXX =(14.0*(T0NS/50.0)**.31) +0.5	
01074	457*		PXX =IXX	
01075	458*		AA(90,8) =IXX*8.0	
01076	459*		AA(90,9) =AA(90,9)*24	
01077	460*		AA(90,12)=AA(90,12)*24	
01100	461*		AA(90,13)=AA(90,13)*24	
01101	462*		AA(90,15)=AA(90,15)*24	
01102	463*		AA(90,14)=AA(90,14)*24	
01103	464*		AA(90,17)=AA(90,17)*24	
01104	465*		RETURN	
01105	466*		END	
			END OF COMPILATION:	NO DIAGNOSTICS.

Table I.-- Continued.

FOR S XXIPA,XXIPA
FOR 59A-07/12-11:94 (0,)

SUBROUTINE XXIPA ENTRY POINT 004256

STORAGE USED: CODE(1) 004346; DATA(0) 001463; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016
0005 BLOCK4 000012

EXTERNAL REFERENCES (BLOCK, NAME)

0006 PMPREC
0007 RELT
0010 STORAG
0011 REFRIG
0012 SILO
0013 PMPCNT
0014 BUCKET
0015 PULVER
0016 AGITOR
0017 REACTR
0020 SCREEN
0021 SCREW
0022 HEATEX
0023 DRYERR
0024 HAMMER
0025 BAGGMA
0026 CNTFGE
0027 SHARP
0030 VESSEL
0031 COLUMN
0032 EVPHOR
0033 BOILER
0034 CONDEN
0035 SCALE
0036 MATER
0037 NPRT\$
0040 NI02\$
0041 NI01\$
0042 SGR
0043 NEXP6\$
0044 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000342	100L	0000	000477	1003F	0001	000527	101L	0000	000410	1021F	0000	000421	1022F
0000	000467	1041F	0001	002322	1044G	0001	002374	1063G	0000	000365	1110F	0000	000246	1113F
0000	000354	1120F	0001	002566	1142G	0001	000014	116G	0000	000510	1201F	0000	000522	1202F
0000	000534	1203F	0000	000546	1204F	0000	000560	1205F	0000	000572	1206F	0000	000604	1207F

Table I.-- Continued.

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00120 18* COST(I)=0.0
00121 19* COSTA(I)=0.0
00122 20* IF(IPTION(1),EQ.2) PRINT 1120
00123 21* IF(IPTION(1),EQ.1) PRINT 1110
00131 22* DO 2 I= 1,20
00132 23* AA (90,I)=0.0
00133 24* AA (91,I)=0.0
00134 25* DO 10 I =30,35
00135 26* BB(I)=BB(I)*.01
00136 27* PRINT 2000
00137 28* FORMAT(1H1/56H DETAILED EQUIPMENT COSTS (ALL COSTS IN 1000.0 DOL
00138 29* CLARS) )
00139 30* PRINT 3001
00140 31* FORMAT (/10H EQUIPMENT TYPE,10X10H CAPACITY,12X6H MATERIAL,
00141 32* C60H BASE MATERIALS LABOR INDIRECT RANGE ,/%
00142 33* C0X60H COST COSTS COSTS MODULE COST + OR - )
00143 34* C UNLOADING AND STORAGE OF FISH
00144 35* TONSA = TONS*2000./8.33
00145 36* GALLONS = TONSA/(24.*60.)
00146 37* GALS = 1.3* GALLONS
00147 38* SUMHP=0.
00148 39* IA(65,1) =0.
00149 40* IA(65,2) =1.0
00150 41* AA(65,17)= GALS*30.
00151 42* NUM = TONS/500 + 1
00152 43* DO 143 I=1,NUM
00153 44* SUMHP=SUMHP+(1.*AA(65,17)*.001*1.5)
00154 45* CALL PMPREC
00155 46* IA(65,2)=0.
00156 47* IF(TONSA.LT.30000.) G=(30000./(24.*60.))*15.
00157 48* IF(TONSA.GE.30000.) G=(450000./(24.*60.))*15.
00158 49* IF(TONS.LE.150.) AA(70,1A)=36.
00159 50* IF(TONS.GE.150.) AA(70,1A)=48.
00160 51* AA(79,17)=100.
00161 52* CALL BELT
00162 53* HP= TONS*.00124 + 13.6
00163 54* SUMHP= SUMHP + HP
00164 55* AA(40,17)= 30.0* TONS
00165 56* IA(40,1) = 0
00166 57* IA(40,2) = 2
00167 58* CALL STORAG
00168 59* IA(40,2)= 0
00169 60* AA(85,17)= 0.5* TONS* 3.0
00170 61* IA(85,1) = 30
00171 62* CALL REFRIG
00172 63* IA(7,1) = 1
00173 64*
00174 65*
00175 66*
00176 67*
00177 68*
00178 69*
00179 70*
00180 71*
00181 72*
00182 73*
00183 74*

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Table I.- Continued.

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75* 4249 FORMAT(25H BRINE MAKE-UP+SALT STOR., 10X ,15H
    1 ,F10.3,3X,F10.3)
76* C
77* C PUMP FOR BRINE MAKE-UP (BRONZF)
78* C
79* C
80* IA(66,1)=1
81* AA(66,17)=TONS*3.*2000./(24.*60.*62.4)*.69*7.75
82* CALL PMPCNT
83* IA(66,1)=0
84* HP=.001*AA(66,17)
85* SUMHP=SUMHP+HP
86* C
87* C PUMP FOR WATER INTO BRINE MAKE-UP
88* C
89* C
90* AA(66,17)=AA(66,17)*.917
91* IA(66,1)=0
92* CALL PMPCNT
93* HP=.001*AA(66,17)
94* SUMHP=SUMHP+HP
95* TONS= TONS/24.
96* AA(71,18)= TONS
97* AA(71,17)= 20.
98* CALL BUCKET
99* HP= TONS* 0.00106
100* SUMHP=HP+SUMHP
101* C FISH GRINDING AND EXTRACTION
102* IF(1PTION(1).EQ.1) GO TO 100
103* C
104* C DRY DEBONING
105* AA(11,17)= TONS* 2000./24.
106* BB(2) = 3.0
107* CALL PULVER
108* FORMAT(//44H THE DRY DEBONING OPTION IS APPROPRIATE)
109* FORMAT(//44H THE WET DEBONING OPTION IS APPROPRIATE)
110* ZA1=0.
111* ZA3=1.
112* GO TO 101
113* CONTINUE
114* C WET DEBONING
115* C
116* ZA1=0.04
117* ZA3=0.
118* NR= 1
119* NA= (TONS/75.) + 1.
120* IF(NA.GT.3) NB = 2
121* IF(NA.GT.3) NA = (TONS/150.)+1.
122* DO 113 J = 1,NA
123* L00PS = L00PS + 1
124* COST(1) = 22.*BB(1)
125* IF(NB.EQ.2) COST(1)= 40.* BB(1)
126* HP=10.
127* IF(NB.EQ.2) HP= 20.
128* SUMHP = SUMHP +
129* COST(2)= COST(1)* .25
130* COST(3)= COST(1)* .25
131* COST(4)= COST(1)* .4
132*
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Table I.--Continued.

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00315 132* COST(5)= COST(1)+ COST(2) + COST(3) +COST(4)
00316 133* COST(6)= .1 * COST(1)
00317 134* DO 114 K=1,7
00322 135* 114 COSTA(K)= COSTA(K) + COST(K)
00324 136* STONE =75.
00325 137* IF(NB.EO.2) STON = 150.
00327 138* PRINT 1113 ,STON,(COST(K),K=1,6)
00336 139* LOOPS=LOOPS + 1
00337 140* 113 CONTINUE
00341 141* 131 CONTINUE
00342 143* ZA2=1. -ZA1
00342 144* C EXTRACTION VESSELS MATERIAL RALATICE
00342 145* C 1=OIL 2=PROTEIN 3=ASH 4=WATER 5= IPA
00342 146* C
00343 147* STM(1,1)=TONS*RB(3n)*ZA2
00344 148* STM(1,2)=.17*STM(1,1)
00345 149* STM(1,3)=.29*STM(1,2)
00346 150* STM(1,4)=.5*STM(1,3)
00347 151* STM(1,5)=.25*STM(1,4)
00350 152* STM(2,1)=TONS*7A2*RB(31)
00351 153* STM(2,2)=.8*STM(2,1)
00352 154* STM(2,3)=.98*STM(2,2)
00353 155* STM(2,4)=1.0*STM(2,3)
00354 156* STM(2,5)=.99*STM(2,4)
00355 157* STM(3,1)=TONS*7A3*RB(32)
00356 158* STM(3,2)=.81*STM(3,1)
00357 159* STM(3,3)=.98*STM(3,2)
00360 160* STM(3,4)=.99*STM(3,3)
00361 161* STM(3,5)=.99*STM(3,4)
00362 162* STM(4,1)=TONS*7A2*RB(33)
00363 163* STM(4,2)=.29*STM(4,1)
00364 164* STM(4,3)=.56*STM(4,2)
00365 165* STM(4,4)=.60*STM(4,3)
00366 166* STM(4,5)=.12*STM(4,4)
00367 167* STM(5,1)=0.
00370 168* STM(5,2)=TONS/50.*1.5
00371 169* STM(5,3)=1.29*STM(5,2)
00372 170* STM(5,4)=1.87*STM(5,3)
00373 171* STM(5,5)=1.84*STM(5,4)
00374 172* STRM(1,5)=0.
00375 173* STRM(2,5)=0.
00376 174* STRM(3,5)=0.
00377 175* STRM(5,5)=TONS*2.
00400 176* STRM(4,5)=0.
00401 177* DO 122 I=4,1,-1
00404 178* DO 122 J=1,5
00407 179* 122 STRM(J,I)= STRM(J,I+1) -STM(J,I+1) +STM(J,I)
00412 180* DO 123 I=1,5
00415 181* * STRM(I)=0.
00416 182* * STRM(I)=0.
00417 183* DO 123 J= 1,5
00422 184* STRM(I)=STM(I) + STM(J,I)
00423 185* STRM(I)=STRM(I)+ STRM(J,I)
00424 186* 123 CONTINUE
00424 187* C
00424 188* C EXTRACTION VESSEL

```

Table I.-- Continued.

```

00424 189*
00427 190*
00430 191*
00431 192*
00431 193*
00432 194*
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00500 228*
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00524 243*
00525 244*
00526 245*

C
TONSA=(TONS*ZA1) + (TONS*RB(32)*ZA2*(1.-ZA3))
TONSJE= TONS-TONSA
SLMXTK= 875.* TONSR / 50.
MIX TANK
GALS= 875.* TONS/50.
AA(73,17)= GALS*.005
IA(66,1)= 2
IA(73,5)= 2
AA(40,17)= GALS
AA(40,18)= 3.2
AA(41,12)=3.2
IA(40,1)= 1
CALL STORAG
GAA= STRMM(1)*2000./(24.*60.)
GAA=GAA/8.33
AA(66,17)=GAA*.0.
IF(GAA.GT.125.) IP= (GAA/125.) + 1
IF(GAA.LE.125.) IP=1
DO 40 IO=1,IP
HP=(AA(66,17)*.001)
SUMHP=HP*SUMHP
CALL PMPCNT
AA(66,17)=(STRMM(1)+STRMM(2))*2000.*30./(24.*60.*8.33)
SUMHP=.001*AA(66,17)+SUMHP
CALL PMPCNT
IF (GALS.GT. 10000.) AA(73,17)=50.
CALL AGITOR

40
C
REACTOR VESFLS
AA(51,17)=TONS*60./50.
IP=(AA(51,17)/144.) +2.
AA(51,17)=IP
VES= TONS*.0.
AA(49,17)= VES
VESH= TONS*16.
IR=1
IF(VES.GT.10000.) IP= (VES/10000.) + 1.
IRR=1
IF(VESH.GT.10000.) IRR= (VESH/10000.)+1.
IF(VES.GT.10000.) VES= 10000.
TANK= 800.* TONS/50.
AA(40,18)= 3.2
AA(41,18)= 3.2
AA(40,17)= TANK
CALL STORAG
SAG= STRMM(2)*2000./(24.*8.33*60.)
IP=1
DO 93 IU=1,IP
IF(SAG.GT.12500.) IP =(SAG/12500.) + 1.
XIP= IP
AA(66,17)= (SAG/XIP)* 24.
CALL PMPCNT
CALL PMPCNT
HP=.001*AA(66,17)
SUMHP=SUMHP+HP

```

Table I.-- Continued.

```

00527 246*      SUMHP=SUMHP+HP
00530 247*      93      CONTINUE
00532 248*      IF(VLESS.GT.10000.) VLESS=10000.
00534 249*      DO 41 I = 1,IR
00537 250*      LOOPS = LOOPS + 3
00540 251*      AA(49,17)= VFS
00541 252*      CALL REACTR
00542 253*      CALL SCREEN
00543 254*      AA(73,17)= .005*VFS
00544 255*      IF(AA(73,17).LT.2.) AA(73,17)=2.
00546 256*      IA(73,5)= 2
00547 257*      CALL AGITOR
00550 258*      SUMHP=SUMHP + 2.5
00551 259*      XIR= IR
00552 260*      SUMHP = SUMHP + AA(73,17)
00553 261*      AA(66,17) = TONS*2000./(24.*8.33*XIR) *(22./60.)
00554 262*      CALL PMPCNT
00555 263*      ABC= AA(66,17)/22.
00556 264*      IF(ABC.LE.2.) HP=2.
00560 265*      IF(ABC.GT.2.) HP=ARC
00562 266*      SUMHP= HP + SUMHP
00563 267*      IA(17,5)=5
00564 268*      DX= SORT(TONS/50.) * 8.
00565 269*      AA(17,17) = 6
00566 270*      AA(17,18) = DX
00567 271*      CALL SCREW
00570 272*      41      CONTINUE
00572 273*      DO 42 J= 1,IR
00575 274*      LOOPS = LOOPS + 9
00576 275*      DO 42 I = 1,3
00601 276*      XIRR=IRR
00602 277*      SUMHP=SUMHP + 2.5
00603 278*      AA(66,17) = TONS*2000./(24.*8.33*XIRR) *(22./60.)
00604 279*      CALL PMPCNT
00605 280*      ABC= AA(66,17)/22.
00606 281*      IF(ABC.GT.2.) HP=ARC
00610 282*      IF(ABC.LE.2.) HP=2.
00612 283*      SUMHP= HP + SUMHP
00613 284*      AA(49,17)=VFS
00614 285*      CALL REACTR
00615 286*      CALL SCREEN
00616 287*      AA(73,17)= .005*VFS
00617 288*      IF(AA(73,17).LT.2.) AA(73,17)=2.
00621 289*      IA(73,5) = 2
00622 290*      SUMHP = SUMHP + AA(73,17)
00623 291*      CALL AGITOR
00624 292*      DX= SORT(TONS/50.) * 8.
00625 293*      AA(17,18) = DX
00626 294*      AA(17,17) = 6.
00627 295*      IA(17,5)=5
00630 296*      CALL SCREW
00631 297*      42      CONTINUE
00631 298*      C PUMPS IN THE EXTRACTION PROCESS
00631 299*      C PUMPS FOR S-1
00634 300*      AA(66,17)=STMM(2)*30.*2000./(24.*60.*8.33)
00635 301*      CALL PMPCNT
00636 302*      SUMHP=.001*AA(66,17)+SUMHP

```

Table I.-- Continued.

```

00636 303* C PUMP FOR S-2
00637 304* AA(66,17)=STMM(3)*2000.*30./(24.*60.*8.33)
00640 305* CALL PMPCNT
00641 306* SUMHP=.001*AA(66,17)+SUMHP
00641 307* C PUMP FOR S-3
00642 308* AA(66,17)=STMM(4)*2000.*30./(24.*60.*8.33)
00643 309* CALL PMPCNT
00644 310* SUMHP=.001*AA(66,17)+SUMHP
00644 311* C PUMP FOR M-3
00645 312* AA(66,17)=STMM(3)*2000.*30./(24.*60.*8.33)
00646 313* CALL PMPCNT
00647 314* SUMHP=.001*AA(66,17)+SUMHP
00650 315* C PUMP FOR SOLIDS INTO DRYER
00651 316* AA(66,17)=STMM(5)*2000.*30./(24.*60.*8.33)
00652 317* CALL PMPCNT
00652 318* SUMHP=.001*AA(66,17)+SUMHP
00652 319* C PUMP FOR M-4
00653 320* AA(66,17)=STMM(4)*2000.*30./(24.*60.*8.33)
00654 321* CALL PMPCNT
00655 322* SUMHP=.001*AA(66,17)+SUMHP
00656 323* C PUMP FOR SOLVENT
00657 324* AA(66,17)=TONS*2.*2000.*30./(24.*60.*8.33)
00657 325* CALL PMPCNT
00660 326* SUMHP=.001*AA(66,17)+SUMHP
00660 327* C REFLUX CONDENSER
00660 328* FF = 25.* TONS/ 50.
00661 329* AA(67,17) = FF
00662 330* CALL HEATEX
00663 331* C
00663 332* C STEAM REQUIREMENTS
00663 333* STEAM2= TONS* 20./50.
00664 334* STEAM3= TONS* 20./50.
00665 335* STEAM4= TONS* 20./50.
00666 336* STEAM1= TONS* 35./50.
00667 337* STEAM= STEAM1+STEAM2+STEAM3+STEAM4
00670 338* C
00670 339* C SOLIDS FROM THE EXTRACTION VESSEL
00670 340* C
00670 341* TASAE= STMM(5)/2.
00671 342* TASB=STMM(1,5)+STMM(2,5)+STMM(3,5)+.05*STMM(4,5)+STMM(5,5)*.126*.05+STM
00672 343* 1(5,5)*.0001*.874
00673 344* TASC=.95*.126*STMM(5,5)+.95*STMM(4,5)
00673 345* TAD=STMM(5,5)*.874*.9999
00674 346* STEAM6= (TASC + (1.0*TASD)) * 2000. /24.
00675 347* STEAM= STEAM6 + STEAM
00676 348* C DRYERS
00676 349* AA(21,17) = 3.8* 16.* TASA/24.
00677 350* IA(21,5) = 6
00677 351* BB(2) = .9
00677 352* CALL DRYERR
00677 353* BR(2)=1.0
00677 354* AA(21,17)=AA(21,17)
00677 355* IA(21,5) = 7
00677 356* CALL DRYERR
00677 357* AA(17,18)=6.
00677 358* AA(17,17)=6.
00677 359*

```

Table I.-- Continued.

```

00711 360* IA(17,5)=1
00712 361* CALL SCREW
00713 362* BB(2)=1.
00714 363* IA(21,5)=7
00715 364* AA(21,17)=AA(21,17)
00716 365* CALL DRYERR
00717 366* AA(21,17)=AA(21,17)
00720 367* IA(21,5) = 8
00721 368* BB(2)=1.0
00722 369* CALL DRYERR
00723 370* AA(17,18)=6
00724 371* AA(17,17)=6
00725 372* IA(17,5)=1
00726 373* CALL SCREW
00727 374* LOOPS = LOOPS + 2
00730 375* LOOPS = LOOPS + 2
00731 376* AA(17,18) = 6.
00732 377* AA(17,17) = 20.
00733 378* IA(17,5) = 1
00734 379* CALL SCREW
00735 380* ZAT= .96
00736 381* IF(IPTION(2).NE.1) ZAT=1.
00740 382* ZAT=1.-ZAT
00741 383* IF(IPTION(2).NE.1.AND.IPTION(2).NE.2) GO TO 300
00743 384* AA(18,17) =(TASR/ 8.)
00744 385* CALL HAMMER
00745 386* HP = (TASB *2000.*75./(8. * 700.))
00746 387* HP = HP/3.
00747 388* SUMHP=SUMHP+HP
00750 389* IF(IPTION(2).EQ.1) GO TO 44
00751 390* DRY DERONING OPTION
00752 391* PRDCTA=((STM(2,5)*ZAT) + (STM(3,5)*7A8))/95
00753 392* PRDCTB=((STM(2,5)*ZAB) + (STM(3,5)*7A7))/95
00754 393* AA(75,17)=PRDCTA*2000./(25.*24.*60.)
00755 394* CALL BAGGMA
00756 395* XAA=AA(75,17)
00757 396* AA(75,17)=PRDCTB*2000./(25.*24.*60.)
00760 397* CALL BAGGMA
00761 398* AA(75,17)=AA(75,17) +XAA
00762 399* AA(75,17)=AA(75,17)*24.*60.
00763 400* GO TO 49
00764 401* CONTINUE
00765 402* AA(18,17)=TASB/8.
00766 403* CALL HAMMER
00767 404* HP=(TASB*2000.*75./(8.*700.))
00770 405* HP=HP/3.
00771 406* SUMHP=SUMHP+HP
00772 407* PRDCTA=((STM(2,5)+STM(3,5))/95)
00773 408* AA(75,17)=PRDCTA*2000./(25.*24.*60.)
00774 409* CALL BAGGMA
00775 410* AA(75,17)=AA(75,17)*24.*60.
00776 411* GO TO 49
00777 412* CONTINUE
00778 413* 44 WET DERONING OPTION
01000 414* AA(75,17) =(STM(2,5)*ZAT) + (STM(3,5)*7A8))/95
01001 415* PRDCTA=AA(75,17)
01002 416* AA(75,17) = AA(75,17)* 2000./(24.*60.*100.) * 4.

```


Table I.-- Continued.

```

11003 417*      CALL BAGGMA
11004 418*      AABAG=AA(75,17)
11005 419*      40 CONTINUE
11005 420*      C
11005 421*      C MIXING TANK SECTION
11005 422*      C
11006 423*      SA = STRMM(1)*.001*70.
11007 424*      IA(40,1) = 1
11008 425*      IA(40,2) = 1
11009 426*      AA(40,17) = SA
11010 427*      CALL STORAG
11011 428*      IA(40,2) = 0
11012 429*      LOOPS = LOOPS + 2
11013 430*      ACID= STRMM(1)*.001
11014 431*      IA(66,1) = 2
11015 432*      AA(66,17) = 30.*ACID
11016 433*      CALL PMPCNT
11017 434*      GAL= STRMM(1) * 2000. / (8.33
11018 435*      HP=.001*AA(66,17)
11019 436*      SUMHP = HP + SUMHP
11020 437*      AA(40,17) = GAL *.01
11021 438*      AA(66,17) = GAL *30. / (24.*60.)
11022 439*      IA(66,1) = 0
11023 440*      IA(40,1) = 2
11024 441*      HP=.001*AA(66,17)
11025 442*      SUMHP = SUMHP + HP
11026 443*      SUMHP=SUMHP+HP
11027 444*      CALL PMPCNT
11028 445*      CALL STORAG
11029 446*      CALL PMPCNT
11030 447*      C
11031 448*      C CENTRIFUGE SECTION
11032 449*      C
11033 450*      SAA=STRMM(1)*1.001
11034 451*      HOP= SAA*2000.*.01 / (24.*8.33
11035 452*      NUM= (HOP/20.) + 1.
11036 453*      HP= NUM* 20
11037 454*      SUMHP= HP + SUMHP
11038 455*      DO 45 I =1,NUM
11039 456*      AA(54,17)=20.
11040 457*      CALL CNTFGE
11041 458*      CONTINUE
11042 459*      45
11043 460*      SAB= STRM(1,1)*1.1
11044 461*      HP=SAB*.025*2000. / (8.33*24.)
11045 462*      H2= (HP/20.) + 1.
11046 463*      HP=N2*20
11047 464*      SUMHP=SUMHP+HP
11048 465*      C PUMP BETWEEN CENTRIFUGES
11049 466*      AA(66,17)=SAB*2000.*30. / (24.*60.*8.33)
11050 467*      CALL PMPCNT
11051 468*      SUMHP=.001*AA(66,17)+SUMHP
11052 469*      DO 46 I =1,N2
11053 470*      AA(52,17) = 20.
11054 471*      CALL SHARP
11055 472*      C
11056 473*      C FISH OIL STORAGE TANK (15 DAYS)
11057 474*      C
11058 475*      C

```

Table I.--Continued.

```

01067 474* AA(90,5)=STRM(1,1)
01070 475* AA(40,17)=AA(90,5)*2000.*15./7.75
01071 476* IA(40,1)=1
01072 477* CALL STORAG
01073 478* AA(66,17)=AA(40,17)*30./(24.*15.*60.)
01074 479* CALL PMPCNT
01075 480* SUMHP=.001*AA(66,17)+SUMHP
01076 481* 46 CONTINUE
01076 482* C
01076 483* C MISCELLA TANK (M-1)
01076 484* C
01100 485* SBC=STRM(1)-(.5*STRM(1,1))
01101 486* AA(40,18)=3.2
01102 487* AA(41,18)=3.2
01103 488* AA(40,17)=SBC*2000./(24.*8.33)
01104 489* IA(40,1)=1
01105 490* CALL STORAG
01106 491* AA(66,17)=30.*(AA(40,17)/60.)
01107 492* IA(66,1)=0
01110 493* CALL PMPCNT
01111 494* CALL PMPCNT
01112 495* HP=.001*AA(66,17)
01113 496* SUMHP=SUMHP+HP
01114 497* SUMHP=SUMHP+HP
01114 498* C PREHEATER FOR DISTILLATION COLUMN
01114 499* C
01114 499* SRC=STRM(1)-(.5*STRM(1,1))
01115 500* STEAM9=SBC*2000./24.*1
01116 501* STEAM = STEAM + STEAM9
01117 502* FTE=STEAM*.1
01120 503* AA(67,17)=FT
01121 504* CALL HEATEX
01122 505* C
01122 506* C DISTILLATION COLUMN (MATERIAL BALANCE)
01122 507* C
01122 508* STOP(1)=STRM(5,1)*.9087*.874
01123 509* STOP(2)=STOP(1)*.1445
01124 510* SROT(1)=STRM(5,1)*.0013*.874
01125 511* SROT(2)=STRM(4,1)+.125*STRM(5,1)-STOP(2)
01126 512* SROT(3)=STRM(1,1)*.5
01127 513* SROT(1)+SROT(2)+SROT(3)
01130 514* C CENTRIFUGE
01130 515* C
01130 516* C
01130 517* AA(66,17)=30.*SROT(1)*2000./(60.*24.*8.33)
01131 518* IA(66,1)=0
01132 519* CALL PMPCNT
01133 520* SUMHP=.001*AA(66,17)+SUMHP
01134 521* HP= SROT(1)*2000./(24.*8.33
01135 522* N3=(HP/20.) + 1
01136 523* HP= 20* N3
01137 524* SUMHP= HP + SUMHP
01140 525* DO 47 I=1,N3
01141 526* AA(54,17)=20.
01144 527* CALL CNTFGE
01145 528* 47 CONTINUE
01146 529* LOOPS = LOOPS + (NIM+ N2 + N3)
01150 530*

```

