PARVCOST:
A PARTICLEBOARD VARIABLE COST PROGRAM

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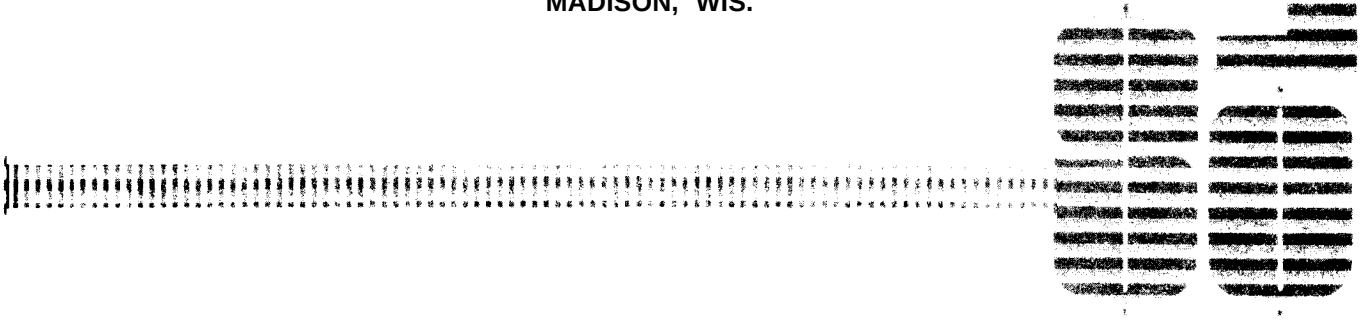

ABSTRACT

PARVCOST, A FORTRAN program, was designed to develop economic and financial analyses of systems for manufacturing particleboard. In the program, costs and requirements of wood are calculated as are chemicals and energy per unit of finished board products. Estimates are made of sensitivity of the finished product costs to changes in unit costs of energy and raw materials. Weight statistics are computed for the finished product and for the profit contribution ratio for values of given products. An appendix is included with a sample program output, two versions of data decks and modifications, notes on use of the two versions, and a listing of the program and documentation cards.

PARVCOST: A PARTICLEBOARD VARIABLE COST PROGRAM

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INTRODUCTION

A computer program for the variable cost of particleboard, PARVCOST, was developed by the Marketing and Economics Analysis Research Work Unit of the Forest Products Laboratory (FPL). The objective was to automate the computations of raw material and energy unit cost, board statistics, and energy requirements for particleboard manufacture from estimates of material costs and energy requirements. Many of the basic concepts used in PARVCOST were adapted from a computer program developed by G. A. Koenigshof, USDA, Forest Service, Athens, Ga., to evaluate veneered particleboard manufacturing systems.

PARVCOST is written in FORTRAN and can be run on a UNIVAC 1110 (Univ. of Wis.), a CDC 6500 (Purdue Univ.), and a DATACRAFT 6024/3 (FPL).

Appended to this report are the following: A sample program output: a listing of a long (documented) version data deck; a sample of a short version data deck; two program cards needed for modification of the two versions; notes on use of the two versions; and a listing of the PARVCOST program and documentation cards.

COMPUTATIONS

PARVCOST calculates costs and requirements of wood, chemicals, and energy per unit of finished board product. It estimates sensitivity of costs of finished products to changes in costs of units of energy and raw materials. It also computes weight statistics for the finished product and the profit contribution ratio for given product values.

Raw Materials, Energy, and Costs

PARVCOST computes input requirements for raw material and energy and variable costs of particleboard manufacture in standard units of finished product output (Mft^2-3/8 in., Mft^2-1/2-in., m^3). Computational outputs of PARVCOST (appendix A) are derived from estimates of process and supply requirements.

Gross input requirements per unit of output for particleboard manufacture are always greater than the final amount of raw materials that physically appear in a unit of the finished product. This is caused by fines, trims, and other processing material and energy losses. The phrase “per unit of output” in this program refers to the gross input requirements per unit of finished board product. Variable costs of production are calculated as gross input requirements per unit of product multiplied by estimated price for given raw material and energy input.

1/ The Laboratory is maintained in cooperation with the University of Wisconsin-Madison.

If an external fuel, in addition to residues fuels, is needed, PARVCOST selects the least expensive alternative fuel-wood, oil, gas, or coal-on the basis of cost per effective heating value. Energy requirements and costs are computed in terms of the least expensive fuel available.

Sensitivity of Unit Variable Costs

Another objective of PARVCOST Is to gage the sensitivity of total gross variable cost to possible changes in individual market costs of raw material (wood, resin, and wax) and energy (electricity and fuel). Sensitivity of total gross variable cost to the cost for each of these is given in the PARVCOST printed output in terms of total gross variable cost per cubic foot of finished product. Sensitivity is expressed as simple linear equations of the form,

$$Y = AX + B$$

where

Y is total gross variable coat per cubic foot of panel product:

A, a "slope" coefficient calculated by the program;

X, an individual item cost on an imput basis (wood cost In $/ft^3$, price of oil in $/barrel); and

B, a constant term calculated by the program.

Sensitivity equations provide for determining the effect that changes in input prices for raw materials will have on total gross variable cost per cubic foot of finished product. If there Is a change In the cost of one raw material, the new total gross variable cost can be calculated by simply applying a sensitivity equation to the new cost of that raw material.

The effect of any magnitude of change in cost of wood raw material, resin, wax, or electricity can be evaluated using the appropriate sensitivity equation. Gross variable cost is a strictly linear function of cost of wood, resin, wax, and electricity for any value of these individual costs. However, only the effect of marginal changes In fuel costs can be evaluated by the sensitivity to the fuel-cost formula. PARVCOST always selects the least expensive fuel on the basis of cost per effective British thermal unit. Large changes In fuel cost may result in substituting one fuel for another.

Profit Contribution Ratio

PARVCOST calculates a profit contribution ratio. Profit contribution Is the net sales value plus any benefits from the sale of surplus residues minus variable costs of production. The profit contribution ratio is the ratio of the profit contribution to the net sales value, which expresses the percent of revenues available to cover other operating costs and yield profits. The PARVCOST profit contribution ratio can be used to gage the relative feasibility of manufacturing particleboard between sites where raw materials, energy, and product outputs have different values, but other operating costs may be assumed equal.

DATA REQUIREMENTS OF OF PARVCOST PROGRAM

Data required by PARVCOST consist of estimates of the following factors: (1) Specific gravity and moisture content of wood, bark, and pressed panel, (2) cost of procuring wood, chemicals, residues, fuel, electricity, (3) costs of finished board product, (4) ratio of bark to wood in roundwood,(5) percents of process residues loss and the width of edging trims, (6) finished panel size, (7) percent face and core furnish, (8) weight percentages of chemicals needed In face and core furnish, (9) British thermal unit value of fines, trims, bark, and fuel, and (10) requirements of heat energy (Btu) and electricity (kWh) per cubic foot of output.

Of a total of 48 input variables, each must be assigned a value. Forty-two are estimates of various particleboard manufacturing factors; five are simple integer option variables that control the format of the printed program output; and one is the title of the printed output. Following is a listing of the 48 input variables required by PARVCOST. The variables are in the order in which they occur in the data deck. The four-letter program name of each variable procedes each definition.

INPUT VARIABLES

1. **CCUF,** cost of wood raw material in dollars per cubic foot (solid volume).
2. **SGRW,** ovendry specific gravity of wood raw material (average value, green volume, and dry weight).
3. **GRMC,** moisture content on an ovendry basis of wood raw material (as a decimal).
4. **PCTB,** ratio of bark to wood in wood raw material (this ratio is on a weight basis and refers only to the bark that Is removed and used as fuel).
5. **WBMC,** moisture content on an ovendry basis of bark (as a decimal).
6. **SGBK,** ovendry specific gravity of bark (average value, green volume, and dry weight).
7. **CRES,** cost of resin In dollars per pound of resin.
8. **PRRF,** weight percent of face blend required to be resin (as a decimal).
9. **PRRC,** weight percent of core blend required to be resin (as a decimal).
10. **CWAX,** cost of wax in dollars per pound of wax.
11. **PWRF,** weight percent of face blend required to be wax (as a decimal).
12. **PWRC,** weight percent of core blend required to be wax (as a decimal).
13. **ODMC,** ovendry basis moisture content of wood coming out of dryer (as a decimal).
14. **PCTF,** weight percent of furnish material lost as dry fines but mostly recoverable as fines fuel (as a decimal).
15. **PCFF,** weight percent of product that Is face furnish (as a decimal).
16. **PCCF,** weight percent of product that Is core furnish (as a decimal).
17. **ODWP,** weight in pounds per solid cubic foot of finished product.
16. **FPMC,** ovendry basis moisture content of wood in finished product (as a decimal).
19. **PTLG,** width in inches of panel trims cut away along length of product.
20. **PTWD,** width in inches of panel trims cut away along width of product.
21. **PWSR,** weight percent of wood raw material that becomes green (wet screened) wood residue.
22. **CORM,** f.o.b.–mill value of any surplus residues (residue mix) in dollars per pound.
23. **CKWH,** cost of electricity in dollars per kilowatt-hour.
24. **BTUF,** average higher heating value of nonbark wood fuel residues In million British thermal units per pound.
25. **BTUB,** average higher heating value of bark residues in million British thermal units per pound.
26. **BTRD,** million British thermal units required at boiler or other heat recovery device per pound of water evaporated by wood dryer.
27. **BTRP,** million British thermal units required at boiler for press steam per cubic foot cut panel product.
26. **BTRT,** million British thermal units required at boiler for thaw pond per cubic foot cut panel product.
29. **BTRH,** million British thermal units required at boiler for heating per cubic foot cut panel product.
30. **BTRM,** million British thermal units required at boiler for miscellaneous purposes per cubic foot cut panel product.
31. **RKWH,** kilowatt-hours of electricity required per cubic foot of cut panel product.
32. **PPWD,** width of pressed panel in inches (trimmed dimension).
33. **PPLG,** length of pressed panel in inches (trimmed dimension).
34. **SALE,** net sales value f.o.b. mill of product in dollars per solid cubic foot.
35. **PGAS,** price of natural gas in dollars per thousand cubic foot.
36. **POIL,** price of fuel oil in dollars per barrel.
37. **PWOD,** price of external (nonprocess residue) wood fuel In dollars per ton.
36. **PCOL,** price of coal in dollars per ton.
39. **BTUG,** million British thermal units per thousand cubic foot of natural gas.
40. **BTUO,** million British thermal units per barrel of oil.
41. **BTUW,** million British thermal units per ton of wood fuel.
42. **BTUC,** million British thermal units per ton of coal.
43. **ITOP,** coded specification of how trims are to be handled (0 = trims recycled as furnish; 1 = trims used as fuel).
44. **IOP1,** coded specification of size of panel for which data should be printed in second data column of data printout (0 (or blank) for 3/8 in., 1 for 1/4 in., 2 for 3/4 in., 3 for 5/8 in., and 4 for 1/2 in.).