```

531* C DISTILLATION COLUMN
532* C
533* C
534* STFAMR=TONS*10709./50.*(STRM(5,5)/(TONS*2.))
535* AA(67,17)=.1*STFAMR
536* CALL HEATEX
537* STEAM = STFAM + cTFAMR
538* TANKA = TONS* 100. /50.
539* IA(40,1)= 1
540* AA(40,17)=TANKA*2000./ (24.*8.33)
541* CALL STORAG
542* AA(66,17)=(TANKA-(.01*STRM(5,5)))*(2000.*30.)/(24.*60.*8.33)
543* CALL PMPCNT
544* SUMHP=.001*AA(66,17)+SUMHP
545* WIDTH= 4. * SORT(TONS/75.)
546* I = WIDTH/2.
547* WIDTH = 2 * I
548* IF (WIDTH.LT.4.001) WIDTH = 4.
549* AA(43,18) = 24.
550* AA(43,20)=WIDTH
551* AA(43,17)= 54.
552* AA(43,1) = .4
553* IA(42,4)=2
554* IA(42,2)=1
555* IA(42,3)=1
556* AA(42,18)=WIDTH
557* AA(42,19)=54
558* CALL VESSEL
559* CALL COLUMN
560* LOOPS = LOOPS + 5
561* WASTE=.01*STRM(5,5)
562* AA(40,17)=(WASTE*2000./8.33*15.)
563* IA(40,1) = n
564* CALL STORAG
565* AA(66,17)=AA(40,17)*30./ (24.*60.*15.)
566* CALL PMPCNT
567* SUMHP=.001*AA(66,17)+SUMHP
568* LOOPS = LOOPS + 1
569* CONDENSER(DISTILLATION COLUMN)
570* WATER=660.*TONS/50.*(STRM(5,5)/(TONS*2.))
571* AA(67,17)=WATER*8.33*60.*.01
572* CALL HEATEX
573* AA(66,17)=(TANKA/60.)*30.
574* CALL PMPCNT
575* HP = 2. *(TONS /75.)
576* SUMHP=SUMHP+HP
577* C
578* C
579* C FISH SOLUABLEFS
580* SROT=SROT(2) + STFAM(2,1)
581* SROT=STRM(2,1)*2.
582* HWAT=SROT-SROT
583* FORMAT(750H FISH SOLUABLES ARE MORE THAN 50 PERCENT PROTEIN
584* IF(HWAT.GE.0.) GO TO 51
585* PRINT 3006
586* AA(90,4)=SROT
587* GO TO 52

```

Table I.--Continued.

01236	588*	51	CONTINUE
01236	589*	C	
01236	590*	C	WATER SOLUBLES HOLD TANK (1 HP)
01236	591*	C	
01237	592*		AA(40,17)=SBQT*2000./(24.*8.4)*1.
01240	593*		IA(40,1)=1
01241	594*		CALL STORAG
01242	595*		IA(40,1)=0
01243	596*		IA(66,1)=0
01244	597*		AA(66,17)=30.*AA(40,17)/60.
01245	598*		CALL PMPCNT
01246	599*		HP=.001*AA(66,17)
01247	600*		SUMHP=SUMHP+HP
01250	601*		AA(90,4)=SBQT
01251	602*		TONA=SBQT*2000./24.
01252	603*		AA(33,17)=TONA/20.
01253	604*		CALL EVPHOR
01254	605*		CALL EVPHOP
01255	606*		CALL EVPHOR
01256	607*		SAQT= STRM(2,1)/.3
01257	608*		IF(SAQT.GE.SBQT) SAQT=SBQT
01261	609*		AA(33,17)=SAQT*2000./(24.*25.)
01262	610*		CALL EVPHOR
01263	611*		STEAM=STEAM+(H*AT*2000./24.)
01264	612*		IA(66,1)=0
01265	613*		AA(66,17)=30.*STRM(2,1)*2.*2000./(10.*60.*24.)
01266	614*		CALL PMPCNT
01267	615*		HP=.001*AA(66,17)
01270	616*		SUMHP=SUMHP+HP
01270	617*	C	
01270	618*	C	ACID MIX TANK
01270	619*	C	
01271	620*		AA(40,17)=STRM(2,1)*2.*2000./(10.*1.)*.01
01272	621*		IA(40,1)=2
01273	622*		CALL STORAG
01274	623*		IA(40,1)=0
01274	624*	C	
01274	625*	C	STORAGE OF FISH SOLUBLES (15 DAYS)
01274	626*	C	
01275	627*		IA(66,1)=0
01276	628*		AA(66,17)=30.*AA(40,17)/(40.*24.)
01277	629*		CALL PMPCNT
01300	630*		HP=.001*AA(66,17)
01301	631*		SUMHP=SUMHP+HP
01302	632*		IA(40,1)=2
01303	633*		AA(40,17)=STRM(2,1)*2.*2000./(10.)*15.
01304	634*		CALL STORAG
01305	635*		IA(40,1)=0
01306	636*		
01307	637*	52	CONTINUE
01311	638*		IF(IPTION(2).NF.1) GO TO 48
01311	639*	C	IF (IPTION(2).EQ.1) LOOPS = 100PS + 1
01313	640*		WET DRYING OPTION
01313	641*	C	AA(91,2) = TONS - STRM(1)
01314	642*		PUMP FOR BONE FEED TO DRYFR
01315	643*		AA(66,17)=AA(91,2)*2000.*30./(24.*60.*8.*33)
01316	644*		CALL PMPCNT
			SUMHP=.001*AA(66,17)+SUMHP

Table I.--Continued.

01317	645*	IA(21,5)=3	
01320	646*	AA(21,7)=AA(91,2)*3.8*2.73.	
01321	647*	STEAMW=AA(91,2)*2000./24.	
01322	648*	STEAM=STEAM + STEAMW	
01323	649*	CALL DRYER	
01324	650*	AA(90,3)=(100IS*(RB(31)+RB(32)+RB(30)) - STM(1,1) - STM(2,1)	
01324	651*	- STM(3,1)) * 1.1	
01324	652*	HAMMER MILL FOR WET DEBONING OPTION	
01325	653*	AA(18,17) = AA(90,3) / 24.	
01326	654*	CALL HAMMER	
01327	655*	AA(75,17)=AA(90,3)*2000.*.04/(24.*60.)	
01330	656*	CALL BAGGMA	
01331	657*	AA(75,17)=(AA(75,17) +AARAG) *24.*60.	
01332	658*	48 CONTINUE	
01332	659*	BOILER	
01333	660*	AA(27,18) =150.	
01334	661*	AA(27,17)=STEAM	
01335	662*	CALL BOILER	
01336	663*	IA(40,1)=2	
01337	664*	AA(40,17)=STEAM*1000.*24./(8.3*140000.)*15.	
01340	665*	CALL STORAG	
01341	666*	IA(66,1)=0	
01342	667*	AA(66,17)=30.*AA(40,17)/(40.*15.*24.)	
01343	668*	CALL PMPCNT	
01344	669*	HP=.001*AA(66,17)	
01345	670*	SUMHP=SUMHP+HP	
01345	671*	CONTROL LOOP	
01346	672*	XLOOPS = L00PS	
01347	673*	COST(1) = X100PS*AA(100,1)	
01350	674*	COST(5) = COST(5)	
01351	675*	COSTA(1) = COSTA(1) + COST(1)	
01352	676*	COSTA(5) = COSTA(5) + COST(5)	
01353	677*	PRINT 1021, COST(1),COST(5)	
01353	678*	C FORK LIFT	
01357	679*	1021 FORMAT(25H CONTROL INSTRUMENTATION ,35X,F10.3,30X,F10.3)	
01360	680*	COST(1) = AA(100,20)	
01361	681*	COST(5) = COST(1)	
01362	682*	COSTA(1) = COSTA(1) + COST(1)	
01363	683*	COSTA(5) = COSTA(5) + COST(5)	
01364	684*	PRINT 1022, COST(1),COST(5)	
01370	685*	AA(8,17) = TONS	
01371	686*	CALL CONDEN	
01372	687*	1022 FORMAT(/ 25H PAYLOADER ,10X,25X,F10.3,30X,F10.3)	
01372	688*	C BOILER WATER TREATMENT	
01372	689*	C	
01372	690*	COST(5)=1.000	
01373	691*	COST(1)=COST(5)	
01374	692*	PRINT 4242,COST(1),COST(5)	
01375	693*	1021 FORMAT(25H BOILER WATER TREATMENT ,10X ,15H ,10H	
01401	694*	1 ,F10.3,30X,F10.3)	
01401	695*	COSTA(1)=COSTA(1)+COST(1)	
01402	696*	COSTA(5)=COSTA(5)+COST(5)	
01403	697*	C SEA WATER PUMPS	
01403	698*	C	
01403	699*	AA(90,10)=WATER*60.+4.*STEAM	
01404	700*		
01404	701*		

Table I.-- Continued.

01405	702*	AA(66,17)=AA(90,10)*1.2/60.		
01406	703*	IA(66,1)=1		
01407	704*	IA(66,4)=2		
01410	705*	CALL PMPCNT		
01411	706*	IA(66,1)=0		
01412	707*	IA(66,4)=0		
01413	708*	HP=.001*AA(66,17)		
01414	709*	SUMHP=SUMHP+HP		
01414	710*	C CARBON ADSORBER		
01414	711*	C		
01414	712*	COST(1)=2.000		
01415	713*	COST(5)=COST(1)		
01416	714*	PRINT 4243,COST(1),COST(5)		
01417	715*	COSTA(1)=COSTA(1)+COST(1)		
01423	716*	COSTA(5)=COSTA(5)+COST(5)		
01424	717*	FORMAT(/25H CARBON ADSORBER		
01425	718*	1 ,F10.3,30X,F10.3)	10X ,15H	,10H
01425	719*	C		
01425	720*	C VERIT CONDENSER		
01425	721*	C		
01425	722*	AA(67,17)=20		
01426	723*	IA(67,1)=1		
01427	724*	IA(67,4)=4		
01430	725*	CALL HEATEX		
01431	726*	IA(67,1)=0		
01432	727*	IA(67,4)=0		
01433	728*	CALL SCALE		
01434	729*	CALL SCALE		
01435	730*	CALL SCALE		
01436	731*	CALL SCALE		
01437	732*	CALL SCALE		
01440	733*	PRINT 1041,(COSTA(J),J=1,6)		
01446	734*	FORMAT(/25H TOTAL COSTS	,35X,6F10.3)	
01447	735*	AA(90,2) = SUMHP*.7457 * 24.		
01450	736*	AA(100,10)= COSTA(5)		
01451	737*	AA(90,1) = STEAM*1000*.24./140000.		
01451	738*	C MATERIAL BALANCE		
01452	739*	IF(IPTION(2),EQ,2) AA(90,3)=PRDCTR		
01454	740*	AA(90,7) = PRDCTA		
01455	741*	AA(90,18)=WASTE		
01456	742*	AA(90,19)=ACID		
01457	743*	CALL MATER(TONS)		
01460	744*	FISH = TONS*2000./24.		
01461	745*	PRINT 1003 , FISH		
01464	746*	FORMAT(/7X27H FISH TO EXTRACTION VESSELS,F8.0,7H LB/HR)		
01465	747*	YYA=STEAM1		
01466	748*	PRINT 1201,YYA		
01471	749*	FORMAT(/8X,15H STEAM(STIRPED VESSEL 1)	,F8.0,7H LB/HR)	
01472	750*	YYB=STEAM2		
01473	751*	PRINT 1202,YYB		
01476	752*	FORMAT(/8X,15H STEAM(STIRPED VESSEL 2)	,F8.0,7H LB/HR)	
01477	753*	YYC= STEAM3		
01500	754*	PRINT 1203,YYC		
01503	755*	FORMAT(/8X,15H STEAM(STIRPED VESSEL 3)	,F8.0,7H LB/HR)	
01504	756*	YYD= STEAM4		
01505	757*	PRINT 1204,YYD		
01510	758*	FORMAT(/8X,15H STEAM(STIRPED VESSEL 4)	,F8.0,7H LB/HR)	

Table I.-- Continued.

01511	759*	YYE = STEAMG	
01512	760*	PRINT 1205,YYF	
01515	761*	FORMAT(/8X,15H STEAM(PREHEATER-DISTILLATION)	,F8.0,7H LR/HR)
01516	762*	YYGE = STEAMR	
01517	763*	PRINT 1206,YYG	
01522	764*	FORMAT(/8X,15H STEAM(RFBOILER)	,F8.0,7H LR/HR)
01523	765*	YYH = STEAMK	
01524	766*	PRINT 1207,YYH	
01527	767*	FORMAT(/8X,15H STEAM(ROTARY DRYER FPC)	,F8.0,7H LR/HR)
01530	768*	YYIE = STEAMW	
01531	769*	PRINT 1208,YYI	
01534	770*	FORMAT(/8X,15H STEAM(ROTARY DRYER RONE MEAL)	,F8.0,7H LR/HR)
01535	771*	YYJE=(STEAM*4.)	
01536	772*	PRINT 1209,YYJ	
01541	773*	YYKE = WATER	
01542	774*	PRINT 1210,YYK	
01545	775*	FORMAT(/8X,15H COOLING WATER DISTILLATION COND.	,F8.0,8H GAL/MIN)
01546	776*	FORMAT(/8X,15H COOLING WATER CONDENSER	,F8.0,8H GAL/HR)
01547	777*	YYLE = STEAM	
01550	778*	PRINT 1211,YYL	
01553	779*	FORMAT(/8X,15H TOTAL STEAM	,F8.0,7H LR/HR)
01554	780*	YYME=((STEAM*4.)+WATER*60.1*8.33	
01555	781*	PRINT 1212,YYM	
01560	782*	FORMAT(/8X,15H TOTAL WATER	,F8.0,7H LR/HR)
01561	783*	PRINT 1213	
01563	784*	FORMAT(/40X, 9H STEAM 1.7X,9H STREAM 2.7X,9H STREAM 3.7X,9H STR	
01563	785*	CEAM 4.7X,9H STREAM 5.7X	
01564	786*	PRINT 1214,(STRM(1,K),K=1,5)	
01572	787*	PRINT 1215,(STRM(2,K),K=1,5)	
01600	788*	PRINT 1216,(STRM(3,K),K=1,5)	
01606	789*	PRINT 1217,(STRM(4,K),K=1,5)	
01614	790*	PRINT 1218,(STRM(5,K),K=1,5)	
01622	791*	PRINT 1219,(STM (1,K),K=1,5)	
01630	792*	PRINT 1220,(STM (2,K),K=1,5)	
01636	793*	PRINT 1221,(STM (3,K),K=1,5)	
01644	794*	PRINT 1222,(STM (4,K),K=1,5)	
01652	795*	PRINT 1223,(STM (5,K),K=1,5)	
01660	796*	FORMAT(/10X,20H RAFFINATE OIL	,10X,4(F10.3, AX),F10.3)
01661	797*	FORMAT(/10X,20H RAFFINATE ASH	,10X,4(F10.3, AX),F10.3)
01662	798*	FORMAT(/10X,20H RAFFINATE PROTEIN	,10X,4(F10.3, AX),F10.3)
01663	799*	FORMAT(/10X,20H RAFFINATE WATER	,10X,4(F10.3, AX),F10.3)
01664	800*	FORMAT(/10X,20H RAFFINATE ALCOHOL	,10X,4(F10.3, AX),F10.3)
01665	801*	FORMAT(/10X,20H EXTRACT OIL	,10X,4(F10.3, AX),F10.3)
01666	802*	FORMAT(/10X,20H EXTRACT ASH	,10X,4(F10.3, AX),F10.3)
01667	803*	FORMAT(/10X,20H EXTRACT PROTEIN	,10X,4(F10.3, AX),F10.3)
01670	804*	FORMAT(/10X,20H EXTRACT WATER	,10X,4(F10.3, AX),F10.3)
01671	805*	FORMAT(/10X,20H EXTRACT ALCOHOL	,10X,4(F10.3, AX),F10.3)
01672	806*	XXAE = STM(5) * 2000./24.	
01673	807*	PRINT 1224, XVA	
01676	808*	FORMAT(/8X,15H FLOW FROM EXTRACTION VESSEL 4	,F8.0,7H LR/HR)
01677	809*	XXRE = STM(1) * 2000./24.	
01700	810*	FORMAT(/8X,15H FLOW FROM EXTRACTION VESSEL 1	,F8.0,7H LR/HR)
01701	811*	PRINT 1225, XXB	
01704	812*	XXC = (SAA-(.5*STM(1,1)))*2000./24.	
01705	813*	PRINT 1226,XXC	
01710	814*	FORMAT(/8X,15H AMIENUS STREAM(CENTRIFUG)	,F8.0,7H LR/HR)
01711	815*	XXDE=(STOP(1)+STOP(2))*2000./24.	

Table I.-- Continued.

01712	01716*	PRINT 1227,XXH		
01715	017*	FORMAT(/8X,15H TOPS FROM DISTILLATION COLUMN		,F8.0,7H LR/HR)
01716	018*	XXE= SROTT*2000./24.		
01717	019*	PRINT 1228,XXE		
01722	020*	FORMAT(/8X,15H BOTTOMS FROM DISTILLATION COLUMN		,F8.0,7H LR/HR)
01723	021*	XXF =(1.5*STRM(1,1)*2000./24.)		
01724	022*	PRINT 1229,XXF		
01727	023*	FORMAT(/8X,15H OIL FROM SECOND CENTRIFUGE		,F8.0,7H LR/HR)
01730	024*	XXG= AA(90,5)*2000./24.		
01731	025*	PRINT 1230,XXG		
01734	026*	FORMAT(/8X,15H FISH OIL PRODUCT		,F8.0,7H LR/HR)
01735	027*	XXH=AA(90,3)*2000./24.		
01736	028*	FORMAT(/8X,15H FISH PROTEIN CONCENTRATE		,F8.0,7H LR/HR)
01737	029*	XXI=AA(90,7)*2000./24.		
01740	030*	PRINT 1232,XXH		
01743	031*	PRINT 1231,XXI		
01746	032*	FORMAT(/8X,15H BONE MEAL CONCENTRATE		,F8.0,7H LR/HR)
01747	033*	AA(95,1) = STRM(1,2) * 2.		
01750	034*	XXJ = AA(95,1)* 2000./24.		
01751	035*	PRINT 1233,XXJ		
01754	036*	FORMAT(/8X,15H FISH SOLUBLES		,F8.0,7H LR/HR)
01755	037*	IXX=(14.0*(TONS/50.1**31) + 0.5		
01756	038*	AA(90,8)=IXX**8		
01757	039*	AA(90,9)=(YYJ+YYK*60.)*24.		
01760	040*	AA(90,13) = AA(90,13) + (AA(90,3)+AA(90,7)+AA(90,20)+AA(90,4))		
01761	041*	RETURN		
01762	042*	END		

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S PRESCK,PRESCK
FOR 59A-07/12-11:04 (1.)

SUBROUTINE PRESCK ENTRY POINT 002401

STORAGE USED: CODE(1) 002445; DATA(0) 001006; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 PMPREC
0006 RELT
0007 STORAG
0010 REFRIG
0011 SILO
0012 PMPCNT
0013 BUCKET
0014 DRYERR
0015 SCREW
0016 SCRFEN
0017 REACTR
0020 AGITOR
0021 HAMMER
0022 RAGGMA
0023 FVPELM
0024 EVPSPR
0025 SHARP
0026 BOILER
0027 CONDEN
0030 SCALE
0031 WATER
0032 NRDC\$
0033 NI02\$
0034 NPRT\$
0035 NI01\$
0036 NEXP\$
0037 NERR\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	00046	100F	0000	00005	100F	0000	000073	100F	0000	000260	100F	0000	000271	100F
0000	00302	100F	0000	000313	100F	0000	000324	100F	0000	000335	100F	0000	000370	100F
0001	00722	101L	0000	000401	1010F	0000	000412	1011F	0000	000423	1012F	0000	000434	1013F
0000	00045	1014F	0000	000456	1015F	0000	000467	1016F	0000	000346	1017F	0000	000500	1018F
0000	000511	1019F	0001	000757	102L	0000	000522	1020F	0000	000533	1021F	0000	000544	1022F
0000	000555	1023F	0001	001002	103L	0000	000566	1030F	0000	000577	1031F	0000	000610	1032F
0000	000357	1033F	0000	000251	1041F	0000	000215	1050F	0000	000233	1051F	0001	000024	1066
0000	000034	111F	0001	000031	1146	0000	000036	1226	0000	000106	2000F	0001	000152	2016
0000	000121	3000F	0001	000406	3056	0000	000177	4242F	0000	000161	4249F	0000	000036	5000F

Table I.--Continued.

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0001 001450 600G 0001 001525 622G 0001 002001 727G 0001 002027 742G 0003 R 000000 AA
0003 R 004704 BB 0000 R 000000 COST 0004 R 000007 742G 0000 R 000014 DRYSLD
0000 R 000027 FISH 0000 R 000000 G 0000 R 000003 GALN 0000 R 000007 HP
0000 I 000000 I 0003 I 003720 IA 0000 000002 TNP5 0000 I 000017 INST 0000 I 000032 IXX
0000 I 000026 J 0000 I 000010 LOOPC 0000 I 000012 NA 0000 R 000005 NUM 0000 R 000022 PROD
0000 R 000033 PXX 0000 R 000021 SLD5 0000 R 000031 STEAM 0000 R 000004 SUMHP 0000 R 000001 TONSA
0000 R 000011 TONSG 0000 R 000020 VOLD 0000 R 000016 VOLT 0000 R 000023 WATER 0000 R 000024 WATEVP
0000 R 000015 XLIGD 0000 R 000025 XLOOPS 0000 R 000013 XNA

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1* SUBROUTINE PRESCK(TONS)
2* COMMON/BLOCK1/AA(100,20),IA(100,5),BB(100)
3* COMMON /BLOCK2/ COST(7),COSTA(7)
4* DO 1 I=1,7
5* COST(I)=0.0
6* COSTA(I)=0.0
7* DO 2 I=1,20
8* AA(90,I)=0.0
9* AA(91,I)=0.0
10* DO 10 I=30,33
11* BB(1)=BB(1)*0.01
12* READ 111, BB(40),BR(41),BR(42),BR(43),BR(44)
13* FORMAT(5E12.5)
14* PRINT 5000
15* FORMAT(78X36H ANTI-OXIDANT PRICE AND EFFECTIVENESS )
16* PRINT 1001,BR(44),BR(43)
17* PRINT 1000
18* FORMAT(78X31H ENZYME PRICE AND EFFECTIVENESS )
19* PRINT 1001,BR(41),BR(40)
20* FORMAT(78X8H PRICE =,F5.2,12H DOLLARS/LR,,F4.3,3AH LR REQUIRED PF
21* CR 100 LB OF PRESS CAKE )
22* IF(BR(42).GT. 0.0) PRINT 1002,BR(42)
23* FORMAT(78XFR.2,51H PERCENT OF DISSOLVED PROTEIN PACKAGED AS RCF PA
24* CSTE )
25* PRINT 2000
26* FORMAT(1H1/55H DETAILED EQUIPMENT COSTS (AIL COSTS IN 1000.0 DOL
27* CLARS) )
28* PRINT 3000
29* FORMAT (/719H EQUIPMENT TYPE,10X10H CAPACITY,12XQH MATERIAL,
30* C60H BASE MATERIALS LABCR INDIRECT MODULE RANGE ,/A
31* C0X60H COST COSTS COSTS COST + OR - )
32*
33* C UNLOADING AND STORAGE OF FISH
34*
35* TONSA=TONS*2000./A.33
36* GALLON=TONSA/(24.*60.)
37* GALS=GALLON*1.3
38* SUNHP= 0.
39* IA(65,1)= 0
40* IA(65,2)= 1.0
41* AA(65,17)= GALS*30.
42* NUM= TONS/500 + 1
43* DO 143 I=1,NUM
44* CALL PMPREC
45* IA(65,2)= 0.0

```


Table I.--Continued.

```

00206 46*      SUMHP= SUMHP + (AA(45,17)*.001*1.5)
00207 47*      SUMHP= SUMHP + (AA(45,17)*.001*1.5)
00210 48*      IF(TONSA*LT.30000.) G=(30000./(24.*60.))*15.
00212 49*      IF(TONSA*GE.30000.) G=(450000./(24.*60.))*15.
00214 50*      IF(TONS.LE.150.) AA(70,18)= 36.
00216 51*      IF(TONS.GT.150.) AA(70,18)= 48.
00220 52*      AA(70,17)=100.
00221 53*      CALL BELT
00222 54*      HP = TONS*0.00124 +13.6
00223 55*      SUMHP = HP + SUMHP
00224 56*      AA(40,17)=30.0*TONS
00225 57*      IA(40,1)=0.0
00226 58*      IA(40,2)=2
00227 59*      CALL STORAG
00230 60*      IA(40,2)=0
00231 61*      AA(85,17)=0.5*TONS**3.0
00232 62*      IA(85,1) =30
00233 63*      CALL REFRIG
00234 64*      SUMHP = SUMHP + 4.7*AA(45,17)
00235 65*      IA(7,1)=1
00236 66*
00237 67*      C FISH STORAGE FOR 3 DAYS
00238 68*      C
00239 69*      AA(7,17)=3.*TONS*2000.*1.69/62.4
00240 70*      CALL SILO
00241 71*      COST(1)=1.19
00242 72*      IF(TONS*GE.300) COST(1)=1.88
00243 73*      COST(5)=COST(1)
00244 74*      PRINT 4249, COST(1), COST(5)
00250 75*      COSTA(1)=COSTA(1)+COST(1)
00251 76*      COSTA(5)=COSTA(5)+COST(5)
00252 77*      FORMAT(25H BRINE MAKE-UP+SALT STOR., 10X ,15H
00253 78*      1 ,F10.3,3nX,F10.3)
00254 79*      C PUMP FOR BRINE MAKE-UP (BRONZE)
00255 80*      C
00256 81*      IA(66,1)=1
00257 82*      AA(66,17)=TONS*.3.*20000./(24.*60.*62.4)*.69*7.75
00258 83*      CALL PMPCNT
00259 84*      IA(66,1)=0
00260 85*      HP=.0010*AA(66,17)
00261 86*      SUMHP=SUMHP+HP
00262 87*      C
00263 88*      C PUMP FOR WATER INTO BRINE MAKE-UP
00264 89*      C
00265 90*      AA(66,17)=AA(66,17)*.917
00266 91*      IA(66,1)=0
00267 92*      CALL PMPCNT
00268 93*      HP=.0010*AA(66,17)
00269 94*      SUMHP=SUMHP+HP
00270 95*      LOOPS=0.0
00271 96*      LOOPS=LOOPS+3.
00272 97*      TONSG=TONS/24.
00273 98*      AA(71,18)= TONSG
00274 99*      AA(71,17)= 20.
00275 100*      CALL BUCKET
00276 101*      HP = TONS*0.00106
00277 102*

```

Table I.-- Continued.

```

00275 103*      SUMHP = HP + SUMHP
00275 104*      C
00275 105*      C FISH COOKERS AND SCREW PRESS
00275 106*      C
00276 107*      AA(91,16) = 0.2*TONS
00277 108*      AA(91,10)=TONS+AA(91,16)
00300 109*      IF (TONS .GT. 450) NA=(TONS/250) +1.
00302 110*      IF (TONS .LE. 450) NA=(TONS/100) +1.
00304 111*      DO 3 I=1,NA
00307 112*      BR(2)=2.1
00310 113*      XNA = NA
00311 114*      IA(21,5)=4
00312 115*      AA(21,17)=TONS/XNA
00313 116*      CALL DRYERR
00313 117*      C PUMP TO PRESS
00314 118*      AA(66,17)=AA(91,10)*.2000./(24.*8.33*60.)
00315 119*      IA(66,1)=0
00316 120*      CALL PMPCNT
00317 121*      HP=.001*AA(66,17)
00320 122*      SUMHP=HP+SUMHP
00321 123*      IA(17,5)=3
00322 124*      BR(2)=2.6
00323 125*      IF (TONS .GT. 450) AA(17,17)= 21.
00325 126*      IF (TONS .GT. 450) AA(17,18)= 16.
00327 127*      IF (TONS .LE. 450) AA(17,18)= 12.
00331 128*      IF (TONS .LE. 450) AA(17,17)= 15.
00333 129*      CALL SCREW
00334 130*      IF (TONS .GT. 450) AA(51,17)= 10.0
00336 131*      IF (TONS .LE. 450) AA(51,17)= 4.0
00340 132*      CALL SCREEN
00341 133*      3 CONTINUE
00343 134*      DRYSLD=(.8*BR(32)+.94*BR(31))*TONS
00344 135*      XLTD=(BR(30)+BR(31)+.06*BR(31)+.2*BR(32))*TONS+AA(91,16)
00345 136*      AA(90,16)=2.86*DRYSLD
00345 137*      C
00345 138*      C FISH DIGESTION AND SCREENING
00345 139*      C
00345 140*      C
00345 141*      C SCREW CONVEYOR
00345 142*      C
00346 143*      AA(17,18)=6
00347 144*      AA(17,17)=20
00350 145*      IA(17,5)=1
00351 146*      CALL SCREW
00352 147*      AA(90,18)=AA(91,10)-AA(90,16)
00353 148*      AA(90,5)=TONS*RB(30)*(397./500.)
00354 149*      AA(7,17)=27.4*AA(90,16)*50.
00355 150*      CALL SILO
00356 151*      AA(91,17)=AA(91,10)-AA(90,16)-AA(90,5)
00356 152*      C PUMP FOR WATER AND SLUDGE
00357 153*      AA(66,17)=AA(91,17)*.2000.*30./(24.*60.*8.33)
00360 154*      IA(66,1)=0
00361 155*      CALL PMPCNT
00362 156*      HP=.001*AA(66,17)
00363 157*      SUMHP=HP+SUMHP
00364 158*      AA(90,15)=AA(90,16)*.0084
00365 159*      AA(90,13)=(BR(30)+BR(31)+BR(32))*TONS*.0001

```

Table I.--Continued.

```

160* AA(90,17)=TONS*0.022
161* AA(90,12)=AA(90,16)*RB(40)/100.0
162* AA(91,1)=AA(90,16)+AA(90,17)+AA(90,15)+AA(90,12)+AA(91,17)+AA(90,1
C3)
163* VOLT=AA(91,1)*2000/(R.33*4.8)
164* AA(51,2)=2.0
165* AA(51,17)=2.0
166* AA(49,17)=VOLT/3
167* IF(AA(49,17).LT. 10000) AA(73,17) = AA(49,17)*0.005
168* IF(AA(49,17).LT. 10000) GO TO 101
169* IF(AA(49,17).LT. 10000) GO TO 101
170* IF( AA(49,17).GT. 10000) AA(73,17) = 50.
171* IF(AA(49,17).GT. 10000) AA(40,17)=10000
101 CALL REACTR
172* CALL AGITOR
173* CALL SCREEN
174* CALL REACTR
175* CALL AGITOR
176* CALL SCREEN
177* CALL REACTR
178* CALL AGITOR
179* CALL SCREEN
180* INST = 3
181* HP = 3*AA(73,17)
182* SUMHP = HP + SUMHP
183* VOLD =VOLT -AA(49,17)*3
184* IF(VOLD.LT. 500) GO TO 103
185* IF(VOLD.LT. 10000) AA(40,17)=VOLD
186* IF(AA(49,17).LT. 10000) AA(73,17) = AA(49,17)*0.005
187* IF(VOLD.GT. 10000) AA(40,17)=10000
188* IF( AA(49,17).GT. 10000) AA(73,17) = 50.
189* CALL REACTR
190* CALL AGITOR
191* CALL SCREEN
192* INST = INST + 1
193* VOLD = VOLD -AA(49,17)
194* HP = AA(73,17)
195* SUMHP = HP + SUMHP
196* GO TO 102
103 CONTINUE
C C
C ROH/E FEED STREAM
C
200*
201*
202*
203* RB(2)=1.
204* SLDS=((155./667.)*RB(31))+((68./145.)*RB(32))+((103./500.)*(14./10
C3.)*RB(30))*TONS+((20./112.)*(AA(90,12)+AA(90,13)+AA(90,15)+AA(90
117))*68./145.))
205*
206* AA(91,2)=(340./137.)*SLDS
C C
C SCREW CONVEYOR
C
208*
209*
210* AA(17,18)=6
211* AA(17,17)=20
212* IA(17,5)=1
213* CALL SCREW
214* IA(21,5)=3
215* AA(21,17)=AA(91,2)*2.5
216* CALL DRYERR

```

Table I.-- Continued.

00457	217*	AA(90,3)=1-.05*SLDS
00460	218*	AA(91,12)=AA(91,2)-AA(90,3)
00460	219*	C BAGGING MACHINE AND HAMMER MILL FOR BONE FEED
00460	220*	C
00460	221*	AA(75,17)=AA(90,3)*2000./124.*60.*25.)
00462	222*	IA(75,2)=0
00463	223*	IA(75,1)=0
00464	224*	AA(18,17)=AA(90,3)/24.
00465	225*	CALL HAMMER
00466	226*	CALL BAGGMA
00467	227*	AA(75,5)=AA(75,17)
00467	228*	C
00467	229*	C
00467	230*	C DIGESTED SOLIDS STREAM
00467	231*	C
00470	232*	AA(91,3)=AA(91,1)-AA(91,2)
00471	233*	AA(40,17)=AA(91,3)*2000/(8.33*24)
00471	234*	IA(40,1)=1
00472	235*	CALL STORAG
00473	236*	IA(40,1)=0
00474	237*	C PUMPS BEFORE AND AFTER HOLD TANK
00474	238*	IA(66,1)=0
00475	239*	AA(66,17)=AA(40,17)*30./60.
00476	240*	CALL PMPCNT
00477	241*	CALL PMPCNT
00500	242*	SUMHP=SUMHP+2*.001*AA(66,17)
00501	243*	AA(91,6)=AA(91,3)
00502	244*	PROD=((612./667.)*BR(31))+((86./103.)*(103./500.)*BB(30))+((77./103.)*BB(32))+((120./112.)*(AA(90,12)+AA(90,13)+AA(90,15)+AA(90,17))*77./145.))
00503	245*	WATER=AA(91,3)*2000./18.33*24.)
00503	246*	HP=0.01*AA(91,3)*2000./18.33*24.)
00503	247*	SUMHP=HP+SUMHP
00504	248*	AA(91,13)=WATEVP
00505	249*	AA(31,17)=AA(91,13)*2000./24.*25)
00506	250*	CALL EVFLM
00507	251*	C HOLD TANK FOR DIGESTED SOLIDS
00510	252*	C
00511	253*	AA(91,7)=2.*PROD
00512	254*	AA(40,17)=AA(91,7)*2000./18.33*24.)
00512	255*	IA(40,1)=0
00512	256*	CALL STORAG
00512	257*	C PUMP AFTER WIPE FILM EVAPORATOR
00513	258*	AA(66,17)=AA(40,17)*30./60
00514	259*	IA(66,1)=0
00515	260*	CALL PMPCNT
00516	261*	HP=.001*AA(66,17)
00516	262*	SUMHP=HP+SUMHP
00517	263*	AA(90,6)=AA(91,7)*BR(42)*.01
00520	264*	C PUMP BEFORE CANNING MACHINE
00521	265*	AA(66,17)=AA(90,6)*2000.*30./18.33*24.*60.)
00522	266*	IF(BB(42).GT.0.0) CALL PMPCNT
00524	267*	HP=.001*AA(66,17)
00524	268*	SUMHP=HP+SUMHP
00524	269*	C
00525	270*	C
00526	271*	C
00530	272*	C
00531	273*	C

Table I.--Continued.

```

00532 274* AA(75,17)=AA(90,6)*2000.0/(8.33*24.0*60.0*5.0)
00533 275* IA(75,1)=1.0
00534 276* IA(75,2)=2.0
00535 277* IF(BU(42).GT.0.0) CALL RAGGMA
00537 278* AA(75,4)=AA(75,17)
00540 279* IA(75,1)=0.0
00541 280* IA(75,2)=0.0
00542 281* AA(75,4)=AA(75,4)*60.*24.
00543 282* AA(91,9)=AA(91,7)-AA(90,6)
00544 283* AA(90,7)=AA(91,9)/(2.*.95)
00544 284* C PUMP BEFORE SPRAY DRYER
00545 285* AA(66,17)=AA(90,7)*2000.*30./(8.33*60.*24.)
00546 286* IA(66,1)=0
00547 287* CALL PMPCNT
00550 288* HP=.001*AA(66,17)
00551 289* SUMHP=HP+SUMHP
00552 290* AA(91,14)=AA(91,9)-AA(90,7)
00553 291* AA(30,17)=AA(91,14)*2000.0/24.0
00554 292* CALL EVSPR
00555 293* AA(75,17)=(AA(75,17)+AA(75,5))*60.*24.
00556 294* IF(BU(42).LT.100) CALL RAGGMA
00560 295* AA(75,17)=AA(75,17)*60.*24.
00560 296*
00560 297* C FISH OIL STREAM
00560 298* C
00561 299* AA(40,17)=AA(90,18)*2000/(8.33*24)
00562 300* IA(40,1)=0
00563 301* CALL STORAG
00563 302* C PUMPS AFTER SCREFN AND BFFORE CENTRIFUGE
00564 303* AA(66,17)=AA(40,17)*30./60.
00565 304* IA(66,1)=0
00566 305* CALL PMPCNT
00567 306* CALL PMPCNT
00570 307* HP=.001*AA(66,17)
00571 308* SUMHP=HP+SUMHP
00572 309* SUMHP=HP+SUMHP
00573 310* AA(91,4)=1.1*AA(90,5)
00574 311* HP=0.01*AA(90,18)*2000.0/(8.33*24.0)
00575 312* SUMHP=HP+SUMHP
00576 313* NUM=HP/20. +1
00577 314* DO 40 I=1,NUM
00602 315* AA(52,17)=20.
00603 316* CALL SHARP
00605 317* AA(40,17)=AA(91,4)*2000/(8.33*24)
00606 318* CALL STORAG
00606 319* C PUMP BEFORE AND AFTER H01D TANK
00607 320* AA(66,17)=AA(40,17)*30./60.
00610 321* IA(66,1)=0
00611 322* CALL PMPCNT
00612 323* CALL PMPCNT
00613 324* HP=.001*AA(66,17)
00614 325* SUMHP=HP+SUMHP
00615 326* SUMHP=HP+SUMHP
00616 327* HP=0.025*AA(91,4)*2000.0/(8.33*24.0)
00617 328* SUMHP=HP+SUMHP
00620 329* NUM=HP/20. +1
00621 330* DO 30 I=1,NUM

```


Table I.--Continued.

```

00624 331* AA(52,17) =20.0
00625 332* 30 CALL SHARP
00625 333* C
00625 334* C FISH OIL STORAGE (15 DAYS)
00625 335* C
00627 336* AA(40,17)=AA(90,5)*2000./A.33*15.
00630 337* IA(40,1) =0.0
00631 338* CALL STORAG
00632 339* AA(66,17)=AA(90,5)*30.0*2000.0/(8.33*24*60)
00633 340* SUMHP= SUMHP+(AA(66,17)*0.001)
00634 341* IA(66,1) =1
00635 342* CALL PMPCNT
00635 343* C
00635 344* C SUMMATION OF STEAM,WATER AND FIECTRICITY
00635 345* C
00636 346* AA(91,15)=(AA(91,11)+AA(91,12)+AA(91,13)+AA(91,14))*1.05 +
00636 347* C 1.05*(AA(91,16) +AA(91,18) +AA(91,19))
00637 348* AA(27,17)=AA(91,15)*2000.0/24
00640 349* CALL BOILER
00640 350* C
00640 351* C BOILER WATER TREATMENT
00640 352* C
00641 353* COST(1)=1.000
00642 354* COST(5)=COST(1)
00643 355* PRINT 4242,COST(1),COST(5)
00647 356* 4242 FORMAT(/25H BOILER WATER TREATMENT , 10X ,15H ,10H
00647 357* 1 ,F10.3,30X,F10.3)
00650 358* COSTA(5)=COSTA(5)+COST(5)
00651 359* COSTA(1)=COSTA(1)+COST(1)
00651 360* C
00651 361* C FUEL OIL STORAGE (15 DAYS)
00651 362* C
00652 363* IA(40,1)=2
00653 364* AA(40,17)=AA(27,17)/A.33*24*.0012*15.
00654 365* CALL STORAG
00655 366* AA(66,1)=0
00656 367* AA(66,17)=30.*AA(40,17)/(15.*60.)
00657 368* CALL PMPCNT
00660 369* HP=.0010*AA(66,17)
00661 370* SUMHP=SUMHP+HP
00661 371* C
00661 372* C SEA WATER PUMPS
00661 373* C
00662 374* AA(90,10)=4.*8.33*AA(91,13)+AA(91,14)+AA(91,18)+AA(91,19)*1.2
00663 375* AA(66,17)=AA(90,10)*2000.0/(8.33*24*60*0.066)
00664 376* IA(66,1)=1
00665 377* IA(66,4)=2
00666 378* CALL PMPCNT
00667 379* IA(66,4)=0
00670 380* IA(66,1)=0
00671 381* SUMHP = SUMHP+(AA(66,17)*.001*1.5)
00672 382* AA(90,9) =1.1*(3*TONS+AA(90,15)/.15 +0.1*AA(91,4)+AA(91,16))
00673 383* XLOOPS=XLOOPS+18.+3.*INST*NA
00674 384* COST(1)=XLOOPS *AA(100,1)
00675 385* COST(5)=COST(1)
00676 386* COSTA(1) = COSTA(1) + COST(1)
00677 387* COSTA(5)=COSTA(5) + COST(5)

```

Table I.-- Continued.

```

388*      PRINT 1050 COST(1),COST(5)
389*      1050 FORMAT(/ 25H CONTROL INSTRUMENTATION , 10X ,15H
390*      1
391*      AA(18,17) = TONS
392*      CALL CONDEN
393*      AA(72,17) = 18.
394*      CALL SCALE
395*      CALL SCALE
396*      CALL SCALE
397*      CALL SCALE
398*      COST(1)=AA(100,2)
399*      COST(5)=COST(1)
400*      COST(1)=COST(1) + COST(1)
401*      COST(5)=COST(5) + COST(5)
402*      PRINT 1051, COST(1),COST(5)
403*      1051 FORMAT(/ 25H PAYLOADER AND FORK LIFT , 10X ,15H
404*      1
405*      ,F10.3,30X,F10.3)
406*      PRINT 1041,(COSTA(J),J=1,6)
407*      1041 FORMAT(/25H TOTAL COSTS
408*      COST(7)=0.02*COST(1)
409*      AA(100,10)=COST(5)
410*
411*      C
412*      C MATERIAL BALANCE INFORMATION PRINTOUT. ALL STREAMS HERE IN LB/HR
413*      C
414*      AA(90,2)= SIMPL* .7457 * 24.
415*      AA(90,10)=AA(90,10)*2000./(24.*8.33)
416*      CALL WATER(TONS)
417*      DO 50 I=1,20
418*      AA(90,I)=AA(90,I)*2000/24
419*      FISH=TONS*2000/24
420*      PRINT 1003,FISH
421*      1003 FORMAT(/8X26H FISH FEED TO COOKERS
422*      PRINT 1004,AA(91,16)
423*      1004 FORMAT(/8X26H COOKERS STEAM
424*      PRINT 1005,AA(90,16)
425*      1005 FORMAT(/8X26H PREFS CAKE TO DIGESTERS
426*      PRINT 1006,AA(91,17)
427*      1006 FORMAT(/8X26H FISH SOL. TO DIGESTERS
428*      PRINT 1007,AA(90,12)
429*      1007 FORMAT(/8X26H ENZYME TO DIGESTERS
430*      PRINT 1008,AA(90,15)
431*      1008 FORMAT(/8X26H CAOH TO DIGESTERS
432*      PRINT 1017,AA(90,13)
433*      1017 FORMAT(/8X26H ANTI-OXIDANT TO DIGESTERS
434*      PRINT 1033,AA(90,17)
435*      1033 FORMAT(/8X26H 5N NaOH TO DIGESTERS
436*      PRINT 1009,AA(91,2)
437*      1009 FORMAT(/8X26H FEED TO ROTARY DRYER
438*      PRINT 1010,AA(91,12)
439*      1010 FORMAT(/8X26H ROTARY DRYER STEAM
440*      PRINT 1011,AA(90,3)
441*      1011 FORMAT(/8X26H BONE FEED PRODUCT
442*      PRINT 1012,AA(91,3)
443*      1012 FORMAT(/8X26H DIGESTER LIQUOR
444*      PRINT 1013,AA(91,6)
445*      1013 FORMAT(/8X26H FEED TO FILM EVAPORATOR

```

Table I.--Continued.

01034	445*	PRINT 1014,AA(91,13)	
01037	446*	FORMAT(/8X26H FILM EVAPORATOR STEAM	,F8.0,7H LB/HR)
01040	447*	COOL =AA(91,13)*4	
01041	448*	PRINT 1015,COOL	
01044	449*	FORMAT(/8X26H FILM EVAPORATOR COOLING	,F8.0,7H GAL/HR)
01045	450*	PRINT 1016,AA(91,7)	
01050	451*	FORMAT(/8X26H FISH PASTE	,F8.0,7H LB/HR)
01051	452*	AA(90,13)=0.05*AA(91,7)*0.01	
01052	453*	PRINT 1018,AA(90,6)	
01055	454*	FORMAT(/8X26H PACKAGED AS FISH PASTE	,F8.0,7H LB/HR)
01056	455*	PRINT 1019,AA(91,9)	
01061	456*	FORMAT(/8X26H FEED TO SPRAY EVAPORATOR	,F8.0,7H LB/HR)
01062	457*	PRINT 1020,AA(91,14)	
01065	458*	FORMAT(/8X26H SPRAY EVAPORATOR STEAM	,F8.0,7H LB/HR)
01066	459*	COOL=4*AA(91,14)	
01067	460*	PRINT 1021,COOL	
01072	461*	FORMAT(/8X26H SPRAY EVAP. COOLING	,F8.0,7H GAL/HR)
01073	462*	PRINT 1022,AA(90,7)	
01076	463*	FORMAT(/8X26H DRY CONCENTRATE	,F8.0,7H LB/HR)
01077	464*	PRINT 1023,AA(90,5)	
01102	465*	FORMAT(/8X26H FISH OIL	,F8.0,7H LB/HR)
01103	466*	STEAM=AA(27,17)-AA(91,12)-AA(91,13)-AA(91,14)-AA(91,18)-AA(91,19)	
01103	467*	C-AA(91,16)	
01104	468*	PRINT 1030,STEAM	
01107	469*	FORMAT(/8X26H MISCELLANEOUS STEAM	,F8.0,7H LB/HR)
01110	470*	AA(90,9)=AA(90,9)/8.33	
01111	471*	PRINT 1031,AA(90,9)	
01114	472*	FORMAT(/8X26H CITY WATER	,F8.0,7H GAL/HR)
01115	473*	AA(90,10)=AA(90,10)*24./2000.	
01116	474*	PRINT 1032,AA(90,10)	
01121	475*	FORMAT(/8X26H PROCESS WATER	,F8.0,7H GAL/HR)
01122	476*	AA(90,11)=AA(27,17)*24*0.0112	
01123	477*	AA(90,2)=SUM-IP* .7457 * 24.	
01124	478*	AA(90,3)=AA(90,3)*24/2000	
01125	479*	AA(90,5)=AA(90,5)*24/2000	
01126	480*	AA(90,6)=AA(90,6)*24/2000	
01127	481*	AA(90,7)=AA(90,7)*24/2000	
01130	482*	IXX =(14.0*(TONS/50.01**31) +0.5	
01131	483*	PXX =IXX	
01132	484*	AA(90,8)=IXX*8.-0	
01133	485*	AA(90,9)=AA(90,9)*24	
01134	486*	AA(90,12)=AA(90,12)*24	
01135	487*	AA(90,13)=AA(90,13)*24	
01136	488*	AA(90,15)=AA(90,15)*24	
01137	489*	AA(90,17)=AA(90,17)*24	
01140	490*	RETURN	
01141	491*	END	

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S HOPPER HOPPER
FOR S9A-07/12-11:04 (0,)

SUBROUTINE HOPPER ENTRY POINT 00007*

STORAGE USED: CODE(1) 000100; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000043 116G 0001 000055 125G 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA 0000 000021 INJP\$
0000 I 000000 IX 0000 I 000002 J

SUBROUTINE HOPPER

IX = 6

COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)

COMMON /BLOCK2/ COST(7),COSTA(7)

COST(1) = COST(1)*AA(IX,18)

COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)

COST(2) = COST(1)*AA(IX,11)

COST(3) = COST(1)*AA(IX,12)

COST(4) = COST(1)*AA(IX,13)

COST(5) = COST(1) + COST(2) + COST(3) + COST(4)

COST(6) = COST(5)*AA(IX,15)

DO I = 1,6

1 COSTA(I) = COST(1) + COSTA(I)

PRINT 1000,AA(IX,17),COST(I),J=1,6

1000 FORMAT(/25H CONICAL HOPPER

C SST ,6F10.3)

RETURN

END

,F10.3,15H CUBIC FT. ,10H

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S SILO,SILO
FOR S9A-07/12-11:04 (0,)

SUBROUTINE SILO ENTRY POINT 000116

STORAGE USED: CODE(1) 000122; DATA(0, 000050; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0000	000020	1001F	0001	000047	120G	0001	000063	130G	0001	000101	140G
0003	R	000000	AA	0003	R	004704	BB	0004	R	000000	COST	0004	R	000007
0003	I	003720	IA	0000	000000	0	INJPC	0000	I	000000	IX	0000	I	000001

```

00101 1* SUBROUTINE SILO
00103 2* IX=7
00104 3* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00105 4* COMMON/BLOCK2/ COST(7),COSTA(7)
00106 5* IF(IA(7,1).EQ.1) AA(7,11)=0.20
00110 6* COST(1)= BB(1)* AA(7,7)*AA(7,17)**AA(7,R)
00111 7* COST(1)= .001* COST(1)
00112 8* COST(2) = COST(1)* AA(7,11)
00113 9* COST(3)= COST(1)* AA(7,12)
00114 10* COST(4)= COST(1)* AA(7,13)
00115 11* COST(5)= COST(1)+ COST(2)*COST(3) +COST(4)
00116 12* COST(6)= COST(1)*AA(1X,15)
00117 13* DO 1 I =1,7
00122 14* 1 COSTA(I)=COST(I) + COSTA(I)
00124 15* IF(IA(7,1).EQ.0) PRINT 1000 ,AA(7,17),(COST(I),I=1,6)
00134 16* IF(IA(7,1).EQ.1) PRINT 1001,AA(7,17),(COST(J),J=1,6)
00144 17* 1000 FORMAT(/ 25H STORAGE BIN
00144 18* 1 STEEL ,6F10.3)
00145 19* 1001 FORMAT(/25H REDWOOD STORAGE BIN ,F10.0,15H CUBIC FEET ,10H
00146 20* CREDWOOD ,6F10.3)
00146 21* RETURN
00147 22* END

```

END OF COMPILE: NO DIAGNOSTICS.

Table I.--Continued.

QFOR,S CONDEN,CONDEN
FOR S9A-07/12-11:04 (0,)

SUBROUTINE CONDEN ENTRY POINT 000065

STORAGE USED: CODE(1) 000071; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000006 1166 0001 000050 1256 0003 R 000000 AA 0003 R 004704 88
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 T 0000 000000 INJPS
0000 I 000000 IX 0000 T 000002 J

00101 1* SUBROUTINE CONDEN
00103 2* IX=8
00104 3* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00105 4* COMMON/BLOCK2/ COST(7),COSTA(7)
00106 5* COST(1)=BB(1)*AA(A,7)*AA(R,17)**AA(8,R)
00107 6* COST(1) = COST(1)*0.001
00110 7* COST(2) = COST(1) * AA(8,11)
00111 8* COST(3) = COST(1) * AA(8,12)
00112 9* COST(4) = COST(1) * AA(8,13)
00113 10* COST(5)= COST(1)+ COST(2) + COST(3) + COST(4)
00114 11* COST(6)= COST(1)*AA(8,15)
00115 12* DO 1 I= 1,7
00120 13* 1 COSTA(I) = COSTA(1) + COST(I)
00122 14* PRINT 1000, AA(8,17), (COST(J),J=1,6)
00131 15* 1000 FORMAT(/ 25H SCRUBFRS ,F10.3,15H TONS PROCESSED,10H
00131 16* 1 STEEL ,6F10.3)
00132 17* RETURN
00133 18* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S PULVER,PULVER
FOR 59A-07/12-11:04 (0,)

SUBROUTINE PULVER ENTRY POINT 000073

STORAGE USED: CODE(1) 000100; DATA(0) 000033; BLANK COMMON(2) 000000

COMMON RLOCKS:

0003 RLOCK1 005050
0004 RLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000043 1176 0001 000055 126G 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA 0000 000022 INJPS
0000 I 000000 IX 0000 I 000002 J

```

nn101 1* SUBROUTINE PULVER
nn103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
nn104 3* COMMON/BLOCK2/ COST(7), COSTA(7)
nn105 4* IX=11
nn106 5* 1000 FORMAT(/ 25H PULVERIZER ,F10.3,15H POUNDS/HOUR ,10H
nn106 6* 1 SS ,6F10.3)
nn107 7* COST(1)= BB(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
nn110 8* COST(1)=COST(1)*.001
nn111 9* COST(2)= COST(1)*AA(IX,11)
nn112 10* COST(3)= COST(1)*AA(IX,12)
nn113 11* COST(4)= COST(1)*AA(IX,13)
nn114 12* COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
nn115 13* COST(6)= COST(5)*AA(IX,15)
nn116 14* DO 1 I=1,6
nn121 15* 1 COSTA(I)=COST(I)+COSTA(I)
nn123 16* PRINT 1000, AA(IX,17),(COST(J),J=1,6)
nn132 17* RETURN
nn133 18* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

QFOR,S SCREW,SCREW
FOR S9A-07/12-11:04 (0,)

SUBROUTINE SCREW ENTRY POINT 000246

STORAGE USED: CODE(1) 000257; DATA(0) 000126; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000052	1000F	0000	000020	1001F	0000	000003	1002F	0000	000035	1006F	0001	000212	13L
0001	000224	14L	0001	000117	140G	0001	000135	150G	0001	000161	162G	0001	000201	174G
0001	000220	206G	0001	000036	31L	0003	R	000000	AA	0003	R	004704	BB	0004
0004	R	000007	COSTA	0000	I	000001	I	0003	I	0000	I	000105	INJPs	0000
0000	I	000002	J	0000	I	000001	I	0003	I	0000	I	000000	IX	0000

```

nn101 1* SUBROUTINE SCREW
nn103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
nn104 3* COMMON/BLOCK2/ COST(7), COSTA(7)
nn105 4* IX=17
nn106 5* IF(AA(IX,18).LT.6.1) GO TO 31
nn107 6* AA(17,7) = 270.
nn108 7* AA(17,8) = 0.80
nn109 8* IF(AA(IX,18).LT.12.1) GO TO 31
nn110 9* AA(17,7) = 290.
nn111 10* AA(17,8) = 0.75
nn112 11* IF(AA(IX,18).LT.14.1) GO TO 31
nn113 12* AA(17,7) = 300.
nn114 13* AA(17,8) = 0.60
nn115 14* 31 CONTINUE
nn116 15* IF(IA(17,5).EQ.2) RB(2) = 5.0
nn117 16* IF(IA(17,5).EQ.5) RB(2) = 5.3
nn118 17* COST(1) = BB(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
nn119 18* COST(1)=COST(1)*.001
nn120 19* COST(1)=BB(2)*COST(1)
nn121 20* COST(2) = COST(1)*AA(IX,11)
nn122 21* COST(3) = COST(1)*AA(IX,12)
nn123 22* COST(4) = COST(1)*AA(IX,13)
nn124 23*
nn125 24*
nn126 25*
nn127 26*
nn128 27*
nn129 28*
nn130 29*
nn131 30*
nn132 31*
nn133 32*
nn134 33*

```

Table I.--Continued.