45. **IOP2,** coded specification of size of panel for which data should be printed in third data column of data printout (0 (or blank) for 1/2 in., 1 for 1/4 in., 2 for 3/4 in., 3 for 5/8 in., and 4 for cubic meter).
46. **NOPT,** coded specification of number of data columns to be printed on printed output (3 for 3 columns, 0 (or blank) for 5 columns).
47. **NCOP,** specification of number of copies of output to be printed (01 to 10).
48. **TITL,** an alphanumeric array for input of title of printed output.

STRUCTURE OF DATA DECK

The PARVCOST data deck has two versions: A long, documented version (DV) (appendix B) and a short, not documented version (SV) for which a sample is given in appendix C. Either version may be used for entering data into the PARVCOST program. The two versions enter exactly the same data in the same order. The only difference between the two versions is that only the long version contains documentation of each input variable.

LONG VERSION DATA DECK

The DV data deck (appendix B) has 104 lines. Most of the DV data deck is documentation that explains the data-coding sequence: it does not influence the function of the program. The documentation in the DV data deck is essential if the deck is stored in a computing facility, communication is established via a teletype terminal or similar device, and stored data is to be edited line-by-line. A list of the DV data deck can also be used as a coding guide reference if using the SV data deck.

In using the DV data deck, data to be entered Is shown In appendix B and follows "WOOD RAW MATERIAL COST PER CUBIC FOOT." The numerical information is given that should be entered in columns 6 through 18; each datum must include a decimal point. Program controls are entered as integer data without decimal points in columns 1 and 2 (as indicated) on the five data cards preceding the program title cards (last cards in data deck). Alphanumeric (title of output) data are entered on the last two cards of the data deck. All of the other data columns and documentation comments of the DV data deck are nonfunctional.

Use of the DV data deck requires that program card 6 be replaced by card 6B (appendix D). Thus, if using the DV data deck, remove main program card number 6 and insert card number 6B in the same place in the main program. The program will not run with the DV data deck unless this modification has been made.

SHORT VERSION DATA DECK FORMAT

The SV data deck consists of 10 data cards. Forty-eight input variables are entered on 10 cards in the same order listed in the long version section on data requirements. if using the SV deck, all of the required statistics of particleboard manufacture (the first 42 input variables) are entered on cards 1 to 6 (table 1). Program control specifications (input variables 43-47) are entered on card 7. The title of the output is entered on cards 8 through 10.

Cards 1 through 6, instructions: The estimates for the first 42 input variables are

entered on the first six cards of the SV data deck. Seven estimates are entered on each card. One estimate is punched in every 10 spaces starting in columns 1 through 10 of each card. Each estimate that is punched must include a decimal point. An estimate may be punched anywhere in the 10-space field allotted to each variable. Input variables for cards 1 through 6 and the columns for their entry are listed-in table 1.

Table 1 .—**Input variables for cards 1 through 6**

Card. No.	Columns						
	1-10	11-20	21-30	31-40	41-50	51-60	61-70
1	CCUF	SGRW	GRMC	PCTB	WBMC	SGBK	CRES
2	PRRF	PRRC	CWAX	PWRF	PWRC	ODMC	PCTF
3	PCFF	PCCF	ODWP	FPMC	PTLG	PTWD	PWSR
4	CORM	CKWH	BTUF	BTUB	BTRD	BTRP	BTRT
5	BTRH	BTRM	RKWH	PPWD	PPLG	SALE	PGAS
6	POIL	PWOD	PCOL	BTUG	BTUO	BTUW	BTUC

Card 7, instructions: input variables 43 through 47 are specified on card 7. The single integer specifications for ITOP, IOP1, IOP2, and NOPT are punched in columns 1 through 4, respectively. The two integer specifications for NCOP are punched In columns 5 and 6. The appropriate integers to punch in these columns are discussed in the listing of input variables in the various section on data requirements for the PARVCOST program.

Cards 8 through 10, instructions: The title desired to be printed at the top of the program output is punched on cards 8 through 10 of the SV data deck. The title should be typed on the center of these cards.

Appendix B is a listing of a sample SV data deck. Note that it contains the same data as the sample listing of the DV version in appendix A. If the SV version of the data deck is used, program card 6 (not 6B, see appendix D) must be in the program deck. The program will not run with the SV data deck unless program card 6 is in the program deck and card 6B has been removed.

APPENDIX A.–Sample Program Output Obtained by Running PARVCOST with Sample Data from Appendixes B or C

MATERIAL AND RESOURCE REQUIREMENTS, BOARD STATS. AND VARIABLE COSTS FOR MANUFACTURE OF STRUCTURAL PARTICLEBOARD PER UNIT OF OUTPUT (HYPOTHETICAL TEST)

	$/CU.FT.	$/MSF 3/8 IN. BASIS	1/2 IN. BASIS	5/8 IN. BASIS	$/CU.METER
NET SALES VALUE	$ 2.9760	$ 93.000	$ 124.000	$ 155.000	$ 105,083
VARIABLE COSTS OF PRODUCTION					
WOOD ($ .2800/CU. FT.)	$ .2859	$ 8.936	$ 11.914	$ 14.893	$ 10.097
RESIN (6.5%, $ .38/LB.)	.9008	28.150	37.533	46.917	31.807
WAX (1.0%, $ .12/LB.)	.0438	1.368	1.823	2.279	1.545
ELECTRIC POWER ($ .020/KWH)	.1200	3.750	5.000	6.250	4.237
DRYER HEAT (FUEL=$ .206/MM BTU)	.0112	.351	.468	.585	.396
PROC.STEAM (FUEL=$ .206/MM BTU)	.0095	.298	.398	.497	.337
LESS RESIDUE VAL.($ 48.00/BDU)	.0000	.000	.000	.000	.000
GROSS VARIABLE COST	$ 1.3713	$ 42.853	$ 57.137	$ 71.421	$ 48.420
PROFIT CONTRIBUTION	$ 1.6047	$ 50.197	$ 66.863	$ 83,579	$ 56.662
P. C. RATIO	53.9%				

SENSITIVITY OF GROSS VARIABLE COST PER CU. FT. OF FINISHED PRODUCT OUTPUT

VAR. COST/CU. FT. = 1.0212 « (WOOD COST/CU. FT.) + 1.0853
VAR. COST/CU. FT. = 2.375 « (RESIN COST/LB) + .4705
VAR. COST/CU. FT. = .3647 « (WAX COST/LB.) + 1.3275
VAR. COST/CU. FT. = 6.0000 « (ELECTRICITY COST/KWH) + 1.2513
VAR. COST/CU. FT. = .0005 « (PRICE OF COAL/TON) + 1.3624
VAR. COST/CU. FT. = .0133 « (PRICE OF NAT. GAS/MCF) + 1.3594

BOARD STATISTICS	LBS./CU.FT.	LBS./MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	LBS./CU.METER
GROSS BOARD WEIGHT	38.150	1192.187	1589.585	1986.979	1347.076
WEIGHT OF WATER(9.0% M.C.)	3.150	98.437	131.250	164.062	111.226
OVEN DRY WGT. OF BOARD	35.000	1093.750	1458.334	1822.917	1235.850
WGT. OF RESINS (6.5% SOLIDS)	2.275	71.094	94.792	118.490	80.330
WGT. OF WAX (1.0% SOLIDS)	.350	10.937	14.583	18.229	12.358
WEIGHT OF WOOD	32.375	1011.719	1348.959	1686.198	1143.161
RAW MATERIAL REQUIREMENTS	**REQ./CU.FT.**	**REQ./MSF 3/8 IN.BASIS**	**1/2 IN. BASIS**	**5/8 IN. BASIS**	**REQ./CU.METER**
WOOD (O. D. SPEC. GRAV. = .59)					
POUNDS OF O.D. WOOD	37.757	1179.907	1573.210	1966.511	1333.200
POUNDS OF GREEN WOOD	67.963	2123.832	2831.778	3539.720	2399.760
CU. FT. OF ROUNDWOOD	1.021	31.914	42.551	53.189	36.060
RESIN (LBS. SOLIDS/LIQUID)	2.371	74.079	98.772	123.465	83.703
WAX (LBS. SOLIDS)	.365	11.397	15.196	18.995	12.877

FUEL AND POWER STATISTICS IN MILLION B.T.U.S

	BTUS/CU.FT.	BTUS/MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	BTUS/CU.METER
FUEL REQUIREMENTS					
DRYER HEAT					
(.001700BTUS/LB.WATER EVAP.)	.047498	1.484323	1.979098	2.473871	1.677166
PROCESS STEAM					
PRESS	.019200	.600000	.800001	1.000000	.677952
THAW POND	.002000	.062500	.083333	.104167	.070620
HEATING	.016000	.500000	.666667	.833333	.564960
MISCELLANEOUS	.003200	.100000	.133333	.166667	.112992
TOTAL FUEL REQUIRED	.087898)	2.746823	3.662433	4.578037	3.103690
WOOD FUEL GENERATED					
DRY FINES/TRIMS(8.0%/ 2.0%)	.023277	.727416	.969889	1.212360	.821922
WET BARK(.12:1 RATIO OF RDWD)	.031196	.974865	1.299821	1.624775	1.101519
SCREENED WET WOOD RESIDUES	.010886	.340184	.453579	.566974	.384381
TOTAL FUEL GENERATED	.065359	2.042465	2.723289	3.404109	2.307822
AUXILIARY FUEL BTU	.011534	.360435	.480580	.600725	.407263
NET FUEL REQUIREMENT	.011006	.343922	.458563	.573204	.308605

FUEL AND POWER REQUIRED	REQ./CU.FT.	REQ./MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	REQ./CU.METER
KWH. ELECT. POWER ($.020/KWH)	6.0000	187.500	250.000	312.500	211.860
TONS COAL ($ 18.00/TON)	.000491	.015354	.020472	.025589	.017348
MCF. AUX. GAS ($ .90/MCF.)	.013257	.414293	.552391	.690489	.468118