```

00135      COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
00136      COST(6)= COST(1)*AA(IX,15)
00137      DO 1 I=1,6
00142      1 COSTA(I)=COST(I)+COSTA(I)
00144      IF(IA(17,5).EQ.5) PRINT 1006, AA(17,17),(COST(J),J=1,6)
00154      IF(IA(17,5).EQ.5) GO TO 14
00156      IF(IA(17,5).EQ.3) PRINT 1002,AA(IX,17),(COST(J),J=1,6)
00166      IF(IA(17,5).EQ.3) GO TO 14
00170      1002 FORMAT(/25H SCREW PRESS ,F10.0,15H FEET ,10H
00171      C SST ,6F10.3)
00200      PRINT 1000, AA(IX,17),(COST(J),J=1,6)
00202      IF(IA(17,5).EQ.2) GO TO 13
00203      GO TO 14
00212      13 PRINT 1001,AA(17,17),(COST(J),J=1,6)
00213      1001 FORMAT(/ 25H SCREW PRESS ,F10.3,15H FEET ,10H
00214      1 STEEL ,6F10.3)
00215      14 CONTINUE
00216      IA(17,5) = 1
00217      1006 FORMAT(/25H PULP PRESS ,F10.3,15H FEET ,10H
00220      1 STEEL ,6F10.3)
00221      1000 FORMAT(/ 25H SCREW CONVEYER ,F10.3,15H FEET ,10H
00222      1 SS ,6F10.3)
00223      BB(2)=1.
00224      RETURN
00225      END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

@FOR,S HAMMER,HAMMER
FOR S9A-07/12-11:04 (0,)

SUBROUTINE HAMMER ENTRY POINT 000107

STORAGE USED: CODE(1) 000114; DATA(0) 000034; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1G00F	0001	000057	121G	0001	000071	130G	0001	000034	2L	0003	R	000000	AA
0003	R	004704	BB	0004	R	000000	COST	0004	R	000007	COSTA	0003	I	000001	I
0000	000023	INJP\$	0000	I	000000	IX	0000	I	000002	J					

```

00101 1* SUBROUTINE HAMMER
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX = 18
00106 5* IF(AA(18,17).LT.1.) COST(1)=.5
00107 6* IF(AA(18,17).LT.1.) GO TO 2
00108 7* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00109 8* COST(2)=COST(1)*AA(IX,11)
00110 9* COST(3) = COST(1)*AA(IX,12)
00111 10* COST(4) = COST(1)*AA(IX,13)
00112 11* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00113 12* COST(6) = COST(5)*AA(IX,15)
00114 13* DO 1 I=1,6
00115 14* COST(I)=COST(1)+COSTA(I)
00116 15* PRINT 1000,AA(IX,17),(COST(I),I=1,6)
00117 16* 1000 FORMAT(25H HAMMER MILL ,F10.3,15H TONS PER HR. ,10H
00118 17* C SST ,6F10.3)
00119 18* RETURN
00120 19* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

FOR S DRYER, DRYER
FOR S9A-07/12-11:04 (0,)

SUBROUTINE DRYER ENTRY POINT 000073

STORAGE USED: CODE(1) 000100; DATA(0) 000033; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	000043	117G	0001	000055	124G	0003	R	000000	AA	0003	R	004704	BB
0004	R	000000	COST	0004	R	000007	COSTA	0000	I	000001	I	0003	R	003720	IA	
0000	I	000000	IX	0000	I	000002	J						0000		000022	INJPS

00101	1*	SUBROUTINE DRYER														
00103	2*	COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)														
00104	3*	COMMON/BLOCK2/ COST(7),COSTA(7)														
00105	4*	IX=19														
00106	5*	1000 FORMAT(/ 25H DRUM DRYER														
00106	6*	1 SS ,6F10.3)														
00107	7*	COST(1)=BB(1)*AA(IX,7)*AA(IX,7)*AA(IX,8)														
00110	8*	COST(1)=COST(1)*.001														
00111	9*	COST(2)=COST(1)*AA(IX,11)														
00112	10*	COST(3)=COST(1)*AA(IX,12)														
00113	11*	COST(4)=COST(1)*AA(IX,13)														
00114	12*	COST(5)=COST(1)+COST(2)+COST(3)+COST(4)														
00115	13*	COST(6)=COST(5)*AA(IX,15)														
00116	14*	DO 1 I=1,6														
00121	15*	1 COSTA(I)=COST(1)+COSTA(I)														
00123	16*	PRINT 1000, AA(IX,17), (COST(J), J=1,6)														
00132	17*	RETURN														
00133	18*	END														

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S DRYERP, DRYERP
FOR S9A-07/12-11:04 (n,)

SUBROUTINE DRYERP ENTRY POINT 000073

STORAGE USED: CODE(1) 000100; DATA(n) 000033; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000043 1176 0001 000055 1266 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA 0000 000022 INJPS
0000 I 000000 IX 0000 I 000002 J

```

00101 1* SUBROUTINE DRYERP
00103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=20
00106 5* 1000 FORMAT(/ 25H PAN DRYER ,F10.3,15H SQUARE FEET ,10H
00107 6* 1 SS ,6F10.3)
00108 7* COST(1)= BB(1)*AA(1X,7)*AA(IX,17)**AA(IX,8)
00109 8* COST(1)=COST(1)*.001
00110 9* COST(2)= COST(1)*AA(1X,11)
00111 10* COST(3)= COST(1)*AA(1X,12)
00112 11* COST(4)= COST(1)*AA(1X,13)
00113 12* COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
00114 13* COST(6)= COST(5)*AA(1X,15)
00115 14* DO 1 I=1,6
00116 15* 1 COSTA(I)=COST(I)+COSTA(I)
00117 16* PRINT 1000, AA(IX,17),(COST(J),J=1,6)
00118 17* RETURN
00119 18* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

FOR S DRYERR DRYERR
FOR S9A-07/12-11:04 (0,)

SUBROUTINE DRYERR ENTRY POINT 000000

STORAGE USED: CODE(1) 000305; DATA(0) 000153; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 RLOCK2 000016
0004 RLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000052	1000F	0000	000121	1001F	0000	000067	1003F	0000	000104	1004F	0001	000073	122G
0001	000247	13L	0001	000111	132G	0001	000261	14L	0001	000127	142G	0001	000145	152G
0001	000176	171G	0001	000222	203G	0001	000242	217G	0001	000255	227G	0000	000003	3006F
0000	000020	3007F	0000	000035	3008F	0004	R	000000	AA	0004	R	004704	BB	COST
0003	R	000007	COSTA	0000	I	000001	I	00004	I	003720	IA	0000	I	000000
0000	I	000002	J									0000	I	000000

00101	1*	SUBROUTINE DRYERR
00103	2*	COMMON/BLOCK2/ COST(7),COSTA(7)
00104	3*	COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00105	4*	IX=21
00106	5*	COST(1)= BB(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
00107	6*	COST(1)=COST(1)*.001
00110	7*	COST(1)=BB(2)*COST(1)
00111	8*	COST(2)= COST(1)*AA(IX,11)
00112	9*	COST(3)= COST(1)*AA(IX,12)
00113	10*	COST(4)= COST(1)*AA(IX,13)
00114	11*	COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
00115	12*	IF(IA(21,5).GE.6.AND. IA(21,5).LE.8) RB(2)=3.2*BB(2)
00117	13*	COST(1)=BB(2)*COST(1)
00120	14*	COST(6)= COST(5)*AA(IX,15)
00121	15*	DO 1 I=1,6
00124	16*	1 COSTA(I)=COST(I)+COSTA(I)
00126	17*	IF(IA(21,5).EQ.6) PRINT 3006,AA(21,17),(COST(I),I=1,6)
00136	18*	IF(IA(21,5).EQ.7) PRINT 3007,AA(21,17),(COST(I),I=1,6)
00146	19*	IF(IA(21,5).EQ.8) PRINT 3008,AA(21,17),(COST(I),I=1,6)
00156	20*	IF(IA(21,5).GE.6)
00160	21*	FORMAT(25H DRYER

3006 ,F10.3,25H AREA(50.FEET SST

Table I.--Continued.

```

00160 22* C ,6(F10.3))
00161 23* 3007 FORMAT(/25H STRIPPER DRYER ,F10.3,25H AREA(SQ.FEET SST
00161 24* C ,6(F10.3))
00162 25* 3008 FORMAT(/25H CONDITINNER ,F10.3,25H AREA(SQ.FEET SST
00162 26* C ,6(F10.3))
00163 27* IF(IA(21,5).EQ.2) GO TO 13
00165 28* IF(IA(21,5).EQ.3) PRINT 1003,AA(IX,17),(COST(J),J=1,6)
00175 29* IF(IA(21,5).EQ.3) GO TO 14
00177 30* IF(IA(21,5).EQ.4) PRINT 1004,AA(IX,17),(COST(J),J=1,6)
00207 31* IF(IA(21,5).EQ.4) GO TO 14
00211 32* 1000 FORMAT(/ 25H ROTARY VACUUM DRYER ,F10.3,15H SQUARE FEET ,10H
00211 33* 1 SS ,6F10.3)
00212 34* 1003 FORMAT(/ 25H STEAM TUBE DRYER F10.3,15H SQUARE FEET ,10H
00212 35* 1 STEEL ,6F10.3)
00213 36* 1004 FORMAT(/25H STEAM COOKER ,F10.0,15H SQUARE FEET ,10H
00213 37* C SST ,6F10.3)
00214 38* PRINT 1000, AA(IX,17),(COST(J),J=1,6)
00223 39* GO TO 14
00224 40* 13 PRINT 1001,AA(21,17),(COST(J),J=1,6)
00233 41* 1001 FORMAT(/ 25H STEAM COOKER ,F10.3,15H SQUARE FEET ,10H
00233 42* 1 STEEL ,6F10.3)
00234 43* 14 CONTINUE
00235 44* IA(21,5)= 1
00236 45* BB(2)=1.
00237 46* BB(3)=1.
00240 47* RETURN
00241 48* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S BOILER, BOILER
FOR S9A-07/12-11:04 (0,)

SUBROUTINE BOILER ENTRY POINT 000114

STORAGE USED: CODE(1) 000120; DATA(0) 000040; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000004 1000F 0001 000060 1226 0001 000077 1326 0003 R 000000 AA 0003 R 004704 88
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000002 I 0003 003720 IA 0000 000030 INUP\$
0000 I 000000 IX 0000 I 000003 J 0000 R 000001 S

SUBROUTINE BOILER

COMMON/BLOCK1/ AA(10,20),IA(10,5),BB(100)
COMMON/BLOCK2/ COST(7),COSTA(7)

IX=27
S=AA(27,7) +(0.3*AA(27,18))
IF(AA(27,18).GT.150.) S= 500.
IF(AA(27,18).GT.300.) S= 560.
S=0.001*S

COST(1)= S*BB(1)*AA(27,17)*AA(27,8)

COST(2)= COST(1)*AA(27,11)

COST(3)= COST(1)*AA(27,12)

COST(4)= COST(1)*AA(27,13)

COST(5)= COST(1)+COST(2)+COST(3)+COST(4)

DO 1 I=1,6

COST(6)= COST(5)*AA(27,15)

1 COSTA(1)=COSTA(1) + COST(I)

PRINT 1000, AA(IX,17), (COST(J),J=1,6)

1000 FORMAT(25H BOILER

1 SS

RETURN

END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S EVPSR*EVPSR
FOR 9A-07/12-11:04 (0.)

SUBROUTINE EVPSR ENTRY POINT 000070

STORAGE (USED: CODE(1) 000075; DATA(0) 000031; BLANK COMMON(2) 000000)

COMMON RLOCKS:

0003 RLOCK2 000016
0004 RLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000040 115G 0001 000052 124G 0004 R 000000 AA 0004 R 004704 BB
0003 R 000000 COST 0003 R 000007 COSTA 0000 I 000001 I 0004 003720 IA 0000 000021 INJPS
0000 I 000000 IX 0000 I 000002 J

```

nn101 1* SUBROUTINE FVPSR
nn103 2* COMMON /BLOCK2/ COST(7),COSTA(7)
nn104 3* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
nn105 4* IX=30
nn106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
nn107 6* COST(2) = COST(1)*AA(IX,11)
nn110 7* COST(3) = COST(1)*AA(IX,12)
nn111 8* COST(4) = COST(1)*AA(IX,13)
nn112 9* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
nn113 10* COST(6) = COST(5)*AA(IX,15)
nn114 11* DO 1 I=1,6
nn117 12* 1 COSTA(I)=COST(I)+COSTA(I)
nn121 13* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
nn130 14* 1000 FORMAT(/25H SPRAY EVAPORATOR ,F10.2,15H LB/HR EVAP. ,10H
nn130 15* CSST ,6F10.3)
nn131 16* RETURN
nn132 17* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR, S EVPFLM, EVPFLM
FOR 59A-07/12-11:05 (0,)

SUBROUTINE EVPFLM ENTRY POINT 000067

STORAGE USED: CODE(1) 000073; DATA(0) 000030; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK2 000016
0004 BLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	0000044	1176	0001	000052	124G	0004	R	000000	AA	0004	R	004704	BB	
0003	R	000000	COST	0003	P	000007	COSTA	0000	I	000002	I	0004	R	003720	IA	0000	000021
0000	I	000000	IX	0000	I	000001	J										INLP\$

00101 1* SUBROUTINE EVPFLM
00103 2* COMMON /BLOCK2/ COST(7), COSTA(7)
00104 3* COMMON /BLOCK1/ AA(100,20), IA(100,5), RB(100)
00105 4* IX=31
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* COST(2) = COST(1)*AA(IX,11)
00110 7* COST(3) = COST(1)*AA(IX,12)
00111 8* COST(4) = COST(1)*AA(IX,13)
00112 9* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00113 10* COST(6) = COST(5)*AA(IX,15)
00114 11* PRINT 1000, AA(IX,17), (COST(J), J=1,6)
00123 12* DO 1 I=1,6
00126 13* 1 COSTA(I)=COST(I)+COSTA(I)
00130 14* 1000 FORMAT(/25H WIPE FILM EVAPORATOR ,F10.2,15H SQUARE FT. ,10H
00130 15* CSST ,6F10.3)
00131 16* RETURN
00132 17* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

QVFOR,S EVPFRC,EVPFRC
FOR 59A-07/12-11:05 (0,)

SUBROUTINE EVPFRC ENTRY POINT 000072

STORAGE USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000042 1166 0001 000054 1256 0003 R 000000 AA 0003 R 004704 RB
0004 R 000000 COST 0004 R 000047 COSTA 0000 I 000001 I 0000 003720 IA
0000 I 000000 IX 0000 I 000002 J

00101 1* SUBROUTINE EVPFRC
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX = 32
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
00107 6* COST(1) = COST(1)*AA(IX,18)
00110 7* COST(2) = COST(1)*AA(IX,11)
00111 8* COST(3) = COST(1)*AA(IX,12)
00112 9* COST(4) = COST(1)*AA(IX,13)
00113 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00114 11* COST(6) = COST(5)*AA(IX,15)
00115 12* DO 1 I=1,6
00120 13* 1 COSTA(I)=COST(I)+COSTA(I)
00122 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00131 15* 1000 FORMAT(25H FORCED CTR. EVAPORATOR ,F10.3,15H SURFACE SQ FT.,10H
00131 16* C SST ,6F10.3)
00132 17* RETURN
00133 18* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR, S EVPHOR, EVPHOR
FOR S9A-07/12-11:35 (0,)

SUBROUTINE EVPHOR ENTRY POINT 000070

STORAGE USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000042 1166 0001 000054 1256 0003 R 004704 RB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA
0000 I 000000 IX 0000 T 000002 J 0000 000021 INJPS

```

00101 1* SUBROUTINE EVPHOR
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX = 33
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* COST(1) = COST(1)*AA(IX,18)
00110 7* COST(2) = COST(1)*AA(IX,11)
00111 8* COST(3) = COST(1)*AA(IX,12)
00112 9* COST(4) = COST(1)*AA(IX,13)
00113 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00114 11* COST(6) = COST(5)*AA(IX,15)
00115 12* DO 1 I=1,6
00120 13* 1 COSTA(I)=COST(1)+COSTA(I)
00122 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00131 15* 1000 FORMAT(/25H VERTICAL EVAPORATOR ,F10.3,15H SURFACE SQ FT.,10H
00132 16* C SST 6F10.3)
00133 17* RETURN
00133 18* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

QFOR,S STORAGE,STORAG
FOR 59A-07/12-11:05 (0,)

SUBROUTINE STORAG ENTRY POINT 000177

STORAGE USED: CODE(1) 000204; DATA(0), 000104; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000012	10L	0001	000121	10011	0000	000004	1010F	0000	000021	1011F	0000	000036	1028F
0000	000053	1029F	0001	000064	130G	0001	000114	147G	0001	000130	157G	0001	000144	167G
0001	000160	177G	0001	000016	20L	0001	000041	21L	0001	000151	28L	0001	000135	29L
0001	000165	30L	0003	R	000000	AA	0003	R	004704	BB	0000	R	000000	COST
0004	R	000007	COSTA	0000	I	000002	I	0003	I	000720	IA	0000	I	000000
0000	I	000003	J											IX

00101	1*	SUBROUTINE STORAG
00103	2*	COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104	3*	COMMON /BLOCK2/ COST(7),COSTA(7)
00105	4*	AA(40,17) = AA(40,17)*0.01
00106	5*	IF (AA(40,17) .GT. 10.0) GO TO 10
00110	6*	IX = 40
00111	7*	GO TO 20
00112	8*	IX = 41
00113	9*	AA(41,17) = AA(40,17)
00114	10*	COST(1) = BR(1)*AA(1X,7)*AA(IX,17)*AA(IX,8)
00115	11*	COST = COST(1)
00115	12*	C SST MATERIAL FACTOR = AA(40,18), INDEX = IA(40,U) = 1
00116	13*	IF (IA(40,1) - 1) 21,22,21
00121	14*	COST(1) = COST(1)*AA(IX,18)
00122	15*	COST(2) = COST(1)*AA(IX,11)
00123	16*	COST(3) = COST*AA(IX,12)
00124	17*	COST(4) = COST(1)*AA(IX,13)
00125	18*	COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00126	19*	COST(6) = COST(5)*AA(IX,15)
00127	20*	DO 1 I=1,6
00132	21*	1 COSTA(I)=COST(I)+COSTA(I)

Table I.--Continued.

00134	22*	AA(IX,17) = AA(IX,17)*100.0	
00135	23*	IF(IA(40,2).EQ.1) GO TO 29	
00137	24*	IF(IA(40,2).EQ.2) GO TO 28	
00141	25*	IF (IA(40,1) - 1)1000,1001,1000	
00144	26*	1000 PRINT 1010,AA(IX,17),(COST(J),J=1,6)	
00153	27*	GO TO 30	
00154	28*	1001 PRINT 1011,AA(IX,17),(COST(J),J=1,6)	
00163	29*	GO TO 30	
00164	30*	PRINT 1029,AA(IX,17),(COST(J),J=1,6)	
00173	31*	GO TO 30	
00174	32*	PRINT 1028,AA(IX,17),(COST(J),J=1,6)	
00203	33*	GO TO 30	
00204	34*	1010 FORMAT(/25H SHOP FAR. STORAGE TANK ,F10.0,15H GALLONS	,10H
00204	35*	C STEEL ,6F10.3)	
00205	36*	1011 FORMAT(/25H SHOP FAR. STORAGE TANK ,F10.0,15H GALLONS	,10H
00205	37*	C SST ,6F10.3)	
00206	38*	1028 FORMAT(/25H WATER DIMP TANK ,F10.0,15H GALLONS	,10H
00206	39*	CSTEEL ,6F10.3)	
00207	40*	1029 FORMAT(/25H ACID STORAGE TANK ,F10.0,15H GALLONS	,10H
00210	41*	C SST ,6F10.3)	
00211	42*	30 CONTINUE	
00212	43*	RETURN	
	44*	END	

END OF COMPILATION:

NO DIAGNOSTICS.

Table I.-- Continued.

QFOR,S VESSEL,VESSEL
FOR 59A-07/12-11:05 (0,)

SUBROUTINE VESSEL ENTRY POINT 000210

STORAGE USED: CODE(1) 000215; DATA(0) 000065; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	00004	1000F	0001	000141	144G	0001	000157	156G	0001	000172	165G	0000	000021	2000F
0001	000077	3L	0001	000105	4L	0001	000163	5L	0003	R	000000	AA	0003	R 004704 BB
0004	R	000000	COST	0004	R	000007	COSTA	0000	R	000001	F	0000	I	003720 IA
0000	000054	INJP\$	0000	I	000000	IX	0000	R	000002	I				

00101	1*	SUBROUTINE VESSEL
00103	2*	COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104	3*	COMMON/BLOCK2/ COST(7),COSTA(7)
00105	4*	IX=42
00106	5*	IF(IA(42,3).EQ.1) F=AA(42,1)
00110	6*	IF(IA(42,3).EQ.2) F=AA(42,2)
00112	7*	IF(IA(42,3).EQ.3) F=AA(42,3)
00114	8*	U= AA(42,18)**1.6*AA(42,19)*0.132
00115	9*	IF(IA(42,2).EQ.1) COST(1)=.313*U**0.81 *BB(1)
00117	10*	IF(IA(42,2).EQ.2) COST(1)=.260*U**0.759*BB(1)
00121	11*	IF(IA(42,2).NF.1) GO TO 3
00123	12*	AA(42,11)= 1.038
00124	13*	AA(42,12)= .992
00125	14*	AA(42,13)= 1.20
00126	15*	GO TO 4
00127	16*	3 AA(42,11) = 0.645
00130	17*	AA(42,12) = 0.615
00131	18*	AA(42,13) = 0.916
00132	19*	4 CONTINUE
00133	20*	COST(4)= COST(1)* AA(IX,13)
00134	21*	COST(3)= COST(1)* AA(IX,12)
00135	22*	COST(2)= COST(1)* AA(IX,11)
00136	23*	COST(1) =COST(1)*F

Table I.--Continued.

```

nn137      24*      COST(5)=COST(1)+COST(2)+COST(3)+COST(4)
nn140      25*      AA(42,17)=3.14159*.25*AA(42,18)*AA(42,18)*AA(42,19)
nn141      26*      COST(7)=0.
nn142      27*      COST(6)= COST(1)*AA(IX,15)
nn143      28*      DO 1 I=1,7
nn146      29*      1 COSTA(I) = COSTA(I) +COST(I)
nn150      30*      1000 FORMAT(/ 25H PRESSURE VESSEL
nn150      31*      1 SS ,6F10.3)
nn151      32*      IF(IA(42,4).EQ.2) GO TO 5
nn153      33*      PRINT 1000, AA(IX,17), (COST(I),I=1,6)
nn162      34*      5 PRINT 2000, AA(IX,17),(COST(I),I=1,6)
nn171      35*      2000 FORMAT(/25H DIST. COLUMN SHELL
nn171      36*      1 SS ,6F10.3)
nn172      37*      RETURN
nn173      38*      END

```

,F10.3,15H CUBIC FEET ,10H

,F10.3,15H CUBIC FEET ,10H

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S COLUMN COLUMN
FOR S9A-07/12-11:05 (0,)

SUBROUTINE COLUMN ENTRY POINT 000157

STORAGE USED: CODE(1) 000163; DATA(0) 000044; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000005 1000F 0001 000130 1366 0001 000142 1456 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 R 000002 FM 0000 R 000001 FS
0000 I 000004 I 0003 I 0003720 IA 0000 000034 INJP\$ 0000 I 000000 IX

00101 1* SUBROUTINE COLUMN
00103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=43
00106 5* 1000 FORMAT(/ 25H DISTILLATION COLUMN ,F10.3,15H FEET(HIGHT) ,10H
00107 6* 1 SS ,6F10.3)
00108 7* FM=1.0+ (0.4)*((24.-AA(43,18))/6.)
00109 8* FM=AA(43,1)
00110 9* FT=0.
00111 10* IF(AA(43,2).GT.2.) FT=AA(43,4)
00112 11* IF(AA(43,2).GT.4.) FT=AA(43,5)
00113 12* IF(IA(43,3).EQ.2) FM=0.
00114 13* IF(AA(43,17).LE.4.) AA(43,7)=8.3*(AA(43,20))
00115 14* IF(AA(43,17).GE.4.) AA(43,7)=AA(43,20)*(AA(43,20)+4.3)
00116 15* COST(1)=(AA(43,17)*AA(43,8))*AA(43,7)*BB(1)*(FS+FT)
00117 16* COST(1)=COST(1)*.001
00118 17* COST(2)= COST(1)* AA(IX,11)
00119 18* COST(3)= COST(1)* AA(IX,12)
00120 19* COST(4)= COST(1)* AA(IX,13)
00121 20* COST(7)=0.
00122 21* COST(1)= COST(1)*(1.+FM)
00123 22* COST(5)=COST(1)+COST(2)+COST(3)+COST(4)
00124 23* COST(6)= COST(1)*AA(IX,15)
00125 24* DO 1 I=1,7

Table I.-- Continued.

```

00140      25*      1  COSTA(I) = COSTA(I) +COST(I)
00142      26*      PRINT 1000, AA(43,17), (COST(I), I=1,6)
00151      27*      RETURN
00152      28*      END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S REACTR,REACTR
FOR 59A-07/12-11:05 (0,)

SUBROUTINE REACTR ENTRY POINT 000072

STORAGE USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 0000042 1166 0001 000054 1256 0003 R 000000 AA 0003 R 004704 RB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA 0000 000021 INJPS
0000 I 000000 IX 0000 T 000002 J

00101 1* SUBROUTINE REACTR
00103 2* COMMON/BLOCK1/AA(100,20),IA(100,5),BB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=49
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* COST(1) = COST(1)*AA(49,18)
00110 7* COST(2) = COST(1)*AA(IX,11)
00111 8* COST(3) = COST(1)*AA(IX,12)
00112 9* COST(4) = COST(1)*AA(IX,13)
00113 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00114 11* COST(6) = COST(5)*AA(IX,15)
00115 12* DO 1 I=1,6
00120 13* 1 COSTA(I)=COST(I)+COSTA(I)
00122 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00131 15* 1000 FORMAT(/25H JACKETED REACTOR VESSEL ,F10.0,15H GALLONS ,10H
00131 16* CSST ,6F10.3)
00132 17* RETURN
00133 18* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S GRINDR GRINDR
FOR S9A-07/12-11:05 (0,)

SUBROUTINE GRINDR ENTRY POINT 000070

STORAGE USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000042 1166 0001 000054 1256 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0000 0000021 INJP\$
0000 I 000000 IX 0000 I 000002 J

```

00101 1* SUBROUTINE GRINDR
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX=50
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* COST(1) = COST(1)*AA(50,18)
00108 7* COST(2) = COST(1)*AA(IX,11)
00109 8* COST(3) = COST(1)*AA(IX,12)
00110 9* COST(4) = COST(1)*AA(IX,13)
00111 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00112 11* COST(6) = COST(5)*AA(IX,15)
00113 12* DO 1 I=1,6
00114 13* 1 COSTA(I)=COST(I)+COSTA(I)
00115 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00116 15* 1000 FORMAT(/25H FISH GRINDER ,F10.3,15H TONS/HR ,10H
00117 16* CSST ,6F10.3)
00118 17* RETURN
00119 18* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

FOR S SCREEN SCREEN
FOR S9A-07/12-11:05 (0.)

SUBROUTINE SCREEN ENTRY POINT 000070

STORAGE (USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000)

COMMON BLOCKS:

0003 BLOCK1 000500
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 MEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000042 116G 0001 000054 125G 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA 0000 000021 INJP\$
0000 I 000000 IX 0000 I 000002 J

00101 1* SUBROUTINE SCREEN
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX = 51
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
00107 6* COST(1) = COST(1)*AA(IX,18)
00108 7* COST(2) = COST(1)*AA(IX,11)
00109 8* COST(3) = COST(1)*AA(IX,12)
00110 9* COST(4) = COST(1)*AA(IX,13)
00111 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00112 11* COST(6) = COST(5)*AA(IX,15)
00113 12* DO 1 I=1,6
00114 13* 1 COST(I)=COST(I)+COSTA(I)
00115 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00116 15* 1000 FORMAT(25H VIBRATING SCREEN ,F10.3,15H SURFACE SQ FT.,10H
00117 16* C SST ,6F10.3)
00118 17* RETURN
00119 18* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S SHARP,SHARP
FOR S9A-07/12-11:05 (0,)

SUBROUTINE SHARP ENTRY POINT 000073

STORAGE USED: CODE(1) 000100; DATA(0) 000033; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	000003	116G	0001	000055	125G	0003	R	000000	AA	0003	R	004704	BB		
0004	R	000000	COST	0004	R	000007	COSTA	0000	I	000001	I	0003	R	003720	IA	0000	000022	INJPS
0000	I	000000	IX	0000	I	000002	J											

```

nn101 1* SUBROUTINE SHARP
nn103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
nn104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
nn105 4* IX=52
nn106 5* COST(1)=BB(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
nn107 6* COST(1)=COST(1)*.001
nn110 7* COST(2)=COST(1)*AA(IX,11)
nn111 8* COST(3)=COST(1)*AA(IX,12)
nn112 9* COST(4)=COST(1)*AA(IX,13)
nn113 10* COST(5)=COST(1)+COST(2)+COST(3)+COST(4)
nn114 11* COST(6)=COST(5)*AA(IX,15)
nn115 12* DO 1 I=1,6
nn120 13* 1 COSTA(I)=COST(1)+COSTA(I)
nn122 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
nn131 15* 1000 FORMAT(75H SHARPLES CENTRIFUGE ,FIN,3,15H HORSEPOWER ,10H
nn131 16* 1 SS ,6F10.3)
nn132 17* RETURN
nn133 18* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

QFOR.S ROWL,BOWL
FOR S9A-07/12-11:05 (0,)