APPENDIX B.—Listing of Long, or Documented, Version Data Deck

```
THIS THE DOCUMENTED VERSION OF THE PARVCOST DATA DECK
              COLUMN WIDTHS
     6×              18×              30×
WOOD RAW MATERIAL COST PER CUBIC FOOT
CCUF=    .28
O. D. SPECIFIC GRAVITY OF THE WOOD RAW MATERIAL
SGRW= 0.59295
MOISTURE CONTENT O. D. BASIS OF THE GREEN WOOD RAW MATERIAL
GRMC=    .80
RATIO OF BARK TO WOOD IN WOOD RAW MATERIAL
PCTB=    .12
MOISTURE CONTENT O. D. BASIS OF GREEN BARK MATERIAL
WBMC= 1.00
O. D. SPECIFIC GRAVITY OF THE BARK
SGBK= 0.700
COST OF RESIN PER POUND IS
CRES=    .38
PERCENT RESIN REQUIRED IN FACE IS
PRRF=    .07
PERCENT RESIN REQUIRED IN CORE IS
PRRC=    .05
COST OF WAX PER POUND OF WAX IS
CWAX=    .12
PERCENT OF WAX REQUIRED IN FACE IS
PWRF=    .01
PERCENT OF WAX REQUIRED IN CORE IS
PWRC=    .01
MOIST. CONTENT WOOD OUT OF DRYER
ODMC=    .06
THE RECOVERABLE PERCENT OF FINES LOSS (WEIGHT PERCENT OF WOOD RAW MATERIAL)
PCTF=    .08
PERCENT OF PRODUCT IN FACE FURNISH
PCFF=    .75
PERCENT OF PRODUCT IN CORE FURNISH
PCCF=    .25
O.D. WT. OF PRESSED PANEL/CU.FT.
ODWP=35.0
MOIST. CONTENT OF WOOD IN PRODUCT
FPMC= .09
PANEL TRIMS ALONG LENGTH (INCHES)
PTLG= 1.5
PANEL TRIMS ALONG WIDTH (INCHES)
PTWD= 1.5
PERCENT OF WOOD RAW MATERIAL LOST AS GREEN RESIDUE, (RECOVERED AS FUEL)
PWSR= 0.05
VALUE F.O.B.-MILL PROCESS GENERATED WOOD AND BARK RESIDUES (AVERAGES/POUND)
CODR=0.000
COST OF ELECTRICITY PER KWH.
CKWH=    .020
BTU IN WOOD FINES AND RESIDUES (MILLION BTU/LB. O.D. HIGHER HEATING VALUE)
BTUF=.008500
BTU IN BARK (MILLION BTU/LB. O.D. HIGHER HEATING VALUE)
BTUB=.009500
DRIER BTU DEMAND AT BOILER--MILLION BTU/LB. WATER EVAPORATED
BTRD=    .001700
PROC. STEAM PRESS BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRP=    .019200
THAW POND STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRT= 0.002000
HEATING STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRH= .016000
MISCELLANEOUS STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRM= .003200
ELECTRIC USAGE--KWH./CU. FT. PANELS
RKWH= 6.000
PRESSED PANEL WIDTH (INCHES)
PPWD= 48.0
PRESSED PANEL LENGTH (INCHES)
PPLG= 96.0
THE NET SALES VALUE (S/CU. FT.)
SALE= 2.976
AVERAGE ANTICIPATED PRICE OF NATURAL GAS PER MCF
PGAS= 0.90
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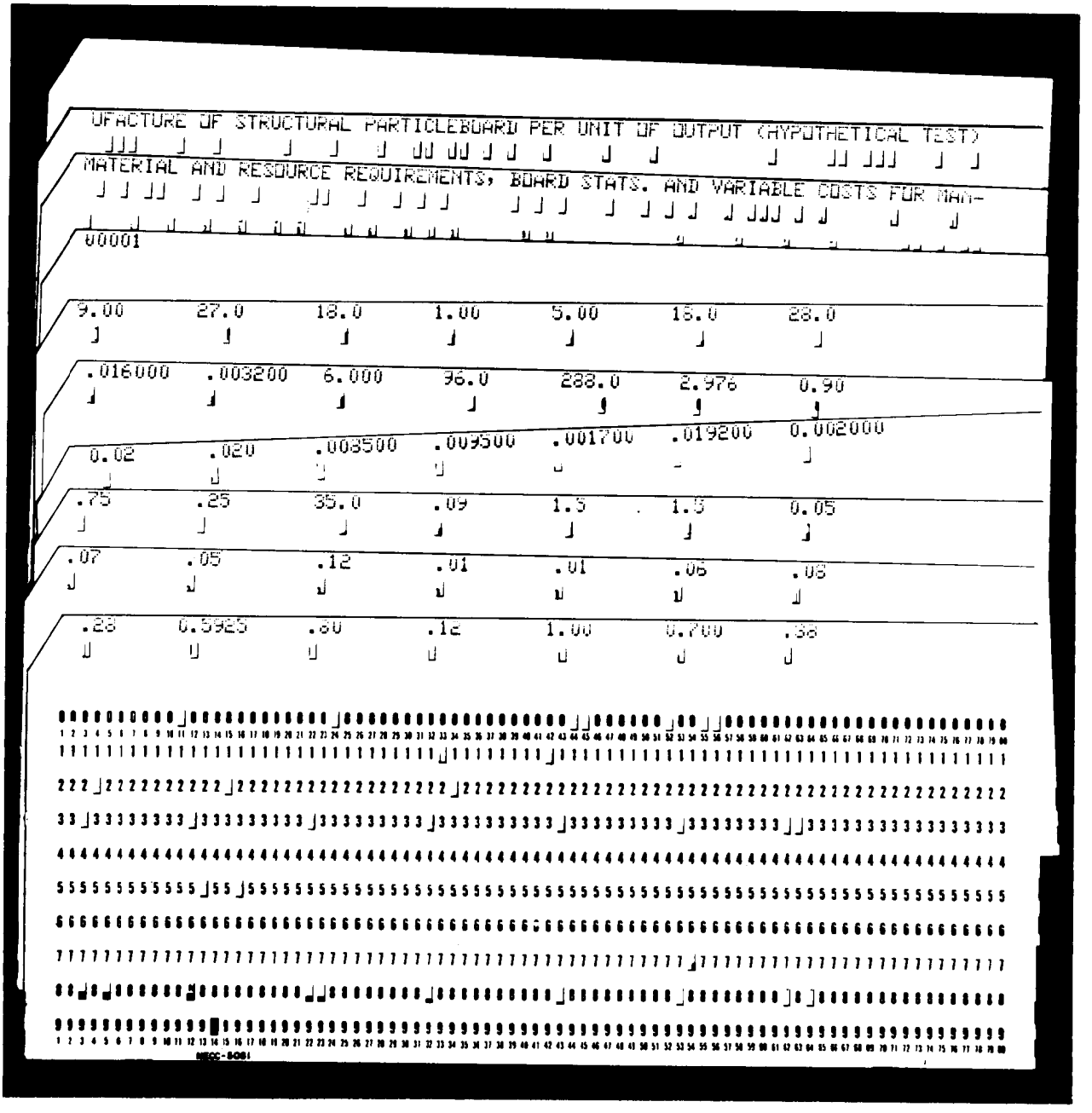
AVERAGE ANTICIPATED PRICE OF OIL PER BARREL
POIL= 9.00
AVERAGE ANTICIPATED PRICE OF WOOD TO BE USED AS FUEL PER TON
PWOD=17.00
AVERAGE ANTICIPATED PRICE OF COAL PER TON
PCOL= 18.0
MILLION BTUS AVAILABLE PER MCF OF NATURAL GAS
BTUG= 1.00
MILLION BTUS AVAILABLE PER BARREL OF OIL
BTUO= 5.00
MILLION BTUS AVAILABLE PER TON OF WOOD
BTUW= 18.0
MILLION BTUS AVAILABLE PER TON OF COAL
BTUC= 28.0
LEAVE NEXT LINE BLANK IF TRIMS ARE RECYCLED AS FURNISH, 1 IN COL. 1 IF AS FUEL

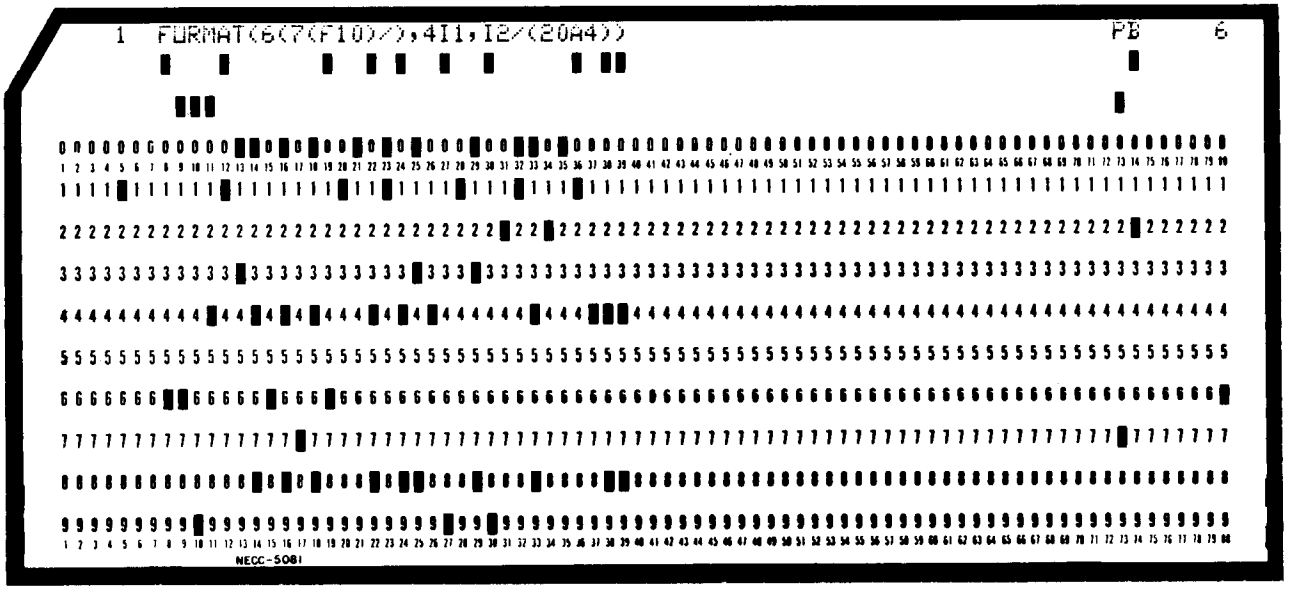
ON THE FOLLOWING LINE SPECIFY IOP1, THE TYPE OF OUTPUT IN COLUMN 2, SPECIFY
1 FOR 1/4 IN.,2 FOR 3/4 IN.,3 FOR 5/8 IN.,4 FOR 1/2 IN., DEFAULT (0) IS 3/8 IN.
0
ON THE FOLLOWING LINE SPECIFY IOP2, THE TYPE OF OUTPUT IN COLUMN 3, SPECIFY
1 FOR 1/4 IN.,2 FOR 3/4 IN., 3 FOR 5/8 IN., 4 FOR CU, METER, DEFAULT (0) IS 1/2 IN.
0
ON THE NEXT LINE SPECIFY THE NUMBER OF COLUMNS OF DATA OUTPUT TOBE PRINTED
SPECIFY 3 FOR 3 COLUMN WIDTH, DEFAULT (0) IS 5 COLUMN WIDTH
0
ON THE FOLLOWING LINE SPECIFY NCOP, THE NUMBER OF COPIES (01 TO 10)
01
CENTER THE TITLE ON THE NEXT THREE LINES
MATERIAL AND RESOURCE REQUIREMENTS, BOARD STATS. AND VARIABLE COSTS FOR MAN-
UFACTURE OF STRUCTURAL PARTICLEBOARD PER UNIT OF OUTPUT (HYPOTHETICAL TEST)

APPENDIX C.—**Sample of Short Version Data Deck**

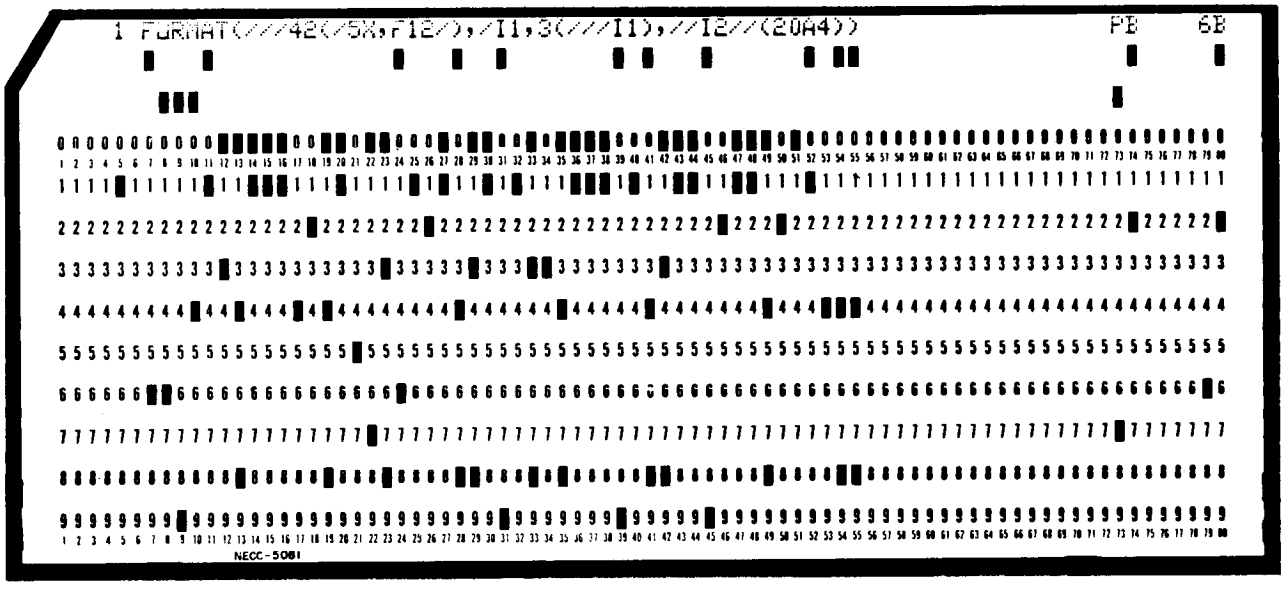
Data and cards of the short version data deck: The same sample data presented for the documented version sample in appendix A are presented here as they would be entered in the data deck for the short version.



APPENDIX D.-Program Cards 6 and 6B



Program card 6, to be used with the short version data deck:



Program Card 6B, for the long, documented version data deck:

Calculation of Fuel Statistics

PARVCOST uses the data input prices and heating values of the four types of external fuel-wood, coal, oil, and natural gas-to select the most economical fuel. It may become desirable to exclude one or more of these fuels from consideration (for example, natural gas may be excluded as a potential fuel if supplies are interruptible). Any one of the four fuels can be excluded as a fuel by inputting an imaginary high price for that fuel, because PARVCOST considers only the least expensive fuel. However, an accurate cost for procuring either oil or natural gas should always be entered in the data deck. The reason is oil or natural gas will be needed as an auxiliary fuel for wood residues, bark, and external wood fuel. The program calculates the cost of auxiliary fuel on the basis of the cost of oil or natural gas, whichever is cheapest per effective British thermal unit.

The price of fuel as given in the output (in dollars per million effective Btu's) is a weighted average that includes the cost of auxiliary fuel and the reduction in costs attributable to using process residue fuel. If process residues are sufficient to supply the energy requirement, fuel price is simply the price of auxiliary fuel per million effective British thermal units from residues and auxiliary fuel.

PARVCOST includes subroutines that calculate the effective heating value of fuels. All data for heating value entered in the data deck should be the "higher heating" value, which is the maximum heat released by combustion of dry fuel determined in a bomb calorimeter. This is the most common method of reporting the heating value of fuels.

Internal Program Assumptions

Several process variables are assigned fixed values within the PARVCOST program. These variables include the following:

PERM, the percent of nonrenewable fines loss, which is assigned a value of 3 percent in statement number 78;

FACT, the weight in pounds of a bone-dry unit of process residues mix, which is assigned a value of 2,400 in statement number 182;

AUXF, the percent of process requirement of British thermal units that must be supplied by auxiliary fuel for wood or residues fuel, which is assigned a value of 5 percent in statement number 109;

T1, the ambient temperature of fuel and air for combustion of residue fuels in degrees Fahrenheit, which is assigned a value of 68 in statement number 8 of subroutine SUB1;

T2, the stack gas temperature for combustion of residue fuels in degrees Fahrenheit, which is assigned a value of 400 in statement number 9 of subroutine SUB1; and

PCTR, the percent excess air in combustion of residue fuels, which is assigned a value of 40 percent in statement number 7 of subroutine SUB1.

If it is necessary to change any of these fixed assumptions, the program statements must be changed.

APPENDIX F.—Listing of PARVCOST Program and Documentation Cards

```
C*****************************************************************
C*****************************************************************
C*                                                               *
C*                                                               *
C*          PARTICLEBOARD  VARIABLE  COST  PROGRAM:  PARVCOST    *
C*                                                               *
C*                              BY                               *
C*                                                               *
C*                          PETER J. INCE                        *
C*                                                               *
C*                              AND                              *
C*                                                               *
C*                        GEORGE B.  HARPOLE                     *
C*                                                               *
C*                U. S.  FOREST  PRODUCTS LAB.,  USDA            *
C*                                                               *
C*                   MADISON,  WISCONSIN  53705                  *
C*                                                               *
C*                          MARCH, 1977                          *
C*                                                               *
C*                                                               *
C*                                                               *
C*       PARVCOST IS A FORTRAN PROGRAM DESIGNED TO ASSIST        *
C*   DEVELOPMENT OF ECONOMIC AND FINANCIAL ANALYSIS OF PARTICLEBOARD *
C*   MANUFACTURING SYSTEMS.  PARVCOST CALCULATES COSTS AND       *
C*   REQUIREMENTS OF WOOD,  CHEMICALS AND ENERGY PER UNIT OF     *
C*   FINISHED BOARD PRODUCT.  IT ESTIMATES SENSITIVITY OF FINISHED *
C*   PRODUCT COSTS TO CHANGES IN UNIT COSTS OF ENERGY AND RAN    *
C*   MATERIALS.  IT ALSO COMPUTES WEIGHT STATISTICS FOR THE      *
C*   FINISHED PRODUCT AND THE PROFIT CONTRIBUTION RATIO FOR      *
C*   GIVEN PRODUCT VALUES.                                       *
C*                                                               *
C*       PARVCOST PROGRAM INPUT REQUIRES ESTIMATES OF (1) SPECIFIC *
C*   GRAVITY AND MOISTURE CONTENT OF WOOD, BARK AND PRESSED PANEL, *
C*   (2) MARKET PRICES OF WOOD, CHEMICALS, RESIDUES, BARK,       *
C*   FUEL,  ELECTRICITY AND THE FINISHED BOARD PRODUCT, (3) RATIO *
C*   OF BARK TO WOOD IN ROUNDWOOD,  (4) PROCESS FINES LOSS PERCENT *
C*   AND WIDTH OF EDGING TRIMS,  (5) FINISHED PANEL SIZE. PERCENT *
C*   FACE AND CORE FURNISH,  AND PERCENTAGES OF CHEMICALS NEEDED *
C*   IN FURNISH, (6) B.T.U. VALUE OF RESIDUES, BARK AND FUEL,    *
C*   (7) B.T.U. REQUIREMENTS PER CUBIC FOOT OF OUTPUT FOR PROCESS *
C*   STEAM AND ALSO ELECTRICITY REQUIREMENTS.                    *
C*                                                               *
C*                                                               *
C*                                                               *
C*                          KEY  TERMS                           *
C*                          *  *  *  *                           *
C*                                                               *
C*   PER UNIT OF OUTPUT ***  (PER UNIT OF PRODUCT, PER CUBIC FOOT *
C*        CUT PANELS,  OR PER CUBIC FOOT OF CUT PANEL PRODUCT)   *
C*        EXCEPT FOR BOARD WEIGHT STATISTICS, PER UNIT OF OUTPUT *
C*        ALWAYS REFERS TO THE GROSS MATERIAL REQUIREMENTS OR    *
C*        COSTS OF INPUTS PER UNIT OF FINISHED BOARD PRODUCT     *
C*        OUTPUT AND INCLUDE THE QUANTITIES OR COSTS OF ALL      *
C*        MATERIALS LOST FROM THE FINISHED PRODUCT OUTPUT AS     *
C*        TRIMS OR RESIDUE.  BOARD WEIGHT STATISTICS ARE ABSOLUTE *
C*        STATISTICS WHICH DO NOT INVOLVE PROCESSING WEIGHT LOSSES. *
C*                                                               *
C*   SENSITIVITY OF UNIT VARIABLE COST ***  THE SENSITIVITY OF THE *
C*        UNIT VARIABLE COST (COST PER CUBIC FOOT OF OUTPUT) To THE *
C*        COSTS OF WOOD, RESIN, WAX ELECTRICITY, AND FUEL ARE    *
C*        EXPRESSED IN THE FORM OF LINEAR EQUATIONS, THESE       *
C*        EQUATIONS APPLY ONLY TO THE SENSITIVITY OF GROSS VARIABLE *
C*        COST PER CUBIC FOOT OF FINISHED PRODUCT OUTPUT.        *
C*                                                               *
C*                                                               *
C*****************************************************************
C*                                                               *
C*                                                               *
C*   ALPHABETICAL LISTING AND DEFINITIONS OF PROGRAM VARIABLES   *
C*                                                               *
C*                                                               *
C*      'INPUT'  MEANS  THE  VARIABLE IS AN  INPUT  VARIABLE     *
C*               AND  HENCE  OCCURS  ALSO IN  THE DATA  DECK     *
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C*                                                                      *
C*      'INTERNAL' MEANS THE VARIABLE IS USED STRICTLY WITHIN           *
C*            THE PROGRAM AND APPEARS ONLY FOR THE PURPOSES             *
C*            OF CALCULATION OR CLARIFICATION                           *
C*                                                                      *
C*      'OUTPUT' MEANS THE VARIABLE WILL APPEAR AS PART                 *
C*            OF THE PRINTED OUTPUT (A FEW VARIABLES ARE                *
C*            BOTH 'INPUT' AND 'OUTPUT')                                *
C*                                                                      *
C*      'SUB1'  MEANS THE VARIABLE IS USED WITHIN SUBROUTINE 'SUB1'     *
C*                                                                      *
C*      'SUB2'  MEANS THE VARIABLE IS USED WITHIN SUBROUTINE 'SUB2'     *
C*                                                                      *
C*      *       *       *       *       *       *       *       *       *
C*                                                                      *
C*  A1-A5...(OUTPUT) SENSITIVITY ANALYSIS FIRST ORDER COEFFICIENTS      *
C*            OR 'SLOPE' TERMS IN THE LINEAR EQUATIONS RELATING NET     *
C*            VARIABLE COST TO THE COST, ON AN INPUT BASIS OF ROUNDWOOD *
C*            RESIN, WAX, ELECTRIC POWER, AND FUEL                      *
C*                                                                      *
C*  ABTR....(INTERNAL) AVERAGE EFFECTIVE B.T.U. PER POUND OF            *
C*            RESIDUES                                                  *
C*                                                                      *
C*  AUXF....(INTERNAL) THE PERCENT OF TOTAL WOOD AND AUXILIARY FUEL     *
C*            ON A B.T.U. BASIS WHICH MUST BE AUXILIARY FUEL REQUIRED   *
C*            TO BURN WOOD OR BARK FUEL (AUXF IS ASSIGNED A VALUE BY    *
C*            THE PROGRAM)                                              *
C*                                                                      *
C*  AUXI....(OUTPUT) UNITS OF AUXILIARY FUEL REQUIRED (BARRELS OF OIL   *
C*            OR MCF OF NATURAL GAS) PER CUBIC FOOT OF CUT PANEL        *
C*            PRODUCT                                                   *
C*                                                                      *
C*  AVH.....(SUB1) AVAILABLE HEAT OF WOOD FUEL (BTU'S PER POUND)        *
C*                                                                      *
C*  B1-B5... (OUTPUT) SENSITIVITY ANALYSIS CONSTANTS IN THE LINEAR      *
C*            EQUATIONS RELATING NET VARIABLE COST TO THE COST, ON AN   *
C*            INPUT BASIS OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER,     *
C*            AND FUEL                                                  *
C*                                                                      *
C*  BAUX.... (OUTPUT) B.T.U.S SUPPLIED BY AUXILIARY FUEL PER CU. FT.    *
C*            CUT PANEL PRODUCT                                         *
C*                                                                      *
C*  BTBK....(OUTPUT) B.T.U. VALUE OF THE BARK FUEL GENERATED PER        *
C*            CUBIC FOOT OF CUT PANEL PRODUCT                           *
C*                                                                      *
C*  BTEF.... (SUB2) MILLION EFFECTIVE B.T.U. PER UNIT OF FUEL FOR       *
C*            NON-RESIDUE FUELS                                         *
C*                                                                      *
C*  BTFR.... (INTERNAL) MILLION EFFECTIVE B.T.U.'S IN PROCESS WOOD      *
C*            RESIDUE FUEL PER CUBIC FOOT CUT PANELS                    *
C*                                                                      *
C*  BTFU.... (SUB2) B.T.U. VALUE OF FUEL PER UNIT OF FUEL IN            *
C*            MILLION B.T.U. PER FUEL UNIT                              *
C*                                                                      *
CM  BT-+CCCC0+N-0T+00TP0T+ M+LL+ONS OF BCTC0C -+- +-E+ +T T+E B0+LE-    Q
C*            BY THE DRIER TO EVAPORATE ONE POUND OF MOISTURE           *
C*                                                                      *
C*  BTRH....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER    *
C*            FOR HEATING STEAM PER CUBIC FOOT OF CUT PANEL PRODUCT     *
C*                                                                      *
C*  BTRM....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER    *
C*            FOR MISCELLANEOUS PURPOSES PER CUBIC FOOT Of CUT PANEL    *
C*            PRODUCT                                                   *
C*                                                                      *
C*  BTRP.... (INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER   *
C*            FOR THE PRESS PER CUBIC FOOT OF CUT PANEL PRODUCT         *
C*                                                                      *
C*  BTRT.... (INPUT + OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER *
C*            FOR THE THAN POND PER CUBIC FOOT OF CUT PANEL PRODUCT     *
C*                                                                      *