SUBROUTINE BOWL ENTRY POINT 000073

STORAGE USED: CODE(1) 000100; DATA(0) 000033; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 RLOCK1 005050
0004 RLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	000043	116G	0001	000055	125G	0003 R	000000	AA	0003 R	004704	BB
0004	R	000000	COST	0004	R	000007	COSTA	0000	I	000001	I	0000	000022	INJPS
0000	I	000000	IX	0000	I	000002	J							

```

00101 SUBROUTINE BOWL
00103 COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 COMMON/BLOCK2/ COST(7),COSTA(7)
00105 IX=53
00106 COST(1)= BB(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 COST(1)=COST(1)*.001
00110 COST(2)= COST(1)*AA(IX,11)
00111 COST(3)= COST(1)*AA(IX,12)
00112 COST(4)= COST(1)*AA(IX,13)
00113 COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
00114 COST(6)= COST(5)*AA(IX,15)
00115 DO 1 I=1,6
00120 1 COSTA(I)=COST(I)+COSTA(I)
00122 PRINT 1000, AA(IX,17),(COST(J),J=1,6)
00131 1000 FORMAT(/25H SOLID BOWL CENTRIFUGE ,F10.3,15H HORSEPOWER ,10H
00132 1 SS ,6F10.3)
00133 RETURN
END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S CNTFGE,CNTFGE
FOR S9A-07/12-11:05 (0,)

SUBROUTINE CNTFGE ENTRY POINT 000067

STORAGE USED: CODE(1) 000074; DATA(0) 000033; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	000037	1166	0001	000051	1256	0003	R	000000	AA	0003	R	004704	BB	
0004	R	000000	COST	0034	R	000007	COSTA	0000	I	000001	I	0003	003720	IA	0000	000022	INJPS
0000	I	000000	IX	0000	I	000002	J										

nn101	1*	SUBROUTINE CNTFGE														
nn103	2*	COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)														
nn104	3*	COMMON/BLOCK2/ COST(7), COSTA(7)														
nn105	4*	IX=54														
nn106	5*	COST(1)= BB(1)*AA(54,7)*AA(54,17)*AA(54,8)														
nn107	6*	COST(1)=COST(1)*.001														
nn110	7*	COST(2)= COST(1)* AA(54,11)														
nn111	8*	COST(3)= COST(1)* AA(54,12)														
nn112	9*	COST(4)= COST(1)* AA(54,13)														
nn113	10*	COST(5)= COST(1) + COST(2) + COST(3)+COST(4)														
nn114	11*	COST(6)= COST(5)* AA(54,15)														
nn115	12*	DO 1 I=1,6														
nn120	13*	1 COSTA(I)=COST(I) + COSTA(I)														
nn122	14*	PRINT 1000, AA(IX,17),(COST(J),J=1,6)														
nn131	15*	1000 FORMAT(25H DISK TYPE CENTRIFUGE ,F10.3,15H HORSEPOWER ,10H														
nn131	16*	1 SS ,6F10.3)														
nn132	17*	RETURN														
nn133	18*	END														

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

3FOR,S BLENDR,BLENDR
FOR S9A-07/12-11:05 (0,)

SUBROUTINE BLENDR ENTRY POINT 000070

STORAGE USED: CODE(1) 000075; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003,1000F 0001 000000 115G 0001 000052 124G 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA
0000 I 000000 IX 0000 I 000002 J 0000 I 000021 INJP\$

```

00101 1* SUBROUTINE BLENDR
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX = 57
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* COST(2) = COST(1)*AA(IX,11)
00110 7* COST(3) = COST(1)*AA(IX,12)
00111 8* COST(4) = COST(1)*AA(IX,13)
00112 9* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00113 10* COST(6) = COST(5)*AA(IX,15)
00114 11* DO 1 I=1,6
00117 12* 1 COSTA(I)=COST(I)+COSTA(I)
00121 13* PRINT 1000,AA(IX,17),(COST(J),J=1,6) ,F10,3,15H CUBIC FT / HR.,10H
00130 14* 1000 FORMAT(/25H SOLIDS BLENDER ,F10.3)
00130 15* C SST
00131 16* RETURN
00132 17* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

QFOR,S PMPREC,PMPREC

FOR S9A-07/12-11:05 (0,)

SUBROUTINE PMPREC ENTRY POINT 000212

STORAGE USED: CODE(1) 000217; DATA(0) 000107; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 AL0G
0006 NEXP6\$
0007 NPRT\$
0010 NIO1\$
0011 NIO2\$
0012 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000005	1000F	0000	000022	1001F	0000	000037	1002F	0000	000054	1003F	0001	000054	11L
0001	000060	12L	0001	000103	1306	0001	000135	14L	0001	000130	145G	0001	000151	15L
0001	000144	155G	0001	000200	16L	0001	000160	165G	0001	000165	17L	0001	000174	175G
0003	R 000000	AA	0003	R 000470	4 RB	0000	R 000002	CAS	0004	R 000000	COST	0004	R 000007	COSTA
0000	R 000000	EXP	0000	T 000003	I	0003	I 000720	IA	0000	I 000076	INJP\$	0000	I 000001	IX
0000	I 000004	J												

```

00101 SUBROUTINE PMPREC
00103 COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
00104 COMMON /BLOCK2/ COST(7),COSTA(7)
00105 IX = 65
00106 AA(IX,17) = AA(IX,17)*0.001
00107 EXP = AA(IX,8) + AA(IX,9)*LOG(AA(IX,17))
00110 COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**EXP
00111 IF(AA(IX,17) .LT. 0.1) COST(1) = 0.9
00113 CAST = COST(1)
00114 IF (IA(IX,1) - 1) 12,11,10
00117 COST(1) = COST(1)*AA(IX,19)
00120 GO TO 12
00121 COST(1) = COST(1)*AA(IX,18)
00122 COST(2) = COST(1)*AA(IX,11)
00123 COST(3) = COST*AA(IX,12)
00124 COST(4) = COST(1)*AA(IX,13)
00125 COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00126 COST(6) = COST(5)*AA(IX,15)
00127 DO 1 I=1,6
00132 1 COSTA(I)=COST(I)*COSTA(I)

```

Table I.--Continued.

00134	21*	AA(IX,17) = 1000.0*AA(IX,17)	
00135	22*	IF(IA(IX,2) .EQ. 1) GO TO 17	
00137	23*	IF(IA(IX,1) - 1) 13,14,15	
00140	24*	PRINT 1000,AA(IX,17),(CONST(J),J=1,6)	
00151	25*	GO TO 16	
00152	26*	PRINT 1001,AA(IX,17),(CONST(J),J=1,6)	
00161	27*	GO TO 16	
00162	28*	PRINT 1002,AA(IX,17),(CONST(J),J=1,6)	
00171	29*	GO TO 16	
00172	30*	PRINT 1003,AA(IX,17),(CONST(J),J=1,6)	
00201	31*	CONTINUE	
00202	32*	FORMAT(/25H RECIPROCATING PUMP	,F10.0,15H GPM TIMES PSI ,10H
00202	33*	C STEEL ,6F10.3)	
00203	34*	FORMAT(/25H RECIPROCATING PUMP	,F10.0,15H GPM TIMES PSI ,10H
00203	35*	C BRONZE ,6F10.3)	
00204	36*	FORMAT(/25H RECIPROCATING PUMP	,F10.0,15H GPM TIMES PSI ,10H
00204	37*	C SST ,6F10.3)	
00205	38*	FORMAT(/25H FISH PUMPS	,F10.0,15H GPM TIMES PSI ,10H
00205	39*	C STEEL ,6F10.3)	
00206	40*	RETURN	
00207	41*	END	

END OF COMPILATION: NO DIAGNOSTICS.

QFOR,S PMPCNT,PMPCNT
FOR S9A-07/12-11:05 (0,)

```

1* SUBROUTINE PMPCNT
2* COMMON /BLOCK1/ AA(100,20),IA(100,5),IB(100)
3* COMMON /BLOCK2/ COST(7),COSTA(7)
4* IX = 66
5* AA(IX,17) = AA(IX,17)*0.001
6* EXP = AA(IX,8) + AA(IX,9)*LOG(AA(IX,17))
7* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**EXP
8* IF(AA(IX,17).LT.0.1) COST(1) = 0.4
9* CAST = COST(1)
10* IF (IA(IX,1) - 1) 12,11,10
11* COST(1) = COST(1)*AA(IX,19)
12* GO TO 12
13* COST(1) = COST(1)*AA(IX,18)
14* COST(2) = COST(1)*AA(IX,11)
15* COST(3) = CAST*AA(IX,12)
16* COST(4) = COST(1)*AA(IX,13)
17* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
18* COST(6) = COST(5)*AA(IX,15)
19* DO 1 I=1,6
20* COSTA(I)=COST(I)+COSTA(I)

```


Table I.-- Continued.

00134	21*	AA(IX,17) = 1000.0*AA(IX,17)	
00135	22*	IF(IA(66,4).EQ.2) GO TO 17	
00137	23*	IF(IA(IX,1) - 1) 13,14,15	
00142	24*	13 PRINT 1000,AA(IX,17),(COST(J),J=1,6)	
00151	25*	GO TO 16	
00152	26*	17 PRINT 1003,AA(IX,17),(COST(J),J=1,6)	
00161	27*	GO TO 16	
00162	28*	1003 FORMAT(/25H SFA WATER PUMPS	,F10.3,15H GPM TIMES PSI ,10H
00162	29*	1 BRONZE ,6F10.3)	
00163	30*	14 PRINT 1001,AA(IX,17),(COST(J),J=1,6)	
00172	31*	GO TO 16	
00173	32*	15 PRINT 1002,AA(IX,17),(COST(J),J=1,6)	
00202	33*	16 CONTINUE	
00203	34*	1000 FORMAT(/25H CENTRIFUGAL PUMP	,F10.3,15H GPM TIMES PSI ,10H
00203	35*	C STEEL ,6F10.3)	
00204	36*	1001 FORMAT(/25H CENTRIFUGAL PUMP	,F10.0,15H GPM TIMES PSI ,10H
00204	37*	C BRONZE ,6F10.3)	
00205	38*	1002 FORMAT(/25H CENTRIFUGAL PUMP	,F10.3,15H GPM TIMES PSI ,10H
00205	39*	C SST ,6F10.3)	
00206	40*	RETURN	
00207	41*	END	
		END OF COMPILATION:	NO DIAGNOSTICS.

Table I.-- Continued.

WFOR.S HEATEX,HEATEX
FOR 59A-07/12-11:35 (0.)

SUBROUTINE HEATEX ENTRY POINT 000164

STORAGE USED: CODE(1) 000171; DATA(0) 000101; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK2 000016
0004 BLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEAP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000107	1001L	0001	000123	1002	0000	000004	1010F	0000	000021	1011F	0000	000036	1013F
0000	000053	1014F	0001	000025	11L	0001	000031	12L	0001	000060	126G	0001	000035	13L
0001	000102	142G	0001	000116	152G	0001	000132	162G	0001	000145	174G	0001	000142	30L
0001	000136	4L	0004	R	000000	AA	0004	R	000001	CAST	0000	R	000000	COST
0003	R	000007	COSTA	0000	I	000002	I	0004	I	000720	IA	0000	I	000000
0000	I	000003	J	0000	I	000002	I	0004	I	000720	IA	0000	I	000000

00101	1*	SUBROUTINE HEATEX
00103	2*	COMMON /BLOCK2/ COST(7),COSTA(7)
00104	3*	COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
00105	4*	IX=67
00106	5*	COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107	6*	CAST = COST(1)
00110	7*	IF (IA(67,1) - 1) 10,11,12
00113	8*	10 GO TO 13
00114	9*	11 COST(1) = COST(1)*AA(67,18)
00115	10*	12 COST(1) = COST(1)*AA(67,19)
00116	11*	GO TO 13
00117	12*	GO TO 13
00120	13*	COST(2) = COST(1)*AA(IX,11)
00121	14*	COST(3) = CAST*AA(IX,12)
00122	15*	COST(4) = COST(1)*AA(IX,13)
00123	16*	COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00124	17*	COST(6) = COST(5)*AA(IX,15)
00125	18*	DO 1 I=1,6
00130	19*	1 COSTA(I)=COST(I)+COSTA(I)
00130	20*	C MATERIAL FACTORS IA(67,1) = 0.1,2 IMPLIES SHELL/TURE =ST/ST,ST/SSST
00130	21*	C AND SST/SSST

Table I.--Continued.

```

nn132      22*      IF (IA(67,4),F0,4) GO TO 4
nn134      23*      IF (IA(67,1) - 1) 1000,1001,1002
nn137      24*      PRINT 1010,AA(IX,17),(COST(J),J=1,6)
nn146      25*      GO TO 30
nn147      26*      1001 PRINT 1011,AA(IX,17),(COST(J),J=1,6)
nn156      27*      GO TO 30
nn157      28*      1002 PRINT 1013,AA(IX,17),(COST(J),J=1,6)
nn166      29*      1010 FORMAT(/25H HEAT EXCHANGER
nn167      30*      C ST/ST ,6F10.3)
nn167      31*      1011 FORMAT(/25H HEAT EXCHANGER
nn167      32*      C ST/SST ,6F10.3)
nn170      33*      1013 FORMAT(/25H HEAT EXCHANGER
nn170      34*      C SST/SST ,6F10.3)
nn171      35*      4 PRINT 1014,AA(IX,17),(COST(J),J=1,6)
nn200      36*      GO TO 30
nn201      37*      1014 FORMAT(/25H VENT CONDENSER
nn201      38*      1 ST/SST ,6F10.3)
nn202      39*      30 CONTINUE
nn203      40*      RETURN
nn204      41*      END

```

,F10.3,15H SURFACE S0 FT.,10H
 ,F10.3,15H SURFACE S0 FT.,10H
 ,F10.3,15H SURFACE S0 FT.,10H
 ,F10.3,15H SURFACE S0 FT.,10H

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

DEFOR,S BELT,BELT
FOR 59A-07/12-11:05 (1,)

SUBROUTINE BELT ENTRY POINT 000123

STORAGE USED: CODE(1) 000130; DATA(10) 000041; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000004	1000F	0001	000071	124G	0001	000103	133G	0003	R	000000	AA	0003	R	004704	RB
0004	R	000000	COST	0004	P	000007	COSTA	0000	I	000002	I	0003	R	003720	IA	
0000	I	000000	IX	0000	I	000003	J	0000	R	000001	Q					

```

00101 1* SUBROUTINE BELT
00103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),RB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=70
00106 5* Q= AA(IX,7)
00107 6* IF(AA(IX,18).GT.35.) AA(IX,7)=AA(IX,7)+ 80.
00111 7* IF(AA(IX,18).GT.47.) AA(IX,7)=AA(IX,7)+ 210.
00113 8* 1000 FORMAT(/25H BELT CONVEYER ,F10.3,15H FEET(LENGTH) ,10H
00113 9* 1 ,6F10.3)
00114 10* COST(1)= RB(1)*AA(IX,7)*AA(IX,7)*AA(IX,8)
00115 11* COST(1)=COST(1)*.001
00116 12* COST(2)= COST(1)*AA(IX,11)
00117 13* COST(3)= COST(1)*AA(IX,12)
00120 14* COST(4)= COST(1)*AA(IX,13)
00121 15* COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
00122 16* COST(6)= COST(5) * AA(IX,15)
00123 17* DO 1 I = 1,6
00126 18* 1 COSTA(I) = COST(1) + COSTA(I)
00130 19* PRINT 1000, AA(IX,7), (COST(J),J=1,6)
00137 20* AA(IX,7)=Q
00140 21* RETURN
00141 22* END

```

FND OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

DEFOR, S BUCKET, BUCKET
FOR 59A-07/12-11:35 (n,)

SUBROUTINE BUCKET ENTRY POINT 000134

STORAGE USED: CODE(1) 000141; DATA(n) 000041; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000004 1000F 0001 000102 1246 0001 000114 1336 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000002 I 0000 I 000027 INJP\$
0000 I 000000 IX 0000 I 000003 J 0000 R 000001 Q

00101 1* SUBROUTINE BUCKET
00103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=71
00106 5* Q= AA(IX,7)
00107 6* 1000 FORMAT(/25H BUCKET CONVEYER ,F10.3,15H FFET(HEIGHT) ,10H
00107 7* 1 SS ,6F10.3)
00110 8* IF(AA(IX,18).GT.30..AND.AA(IX,18).LE.75.) AA(IX,7)=AA(IX,7)+180.
00112 9* IF(AA(IX,18).GT.75.) AA(IX,7)=AA(IX,7)+ 280.
00114 10* COST(1)= BB(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
00115 11* COST(1)=COST(1)*.001
00116 12* COST(2)= COST(1)*AA(IX,11)
00117 13* COST(3)= COST(1)*AA(IX,12)
00120 14* COST(4)= COST(1)*AA(IX,13)
00121 15* COST(5)= COST(1)+COST(2)*COST(3)+COST(4)
00122 16* COST(6)= COST(5)*AA(IX,15)
00123 17* DO 1 I=1,6
00126 18* 1 COSTA(I)=COST(1)+COSTA(I)
00130 19* PRINT 1000, AA(IX,17),(COST(J),J=1,6)
00137 20* AA(IX,7)=0
00140 21* RETURN
00141 22* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

FOR,S SCALE,SCALE
FOR S9A-07/12-11:05 (0,)

SUBROUTINE SCALE ENTRY POINT 000116

STORAGE USED: CODE(1) 000123; DATA(0) 000036; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NPRT\$
0006 NI01\$
0007 NI02\$
0010 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000005 1000F 0001 000046 1266 0001 000100 135G 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000003 I 0003 003720 IA
0000 I 000002 IS 0000 I 000000 IX 0000 I 000004 J 0000 R 000001 SIZE

00101 1* SUBROUTINE SCALE
00103 2* COMMON/BLOCK1/ AA(100,20),IA(10,5),RB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=72
00106 5* 1000 FORMAT(/ 25H SCALE ,F10.3,15H TONS
00106 6* 1 SS ,6F10.3)
00107 7* SIZE=AA(IX,17)
00110 8* IS = SIZE/17.0
00111 9* IF(IS.EQ.1) COST(1)=AA(72,20)*RB(1)
00113 10* IF(IS.EQ.2) COST(1)=AA(72,18)*RB(1)
00115 11* IF(IS.EQ.3) COST(1)=AA(72,19)*RB(1)
00117 12* COST(2)= AA(72,11) * COST(1)
00120 13* COST(3)= 0.00
00121 14* COST(4)= AA(IX,13)*COST(1)
00122 15* COST(5)= COST(1)+COST(2)+COST(3) +COST(4)
00123 16* COST(6)=COST(1)*AA(IX,15)
00124 17* COST(7)=0.
00125 18* DO 1 I=1,7
00130 19* 1 COSTA(I)=COST(I)+COSTA(1)
00132 20* PRINT 1000 , AA(IX,17),(COST(J),J=1,6)
00141 21* RETURN
00142 22* END

END OF COMPILE: NO DIAGNOSTICS.

Table I.-- Continued.

FOR,S AGITOR,AGITOR
FOR S9A-07/12-11:05 (0,)

SUBROUTINE AGITOR ENTRY POINT 000074

STORAGE USED: CODE(1) 000100; DATA(0) 000033; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	0000043	1166	0001	000055	1256	0003	R	000000	AA	0003	R	004704	BB
0004	R	000000	COST	0004	R	000007	COSTA	0000	I	000001	I	0003	R	003720	IA	0000
0000	I	000000	IX	0000	I	000002	J									000022
																INJPS

```

00101 1* SUBROUTINE AGITOR
00103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=73
00106 5* COST(1)= BB(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* COST(1)=COST(1)*.001
00110 7* COST(2)= COST(1)*AA(IX,11)
00111 8* COST(3)= COST(1)*AA(IX,12)
00112 9* COST(4)= COST(1)*AA(IX,13)
00113 10* COST(5)= COST(1)+COST(2)+COST(3)+COST(4)
00114 11* COST(6)= COST(5)*AA(IX,15)
00115 12* DO 1 I=1,6
00120 13* 1 COSTA(I)=COST(I)+COSTA(I)
00122 14* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00131 15* 1000 FORMAT(/ 25H AGITATOR-PROPELLAR ,F10.3,15H HORSEPOWER ,10H
00132 16* 1 SS ,6F10.3)
00133 17* RETURN
00133 18* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

QFOR,S RALMTL,BALMIL
FOR S9A-07/12-11:06 (0,)

SUBROUTINE BALMIL ENTRY POINT 000072

STORAGE USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NIO1\$
0010 NIO2\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000042 1166 0001 000054 1256 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0000 000000 IA 0003 003720 IA
0000 I 000000 IX 0000 I 000002 J 0000 I 000001 INJPS

00101 1* SUBROUTINE RALMIL
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX = 74
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
00107 6* COST(1) = COST(1)*AA(IX,18)
00110 7* COST(2) = COST(1)*AA(IX,11)
00111 8* COST(3) = COST(1)*AA(IX,12)
00112 9* COST(4) = COST(1)*AA(IX,13)
00113 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00114 11* COST(6) = COST(5)*AA(IX,15)
00115 12* DO 1 I=1,6
00120 13* 1 COSTA(I)=COST(I)+COSTA(I)
00122 14* PRINT 100,AA(IX,17),(COST(J),J=1,6)
00131 15* 1000 FORMAT(25H BALL MIL ,FIN.3,15H TONS PER HR. ,10H
00131 16* C SST ,6FIN.3)
00132 17* RETURN
00133 18* END

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S BAGGMA,BAGGMA
FOR S9A-07/12-11:06 (0,)

SUBROUTINE BAGGMA ENTRY POINT 000125

STORAGE USED: CODE(1) 000132; DATA(0) 000051; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 MPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0000	000020	1001F	0001	000053	120G	0001	000070	130G	0001	000107	140G
0003	R	000000	AA	0003	R	004704	BB	0004	R	000007	COSTA	0000	I	000001
0003	I	003720	IA	0000	000007	INJP\$	0000	I	000000	IX	0000	I	000002	J

```

00101 1* SUBROUTINE BAGGMA
00103 2* COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON/BLOCK2/ COST(7),COSTA(7)
00105 4* IX=75
00106 5* IF(IA(75,2).EQ.2) AA(75,7)=AA(75,1)
00107 6* COST(1)=BB(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00108 7* COST(1)=COST(1)*.001
00109 8* COST(2)=COST(1)*AA(IX,11)
00110 9* COST(3)=COST(1)*AA(IX,12)
00111 10* COST(4)=COST(1)*AA(IX,13)
00112 11* COST(5)=COST(1)+COST(2)+COST(3)+COST(4)
00113 12* COST(6)=COST(5)*AA(IX,15)
00114 13* DO 1 I=1,6
00115 14* 1 COSTA(I)=COST(I)+COSTA(I)
00116 15* IF(IA(IX,1).F0.0) PRINT 1000,AA(IX,17),(COST(I),J=1,6)
00117 16* IF(IA(IX,1).F0.1)PRINT 1001,AA(IX,17),(COST(I),J=1,6)
00118 17* 1000 FORMAT(/ 25H BAGGING MACHINE
00119 18* 1 SS ,6F10.3)
00120 19* 1001 FORMAT(/ 25H CANNING MACHINE
00121 20* CSST ,6F10.3)
00122 21* RETURN
00123 22* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR S FILTER
FOR 59A-07/12-11:06 (0,)

SUBROUTINE FILTER ENTRY POINT 000070

STORAGE USED: CODE(1) 000077; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000042 1166 0001 000054 1256 0003 R 000000 AA 0003 R 004704 BB
0004 R 000000 COST 0004 R 000007 COSTA 0000 I 000001 I 0003 003720 IA
0000 I 000000 IX 0000 I 000002 J

00101 1* SUBROUTINE FILTER
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX= 78
00106 5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)*AA(IX,8)
00107 6* COST(1) = COST(1)*AA(IX,18)
00110 7* COST(2) = COST(1)*AA(IX,11)
00111 8* COST(3) = COST(1)*AA(IX,12)
00112 9* COST(4) = COST(1)*AA(IX,13)
00113 10* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00114 11* COST(6) = COST(5)*AA(IX,15)
00115 12* DO 1 I=1,6
00120 13* 1 COSTA(I)=COST(I)+COSTA(I)
00122 14* PRINT 1000,AA(IX,17),COST(J),J=1,6
00131 15* 1000 FORMAT(25H ROT. PRISM FILTER ,F10.3,15H SURFACE SQ.FT.,10H
00131 16* C SST ,6F10.3)
00132 17* RETURN
00133 18* END

END OF COMPILATION: NO DIAGNOSTICS.

FOR, S CRANES, CRANES
FOR 59A-07/12-11:06

```

1* SUBROUTINE CRANES
2* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100),
3* COMMON /BLOCK2/ COST(7),COSTA(7)
4* IX= 80
5* COST(1) = BR(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
6* IF (IA(80,1) - 1) 12,11,10
7* COST(1) = COST(1)*AA(IX,9)
8* GO TO 12
9* COST(1) = COST(1)*AA(IX,18)
10* COST(2) = COST(1)*AA(IX,11)
11* COST(3) = COST(1)*AA(IX,12)
12* COST(4) = COST(1)*AA(IX,13)
13* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
14* COST(6) = COST(5)*AA(IX,15)
15* DO 1 I=1,6
16* COSTA(I)=COST(I)*COSTA(I)
17* IF (IA(80,1) - 1) 13,14,15
18* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
19* GO TO 16
20* PRINT 1001,AA(IX,17),(COST(J),J=1,6)
21* GO TO 16
22* PRINT 1002,AA(IX,17),(COST(J),J=1,6)

```

Table I.-- Continued.

00161	23*	16	CONTINUE			
00162	24*	1000	FORMAT(/25H OVERHEAD CRANE 20FT SPAN,F10.3,15H TONS I IFT			,10H
00162	25*		C STEEL ,6F10.3)			
00163	26*	1001	FORMAT(/25H OVERHEAD CRANE 30FT SPAN,F10.3,15H TONS L IFT			,10H
00163	27*		C STEEL ,6F10.3)			
00164	28*	1002	FORMAT(/25H OVERHEAD CRANE 40FT SPAN,F10.3,15H TONS L IFT			,10H
00164	29*		C STEEL ,6F10.3)			
00165	30*		RETURN			
00166	31*		END			

END OF COMPILATION: NO DIAGNOSTICS.

Table I.-- Continued.

FOR,S DRAGMA,DRAGMA
FOR 59A-07/12-11:06 (0,)

SUBROUTINE DRAGMA ENTRY POINT 000,43

STORAGE USED: CODE(1) 000151; DATA(0) 000051; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1000F	0001	000110	141G	0001	000122	150G	
0003	R	000000	AA	0003	R	004704	BB	0004	R 000000 COST
0003		003720	IA	0000	000036	INJP\$		0000	I 000000 IX

0001	000026	2L	0001	000050	3L
0004	R	000007	COSTA	0000	I 000002 I
0000	R	000001	Q		

nn101	1*	SUBROUTINE DRAGMA
nn103	2*	COMMON/BLOCK1/ AA(100,20),IA(100,5),BB(100,
nn104	3*	COMMON/BLOCK2/ COST(7),COSTA(7)
nn105	4*	IX=81
nn106	5*	Q= AA(IX,7)
nn107	6*	IF(AA(81,18).GT.15.) GO TO 2
nn111	7*	AA(81,11)= 0.27
nn112	8*	AA(81,12)= 0.42
nn113	9*	IF(AA(81,1A).LE.13.) AA(81,7)=7.
nn115	10*	GO TO 3
nn116	11*	2 CONTINUE
nn117	12*	IF(AA(81,18).LE.20.) AA(81,7)=10.
nn121	13*	IF(AA(81,18).LE.1A.) AA(81,7)=9.
nn123	14*	AA(81,11)=0.278
nn124	15*	AA(81,12)=0.382
nn125	16*	3 CONTINUE
nn126	17*	1000 FORMAT(/ 25H DRAG CONVEYER
nn126	18*	,F10.3,15H FEET
nn127	19*	1 SS
nn130	20*	COST(1)=BB(1)*AA(81,7)*AA(81,7)*AA(81,8)
nn131	21*	COST(1)=COST(1)*.001
nn132	22*	COST(2)= COST(1)* AA(IX,11)
nn133	23*	COST(3)= COST(1)* AA(IX,12)
nn134	24*	COST(4)= COST(1)* AA(IX,13)
		COST(5)=COST(1)+COST(2)+COST(3)+COST(4)

Table I.-- Continued.

nn135	25*	AA(IX,15)=.1	
nn136	26*	COST(7)=0.	
nn137	27*	COST(6)= COST(1)*AA(IX,15)	
nn140	28*	DO 1 I=1,7	
nn143	29*	1 COSTA(I) = COSTA(I) +COST(I)	
nn145	30*	PRINT 1000, AA(IX,17), (COST(I),I=1,6)	
nn154	31*	AA(IX,7)=0	
nn155	32*	RETURN	
nn156	33*	END	
		END OF COMPILATION:	NO DIAGNOSTICS.

Table I.--Continued.