C*  BTUB....(INPUT) HIGHER HEATING VALUE IN MILLIONS OF B.T.U. PER      *
C*            POUND OF OVEN DRY BARK FUEL                               *
C*                                                                      *
C*  BTUC....(INPUT) HIGHER HEATING VALUE OF COAL IN MILLION B.T.U.      *
C*            PER TON OF COAL                                           *
C*                                                                      *
C*  BTUE....(SUB1) EFFECTIVE B.T.U.S PER POUND OF WOOD OR BARK          *
C*            RESIDUES FUEL                                             *
C*                                                                      *
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C*    BTUF.... (INPUT) HIGHER HEATING VALUE IN MILLIONS OF B.T.U. PER      *
C*             POUND OF OVEN DRY FINES FUEL                                *
C*                                                                         *
C*    BTUG....(INPUT) HIGHER HEATING VALUE OF NAT. GAS IN MILLION          *
C*             B.T.U. OF NATURAL GAS                                       *
C*                                                                         *
C*    BTUO....(INPUT) HIGHER HEATING VALUE OF OIL IN MILLION B.T.U.        *
C*             PER BARREL OF OIL                                           *
C*                                                                         *
C*    BTUW....(INPUT) HIGHER HEATING VALUE OF EXTERNAL WOOD FUEL IN        *
C*             MILLION B.T.U. PER TON OF WOOD FUEL                         *
C*                                                                         *
C*    BTVF....(INTERNAL) EFFECTIVE B.T.U. VALUE OF FINES PER CUBIC         *
C*             FOOT OF CUT PANEL PRODUCT                                   *
C*                                                                         *
C*    BTWR.... (OUTPUT) MILLION EFFECTIVE B.T.U.'S IN WET WOOD             *
C*             RESIDUES PER CUBIC FOOT CUT PANELS                          *
C*                                                                         *
C*    CAUX.... (OUTPUT) THE COST OF AUXILIARY FUEL PER CUBIC FOOT OF       *
C*             CUT PANEL PRODUCT                                           *
C*                                                                         *
C*    CCUF....(INPUT) THE COST OF WOOD RAW MATERIAL PER CUBIC FOOT OF      *
C*             WOOD RAW MATERIAL                                           *
C*                                                                         *
C*    CFRW....(OUTPUT) CUBIC FEET OF WOOD RAW MATERIAL REQUIRED PER        *
C*             CUBIC FOOT OF CUT PANEL PRODUCT                             *
C*                                                                         *
C*    CKWH....(INPUT+OUTPUT) COST OF ELECTRICITY PER KILOWATT-HOUR         *
C*                                                                         *
C*    COBT....(OUTPUT) THE COST OF FUEL PER MILLION AVERAGE EFFECTIVE      *
C*             B.T.U.                                                      *
C*                                                                         *
C*    CORM.... (INPUT) F.O.B.-MILL MARKET VALUE OF THE RESIDUE MIX         *
C*             PER POUND OF RESIDUES                                       *
C*                                                                         *
C*    CORR....(INTERNAL) WEIGHT OF RESINS REQUIRED BY PROCESS FOR          *
C*             CORE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)   *
C*                                                                         *
C*    CORW....(INTERNAL) WEIGHT OF WAX REQUIRED BY PROCESS FOR CORE        *
C*             FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)        *
C*                                                                         *
C*    CRES.... (INPUT+OUTPUT) THE COST OF RESIN PER POUND OF RESIN         *
C*                                                                         *
C*    CWAX.... (INPUT+OUTPUT) THE COST OF WAX PER POUND OF WAX             *
C*                                                                         *
C*    DHL ..... (SUB1) DRY GAS HEAT LOSS PERCENT OF AVAILABLE HEAT         *
C*                                                                         *
C*    DMCT.... (SUB1) DRY BASIS MOISTURE CONTENT OF WOOD OR BARK FUEL      *
C*                                                                         *
C*    DRYH .... (OUTPUT) FUEL VALUE REQUIRED BY DRYER IN MILLION           *
C*             EFFECTIVE B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT        *
C*                                                                         *
C*    ERDF.... (INTERNAL) MILLION EFFECTIVE B.T.U.'S PER POUND OF          *
C*             PROCESS DRY WOOD RESIDUE FUEL                               *
C*                                                                         *
C*    EBTB....(INTERNAL) THE EFFECTIVE B.T.U.'S PER POUND OF BARK FUEL     *
C*                                                                         *
C*    EBTC....(INTERNAL) MILLION EFFECTIVE B.T.U. PER TON OF COAL          *
C*                                                                         *
C*    EBTG.... (INTERNAL) MILLION EFFECTIVE B.T.U. PER MCF OF NAT. GAS     *
C*                                                                         *
C*    EBTO....(INTERNAL) MILLION EFFECTIVE B.T.U. PER BARREL OF OIL        *
C*                                                                         *
C*    EBTW.... (INTERNAL) MILLION EFFECTIVE B.T.U. PER TON OF EXTERNAL     *
C*             (NON-PROCESS RESIDUE) WOOD FUEL                             *
C*                                                                         *
C*    EBWR....(INTERNAL) MILLION EFFECTIVE B.T.U.'S PER POUND OF           *
C*             PROCESS WET WOOD RESIDUE FUEL                               *
C*                                                                         *
C*    EFF ..... (SUB1) EFFICIENCY PERCENT OF AVAILABLE HEAT                *
C*                                                                         *
C*    FACR.... (INTERNAL) WEIGHT OF RESINS REQUIRED BY PROCESS FOR         *
C*             FACE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)   *
C*                                                                         *
C*    FACT.... (INTERNAL) NUMBER OF POUNDS PER BONE-DRY-UNIT               *
C*                                                                         *
C*    FACW.... (INTERNAL) WEIGHT OF WAX REOUIRED BY PROCESS FOR FACE       *
C*             FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)        *
C*                                                                         *
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C*    FPMC....(INPUT+OUTPUT) MOISTURE CONTENT OF THE WOOD IN THE          *
C*              FINISHED PRODUCT (PERCENT O.D. BASIS)                     *
C*                                                                        *
C*    FPSZ....(INTERNAL) FINISHED PANEL SIZE IN SQUARE INCHES             *
C*                                                                        *
C*    FRQN....(OUTPUT) NET FUEL VALUE REQUIRED IN MILLION EFFECTIVE       *
C*              B.T.U. PER CU. FT. OF CUT PANEL PRODUCT                   *
C*                                                                        *
C*    FUEL....(OUTPUT) THE UNITS OF EXTERNAL NON-RESIDUE FUEL (BARRELS,   *
C*              TONS, OR MCF) REQUIRED PER CUBIC FOOT OF CUT PANEL        *
C*              PRODUCT                                                   *
C*                                                                        *
C*    GBA.....(OUTPUT) GROSS BOARD WEIGHT OF PANELS PER CUBIC FOOT        *
C*              OF PANEL (IN POUNDS)                                      *
C*                                                                        *
C*    GMCT....(SUB1) GREEN BASIS MOISTURE CONTENT OF WOOD OR BARK FUEL    *
C*                                                                        *
C*    GRFF.... (INTERNAL) POUNDS OF PROCESS WOOD FUEL FINES AND TRIMS     *
C*              GENERATED PER CU. FT. OF CUT PANEL PRODUCT                *
C*                                                                        *
C*    GRMC....(INPUT. MOISTURE CONTENT OF WOOD FURNISH RAW MATERIAL       *
C*              BEFORE ENTERING PROCESS (% O.D.)                          *
C*                                                                        *
C*    GRWD.... (OUTPUT) POUNDS OF GREEN WOOD RAM MATERIAL REQUIRED        *
C*              PER CU. FT. OF CUT PANEL PRODUCT                          *
C*                                                                        *
C*    GRWF.... (INTERNAL) POUNDS OF PROCESS WOOD FUEL FINES AND TRIMS     *
C*              AVAILABLE (AFTER DEDUCTION OF THE NON-RENEWABLE LOSS)     *
C*              PER CUBIC FOOT OF CUT PANEL PRODUCT                       *
C*                                                                        *
C*    GWOD.... (OUTPUT) POUNDS OF OVEN DRY WOOD REQUIRED PER CUBIC        *
C*              FOOT OF CUT PANEL PRODUCT                                 *
C*                                                                        *
C*    GWOO....(INTERNAL) GROSS OVEN DRY WEIGHT OF PARTICLEBOARD           *
C*              OUTPUT PER CUBIC FOOT OF CUT PANEL PRODUCT (IN POUNDS)    *
C*                                                                        *
C*    GWTF.... (INTERNAL) GROSS POUNDS OF FURNISH (WOOD PLUS ANY          *
C*              RECYCLED TRIMS) PER CUBIC FOOT CUT PANEL PRODUCT          *
C*                                                                        *
C*    HHL..... (SUBI) HYDROGEN HEAT LOSS PERCENT OF AVAILABLE HEAT        *
C*                                                                        *
C*    HHTV.... (SUB1) THE HIGHER HEATING VALUE OF A WOOD OR BARK FUEL     *
C*              IN B.T.U.S PER POUND                                      *
C*                                                                        *