FOR,S REFRIG,REFRIG
FOR 59A-07/12-11:06 (0,)

SUBROUTINE REFRIG ENTRY POINT 000120

STORAGE USED: CODE(1) 000125; DATA(0) 000031; BLANK COMMON(2) 000000

COMMON RLOCKS:

0003 RLOCK1 005050
0004 RLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NEXP6\$
0006 NPRT\$
0007 NI01\$
0010 NI02\$
0011 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000 000003 1000F 0001 000046 11L 0001 000042 12L
0001 000102 135G 0003 R 000000 AA 0003 R 004704 BB
0000 I 000001 I 0003 T 003720 IA 0000 000021 INJP\$

0001 000070 126G
0004 R 000000 COST
0000 I 000000 IX
0001 000045 13L
0004 R 000007 COSTA
0000 I 000002 J

00101 1* SUBROUTINE REFRIG
00103 2* COMMON /BLOCK1/ AA(100,20),IA(100,5),AB(100)
00104 3* COMMON /BLOCK2/ COST(7),COSTA(7)
00105 4* IX =85
00106 5* COST(1) = BA(1)*AA(IX,7)*AA(IX,17)**AA(IX,8)
00107 6* IF (IA(85,1) .GT. 40) GO TO 13
00111 7* IF (IA(85,1) .GT. 20) GO TO 11
00113 8* IF (IA(85,1) .GT. 1) GO TO 12
00115 9* COST(1) = COST(1)*AA(85,18)
00116 10* GO TO 13
00117 11* COST(1) = COST(1)*AA(85,13)
00120 12* COST(2) = COST(1)*AA(IX,11)
00121 13* COST(3) = COST(1)*AA(IX,12)
00122 14* COST(4) = COST(1)*AA(IX,13)
00123 15* COST(5) = COST(1) + COST(2) + COST(3) + COST(4)
00124 16* COST(6) = COST(5)*AA(IX,15)
00125 17* DO 1 I=1,6
00130 18* COSTA(I)=COST(I)+COSTA(I)
00132 19* PRINT 1000,AA(IX,17),(COST(J),J=1,6)
00141 20* 1000 C FORMAT(/25H MECHANICAL REFRIGERAT. ,F10.3,15H TONS
00142 21* ,6F10.3)
00143 22* RETURN
00144 23* END

,10H

Table I.--Continued.

END OF COMPILATION:	NO	DIAGNOSTICS.
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Table I.--Continued.

FOR S WATER, WATER
FOR 99A-07/12-11:06 (0,)

SUBROUTINE MATER ENTRY POINT 000113

STORAGE USED: CODE(1) 000121; DATA(0, 000151; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0004 NPRT\$
0005 NIO2\$
0006 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000002	105G	0000	000005	1050F	0000	000020	1051F	0000	000031	1052F	0000	000045	1053F
0000	000061	1054F	0000	000075	1055F	0000	000106	1056F	0000	000117	1057F	0000	000130	1058F
0003	R	000000 AA	0000	R	000003 ASH	0003	R	004704 RB	0000	I	000000 I	0003	003720	IA
0000	000141	INJP\$	0000	R	000001 OIL	0000	R	000002 PROT	0000	R	000004 WATER			

0001	1*	SUBROUTINE MATER(TONS)												
00103	2*	COMMON/BLOCK1/AA(100,20),IA(100,5),BB(100)												
00104	3*	DO 10 I=30,32												
00107	4*	10	BB(I)=BB(I)*100.0											
00111	5*	PRINT 1050												
00113	6*	1050	FORMAT(1H1//20X33H MATERIAL AND ENERGY INFORMATION ,//5XRH GFNERA											
00113	7*	CL)												
00114	8*	PRINT 1051,TONS												
00117	9*	1051	FORMAT(/8X26H FISH											
00120	10*	OIL =TONS*RB(30)*0.01												
00121	11*	PROT =TONS*RB(31)*0.01												
00122	12*	ASH =TONS*RB(32)*0.01												
00123	13*	PRINT 1052,RB(30),OIL												
00127	14*	PRINT 1053,RB(31),PROT												
00133	15*	PRINT 1054,RB(32),ASH												
00137	16*	1052	FORMAT(/8X10H OF WHICH ,F6.2,12H PERCENT OR,F8.3,20H - ' - IS											
00137	17*	C OIL)												
00140	18*	1053	FORMAT(8X10H ,F6.2,12H - ' - OR,F8.3,20H - ' -											
00140	19*	C PROTEIN)												
00141	20*	1054	FORMAT(8X10H ,F6.2,12H - ' - OR,F8.3,20H - ' -											
00141	21*	C ASH)												
00142	22*	PRINT 1055,AA(27,17)												
00145	23*	1055	FORMAT(/8X26H PROCFSS STEAM											
00146	24*	WATER=AA(90,10)												
00147	25*	PRINT 1056,WATER												
00152	26*	1056	FORMAT(/8X26H PROCESS COOLING WATER =,F8.0,7H GAL/HR)											

Table I.-- Continued.

00153	27*	PRINT 1057,AA(90,2)	
00156	28*	FORMAT(8X26H ELECTRICITY	
00157	29*	PRINT 1058	
00161	30*	FORMAT(///5X23H EQUIPMENT FLOW RATES	
00162	31*	RETURN	
00163	32*	END	
		END OF COMPILATION:	NO DIAGNOSTICS.

Table I.--Continued.

FOR,S CAPTOL,CAPTOL
FOR S9A-07/12-11:06 (0,)

SUBROUTINE CAPTOL ENTRY POINT 000111

STORAGE USED: CODE(1) 000113; DATA(0) 000073; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050
0004 BLOCK2 000016

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NPRT\$
0006 NI02\$
0007 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000003	1001F	0000	000012	1002F	0000	000021	1003F	0000	000030	1004F	0000	000037	1005F
0000	000046	1020F	0000	000055	2000F	0000	000056	2001F	0003	R	000000	AA	0003	004704 RB
0004	000000	COST	0004	R	000007	COSTA	0000	R	000001	COSTT	0000	R	000002	DOSTT
0003	005720	IA	0000	000066	INJP\$									

00101	1*	SUBROUTINE CAPTOL (TONS)												
00103	2*	COMMON/BLOCK1/ AA(100,20),IA(100,5),RB(100)												
00104	3*	COMMON/BLOCK2/ COST(7),COSTA(7)												
00105	4*	1001	FORMAT(//,25X,20H EQUIPMENT ,F10.3)											
00106	5*	1002	FORMAT(//,25X,20H SPARE PARTS ,F10.3)											
00107	6*	1003	FORMAT(//,25X,20H FACILITIES ,F10.3)											
00110	7*	1004	FORMAT(//,25X,20H ENGINEERING ,F10.3)											
00111	8*	1005	FORMAT(//,25X,20H CONTINGENCIES ,F10.3,//)											
00112	9*	1020	FORMAT(//,25X,20H TOTAL CAPITOL COSTS,F10.3,//)											
00113	10*	2000	FORMAT(1H1)											
00114	11*	2001	FORMAT(20X,30H SUMMARY OF FIXED COSTS ,//)											
00115	12*	PRINT 2000												
00117	13*	PRINT 2001												
00121	14*	COSTT=0.												
00122	15*	COST=COSTA(5)												
00123	16*	PRINT 1001,COSTT												
00126	17*	COSTT=COSTT+COSTT												
00127	18*	COSTT=.02*COSTA(1)												
00130	19*	PRINT 1002,COSTT												
00133	20*	COSTT=COSTT+COSTT												
00134	21*	COSTT=AA(100,9)												
00135	22*	PRINT 1003,COSTT												
00140	23*	COSTT=COSTT+COSTT												
00141	24*	COSTT=COSTT*AA(9A,1)												
00142	25*	PRINT 1004, COSTT												

Table I.--Continued.

nn145	26*	COSTTT=COSTT+COSTTT	
nn146	27*	DOSTT=COSTTT*AA(9R,2)	
nn147	28*	PRINT 1005,DOSTT	
nn152	29*	COSTTT=DOSTT+COSTTT	
nn153	30*	AA(100,10)=COSTTT	
nn154	31*	PRINT 1020,AA(100,10)	
nn157	32*	RETURN	
nn160	33*	END	
		END OF COMPILATION:	NO DIAGNOSTICS.

QFOR,S FASCIL,FASCIL
FOR S9A-07/12-11:06 (0,)

```

1* SUBROUTINE FASCIL(TONS)
2* COMMON /BLOCK1/ AA(100,20),IA(100,5),RB(100)
3* DIMENSION COST(6),COSTT(4)
4* IZ = BB(91)
5* PRINT 1000
6* FORMAT(1H1//14X43H.COST OF FACILITIES AND SITE DEVELOPMENT )
7* PRINT 1001
8* FORMAT(/25X85H UNIT NUMBER BASE
9* CBOR INDIRECT TOTAL RANGE ,/25X85H COST COSTS
10* C OF UNITS COST COSTS COSTS + OR
11* DO 1 J=1,6
12* COST(J) = 0.0
13* COSTT(J) = 0.0
14* ACRE=.0050*TONS
15* COST(2) = AA(99,3)*ACRE
16* COST(5) = COST(2)
17* COST(6) = COST(5)*AA(99,2)
18* PRINT 1010,AA(99,3),ACRE ,(COSTT(J),J=2,6)

```

Table I.-- Continued.

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nn136 19* 1010 FORMAT(/25H LAND ,F10.3,15H PER ACRE ,6F1
nn136 C0.3)
nn137 20* DO 10 J=2,6
nn137 21* COST(J)=COST(J)+COSTT(J)
nn142 22* FENCE=4*SQRT(ACRE*0.0434)
nn144 23* COST(2)=FENCE*AA(99,4)
nn145 24* COST(3)=COST(2)*AA(99,5)
nn146 25* COST(4)=COST(2)*AA(99,1)
nn147 26* COST(5)=COST(2)+COST(3)+COST(4)
nn150 27* COST(6)=COST(5)*AA(99,2)
nn151 28* COST(1)=COST(5)/FENCE
nn152 29* DO 20 J=2,6
nn153 30* COST(J)=COST(J)+COSTT(J)
nn156 31* PRINT 1020,COST(1),FENCE,(COST(J),J=2,6)
nn160 32* PAVE=0.333*ACRE*43.56
nn170 33* COST(2)=PAVE*AA(99,6)
nn171 34* COST(3)=COST(2)*AA(99,7)
nn172 35* COST(4)=COST(2)*AA(99,1)
nn173 36* COST(5)=COST(2)+COST(3)+COST(4)
nn174 37* COST(6)=COST(5)*AA(99,2)
nn175 38* COST(1)=COST(5)/PAVE
nn176 39* DO 30 J=2,6
nn177 40* COST(J)=COST(J)+COSTT(J)
nn202 41* PRINT 1030,COST(1),PAVE,(COST(J),J=2,6)
nn204 42* FENCING
nn214 43* C0.3)
nn214 44* 1030 FORMAT(/25H PAVING ,F10.3,15H PFR 1000 FT ,6F1
nn215 45* DO 40 J=2,6
nn215 46* NOCK=TONS/500. +1
nn216 47* DOCK=2.4*NOCK
nn217 48* COST(2)=DOCK*AA(99,8)
nn220 49* COST(3)=COST(2)*AA(99,9)
nn221 50* COST(4)=COST(2)*AA(99,1)
nn222 51* COST(5)=COST(2)+COST(3)+COST(4)
nn223 52* COST(6)=COST(5)*AA(99,2)
nn224 53* COST(1)=COST(5)/DOCK
nn225 54* DO 40 J=2,6
nn226 55* COST(J)=COST(J)+COSTT(J)
nn231 56* PRINT 1040,COST(1),DOCK,(COST(J),J=2,6)
nn233 57* 1040 FORMAT(/25H DOCK FACILITIES ,F10.3,15H PFR 1000 SQ.FT,6F1
nn243 58* C0.3)
nn243 59* PRINT 1050
nn244 60* FORMAT(/25H BULK STORAGE WAREHOUSE , )
nn246 61* PRINT 1060*AA(99,10)
nn247 62* FORMAT( 25H ELECTRICAL WIRING ,F10.3,15H PFR 1000SQ.FT )
nn252 63* PRINT 1070*AA(99,11)
nn253 64* FORMAT( 25H FIRE PREVENTION EQP.,F10.3,15H PER 1000SQ.FT )
nn256 65* IF(I2.EQ. 1) WARF=0.015*TONS
nn257 66* IF(I2.GT. 1) WARF=0.003*TONS
nn261 67* COST(2)=WARF*AA(99,10)+AA(99,11)+AA(99,12)
nn263 68* COST(3)=COST(2)*AA(99,13)
nn264 69* COST(4)=COST(2)*AA(99,1)
nn265 70* COST(5)=COST(2)+COST(3)+COST(4)
nn266 71* COST(6)=COST(5)*AA(99,2)
nn267 72* COST(1)=COST(5)/WARE
nn270 73* DO 80 J=2,6
nn271 74* COST(J)=COST(J)+COSTT(J)
nn274 75*

```

Table I.--Continued.

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00276 76* PRINT 1080,COST(1),WARE,(COST(J),J=2,6)
00306 77* FORMAT(/25H TOTAL WAREHOUSE ,F10.3,15H PFR 1000 SQ.FT,6F1
00306 78* C0.3)
00307 79* PRINT 1090
00311 80* FORMAT(/25H PROCESS BUILDING )
00312 81* PRINT 1100,AA(99,14)
00315 82* PRINT 1110,AA(99,15)
00320 83* PRINT 1120,AA(99,16)
00323 84* PRINT 1130,AA(99,17)
00326 85* FORMAT(25H ELECTRICAL WIRING ,F10.3,15H PER 1000 SQ.FT )
00327 86* FORMAT(25H HEATING AND VENTIL. ,F10.3,15H PER 1000 SQ.FT )
00330 87* FORMAT(25H PLUMBING(GENERAL) ,F10.3,15H PER 1000 SQ.FT )
00331 88* FORMAT(26H FIRE PREVENTION EQUIP,F 9.3,15HPER 1000 SQ.FT )
00332 89* BUILD =0.01*TONS
00333 90* IF(BUILD .LE. 2) RUILD = 2.0
00335 91* COST(2) =AA(99,18)*RUILD
00336 92* COST(3) =COST(2)*AA(99,19)
00337 93* COST(4) =COST(2)*AA(99,1)
00340 94* COST(5) =COST(2)+COST(3)+COST(4)
00341 95* COST(6) =COST(5)*AA(99,2)
00342 96* COST(1) = COST(5)/BUILD
00343 97* DO 140 J=2,6
00346 98* COST(J) = COST(J) +COST(J)
00350 99* PRINT 1140,COST(1),RUILD,(COST(J),J=2,6)
00360 100* FORMAT(/25H TOTAL BUILDING COSTS ,F10.3,15H PER 1000 SQ.FT,6F1
00361 101* C0.3)
00363 102* IF(IZ.EQ. 1) GO TO 90
00363 103* COST(1) =150.
00364 104* COST(5)=COST(1)
00365 105* DO 150 J=2,6
00370 106* COST(J) = COST(J) +COST(J)
00372 107* PRINT 3012, COST(1),COST(5)
00376 108* FORMAT(/45H LABORATORY CONTROL INSTRUMENTATION ,15X,F10.
00376 109* C3,20X,F10.3)
00377 110* PRINT 2000,(COST(J),J=2,6)
00405 111* FORMAT(/25H TOTAL FACILITIES ,35XSF10.3)
00406 112* AA(100,9)=COST(5)
00407 113* RETURN
00410 114* END

```

END OF COMPILATION: NO DIAGNOSTICS.

Table I.--Continued.

FOR,S OPERAT,OPERAT
FOR 59A-07/12-11:06 (3.)

SUBROUTINE OPERAT ENTRY POINT 001242

STORAGE USED: CODE(1) 001253; DATA(0) 000757; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 BLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0004 NPRT\$
0005 NI02\$
0006 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000127	1001F	0000	000142	1002F	0000	000155	1003F	0000	000170	1004F	0000	000203	1005F
0000	000214	1006F	0000	000242	1007F	0000	000255	1008F	0000	000270	1009F	0001	001226	101L
0000	000300	1010F	0000	000310	1011F	0000	000320	1012F	0000	000330	1013F	0000	000374	1018F
0000	000407	1019F	0000	000341	1020F	0000	000227	106F	0000	000352	1104F	0000	000363	1105F
0001	000022	114G	0000	000065	2000F	0000	000422	2001F	0000	000453	2002F	0000	000460	2003F
0000	000467	2004F	0000	000476	2005F	0000	000505	2006F	0000	000515	2007F	0000	000524	2008F
0000	000533	2009F	0000	000544	2010F	0000	000554	2011F	0000	000563	2012F	0000	000572	2013F
0000	000601	2014F	0000	000610	2015F	0000	000110	2020F	0000	000117	2021F	0001	000230	3L
0000	000666	3000F	0001	000511	330G	0001	000136	4L	0000	000617	4000F	0000	000625	4001F
0000	000643	4002F	0000	000653	4003F	0000	000663	4005F	0000	000673	4006F	0000	000706	4007F
0001	000233	5L	0001	000447	60L	0000	000077	6000F	0001	000565	71L	0001	000572	72L
0001	000572	75L	0001	000572	76L	0003	R 000000	AA	0003	R 004704	BB	0000	R 000064	RYPR0N
0000	R 000052	CANS	0000	R 000053	CAST	0000	R 000000	CST	0000	R 000024	CSTT	0000	R 000063	FPC
0003	003720	IA	0000	000741	INJPK	0000	I 000050	I7	0000	I 000051	J	0000	R 000060	YCONC
0000	R 000054	YCOST	0000	R 000062	YHTM	0000	R 000055	YMFAL	0000	R 000061	YOIL	0000	R 000057	YPAST
0000	R 000056	YSOL												

	1*	SUBROUTINE OPERAT(TONS)												
00101	1*	C SUMMARY OF MATERIAL FLOW STREAMS, UNDER THE INDEX 4A(90,1)												
00101	2*	C 1=FUEL OIL 2=POWER WATER 3=FISH MEAL 4=FISH SOL. 5= FISH OIL												
00101	3*	C 8=MAN HRS 9=CITY WATER												
00101	4*	C 13=ANIOXID. 14=SUHPH.ACTD												
00101	5*	COMMON/BLOCK1/ 4A(100,20),IA(100,5),BB(100)												
00103	6*	DIMENSION CST(20),CSTT(20)												
00104	7*	I7 = BB(91)												
00105	8*	PRINT 2000												
00106	9*	FORMAT(1H1)												
00110	10*	PRINT 2001												
00111	11*	DO 10 J=1,20												
00113	12*	CST(J)=0.0												
00116	13*	10												
00117	14*	CSTT(J)=0.0												

Table I.-- Continued.

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nn121 15* CST(1) = TONS*BB(5)*20.0
nn122 16* PRINT 1001,TONS,CST(1)
nn126 17* CST(2) = AA(90,1)*BR(10)
nn127 18* PRINT 1002,AA(90,1),CST(2)
nn133 19* CST(3) = AA(90,2)*RB(6)*0.01
nn134 20* PRINT 1003,AA(90,2),CST(3)
nn140 21* CST(4)=AA(90,14)*BR(14)
nn141 22* IF(I2 .EQ. 1) PRINT 1004,AA(90,14),CST(4)
nn146 23* IF(I2 .EQ. 3) PRINT 1004,AA(90,14),CST(4)
nn153 24* IF(I2.NE.3.AND.I2.NE.4) GO TO 4
nn155 25* CST(16)=AA(90,17)*RB(10)
nn156 26* PRINT 3000,AA(90,17),CST(16)
nn162 27* CST(15)=AA(90,12)*RB(41)
nn163 28* FORMAT(/25H 5N SODIUM HYDROXIDE ,F8.0,8H LB
nn164 29* IF(I2 .EQ. 3) PRINT 1105,AA(90,12),CST(15)
nn171 30* IF(I2 .EQ. 4) PRINT 1105,AA(90,12),CST(15)
nn176 31* CST(14) = AA(90,15)*BB(16)
nn177 32* IF(I2 .EQ. 3) PRINT 1104,AA(90,15),CST(14)
nn204 33* IF(I2 .EQ. 4) PRINT 1104,AA(90,15),CST(14)
nn211 34* IF(I2 .EQ. 3) GO TO 3
nn213 35* IF(I2 .EQ. 4) GO TO 3
nn215 36* CST(5)=AA(90,13)*BR(13)
nn216 37* GO TO 5
nn217 38* 3 CST(5)=AA(90,13)*BR(44)
nn220 39* 5 CONTINUE
nn221 40* PRINT 1005,AA(90,13),CST(5)
nn225 41* CST(6)=AA(75,17)*BR(15)
nn226 42* PRINT 1006,AA(75,17),CST(6)
nn232 43* CANS=0.0
nn233 44* CANS=AA(75,4)*RB(15)
nn234 45* IF(AA(75,4).GT.0) PRINT 106,AA(75,4),CANS
nn241 46* CST(6)=CST(6)+CANS
nn242 47* CST(7) =AA(90,9)*RB(9)
nn243 48* PRINT 1007,AA(90,9),CST(7)
nn247 49* CST(8) =AA(90,8)*RB(7)
nn250 50* PRINT 1008,AA(90,8),CST(8)
nn254 51* CST(9) =AA(100,10)*RB(8)*0.1/3
nn255 52* PRINT 1009,CST(9)
nn260 53* CST(10) =AA(100,10)/30.
nn261 54* PRINT 1010,CST(10)
nn264 55* CST(11)=CST(8)*0.15
nn265 56* PRINT 1011,CST(11)
nn270 57* CST(12) =CST(10)
nn271 58* 6000 FORMAT(25H BOILER WATER TREATMENT ,21XF8.2,12XF6.2,/)
nn272 59* CAST=3.3
nn273 60* PRINT 6000,CAST
nn276 61* PRINT 1012,CST(12)
nn301 62* CST(13) =CST(8)*0.30
nn302 63* PRINT 1013,CST(13)
nn305 64* IF(I2.NE.2.AND.I2.NF.6.AND.I2.NE.7) GO TO 60
nn307 65* CST(18) =AA(90,18)*BB(18)
nn310 66* AA(90,18)=AA(90,18)*2000.
nn311 67* PRINT 1018,AA(90,18),CST(18)
nn315 68* CST(19) =AA(90,19)*BB(19)
nn316 69* AA(90,19)=AA(90,19)*2000.
nn317 70* PRINT 1019, AA(90,19),CST(19)
nn323 71* 60 CONTINUE

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Table I.-- Continued.

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nn324 72*      YCOST =(CST(1)+CST(2)+CST(3)+CST(4)+CST(5)+CST(6)+CST(7))*BR(50)+
nn334 73*      C(CST(8)+CST(9)+CST(10)+CST(11)+CST(12)+CST(13))*360.0 +(CST(14) +
nn334 74*      C CST(15)+CST(16)+CST(17)+CST(18))*8B(50)
nn325 75*      YCOST=(CST(19)*RB(50)) + YCOST
nn326 76*      YCOST=YCOST+CST*BR(50)
nn327 77*      DO 20 J=2,20
nn332 78*      CST(J) =CST(J-1) + CST(J)
nn333 79*      CST(J) =CST(J-1)+CST(J)
nn335 80*      CST(20)=CST(20)+CST
nn336 81*      PRINT 1020,CST(20)
nn341 82*      PRINT 2002
nn343 83*      IF (I2.NE.2.AND.I2.NF.6) GO TO 76
nn345 84*      IF (I2.NE.6) GO TO 71
nn347 85*      FORMAT(15X,14H HTM FISH MEAL,F8.3,10H TONS/DAY )
nn350 86*      AA(90,20)=AA(90,20)/2000.
nn351 87*      PRINT 2020,AA(90,20)
nn354 88*      GO TO 75
nn355 89*      71 IF (I2.NE.2) GO TO 72
nn357 90*      GO TO 75
nn360 91*      72 CONTINUE
nn361 92*      76 CONTINUE
nn362 93*      75 CONTINUE
nn363 94*      IF (I2 .EQ. 1) PRINT 2003,AA(90,3)
nn367 95*      IF (I2 .GT. 1) PRINT 2011,AA(90,3)
nn373 96*      IF (I2 .EQ. 1) PRINT 2004,AA(90,4)
nn377 97*      IF (I2.GT.2.AND.I2.LT.6) PRINT 2012,AA(90,6)
nn403 98*      IF (I2.EQ.7) PRINT 2004,AA(90,4)
nn407 99*      IF (I2.EQ.2) PRINT 2004,AA(90,4)
nn413 100*      IF (I2 .GT. 1) PRINT 2013,AA(90,7)
nn417 101*      PRINT 2005,AA(90,5)
nn422 102*      YMEAL = AA(90,3)*RB(50)
nn423 103*      YSOL = AA(90,4)*RB(50)
nn424 104*      YPAST = AA(90,6)*RB(50)
nn425 105*      YCONC = AA(90,7)*RB(50)
nn426 106*      YOIL = AA(90,5)*RB(50)
nn427 107*      YHTM=AA(90,20)*8B(50)
nn430 108*      IF (I2.EQ.6) PRINT 2021,YHTM
nn434 109*      IF (I2 .EQ. 1) PRINT 2006,YMEAL
nn440 110*      IF (I2 .GT. 1) PRINT 2010,YMEAL
nn444 111*      IF (I2 .EQ. 1) PRINT 2007,YSOL
nn450 112*      IF (I2.GT.2.AND.I2.LT.6) PRINT 2014,YPAST
nn454 113*      IF (I2.EQ.2) PRINT 2007,YSOL
nn460 114*      IF (I2.EQ.7) PRINT 2007,YSOL
nn464 115*      IF (I2 .GT. 1) PRINT 2015,YCONC
nn470 116*      FORMAT(15X 14H HTM FISH MEAL,F8.0,11H TONS/YEAR )
nn471 117*      PRINT 2008,YOIL
nn474 118*      PRINT 2009,YCOST
nn477 119*      1001 FORMAT(25H FISH
nn477 120*      C.2)
nn500 121*      1002 FORMAT(25H FUEL nI
nn500 122*      C.2)
nn501 123*      1003 FORMAT(25H ELECTRICITY
nn501 124*      C.2)
nn502 125*      1004 FORMAT(25H SULPHURIC ACID
nn502 126*      C.2)
nn503 127*      1005 FORMAT(25H ANTIOXIDANT
nn504 128*      1006 FORMAT(25H PACKAGING
nn504 128*      ,F8.0,8H TONS .5XF8.2,12XF6
nn504 128*      ,F8.0,8H GALLONS.5XF8.2,12XF6
nn504 128*      ,F8.0,8H KWHR .5XF8.2,12XF6
nn504 128*      ,F8.0,8H LB .5XF8.2,12XF6
nn504 128*      ,F8.0,8H I B .5XF8.2)
nn504 128*      ,F8.0,8H BAGS .5XF8.2,12XF6.

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Table I.--Continued.

[illegible]

Table I.-- Continued.

00603	186*	BYPROD=YOIL+YSOL+YMEAL+YPAST	
00604	187*	YCOST=YCOST-RYPROD	
00605	188*	FPC=(YCOST/YCONC)*100.	
00606	189*	PRINT 4007,FPC	
00611	190*	4007 FORMAT(/20X,72H FPC COST WITH RY-PRODUCTS	,F8.1,13H CENTS/POU
00611	191*	CND)	
00612	192*	101 RETURN	
00613	193*	END	
		END OF COMPILATION:	NO DIAGNOSTICS.

Table I.-- Continued.

FOR,S LIBRF,LIBRE
FOR S9A-07/12-11:06 (1,)

SUBROUTINE LIBRE ENTRY POINT 001n77

STORAGE USED: CODE(1) 001106; DATA(0) 000247; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003 DATA1 000050
0004 RLOCK1 005050

EXTERNAL REFERENCES (BLOCK, NAME)

0005 NERR3\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0004 R 000000 AA 0004 R 004704 BB 0003 R 000000 DATAB 0004 003720 IA 0000 000230 INJPS

00101	1*	SUBROUTINE LIBRE			
00103	2*	COMMON/ DATA1 / DATA(8,5)			
00104	3*	COMMON /BLOCK1/ AA(100,20),IA(100,5),BB(100)			
00104	4*	C IDENTIFICATION OF DATA STORED IN LIBRARY SUBROUTINE			
00104	5*	C			
00104	6*	C EQUIPMENT INDEX NUMBERS			
00104	7*	C			
00104	8*	6= CONICAL HOPPER			CALLED BY SUB. HOPPER
00104	9*	11= PULVERISER			CALLED BY SUB. PULVER
00104	10*	17= SCREW CONVEYER			CALLED BY SUB. SCREW
00104	11*	18= HAMMER MILL			CALLED BY SUB. HAMMER
00104	12*	19= DRUM DRYER			CALLED BY SUB. DRYER
00104	13*	20= PAN DRYER			CALLED BY SUB. DRYER
00104	14*	21= ROTARY VACUUM DRYER			CALLED BY SUB. DRYER
00104	15*	27= BOILER			CALLED BY SUB. BOILER
00104	16*	30= SPRAY EVAPORATOR			CALLED BY SUB. EVAPOR
00104	17*	31= WIPE FILM EVAPORATOR			CALLED BY SUB. EVAPOR
00104	18*	32= FORCED CIRCULATION EVAPORAT.			CALLED BY SUB. EVAPOR
00104	19*	33= VERTICAL EVAPORATOR			CALLED BY SUB. EVAPOR
00104	20*	40= SHOP FAN. STORAGE TANK			CALLED BY SUB. STORAGE
00104	21*	42= PRESSURE VESSEL			CALLED BY SUB. VESSEL
00104	22*	43= DISTILLATION COLUMN			CALLED BY SUB. COLUMN
00104	23*	49= JACKETED REACTING VESSEL			CALLED BY SUB. REACTR
00104	24*	50= FISH GRINDER			CALLED BY SUB. GRINDER
00104	25*	51= VIBRATING SCREEN			CALLED BY SUB. SCREEN
00104	26*	52= SHAPLES CENTRIFUGE			CALLED BY SUB. SHARP
00104	27*	53= SOLID BOWL CENTRIFUGE			CALLED BY SUB. BOWL
00104	28*	54= V-BASKET CENTRIFUGE			CALLED BY SUB. CNTRFGE
00104	29*	57= FREE FLOWING SOL. BLFINDER			CALLED BY SUB. BLFINDER
00104	30*	65= RECIPROCAL PUMPS			CALLED BY SUB. PMPREC

Table I.--Continued.

00104	31*	C	66= CENTRIFUGAL PUMPS	CALLED BY SUB	PMPCNT
00104	32*	C	67= SHELL-TUBE HEAT EXCHANGERS	CALLED BY SUB.	HEATEX
00104	33*	C	70= BELT CONVEYER	CALLED BY SUB.	BELT
00104	34*	C	71= BUCKET CONVEYER	CALLED BY SUB.	RACKET
00104	35*	C	72= SCALE	CALLED BY SUB.	SCALE
00104	36*	C	73= AGITATOR-PROPELLER	CALLED BY SUB.	AGITOR
00104	37*	C	74= BALL MILL	CALLED BY SUB.	BALMIL
00104	38*	C	75= BAGGING MACHINE	CALLED BY SUB.	BAGGMA
00104	39*	C	78= ROTARY DRUM FILTER	CALLED BY SUB.	FILTER
00104	40*	C	80= OVERHEAD CRANE	CALLED BY SUB.	CRANES
00104	41*	C	81= DRAG CONVEYER	CALLED BY SUB	DRAGMA
00104	42*	C	85= MECHANICAL REFRIGERATION	CALLED BY SUB.	RFFRIG
00104	43*	C	99= FACILITIES	CALLED BY SUB.	FASCII
00104	44*	C			
00104	45*	C	GENERAL IDENTIFICATION OF THE STORED DATA.		
00104	46*	C	THE FOLLOWING DATA WILL IN MOST CASES BE STORED UNDER THE IDENTIFY-		
00104	47*	C	ING INDEX NUMBER FOR EACH ITEM OF EQUIPMENT. VARIATIONS OR ADDI-		
00104	48*	C	TIONS TO THIS PATTERN ARE EXPLAINED UNDER THE RESPECTIVE HEADINGS.		
00104	49*	C			
00104	50*	C	AA(IX,7) = UNIT COST		
00104	51*	C	AA(IX,8) = EXPONENT OF COST EQUATION		
00104	52*	C	AA(IX,11) = FIELD MATERIALS COST FACTOR		
00104	53*	C	AA(IX,12) = DIRECT LABOR COST FACTOR		
00104	54*	C	AA(IX,13) = INDIRECT COST FACTOR		
00104	55*	C	AA(IX,15) = UNCERTAINTY FACTOR FOR BARE MODULE COST		
00104	56*	C			
00104	57*	C	CONICAL HOPPERS. SIZE UNIT CUBIC FEET. REF GUTHRIE		
00105	58*		AA(6,7) = 0.010		
00106	59*		AA(6,8) = 0.63		
00107	60*		AA(6,11) = 0.04		
00110	61*		AA(6,12) = 0.01		
00111	62*		AA(6,13) = 0.42		
00112	63*		AA(6,15) = 0.10		
00113	64*		AA(6,18) = 2.40		
00113	65*	C	FISH STORAGE		
00114	66*		AA(7,7) = 0.0		
00115	67*		AA(7,8) = 0.9		
00116	68*		AA(7,11) = 0.0		
00117	69*		AA(7,12) = 0.10		
00120	70*		AA(7,13) = .4		
00121	71*		AA(7,15) = 0.1		
00121	72*	C	BAROMETRIC CONDENSER AND SCRUBBERS		
00122	73*		AA(8,7) = 20.		
00123	74*		AA(8,8) = 1.0		
00124	75*		AA(8,11) = 0.33		
00125	76*		AA(8,12) = 0.33		
00126	77*		AA(8,13) = 0.33		
00127	78*		AA(8,15) = 0.1		
00127	79*	C	PULVERIZER		
00130	80*		AA(11, 7) = 520.		
00131	81*		AA(11, 8) = .35		
00132	82*		AA(11,11) = .272		
00133	83*		AA(11,12) = .318		
00134	84*		AA(11,13) = .4		
00135	85*		AA(11,15) = .1		
00135	86*	C	SCREW CONVEYER		
00136	87*		AA(17, 7) = 1000.0		

Table I.--Continued.

nn137	88*	AA(17, 8)=	.9	
nn140	89*	AA(17, 11)=	.272	
nn141	90*	AA(17, 12)=	.318	
nn142	91*	AA(17, 13)=	.4	
nn143	92*	AA(17, 15)=	.1	
nn143	93*	C HAMMER MILL SIZE + COST DATA. REF GUTHRIE		
nn143	94*	C SIZE UNIT = TON PER HOUR		
nn144	95*	AA(18, 7) =	0.5	
nn145	96*	AA(18, 8) =	0.45	
nn146	97*	AA(18, 11) =	0.27	
nn147	98*	AA(18, 12) =	0.431	
nn150	99*	AA(18, 13) =	0.44	
nn151	100*	AA(18, 15) =	0.10	
nn151	101*	C DRUM DRYER		
nn152	102*	AA(19, 7)=	3000.	
nn153	103*	AA(19, 8)=	.38	
nn154	104*	AA(19, 11)=	.279	
nn155	105*	AA(19, 12)=	.461	
nn156	106*	AA(19, 13)=	.4	
nn157	107*	AA(19, 15)=	.1	
nn157	108*	C PAN DRYER		
nn160	109*	AA(20, 7) =	1900.	
nn161	110*	AA(20, 8)=	.38	
nn162	111*	AA(20, 11)=	.279	
nn163	112*	AA(20, 12)=	.461	
nn164	113*	AA(20, 13)=	.4	
nn165	114*	AA(20, 15)=	.1	
nn165	115*	C ROTARY VACUUM DRYER		
nn166	116*	AA(21, 7)=	2500.	
nn167	117*	AA(21, 8)=	.45	
nn170	118*	AA(21, 11)=	.279	
nn171	119*	AA(21, 12)=	.20	
nn172	120*	AA(21, 13)=	.16	
nn173	121*	AA(21, 15)=	.1	
nn173	122*	C BOILER		
nn174	123*	AA(27, 7)=	395.5	
nn175	124*	AA(27, 8)=	.5	
nn176	125*	AA(27, 11)=	.19	
nn177	126*	AA(27, 12)=	.15	
nn200	127*	AA(27, 13)=	.2	
nn201	128*	AA(27, 15)=	.1	
nn201	129*	C SPRAY EVAPORATOR SIZE UNIT = LB OF WATER EVAP. PER HR		
nn201	130*	C PRAY AND FILM EVAP. INCLUDE SCRUBBERS AND BAR. CONDENSRS. BASE		
nn201	131*	C COST FROM CHEM. FNG. FEB. 9, 1970, OTHER FACTORS EQ. TO EVAP. FROM		
nn201	132*	C GUTHRIE		
nn202	133*	AA(30, 7) =	0.050	
nn203	134*	AA(30, 8) =	1.0	
nn204	135*	AA(30, 11) =	0.66	
nn205	136*	AA(30, 12) =	0.24	
nn206	137*	AA(30, 13) =	0.42	
nn207	138*	AA(30, 15) =	0.10	
nn207	139*	C WIPE FILM EVAPORATORS		
nn210	140*	AA(31, 7)=0.9		
nn211	141*	AA(31, 8) =	0.31	
nn212	142*	AA(31, 11) =	0.66	
nn213	143*	AA(31, 12) =	0.24	
nn214	144*	AA(31, 13) =	0.42	

SIZE UNIT = SQ. FT AREA

Table I.--Continued.

nn215	145*	AA(31,15) = 0.10							
nn215	146*	C FORCED CIRCULATION EVAPORATORS	SIZE UNIT= SQ FT	REF	GUTHRIE				
nn216	147*	AA(32,7)=0.6							
nn217	148*	AA(32,8) = 0.70							
nn220	149*	AA(32,11) = 0.66							
nn221	150*	AA(32,12) = 0.24							
nn222	151*	AA(32,13) = 0.42							
nn223	152*	AA(32,15) = 0.10							
nn224	153*	AA(32,18) = 2.40							
nn224	154*	C VERTICAL EVAPORATORS	SIZE UNIT = SQ. FT.	REF.	GUTHRIE				
nn225	155*	AA(33,7) = 0.12							
nn226	156*	AA(33,8) = 0.53							
nn227	157*	AA(33,11) = 0.66							
nn230	158*	AA(33,12) = 0.24							
nn231	159*	AA(33,13) = 0.42							
nn232	160*	AA(33,15) = 0.10							
nn233	161*	AA(33,18) = 2.40							
nn233	162*	C STORAGE TANK SIZE AND COST DATA. REF GUTHRIE							
nn233	163*	C SIZE UNITS 100 GAL CAPACITY . MATERIAL FACTOR INDEX 18 = SST							
nn234	164*	AA(40,7) = 0.88							
nn235	165*	AA(40,8) = 0.31							
nn236	166*	AA(40,11) = 0.20							
nn237	167*	AA(40,12) = 0.27							
nn240	168*	AA(40,13) = 0.49							
nn241	169*	AA(40,15) = 0.10							
nn242	170*	AA(40,18) = 3.2							
nn242	171*	C STORAGE TANK FROM 1000 GAL TO 40000 GAL CAPACITY	STEFL + SST	REF	GUT				
nn242	172*	C HRIE. SIZE UNITS 100-DC GAL							
nn243	173*	AA(41,7) = 0.5							
nn244	174*	AA(41,8) = 0.35							
nn245	175*	AA(41,11) = 0.38							
nn246	176*	AA(41,12) = 0.10							
nn247	177*	AA(41,13) = 0.49							
nn250	178*	AA(41,15) = 0.10							
nn251	179*	AA(41,18) = 3.2							
nn251	180*	C PRESSURE VESSEL							
nn251	181*	C FOR THE PRESSURE VESSEL (TA(42,3) DETERMINES THE METAL, TA(42,2) = 1							
nn251	182*	C IMPLIES VERTICAL CONSTRUCTION(AA(42,18) IS THE DIAMETER, AA(42,19)							
nn251	183*	C IS THE HEIGHT							
nn252	184*	AA(42, 1)= 3.67							
nn253	185*	AA(42, 2)= 2.25							
nn254	186*	AA(42, 3)= 1.0							
nn255	187*	AA(42,15)= .1							
nn255	188*	C DISTILLATION COLUMN							
nn255	189*	C THE METAL, AA(43,20), THE WIDTH, AA(43,18) THE TRAY SEPARATION,							
nn255	190*	C AA(43,17) THF HEIGHT							
nn255	191*	C DETERMINES THE WIDTH							
nn256	192*	AA(43, 4)= 0.4							
nn257	193*	AA(43, 5)= 1.8							
nn260	194*	AA(43,15)= .1							
nn261	195*	AA(43,1)= 1.7							
nn262	196*	AA(43,8) = 1.0							
nn263	197*	AA(43,11)= .3							
nn264	198*	AA(43,12)= .4							
nn265	199*	AA(43,13)= .4							
nn266	200*	AA(43,15)= .1							
nn266	201*	C JACKETED REACTOR VFSSEI	UNIT COST 3*TANK COST DATA GUTHRIE. SIZE=GAL						

Table I.--Continued.

nn267	202*	AA(49,7) = 0.240
nn270	203*	AA(49,8) = 0.35
nn271	204*	AA(49,11) = 0.38
nn272	205*	AA(49,12) = 0.10
nn273	206*	AA(49,13) = 0.49
nn274	207*	AA(49,15) = 0.10
nn275	208*	AA(49,18) = 3.20
nn275	209*	C FISH GRINDER BASED ON 3 TON/HR UNIT COST OF 18300 DOLLARS. OTHER FAC-
nn275	210*	C TORS AS FOR BALL MILL
nn276	211*	AA(50,7) = 2.54
nn277	212*	AA(50,8) = 0.65
nn300	213*	AA(50,11) = 0.54
nn301	214*	AA(50,12) = 0.195
nn302	215*	AA(50,13) = 0.42
nn303	216*	AA(50,15) = 0.10
nn304	217*	AA(50,18) = 2.4
nn304	218*	C VIBRATING SCREEN FILTERS. SINGLE. SIZE UNIT = SURFACE AREA. REF GIITH.
nn305	219*	AA(51,7) = 0.7
nn306	220*	AA(51,8) = 0.58
nn307	221*	AA(51,11) = 0.27
nn310	222*	AA(51,12) = 0.05
nn311	223*	AA(51,13) = 0.42
nn312	224*	AA(51,15) = 0.10
nn313	225*	AA(51,18) = 2.40
nn313	226*	C SHAPLES CENTRIFUGE
nn314	227*	AA(52,7)=5200.
nn315	228*	AA(52, 8)= .68
nn316	229*	AA(52,11)= .26
nn317	230*	AA(52,12)= .34
nn320	231*	AA(52,13)= .4
nn321	232*	AA(52,15)= .1
nn321	233*	C SOLID BOWL CENTRIFUGE
nn322	234*	AA(53, 7)= 1900.
nn323	235*	AA(53,8)= .73
nn324	236*	AA(53,11)= .26
nn325	237*	AA(53,12)= .34
nn326	238*	AA(53,13)= .4
nn327	239*	AA(53,15)= .1
nn327	240*	C VERTICAL BASKET CENTRIFUGE
nn330	241*	AA(54, 7)= 620.
nn331	242*	AA(54, 8)= 1.
nn332	243*	AA(54,11)= .26
nn333	244*	AA(54,12)= .194
nn334	245*	AA(54,13)= .4
nn335	246*	AA(54,15)= .1
nn335	247*	C FLOWING SOLIDS BENDER SIZE UNIT = FT**3/HR UNIT NORMALIZED TO GIVE
nn335	248*	C A COST OF 15000 FOR 750 FT**3/HR POWERED BY 25 HD MOTOR
nn336	249*	AA(57,7) = 0.47
nn337	250*	AA(57,8) = 0.52
nn340	251*	AA(57,11) = 0.48
nn341	252*	AA(57,12) = 0.13
nn342	253*	AA(57,13) = 0.42
nn343	254*	AA(57,15) = 0.10
nn343	255*	C CENTRIFUGAL AND RECD. PUMPS ARE COST FITED BY A QUADRATIC EQ. IN TERMS
nn343	256*	C OF LOG(SIZE). (REF. GUTHRIE) SIZE UNIT = GPM*PSI. THE EQ IS:
nn343	257*	C LOG(COST)= LOG(UNIT COST) + EXP*LOG(SIZE) + BEXP*LOG(SIZE)**2
nn343	258*	C UNIT COST = AA(IX,7) EXP = AA(IX,8) BEXP=AA(IX,9)

Table I.-- Continued.

nn343	259*	C	
nn343	260*	C	C CENTRIFUGAL PUMPS. MATERIAL FACTOR IA(66,1)=0/1/2 =FE/BRONZE/SST
nn343	261*	C	AA(66,18)=BRONZF FACTOR. AA(66,19)= SST FACTOR
nn344	262*		AA(66,7) =0.5
nn345	263*		AA(66,8) =0.174
nn346	264*		AA(66,9) =0.049
nn347	265*		AA(66,11) =0.71
nn350	266*		AA(66,12) =0.35
nn351	267*		AA(66,13) =0.44
nn352	268*		AA(66,15) =0.10
nn353	269*		AA(66,18) = 1.28
nn354	270*		AA(66,19) = 1.93
nn354	271*	C	C RECIPROCATING PUMPS. SAME AS FO CFNTRIFUGAL (REF GUTHRIE)
nn355	272*		AA(65,7) = 3.2
nn356	273*		AA(65,8) = 0.281
nn357	274*		AA(65,9) = 0.0335
nn360	275*		AA(65,11) = 0.71
nn361	276*		AA(65,12) = 0.70
nn362	277*		AA(65,13) = 0.89
nn363	278*		AA(65,15) = 0.10
nn364	279*		AA(65,18) = 1.25
nn365	280*		AA(65,19) = 2.10
nn365	281*	C	C COST AND SIZE VALUES FOR SHELL-TUBE HEAT EXCHANGERS. REF GUTHRIE
nn365	282*	C	C SIZE UNITS ARE SQ. FT OF SURFACE AREA
nn366	283*		AA(67,7) = 0.113
nn367	284*		AA(67,8) = 0.622
nn370	285*		AA(67,11) = 0.714
nn371	286*		AA(67,12) = 0.63
nn372	287*		AA(67,13) = 0.947
nn373	288*		AA(67,15) = 0.17
nn373	289*	C	C MATERIAL FACTORS FOR HEAT EXCHANGERS. SHELL/TUBE. INDEX 1A = ST/SST
nn373	290*	C	C INDEX 19 = SST/SST REF GUTHRIE
nn374	291*		AA(67,18) = 2.25
nn375	292*		AA(67,19) = 3.26
nn375	293*	C	C BELT CONVEYER
nn376	294*		AA(70, 7)= 540.
nn377	295*		AA(70, 8)= .65
nn400	296*		AA(70,11)= .27
nn401	297*		AA(70,12)= .39
nn402	298*		AA(70,13)= .4
nn403	299*		AA(70,15)= .1
nn403	300*	C	C BUCKET CONVEYER
nn404	301*		AA(71, 7)= 220.
nn405	302*		AA(71, 8)= .65
nn406	303*		AA(71,11)= .278
nn407	304*		AA(71,12)= .562
nn410	305*		AA(71,13)= .4
nn411	306*		AA(71,15)= .1
nn411	307*	C	C SCALE
nn412	308*		AA(72,20)= 4.0
nn413	309*		AA(72,18)= 7.2
nn414	310*		AA(72,19)= 8.55
nn415	311*		AA(72,11)=0.08
nn416	312*		AA(72,13)=0.4
nn417	313*		AA(72,15)= 0.1
nn417	314*	C	C AGITATOR
nn420	315*		AA(73, 7)= 350.

Table I.--Continued.

nn421	316*	AA(73, 8)= .5
nn422	317*	AA(73,11)= .276
nn423	318*	AA(73,12)= .344
nn424	319*	AA(73,13)= .4
nn425	320*	AA(73,15)= .1
nn426	321*	C BALL MILL COST DATA. MATERIAL FACTOR INDEX=18. SIF TONS/HR REF GUTHRIE
nn427	322*	AA(74, 7) = 0.55
nn428	323*	AA(74, 8) = 0.65
nn429	324*	AA(74, 11) = 0.54
nn430	325*	AA(74, 12) = 0.195
nn431	326*	AA(74, 13) = 0.42
nn432	327*	AA(74, 15) = 0.10
nn433	328*	AA(74, 18) = 2.4
nn434	329*	C BAGGING MACHINE
nn435	330*	AA(75, 7)=3300.
nn436	331*	AA(75, 8)=0.8
nn437	332*	AA(75, 11)=.40
nn438	333*	AA(75, 12)=0.11
nn439	334*	AA(75, 13)= .4
nn440	335*	AA(75, 15)=.1
nn441	336*	AA(75, 1)=1000.
nn442	337*	C ROTARY DRUM FILTERS. SIZE UNITS SQ.FT. SURFACE REF GUTHRIE
nn443	338*	AA(78, 7) = 1.40
nn444	339*	AA(78, 8) = 0.63
nn445	340*	AA(78, 11) = 0.47
nn446	341*	AA(78, 12) = 0.13
nn447	342*	AA(78, 13) = 0.42
nn448	343*	AA(78, 15) = 0.10
nn449	344*	AA(78, 18) = 2.4
nn450	345*	C OVERHEAD CRANES. INDEX FOR SPAN 0=20FT;1=30FT;2=40FT. SPAN
nn451	346*	C UNIT SIZE FACTORS ARE AA(80,18)=30FT ; AA(80,19)=40FT .SIZE UNITS=TONS
nn452	347*	AA(80, 7) =1.2
nn453	348*	AA(80, 8) =0.60
nn454	349*	AA(80, 11) = 0.46
nn455	350*	AA(80, 12) = 0.12
nn456	351*	AA(80, 13) = 0.42
nn457	352*	AA(80, 15) = 0.10
nn458	353*	AA(80, 18) = 1.6
nn459	354*	AA(80, 19) = 2.0
nn460	355*	C DRAG CONVEYER
nn461	356*	AA(81, 7)=9.
nn462	357*	AA(81, 8)=.8
nn463	358*	AA(81, 13) =.4
nn464	359*	AA(81, 15)= .1
nn465	360*	C MECHANICAL REFRIGRATION. SIZE UNITS= TONS.
nn466	361*	C COOLING TEMP. INDEX = 1A(85,1) WHICH SHOULD CONTAIN TEMP. IN DEG F
nn467	362*	C AA(85,18) THEN CONTAINS FACTOR FOR 20 AA(85,19) FOR 0 DEG
nn468	363*	AA(85, 7) =2.9
nn469	364*	AA(85, 8) = 0.70
nn470	365*	AA(85, 11) =0.17
nn471	366*	AA(85, 12) =0.14
nn472	367*	AA(85, 13) =0.11
nn473	368*	AA(85, 15) =0.10
nn474	369*	AA(85, 18) =1.95
nn475	370*	AA(85, 19) =2.25
nn476	371*	C COST OF FACILITIES INDEX= 99 DETAIL INDEX IDENTIFIES SEP. IDOMS
nn477	372*	C 1= FACILITIES, INDIRECTS 2=FACILITIES CERTAINTY RANGE 3=COST OF LAND

Table I.- Continued.

00476	373*	C PER ACRE 4=COST OF FENCF/1000 FT 5=LABOR FACTOR FENCF 6 = COST OF PAV
00476	374*	C MENT/1000 FT**2 7=LABOR FACTOR PAVEMENT 8= COST OF DOCK 9=COST OF CO
00476	375*	C STRUCT LABOR , 10=WAREHOUSE LIGHTING COST/1000FTSQ 11= WAREH. FIFR PRE
00476	376*	C VENTION COST 12= WAREH. BASE SHELL COST 13= CONST. LABOR FACTOR 14=LI
00476	377*	C GHING 15=HEAT AND VENT. 16= PUMRING 17=FIREPEVENTION 18=RASE 19=LABOR
00477	378*	AA(98,2)=.10
00500	379*	AA(98,1)=0.075
00501	380*	AA(99,1) = 0.34
00502	381*	AA(99,2) = 0.15
00503	382*	AA(99,3)=10.0
00504	383*	AA(99,4) = 1.61
00505	384*	AA(99,5) = 0.32
00506	385*	AA(99,6) = 0.364
00507	386*	AA(99,7) = 1.75
00510	387*	AA(99,8) = 0.65
00511	388*	AA(99,9) = 2.50
00512	389*	AA(99,10) = 0.90
00513	390*	AA(99,11) = 1.10
00514	391*	AA(99,12) = 3.22
00515	392*	AA(99,13) = 0.34
00516	393*	AA(99,14) = 1.75
00517	394*	AA(99,15) = 1.50
00520	395*	AA(99,16) = 1.70
00521	396*	AA(99,17) = 1.10
00522	397*	AA(99,18) = 8.80
00523	398*	AA(99,19) = 0.34
00524	399*	AA(99,20) = 15.
00525	400*	AA(100,1)=3.
00526	401*	AA(100,2)=32.
00527	402*	AA(100,3) = 1.125 E-02
00530	403*	AA(100,4) = 5.00
00531	404*	AA(100,7) = 5.0E-05
00532	405*	AA(100,8) = 1.3 E-05
00533	406*	AA(100,9) = 1.E-07
00534	407*	AA(100,11)=.724
00535	408*	AA(100,12) = .074
00536	409*	AA(100,13)=0.1
00537	410*	AA(100,20) = 20.
00537	411*	C THE BB(1) COMMON BLOCK INCLUDES BUILT IN PRICE SCHEDULES.
00537	412*	C 9=CITY WATER 10=FUEL OIL 13=ANTIOXIDANT 14=SULPHURIC ACID 15=FISH MEA
00537	413*	C L BAGS 16=CAOH 66=PRICE OF BONE MEAL (CENTS/LB) 67=PRICE OF FISH OIL
00537	414*	C (CENTS/LB) 68=PRICE OF FISH SOLUBLE(CENTS/LB)
00540	415*	BB(9)=.25*.001
00541	416*	BB(10)=.06
00542	417*	BB(13)=4.00
00543	418*	BB(14)=.017
00544	419*	BB(15) = 0.25
00545	420*	BB(16) = 0.01
00546	421*	BB(18)=129.22
00547	422*	BB(66)=3.5
00550	423*	BB(67)=4.0
00551	424*	BB(68)=3.5
00552	425*	BB(19)=45.
00552	426*	
00552	427*	C DATA FOR ISOPROPYL EXTRACTION (FRACTION OF STREAM EXTRACFD IN STAGE)
00552	428*	C DATB(STAGE,STREAM) STRFAM INDICES 1-OIL 2-PROTEIN 3-ASH 4-WATER
00552	429*	C 5-ISOPROPYL ALCOHOL

Table I.-- Continued.

	C	
00552	430*	DATR(1,1)= 28./168.
00553	431*	DATR(2,1)= 8./24.
00554	432*	DATR(3,1)= 4./8.
00555	433*	DATR(4,1)= 1./4.
00556	434*	DATR(5,1)= 1./4.
00557	435*	DATR(6,1)= 1./4.
00560	436*	DATR(7,1)= 1./4.
00561	437*	DATR(8,1)= 1./4.
00562	438*	DATR(1,2)= 487./605.
00563	439*	DATR(2,2)= 477./487.
00564	440*	DATR(3,2)= 476./477.
00565	441*	DATR(4,2)= 471./476.
00566	442*	DATR(5,2)= 471./476.
00567	443*	DATR(6,2)= 471./476.
00570	444*	DATR(7,2)= 471./476.
00571	445*	DATR(8,2)= 471./476.
00572	446*	DATR(1,3)= 100./124.
00573	447*	DATR(2,3)= 98./120.
00574	448*	DATR(3,3)= 97./96.
00575	449*	DATR(4,3)= 96./97.
00576	450*	DATR(5,3)= 96./97.
00577	451*	DATR(6,3)= 96./97.
00600	452*	DATR(7,3)= 96./97.
00601	453*	DATR(8,3)= 96./97.
00602	454*	DATR(1,4)= (963.+(.123*125.))/3276.
00603	455*	DATR(2,4)= (543.+(.123*161.))/(963.+(.123*125.))
00604	456*	DATR(3,4)= (324.+(.123*301.))/(543.+(.123*161.))
00605	457*	DATR(4,4)= (38.+(.123*553.))/(324.+(.123*301.))
00606	458*	DATR(5,4)= DATB(4,4)
00607	459*	DATR(6,4)= DATB(5,4)
00610	460*	DATR(7,4)= DATB(6,4)
00611	461*	DATR(8,4)= DATB(7,4)
00612	462*	DATR(1,5)= 125.*.877 / 3276.
00613	463*	DATR(2,5)= 161./125.
00614	464*	DATR(3,5)= 301./161.
00615	465*	DATR(4,5)= 553./301.
00616	466*	DATR(5,5)= DATB(4,5)
00617	467*	DATR(6,5)= DATB(5,5)
00620	468*	DATR(7,5)= DATB(6,5)
00621	469*	DATR(8,5)= DATB(7,5)
00622	470*	RETURN
00623	471*	END
00624	472*	

END OF COMPILE: NO DIAGNOSTICS.

QMAP
MAP 22B -07/12-11:06

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Table I.--Continued.

DRAGMA	3	BLOCK1	2	BLANKCOMMON
	1	015443 015613	4	BLOCK2
	3	BLOCK1	0	060065 060135
CRANFS			2	BLANKCOMMON
	1	015614 015741	4	BLOCK2
	3	BLOCK1	0	060135 060220
FILTER			2	BLANKCOMMON
	1	015762 016040	4	BLOCK2
	3	BLOCK1	0	060221 060251
BAGGMA			2	BLANKCOMMON
	1	016061 016212	4	BLOCK2
	3	BLOCK1	0	060252 060322
BALMIL			2	BLANKCOMMON
	1	016213 016311	4	BLOCK2
	3	BLOCK1	0	060323 060353
AGITOR			2	BLANKCOMMON
	1	016312 016411	4	BLOCK2
	3	BLOCK1	0	060354 060404
SCAF			2	BLANKCOMMON
	1	016412 016534	4	BLOCK2
	3	BLOCK1	0	060407 060444
BUCKET			2	BLANKCOMMON
	1	016535 016675	4	BLOCK2
	3	BLOCK1	0	060445 060505
BFLT			2	BLANKCOMMON
	1	016676 017025	4	BLOCK2
	3	BLOCK1	0	060506 060546
HEATFX			2	BLANKCOMMON
	1	017026 017216	4	BLOCK2
	3	BLOCK2	0	060547 060647
PMPCNT			2	BLANKCOMMON
	1	017217 017435	4	BLOCK1
	3	BLOCK1	0	060650 060756
PMPREC			2	BLANKCOMMON
	1	017436 017654	4	BLOCK2
	3	BLOCK1	0	060757 061065
BIENDR			2	BLANKCOMMON
	1	017655 017751	4	BLOCK2
	3	BLOCK1	0	061066 061116
CNTFGE			2	BLANKCOMMON
	1	017752 020045	4	BLOCK2
	3	BLOCK1	0	061117 061151
BOWI			2	BLANKCOMMON
	1	020046 020145	4	BLOCK2
	3	BLOCK1	0	061152 061204
SHARP			2	BLANKCOMMON
	1	020146 020245	4	BLOCK2
	3	BLOCK1	0	061205 061237
SCRFFN			2	BLANKCOMMON
	1	020246 020344	4	BLOCK2
	3	BLOCK1	0	061240 061270
GRINDR			2	BLANKCOMMON
	1	020345 020443	4	BLOCK2
	3	BLOCK1	0	061271 061321
RFACTR			2	BLANKCOMMON
	1	020444 020542	4	BLOCK2
			0	061322 061352

Table I.-- Continued.

COLUMB	3	BLOCK1	2	BLANKCOMMON
	1	020543 020725	4	BLOCK2
	3	BLOCK1	0	061353 061416
VFSSEL	1	020726 021142	4	BLANKCOMMON
	3	BLOCK1	0	BLOCK2
	1	021143 021346	0	061417 061503
	3	BLOCK1	4	BLANKCOMMON
STORAG	1	021446 021544	4	BLOCK2
	3	BLOCK1	0	061504 061607
FUPHOR	1	021347 021445	4	BLANKCOMMON
	3	BLOCK1	0	BLOCK2
	1	021446 021544	0	061610 061640
	3	BLOCK1	4	BLANKCOMMON
EUPERC	1	021545 021637	4	BLOCK2
	3	BLOCK2	0	061641 061671
EUPFLM	1	021640 021734	2	BLANKCOMMON
	3	BLOCK2	4	BLOCK2
EUPSPR	1	021735 022054	0	061672 061721
	3	BLOCK1	2	BLANKCOMMON
BOILER	1	022055 022341	4	BLOCK1
	3	BLOCK2	0	061722 061752
DRYFR	1	022346 022441	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK1
DRYFRP	1	022442 022541	0	061753 062012
	3	BLOCK1	2	BLANKCOMMON
DRYFR	1	022542 022675	4	BLOCK2
	3	BLOCK1	0	062013 062145
HAMMER	1	022676 023154	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK1
SCREWR	1	023155 023254	0	062146 062220
	3	BLOCK1	2	BLANKCOMMON
PILVER	1	023255 023345	4	BLOCK2
	3	BLOCK1	0	062221 062253
CONFIN	1	023346 023467	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK2
STLO	1	023468 023567	0	062254 062307
	3	BLOCK1	2	BLANKCOMMON
HOPPER	1	023568 023667	4	BLOCK2
	3	BLOCK1	0	062310 062435
PRESCK	1	023668 023767	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK2
X1PA	1	023768 023867	0	062436 062470
	3	BLOCK1	2	BLANKCOMMON
	1	023868 023967	4	BLOCK2
	3	BLOCK1	0	062471 062521
	1	023968 024067	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK2
	1	024068 024167	0	062522 062571
	3	BLOCK1	2	BLANKCOMMON
	1	024168 024267	4	BLOCK2
	3	BLOCK1	0	062572 062622
	1	024268 024367	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK2
	1	024368 024467	0	062623 063630
	3	BLOCK1	2	BLANKCOMMON
	1	024468 024567	4	BLOCK2
	3	BLOCK1	0	063631 065313

Table I.--Continued.

BIODIG	3	BLOCK1	2	BLANKCOMMON
	5	BLOCK4	4	BLOCK2
	1	032603 035152	0	065314 066246
	3	BLOCK1	2	BLANKCOMMON
PRSTPA	1	035153 040771	4	BLOCK2
	3	BLOCK2	0	066247 067656
	5	BLOCK1	2	BLANKCOMMON
FPCXX1	1	040772 043306	4	DATA1
	3	BLOCK4	6	BLOCK4
	5	BLOCK2	0	067657 070456
MAIN	1	043307 043715	2	BLANKCOMMON
	3	BLOCK1	4	BLOCK1
	5	BLOCK4	0	070457 071006
			2	BLANKCOMMON
			4	BLOCK2

SYSRLIBS. LEVEL 53.29
END OF COLLECTION - TIME 4.470 SECONDS

QFIN

RUNID: 7053 ACCOUNT: 154-04-105 PROJECT: FISHFISH

LOAD P0111N 3/0 A -1 7.55

SERVICE 3/0 P0111N : 7053

TIME: 00:01:02.380 IN: 54 OUT: 0

MEMORY TIME: 0:02:50.430

INITIATION TIME: 11:01:32-.00 12.1071

TERMINATION TIME: 11:07:11-.00 12.1071

PAGES: 137

Table II.- IPA plant cost analysis.

IPA PLANT COST ANALYSIS

INPUT DATA

PLANT SIZE	=	200.00 TONS/DAY
MARSHAL/STEVENS INDEX	=	1.135
COST OF FISH	=	1.00 CENTS/LB
ELECTRICITY COSTS	=	1.50 CENTS/KWH
FUEL COST	=	.06 DOLLARS/THERM
LABOR AND SUPV. COSTS	=	4.00 DOLLARS/HR
DEPRECIATION AND INT. CHARGE	=	15.00 PERCENT

FISH COMPOSITION

OIL	=	4.00 PERCENT
PROTEIN	=	16.00
ASH	=	3.00
WATER	=	77.00

OPERATING OPTIONS

OPERATING DAYS PER YEAR = 200.

Table II.-- Continued.

DETAILED EQUIPMENT COSTS (ALL COSTS IN 1000.0 DOLLARS)

EQUIPMENT TYPE	CAPACITY	MATERIAL	BASE COST	MATERIALS COSTS	LABOR COSTS	INDIRECT COSTS	MODULE COST	RANGE + OR -
FISH PUMPS	1301. GPM TIMES PSI	STEEL	3.919	2.783	2.743	3.488	12.934	1.293
BELT CONVEYER	100.000 FEET(LENGTH)		18.796	5.075	7.330	7.518	38.719	3.872
WATER DUMP TANK	6000. GALLONS	STEEL	2.379	.904	.238	1.165	4.686	.469
MECHANICAL REFRIGERAT.	300.000 TONS		347.856	59.136	48.700	38.264	493.956	49.396
REDWOOD STORAGE BIN	32500. CUBIC FEET	REDWOOD	11.747	2.349	1.175	4.699	19.970	1.175
BRINE MAKE-UP+SALT STOR.			1.190				1.190	
CENTRIFUGAL PUMP	71. GPM TIMES PSI	BRONZE	.512	.364	.140	.225	1.241	.124
CENTRIFUGAL PUMP	65.487 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100
BUCKET CONVEYER	20.000 FEET(HEIGHT)	SS	1.750	.487	.984	.700	3.920	.392
PULVERIZER	16666.667 POUNDS/HOUR	SS	17.727	4.822	5.637	7.091	35.277	3.528
SHOP FAB. STORAGE TANK	3500. GALLONS	SST	6.303	2.395	6.303	3.088	18.089	1.809
CENTRIFUGAL PUMP	1000.400 GPM TIMES PSI	SST	1.095	.778	.199	.482	2.554	.255
CENTRIFUGAL PUMP	3123.715 GPM TIMES PSI	SST	1.423	1.010	.258	.626	3.317	.332
AGITATOR-PROPELLAR	17.500 HORSEPOWER	SS	1.662	.459	.572	.665	3.357	.336
SHOP FAB. STORAGE TANK	3200. GALLONS	SST	6.108	2.321	6.108	2.093	17.530	1.753
CENTRIFUGAL PUMP	1698.652 GPM TIMES PSI	SST	1.218	.865	.221	.536	2.839	.284
CENTRIFUGAL PUMP	1698.652 GPM TIMES PSI	SST	1.218	.865	.221	.536	2.839	.284
JACKETED REACTOR VESSEL	6000. GALLONS	SST	18.310	6.958	1.831	8.972	36.071	3.607
VIBRATING SCREEN	3.000 SURFACE SQ FT.	SST	3.606	.974	.180	1.515	6.274	.627
AGITATOR-PROPELLAR	30.000 HORSEPOWER	SS	2.176	.601	.748	.870	4.395	.440
CENTRIFUGAL PUMP	733.627 GPM TIMES PSI	SST	1.043	.740	.189	.459	2.431	.243
PULP PRESS	6.000 FEET	STEEL	5.288	1.438	1.682	2.115	10.523	.529
CENTRIFUGAL PUMP	733.627 GPM TIMES PSI	SST	1.043	.740	.189	.459	2.431	.243
JACKETED REACTOR VESSEL	3200. GALLONS	SST	14.694	5.584	1.469	7.200	28.948	2.895
VIBRATING SCREEN	3.000 SURFACE SQ FT.	SST	3.606	.974	.180	1.515	6.274	.627

Table II.--Continued.

AGITATOR-PROPELLAR	30.000 HORSEPOWER	SS	2.176	.601	.748	.870	4.395	.440
PULP PRESS	6.000 FEET	STEEL	5.288	1.438	1.682	2.115	10.523	.529
CENTRIFUGAL PUMP	733.627 GPM TIMES PSI	SST	1.043	.740	.189	.459	2.431	.243
JACKETED REACTOR VESSEL	3200. GALLONS	SST	14.694	5.584	1.469	7.200	28.948	2.895
VIBRATING SCREEN	3.000 SURFACE SQ FT.	SST	3.606	.974	.180	1.515	6.274	.627
AGITATOR-PROPELLAR	30.000 HORSEPOWER	SS	2.176	.601	.748	.870	4.395	.440
PULP PRESS	6.000 FEET	STEEL	5.288	1.438	1.682	2.115	10.523	.529
CENTRIFUGAL PUMP	733.627 GPM TIMES PSI	SST	1.043	.740	.189	.459	2.431	.243
JACKETED REACTOR VESSEL	3200. GALLONS	SST	14.694	5.584	1.469	7.200	28.948	2.895
VIBRATING SCREEN	3.000 SURFACE SQ FT.	SST	3.606	.974	.180	1.515	6.274	.627
AGITATOR-PROPELLAR	30.000 HORSEPOWER	SS	2.176	.601	.748	.870	4.395	.440
PULP PRESS	6.000 FEET	STEEL	5.288	1.438	1.682	2.115	10.523	.529
CENTRIFUGAL PUMP	412.565 GPM TIMES PSI	SST	.976	.693	.177	.429	2.275	.227
CENTRIFUGAL PUMP	315.100 GPM TIMES PSI	SST	.956	.679	.173	.421	2.230	.223
CENTRIFUGAL PUMP	297.519 GPM TIMES PSI	SST	.953	.677	.173	.419	2.222	.222
CENTRIFUGAL PUMP	2025.850 GPM TIMES PSI	SST	1.269	.901	.230	.558	2.959	.296
CENTRIFUGAL PUMP	290.051 GPM TIMES PSI	SST	.952	.676	.173	.419	2.219	.222
CENTRIFUGAL PUMP	2008.268 GPM TIMES PSI	SST	1.266	.899	.230	.557	2.952	.295
CENTRIFUGAL PUMP	2000.800 GPM TIMES PSI	SST	1.265	.898	.229	.557	2.950	.295
HEAT EXCHANGER	100.000 SURFACE SQ FT.	ST/ST	2.249	1.606	1.417	2.130	7.403	1.258
DRYER	73.450 AREA(SQ.FEET)	SST	50.846	4.926	3.531	2.825	28.936	2.894
STRIPPER DRYER	73.450 AREA(SQ.FEET)	SST	62.772	5.473	3.923	3.139	32.151	3.215
SCREW CONVEYER	6.000 FEET	SS	.998	.271	.317	.399	1.985	.100
STRIPPER DRYER	73.450 AREA(SQ.FEET)	SST	62.772	5.473	3.923	3.139	32.151	3.215
CONDITIONER	73.450 AREA(SQ.FEET)	SST	62.772	5.473	3.923	3.139	32.151	3.215
SCREW CONVEYER	6.000 FEET	SS	.998	.271	.317	.399	1.985	.100
SCREW CONVEYER	20.000 FEET	SS	2.055	.559	.653	.822	4.089	.205
HAMMER MILL	3.727 TONS PER HR.	SST	1.736	.469	.748	.764	3.717	.372
BAGGING MACHINE	1.725 BAGS/MIN	SS	5.795	2.318	.637	2.318	11.068	1.107

Table II.--Continued.

ACID STORAGE TANK	38. GALLONS	SST	2.367	.473	.200	1.160	4.199	.420
CENTRIFUGAL PUMP	1.506 GPM TIMES PSI	SST	.772	.548	.140	.340	1.800	.180
CENTRIFUGAL PUMP	2711.150 GPM TIMES PSI	STEEL	.709	.503	.248	.312	1.772	.177
SHOP FAB. STORAGE TANK	1301. GALLONS	STEEL	1.393	.529	4.458	.683	7.063	.706
CENTRIFUGAL PUMP	2711.150 GPM TIMES PSI	STEEL	.709	.503	.248	.312	1.772	.177
DISK TYPE CENTRIFUGE	20.000 HORSEPOWER	SS	14.074	3.659	2.730	5.629	26.092	2.609
DISK TYPE CENTRIFUGE	20.000 HORSEPOWER	SS	14.074	3.659	2.730	5.629	26.092	2.609
DISK TYPE CENTRIFUGE	20.000 HORSEPOWER	SS	14.074	3.659	2.730	5.629	26.092	2.609
CENTRIFUGAL PUMP	43.746 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100
SHARPLES CENTRIFUGE	20.000 HORSEPOWER	SS	45.257	11.767	15.387	18.103	90.514	9.051
SHOP FAB. STORAGE TANK	3077. GALLONS	SST	13.489	5.126	13.489	6.610	38.714	3.871
CENTRIFUGAL PUMP	.427 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100
SHOP FAB. STORAGE TANK	5383. GALLONS	SST	7.327	2.784	7.327	3.590	21.030	2.103
CENTRIFUGAL PUMP	26.913 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100
CENTRIFUGAL PUMP	26.913 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100
HEAT EXCHANGER	448.365 SURFACE SQ FT. ST/ST	STEEL	5.720	4.084	3.603	5.417	18.824	3.200
CENTRIFUGAL PUMP	780.882 GPM TIMES PSI	STEEL	.545	.387	.191	.240	1.363	.136
DISK TYPE CENTRIFUGE	20.000 HORSEPOWER	SS	14.074	3.659	2.730	5.629	26.092	2.609
HEAT EXCHANGER	4283.600 SURFACE SQ FT. ST/ST	STEEL	23.283	16.624	14.669	22.049	76.626	13.026
SHOP FAB. STORAGE TANK	4002. GALLONS	SST	6.605	2.510	6.605	3.237	18.957	1.896
CENTRIFUGAL PUMP	1980.792 GPM TIMES PSI	STEEL	.654	.464	.229	.288	1.635	.163
DIST. COLUMN SHELL	1526.813 CUBIC FEET	SS	65.250	18.455	17.637	21.335	122.677	6.525
DISTILLATION COLUMN	54.000 FEET (HEIGHT)	SS	10.605	2.273	3.030	3.030	18.938	1.061
SHOP FAB. STORAGE TANK	14406. GALLONS	STEEL	3.232	1.228	10.342	1.584	16.395	1.639
CENTRIFUGAL PUMP	.200 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100
HEAT EXCHANGER	13374.648 SURFACE SQ FT. ST/ST	STEEL	47.272	33.753	29.782	44.767	155.574	26.448
CENTRIFUGAL PUMP	200.000 GPM TIMES PSI	STEEL	.487	.346	.170	.214	1.217	.122
SHOP FAB. STORAGE TANK	1577. GALLONS	SST	4.768	1.812	4.768	2.336	13.684	1.368
CENTRIFUGAL PUMP	7.884 GPM TIMES PSI	STEEL	.400	.284	.140	.176	1.000	.100

Table II.--Continued.

VERTICAL EVAPORATOR	662.220	SURFACE SQ FT, SST	10.221	6.746	2.453	4.293	23.713	2.371
VERTICAL EVAPORATOR	662.220	SURFACE SQ FT, SST	10.221	6.746	2.453	4.293	23.713	2.371
VERTICAL EVAPORATOR	662.220	SURFACE SQ FT, SST	10.221	6.746	2.453	4.293	23.713	2.371
VERTICAL EVAPORATOR	79.588	SURFACE SQ FT, SST	3.325	2.195	.798	1.397	7.715	.771
CENTRIFUGAL PUMP	59.691	GPM TIMES PSI STEEL	.400	.284	.140	.176	1.000	.100
SHOP FAB. STORAGE TANK	29.	GALLONS STEEL	.678	.136	.183	.332	1.329	.133
CENTRIFUGAL PUMP	.597	GPM TIMES PSI STEEL	.400	.284	.140	.176	1.000	.100
SHOP FAB. STORAGE TANK	42977.	GALLONS STEEL	4.738	1.800	15.161	2.322	24.021	2.402
BOILER	62097.921	POUNDS/HOUR SS	124.585	23.671	18.688	24.917	191.861	19.186
SHOP FAB. STORAGE TANK	19169.	GALLONS STEEL	3.572	1.357	11.429	1.750	18.108	1.811
CENTRIFUGAL PUMP	.266	GPM TIMES PSI STEEL	.400	.284	.140	.176	1.000	.100
CONTROL INSTRUMENTATION			87.000				1.000	
PAYLOADER			20.000				20.000	
SCRUBBERS	200.000	TONS PROCESSED STEEL	4.540	1.498	1.498	1.498	9.034	.454
BOILER WATER TREATMENT			1.000				1.000	
SEA WATER PUMPS	8179.034	GPM TIMES PSI BRONZE	1.300	.923	.355	.572	3.151	.315
CARBON ADSORBER			2.000				2.000	
VENT CONDENSER	20.000	SURFACE SQ FT, ST/SST	1.860	1.328	.521	1.761	5.470	.930
SCALE	18.000	TONS SS	4.540	.363	.000	1.816	6.719	.454
SCALE	18.000	TONS SS	4.540	.363	.000	1.816	6.719	.454
SCALE	18.000	TONS SS	4.540	.363	.000	1.816	6.719	.454
SCALE	18.000	TONS SS	4.540	.363	.000	1.816	6.719	.454
TOTAL COSTS			1400.533	331.836	319.878	359.491	2163.078	221.047

Table II.-- Continued.

MATERIAL AND ENERGY INFORMATION

GENERAL

FISH = 200,000 TONS/DAY
 OF WHICH 4.00 PERCENT OR 8,000 - " - IS OIL
 16.00 - " - OR 32,000 - " - PROTEIN
 3.00 - " - OR 6,000 - " - ASH

PROCESS STEAM = 62098. LB/HR
 PROCESS COOLING WATER = 408952. GAL/HR
 ELECTRICITY 12214. KWHR

EQUIPMENT FLOW RATES

FISH TO EXTRACTION VESSELS 16667. LB/HR

STEAM(STIRRED VESSEL 1)	140. LB/HR
STEAM(STIRRED VESSEL 2)	80. LB/HR
STEAM(STIRRED VESSEL 3)	80. LB/HR
STEAM(STIRRED VESSEL 4)	80. LB/HR
STEAM(PREHEATER-DISTILLATION)	4484. LB/HR
STEAM(REBOILER)	42836. LB/HR
STEAM(ROTARY DRYER FPC)	2348. LB/HR
STEAM(ROTARY DRYER BONE MEAL)	0. LB/HR
COOLING WATER CONDENSER	248392. GAL/HR
COOLING WATER DISTILLATION COND.	2676. GAL/MIN
TOTAL STEAM	62098. LB/HR
TOTAL WATER	3406568. LB/HR

	STREAM 1	STREAM 2	STREAM 3	STREAM 4	STREAM 5
RAFFINATE OIL	7.951	1.311	.345	.148	.000
RAFFINATE ASH	1.332	.192	.095	.047	.000
RAFFINATE PROTEIN	7.163	.763	.251	.251	.000

Table II.-- Continued.

RAFFINATE WATER	152.199	42.859	23.209	13.205	.000
RAFFINATE ALCOHOL	373.568	379.368	381.108	387.842	400.000
EXTRACT OIL	8.000	1.360	.394	.197	.049
EXTRACT ASH	6.000	4.860	4.763	4.715	4.668
EXTRACT PROTEIN	32.000	25.600	25.088	25.088	24.837
EXTRACT WATER	154.000	44.660	25.010	15.006	1.801
EXTRACT ALCOHOL	.000	6.000	7.740	14.474	26.632
FLOW FROM EXTRACTION VESSEL 4	4832. LB/HR				
FLOW FROM EXTRACTION VESSEL 1	45168. LB/HR				
AQUEOUS STREAM(CENTRIFUGE)	44882. LB/HR				
TOPS FROM DISTILLATION COLUMN	31088. LB/HR				
BOTTOMS FROM DISTILLATION COLUMN	13809. LB/HR				
OIL FROM SECOND CENTRIFUGE	331. LB/HR				
FISH OIL PRODUCT	663. LB/HR				
BONE MEAL CONCENTRATE	0. LB/HR				
FISH PROTEIN CONCENTRATE	2588. LB/HR				
FISH SOLUABLES	218. LB/HR				

Table II.--Continued.

COST OF FACILITIES AND SITE DEVELOPMENT						
	UNIT COST	NUMBER OF UNITS	BASE COST	LABOR COSTS	INDIRECT COSTS	TOTAL COSTS
						RANGE + OR -
LAND	10.000 PER ACRE	1.000	10.000	.000	.000	10.000 1.500
FENCING	2.673 PER 1000 FT	.833	1.342	.429	.456	2.227 .334
PAVING	1.125 PER 1000 SQ.FT	14.505	5.280	9.240	1.795	16.315 2.447
DOCK FACILITIES	2.496 PER 1000 SQ.FT	2.400	1.560	3.900	.530	5.990 .899
BULK STORAGE WAREHOUSE						
ELECTRICAL WIRING	.900 PER 1000SQ.FT					
FIRE PREVENTION EOP.	1.100 PER 1000SQ.FT					
TOTAL WAREHOUSE	8.770 PER 1000 SQ.FT	.600	3.132	1.065	1.065	5.262 .789
PROCESS BUILDING						
ELECTRICAL WIRING	1.750 PER 1000 SQ.FT					
HEATING AND VENTIL.	1.500 PER 1000 SQ.FT					
PLUMBING(GENERAL)	1.700 PER 1000 SQ.FT					
FIRE PREVENTION EQUIP	1.100PER 1000 SQ.FT					
TOTAL BUILDING COSTS	14.784 PER 1000 SQ.FT	2.600	22.880	7.779	7.779	38.438 5.766
LABORATORY CONTROL INSTRUMENTATION			150.000			150.000
TOTAL FACILITIES			67.074	30.193	19.405	228.233 17.501

Table II.--Continued.

SUMMARY OF FIXED COSTS

EQUIPMENT	2163.078
SPARE PARTS	28.011
FACILITIES	228.233
ENGINEERING	181.449
CONTINGENCIES	260.077
TOTAL CAPITAL COSTS	2860.848

Table II.--Continued.

OPERATING COSTS		
COST ITEM	QUANTITY USED	COST IN DOLLARS PER DAY
FISH	200. TONS	4000.00
FUEL OIL	10645. GALLONS	638.72
ELECTRICITY	12214. KWHR	158.78
ANTIOXIDANT	45.38 LB	181.54
PACKAGING	2485. BAGS	621.16
CITY WATER	9814840. GALLONS	2453.71
LABOR AND SUPERVISION	176. MAN HR.	704.00
DEPRECIATION		1430.42
MAINTENANCE		95.36
PAYROLL EXTRAS		105.60
BOILER WATER TREATMENT		3.30
INSURANCE AND TAXES		95.36
OVERHEAD		211.20
ISOPROPYL ALCOHOL	8000. POUNDS	516.88
PHOSPHORIC ACID	1084. POUNDS	24.39
TOTAL OPERATING COSTS		14240.43
PRODUCTION RATE		
BONE MEAL	.000 TONS/DAY	
FISH SOL.	14.326 TONS/DAY	
DRY CONC.	31.058 TONS/DAY	
FISH OIL	7.951 TONS/DAY	
BONE MEAL	0. TONS/YEAR	
FISH SOL.	2865. TONS/YEAR	
DRY CONC.	6212. TONS/YEAR	
FISH OIL	1590. TONS/YEAR	
YEARLY OPERATING COST = .267080+07 DOLLARS		

Table II.--Continued.

BY-PRODUCT	PRODUCTION COST OF FPC PRICE (CENTS/POUND)	TOTAL WORTH (DOLLARS/YEAR)
FISH OIL	4.0	.127211+06
FISH SOLUBLES	3.5	.200561+06
	FPC COST WITHOUT BY-PRODUCTS	21.5 CENTS/POUND
	FPC COST WITH BY-PRODUCTS	18.9 CENTS/POUND

Table III
Cost Data for 50 ton/day Capacity Plants

Plant Type	Fish Type	Capital Costs \$·10 ⁶	Yearly Production Rates and Costs					FPC Cost Disregarding by product ¢/lb	FPC with product by product ¢/lb
			Bone Meal tons/yr	Fish Paste tons/yr	Dry Con. tons/yr	Fish Oil tons/yr	Operating costs \$·10 ⁶		
Biological	Fat	1.35	1340	-	1360	900	0.985	36.1	30.
Press Cake-Biological	Fat	1.41	340	-	1960	950	0.896	22.8	20.3
IPA	Lean	1.58	-	720	1550	400	0.987	31.8	29.1
Press Cake-	Fat	1.57	-	1110	1400	1410	0.879	31.2	25.1
IPA	Lean	1.57	-	1110	1400	400	0.88	31.3	27.4

Table IV
Cost Data for 200 ton/day Capacity Plants

Plant Type	Fish Type	Capital Costs \$•10 ⁶	Yearly Production Rates and Costs					FPC Cost Disregarding by product \$/lb	FPC with product by \$/lb
			Bone Meal tons/yr	Fish Paste tons/yr	Dry Con. tons/yr	Fish Oil tons/yr	Operating costs \$•10 ⁶		
Biological	Fat	2.40	5350	-	5450	3600	2.76	25.3	19.2
Press Cake Biological	Fat	2.65	1380	-	7860	3800	2.40	15.3	12.7
IPA	Lean	2.73	-	2860	6210	1590	2.64	21.2	18.6
Press Cake	Fat	2.82	-	4430	5620	4790	2.22	19.8	13.6
IPA	Lean	2.82	-	4430	5620	1600	2.23	19.8	16.0

Table V
Cost Data for 1000 ton/day Capacity Plants

Plant Type	Fish Type	Capital Costs \$•10 ⁶	Yearly Production Rates and Costs					FPC Cost Disregarding by product ¢/lb	FPC with product by ¢/lb
			Bone Meal tons/yr	Fish Paste tons/yr	Dry Con. tons/yr	Fish Oil tons/yr	Operating costs \$•10 ⁶		
Biological	Fat	7.71	26700	-	27300	1800	11.65	21.4	15.3
Press Cake Biological	Fat	8.01	6900	-	39300	1900	9.70	12.3	9.8
IPA	Lean	7.13	-	14300	31000	7900	10.6	17.1	14.4
Press Cake	Fat	7.023	-	22100	28100	24000	8.41	15.0	8.8
IPA	Lean	7.024	-	22100	28100	8000	8.46	15.0	11.1

Table VI
Cost Data for Fish Meal Plants

Plant Capacity tons/day	Fish Type	Capital Costs \$.10%	Yearly Production and Costs		
			Fish Meal tons/yr	Fish Oil tons/yr	Operating costs \$.10%
50	Fat	.728	2090	1010	0.687
	Lean	.725	1960	340	0.675
200	Fat	1.12	8400	4030	1.72
	Lean	1.11	7860	1340	1.68
1000	Fat	2.84	41800	20000	6.64
	Lean	2.62	39000	6700	6.36

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