C*    IFOP....(INTERNAL) INTEGER OPTION VARIABLE SPECIFYING THE TYPE OF   *
C*              FUEL BEING USED: OIL, COAL, NAT. GAS OR WOOD              *
C*                                                                        *
C*    IOP1.... (INPUT) AN OPTION VARIABLE TO SPECIFY THE KIND OF          *
C*              OUTPUT TO BE DELIVERED IN COLUMN TWO OF THE PRINTOUT      *
C*                                                                        *
C*    IOP2.... (INPUT) AN OPTION VARIABLE TO SPECIFY THE KIND OF          *
C*              OUTPUT TO BE DELIVERED IN COLUMN THREE OF THE PRINTOUT    *
C*                                                                        *
C*    ITOP....(INPUT) AN OPTION VARIABLE TO SPECIFY WHETHER OR NOT        *
C*              TRIMS WILL BE RECYCLED AS FURNISH (0=RECYCLED, 1=TRIMS    *
C*              USED AS FUEL)                                             *
C*                                                                        *
C*    NAxF.... (INTERNAL) AN OPTION VARIABLE TO CONTROL THE TYPE OF       *
C*              AUXILIARY FUEL BEING USED (1 FOR OIL, 2 FOR NATURAL GAS)  *
C*                                                                        *
C*    NCOP....(INPUT) AN OPTION VARIARLE TO CONTROL THE NUMBER OF         *
C*              COPIES OF PRINTED OUTPUT (1 TO 10)                        *
C*                                                                        *
C*    NOPT....(INPUT) AN OPTION VARIABLE TO CONTROL THE WIDTH OF          *
C*              THE PRINTED OUTPUT (3 OR 5 COLUMS OF DATA)                *
C*                                                                        *
C*    ODMC.... (INPUT) MOISTURE CONTENT OF THE WOOD COMING OUT OF THE     *
C*              DRYER (% O.D.)                                            *
C*                                                                        *
C*    ODWP.... (INPUT+OUTPUT) THE OVEN DRY WEIGHT OF THE PRESSED PANELS   *
C*              PEW CUBIC FOOT OF PANEL (IN POUNDS)                       *
C*                                                                        *
C*    ODWW.... (OUTPUT) THE OVEN DRY WEIGHT OF WOOD AFTER PRESSING        *
C*              IN A CUBIC FOOT OF PRESSED PANEL (IN POUNDS)              *
C*                                                                        *
C*    P.......(INTERNAL) PRICE OF FUEL PER EFFECTIVE B.T.U.               *
C*                                                                        *
C*    PCCF.... (INPUT) PERCENT OF THE PRODUCT THAT IS CORE FURNISH        *
C*                                                                        *
C*    PCFF.... (INPUT) PERCENT OF THE PRODUCT THAT IS FACE FURNISH        *
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C*                                                                      *
C*   PCOL....(INPUT) PRICE OF COAL IN DOLLARS PER TON                   *
C*                                                                      *
C*   PCON....(OUTPUT) THE PROFIT CONTRIBUTION AS THE NET SALES VALUE    *
C*             MINUS THE VARIABLE COSTS OF PRODUCTION PER CUBIC FOOT    *
C*             OF CUT PANEL PRODUCT                                     *
C*                                                                      *
C*   PCRA....(OUTPUT) THE PROFIT CONTRIBUTION RATIO (RATIO OF THE       *
C*             PROFIT CONTRIBUTION TO NET SALES VALUE)                  *
C*                                                                      *
C*   PCTB....(INPUT+OUTPUT) VOLUME RATIO OF BARK TO WOOD IN THE         *
C*             ROUNDWOOD RAW MATERIAL EXPRESSED AS A DECIMAL            *
C*                                                                      *
C*   PCTF.... (INPUT+OUTPUT) THE RECOVERABLE PERCENT FINES-LOSS IN      *
C*             CUTTING AND CHIPPING OF RAW WOOD (PERCENT OF RAW WOOD)   *
C*                                                                      *
C*   PCTR....(SUB1) PERCENT EXCESS AIR IN RESIDUE FUEL COMBUSTION       *
C*             (ASSIGNED A VALUE OF 40% BY THE PROGRAM)                 *
C*                                                                      *
C*   PCTT....(OUTPUT) PERCENT OF PARTICLEBOARD OUTPUT THAT IS CUT       *
C*             AWAY AS TRIMS                                            *
C*                                                                      *
C*   PERM.... (INTERNAL) A PERCENT OF THE FINES GENERATED THAT IS       *
C*             PERMANENTLY LOST (NON-RECOVERABLE LOSS-NOT TO BE         *
C*             CONFUSED WITH 'PCTF')                                    *
C*                                                                      *
C*   PF..... (INTERNAL) COST OF EXTERNAL PURCHASED FUEL, EXCLUDING      *
C*             AUXILIARY FUEL PER CU. FT. CUT PANELS                    *
C*                                                                      *
C*   PGAS....(INPUT) PRICE OF NATURAL GAS IN DOLLARS PER MCF            *
C*                                                                      *
C*   POIL.... (INPUT) PRICE OF OIL IN DOLLARS PER BARREL                *
C*                                                                      *
C*   PPLG . . . .(INPUT) THE LENGTH OF THE CUT PANEL PRODUCT IN INCHES  *
C*                                                                      *
C*   PPWD....(INPUT) THE WIDTH OF THE CUT PANEL PRODUCT IN INCHES       *
C*                                                                      *
C*   PR . . . . . (OUTPUT) THE PERCENT OF THE OVEN DRY PANEL PRODUCT THAT *
C*             IS RESIN, BY WEIGHT                                      *
C*                                                                      *
C*   PRRC.... (INPUT) THE REQUIRED RESIN WEIGHT PERCENT OF CORE FURNISH *
C*                                                                      *
C*   PRRF....(INPUT) THE REQUIRED RESIN WEIGHT PERCENT OF FACE FURNISH  *
C*                                                                      *
C*   PTLG.... (INPUT) THE WIDTH IN INCHES OF THE STRIP OF TRIMS CUT     *
C*             AWAY ALONG THE PANEL LENGTH (AVERAGE FIGURE)             *
C*                                                                      *
C*   PTWD....(INPUT) THE WIDTH IN INCHES OF THE STRIP OF TRIMS CUT      *
C*             AWAY ALONG THE PANEL WIDTH (AVERAGE FIGURE)              *
C*                                                                      *
C*   PW......(OUTPUT) THE PERCENT OF THE OVEN DRY PANEL PRODUCT THAT    *
C*             IS WAX, BY WEIGHT                                        *
C*                                                                      *
C*   PWOD....(INPUT) PRICE OF EXTERNAL WOOD FUEL IN DOLLARS PER TON     *
C*                                                                      *
C*   PWRC....(INPUT) THE REQUIRED WAX PERCENT OF CORE FURNISH           *
C*                                                                      *
C*   PWRF.... (INPUT) THE REQUIRED WAX PERCENT OF FACE FURNISH          *
C*                                                                      *
C*   PWSR....(INPUT) THE PERCENT OF GREEN WOOD RAW MATERIAL WHICH IS    *
C*             LOST AS SCREENED WET RESIDUES IN THE PROCESS FROM THE    *
C*             DEBARKER TO THE DRYER BUT WHICH MAY BE RECOVERED AS      *
C*             'WET SCREENED' WOOD FUEL                                 *
C*                                                                      *
C*   RDWC....(OUTPUT) THE COST OF WOOD RAW MATERIAL PER CUBIC FOOT      *
C*             OF CUT PANEL PRODUCT                                     *
C*                                                                      *
C*   RESR....(OUTPUT) MARKET VALUE OR REALIZATION FOR EXCESS RESIDUES   *
C*             (ASSUMES EXCESS RESIDUES ARE MARKETED IN A MIX WITH      *
C*             AMOUNTS OF EACH RESIDUE TYPE PROPORTIONAL TO AMOUNTS     *
C*             PRODUCED) PER CU. FT. CUT PANEL PRODUCT                  *
C*                                                                      *
C*   RESV.... (OUTPUT) MARKET VALUE OF RESIDUE MIX PER BONE-DRY-UNIT    *
C*             (2400 POUNDS)                                            *
C*                                                                      *
C*   RKWH.... (INPUT+OUTPUT) THE REQUIRED KILOWATT-HOURS OF ELECTRICITY *
C*             PER CUBIC FOOT OF CUT PANEL PRODUCT                      *
C*                                                                      *
C*   SALE.... (INPUT+OUTPUT) THE NET SALES VALUE OF THE CUT PANEL       *
C*             PRODUCT PER CUBIC FOOT                                   *
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C*                                                                      *
C*   SGBK....(INPUT) THE OVEN DRY SPECIFIC GRAVITY OF THE BARK          *
C*                                                                      *
C*   SGRW.... (INPUT+OUTPUT) THE OVEN DRY SPECIFIC GRAVITY OF THE WOOD  *
C*            RAW MATERIAL                                              *
C*                                                                      *
C*   SHL . . . . . (SUB1) SENSIBLE HEAT LOSS (HEAT LOSS DUE TO MOISTURE)*
C*            PERCENT OF AVAILABLE HEAT                                 *
C*                                                                      *
C*   T1 . . . . . (SUB1) TEMPERATURE OF RESIDUE FUELS AND FURNACE AIR   *
C*            BEFORE COMBUSTION IN DEGREES FAHRENHEIT                   *
C*                                                                      *
C*   T2 . . . . . (SUBl) STACK GAS TEMPERATURE FOR COMBUSTION OF RESIDUE*
C*            FUELS IN DEGREES FAHRENHEIT                               *
C*                                                                      *
C*   TBTG....(OUTPUT) TOTAL FUEL VALUE GENERATED, MILLION EFFECTIVE     *
C*            B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT                *
C*                                                                      *
C*   TBTR.... (OUTPUT) TOTAL FUEL VALUE REQUIRED BY DRYER AND PROCESS   *
C*            STEAM, MILLION B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT *
C*                                                                      *
C*   TCDH....(OUTPUT) THE DRYER HEAT PORTION OF HEAT ENERGY COST        *
C*            PER CUBIC FOOT OF CUT PANEL PRODUCT                       *
C*                                                                      *
C*   ICFR..... (INTERNAL) THE TOTAL COST OF FUEL PER CUBIC FOOT OF CUT  *
C*            PANEL PRODUCT (INCLUDES COST OF AUXILIARY FUEL)           *
C*                                                                      *
C*   TCKw.... (OUTPUT) THE TOTAL COST FOR ELECTRIC POWER PER CUBIC      *
C*            FOOT OF CUT PANEL PRODUCT                                 *
C*                                                                      *
C*   TCPS.... (OUTPUT) THE PROCESS STEAM SHARE OF TOTAL HEAT ENERGY     *
C*            COST PER CUBIC FOOT OF CUT PANEL PRODUCT                  *
C*                                                                      *
C*   TCRE.... (OUTPUT) TOTAL COST OF RESIN PER CUBIC FOOT OF CUT        *
C*            PANEL PRODUCT                                             *
C*                                                                      *
C*   TCwX.... (OUTPUT) TOTAL COST OF  WAX PER CUBIC FOOT OF CUT PANEL   *
C*            PRODUCT                                                   *
C*                                                                      *
C*   THL..... (SUB1) TOTAL HEAT LOSS PERCENT OF AVAILABLE HEAT          *
C*                                                                      *
C*   TITL.... (INPUT+OUTPUT) AN ALPHANUMERIC ARRAY FOR THE PRINTED      *
C*            OUTPUT TITLE WHICH MAY BE SPECIFIED IN THE DATA DECK      *
C*                                                                      *
C*   TMWT.... (INTERNAL) POUNDS OF TRIMS GENERATED PER CUBIC FOOT of    *
C*            CUT PANEL PRODUCT                                         *
C*                                                                      *
C*   lNVC.... (OUTPUT) THE GROSS VARIABLE COST OF ENERGY AND RAW        *
C*            MATERIALS FOR THE PROOUCTION PROCESS PER CUBIC FOOT OF    *
C*            CUT PANEL PRODUCT                                         *
C*                                                                      *
C*   TRES.... (OUTPUT) TOTAL WEIGHT OF RESIN REQUIRED IN POUNDS PER     *
C*            CUBIC FOOT OF CUT PANEL PRODUCT                           *
C*                                                                      *
C*   TRMS....(INTERNAL) SQUARE INCHES OF TRIM LOSS PER PANEL            *
C*                                                                      *
C*   TWAX....(OUTPUT) TOTAL WEIGHT OF WAX REQUIRED IN POUNDS PER        *
C*            CUBIC FOOT OF CUT PANEL PRODUCT                           *
C*                                                                      *
C*   V(I, J)..(OUTPUT) TWO DIMENSIONAL ARRAY FOR STORAGE OF OUTPUT      *
C*            VARIABLES AND CONVERSION TO MSF AND CUBIC METER BASIS     *
C*            BASIS                                                     *
C*                                                                      *
C*   WBMC....(INPUT) THE MOISTURE CONTENT OF THE BARK (PERCENT          *
C*            OVEN DRY BASIS)                                           *
C*                                                                      *
C*   WOR . . . . . (OUTPUT) WEIGHT OF RESINS IN THE PANELS (IN POUNDS   *
C*            PER CUBIC FOOT OF PRESSED PANEL)                          *
C*                                                                      *
C*   WOW..... (OUTPUT) WEIGHT OF WATER IN THE PANELS (IN POUNDS PER     *
C*            CUBIC FOOT OF PRESSED PANEL)                              *
C*                                                                      *
C*   WTWD.... (SUB1) WEIGHT OF DRY FUEL PER POUND OF GREEN OR WET       *
C*            WOOD OR BARK FUEL                                         *
C*                                                                      *
C*   WTWR....(INTERNAL) POUNDS OF WET WOOD RESIDUES GENERATED PER       *
C*            CUBIC FOOT CUT PANEL PRODUCT                              *
C*                                                                      *
C*   WWX..... (OUTPUT) WEIGHT OF WAX IN THE PANELS (IN POUNDS PER       *
C*            CUBIC FOOT OF PRESSED PANEL)                              *
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      DIMENSION V(5,40), TITL (60) , P (4)                                    PB    1
      READ (5,1) CCUF, SGRW, GRMC, PCTB, WBMC, SGBK, CRES, PRRF, PRRC, CWAX, PWRF, PB    2
     1PWRC, ODMC, PCTF, PCFF, PCCF, ODWP, FPMC, PTLG, PTWD, PWSR, CORM, CKWH, BTUF, PB    3
     2BTUB, BTRD, BTRP, BTRT, BTRH, BTRM, RKWH, PPWD, PPLG, SALE, PGAS, POIL, PWOD, PB    4
     3PCOL, BTUG, BTUO, BTUW, BTUC, ITOP, IOP1, IOP2, NOPT, NCOP, (TITL (I), I=1, 60) PB    5
    1 FORMAT (6 (7 (F10) / ), 4I1, I2/(20A4))                                 PB    6
      V(1,1)=SALE                                                             PB    7
      V(1,13)=ODWP                                                            PB    8
      V(1,34)=RKWH                                                            PB    9
C *** WATER WT, IN CU. FT. PRESSED PANEL (M.C. BASED ON O.D. WT.)             PB   10
      WOW=ODWP * FPMC                                                         PB   11
      V(l,l2)=WOW                                                             PB   12
C *** RESIN WT. IN CU. FT. PRESSED PANEL-EXCLUDING RECYCLED TRIMS RESIN       PB   13
      WOR=ODWP * ((PCFF * PPRF) + (PCCF * PRRC))                              PB   14
      V(1,14)=WOR                                                             PB   15
C *** WAX WT. IN CU. FT. PRESSED PANEL-EXCLUDING RECYCLED TRIMS WAX           PB   16
      WWX=ODWP * ((PCFF * PWRF) + (PCCF * PWRC))                              PB   17
      V(l,l5)=WWX                                                             PB   18
C *** O.D. WT. OF WOOD (OR 'FURNISH' IF TRIMS RECYCLED) IN CU. FT. PANEL      PB   19
      CWW=ODWP-WOR-WWX                                                        PB   20
      V(1,17)=ODWW                                                            PB   21
C *** WT. OF PANELS INCLUDING MOISTURE/CU. FT.                                PB   22
      GBW=ODWP+WOW                                                            PB   23
      V(l,l1)=GBW                                                             PB   24
C *** RESIN WEIGHT PERCENT OF FURNISH, WAX AND RESIN IN O.D. PANEL            PB   25
      PR=WOR/ODWP                                                             PB   26
C *** WAX WEIGHT PERCENT OF FURNISH, WAX AND RESIN IN O.D. PANEL              PB   27
      PW=WWX/ODWP                                                             PB   28
C *** SQUARE INCH OF TRIM LOSS PER PANEL                                      PB   29
      TRMS = ((PTLG * PPLG) + (PTWD * (PPWD + (2.0 * PTLG)))) * 2.0           PB   30
C *** FINISHED PANEL SIZE IN SQ. IN.                                          PB   31
      FPSZ = PPLG * PPWD                                                      PB   32
C *** PERCENT OF GROSS OUTPUT THAT IS TRIMS                                   PB   33
      PCTT = TRMS / (FPSZ + TRMS)                                             PB   34
C *** O.D. WT. OF GROSS OUTPUT PER CU. FT. TRIMMED FINISHED PANELS            PB   35
      GWOO = ODWP * (1.0 / (1.0-PCTT))                                        PB   36
C *** WEIGHT OF FACE RESINS REQUIRED PER CU. FT. CUT PANELS                   PB   37
      FACR = GWOO * PRRF * PCFF                                               PB   38
C *** WEIGHT OF CORE RESINS REQUIRED PER CU. FT. OF CUT PANELS                PB   39
      CORR=GWOO * PRRC * PCFF                                                 PB   40
C *** WEIGHT OF FACE WAX REQUIRED PER CU. FT. OF CUT PANEL PRODUCT            PB   41
      FACW = GWOO * PWRF * PCFF                                               PB   42
C *** WEIGHT OF CORE WAX REQUIRED PER CU. FT. OF CUT PANEL PRODUCT            PB   43
      CORW = GWOO * PWRC * PCCF                                               PB   44
C *** TOTAL WT. OF RESIN REQUIRED/CU. FT. CUT PANELS                          PB   45
      TRES=FACR+CORR                                                          PB   46
      V(1,21) = TRES                                                          PB   47
C *** TOTAL WT. OF WAX REQUIRED/CU. FT. CUT PANELS                            PB   48
      TWAX = FACW + CORW                                                      PB   49
      V(1,22) = TWAX                                                          PB   50
C *** TOTAL COST OF RESIN / CU. FT. CUT PANELS                                PB   51
      TCRE = TRES * CRES                                                      PB   52
      V(1,3) = TCRE                                                           PB   53
C *** TOTAL COST OF WAX / CU. FT. CUT PANELS                                  PB   54
      TCWX = TWAX * CWAX                                                      PB   55
      V(1,4) = TCWX                                                           PB   56
C *** GROSS LBS. OF FURNISH NEEDED / CU. FT. CUT PANEL                        PB   57
      GWTF = (GWOO - (TWAX + TRES))                                           PB   58
C *** GROSS O.D. LBS. OF WOOD NEEDED IF TRIMS ARE NOT RECYCLED                PB   59
      IF (ITOP .EQ. 1) GWOD = (GWTF * (1.0 / (1.0 - PCTF))) * (1.0 / (1.0 - PWSR))  PB   60
C *** LBS. OF TRIMS GENERATED / CU. FT. CUT PANELS                            PB   61
      TMWT = GWOO * PCTT                                                      PB   62
C *** GROSS O.D. LBS. OF WOOD NEEDED IF TRIMS ARE RECYCLED                    PB   63
      IF (ITOP .EQ. 0) GWOD = (GWTF - (0.5 * TMWT)) * (1.0/(1.0-PCTF)) * (1.0 / (1,0-PB   64
     1PWSR))                                                                  PB   65
      V(1, 18) = GWOD                                                         PB   66
C *** GROSS LBS. OF GREEN WOOD NEEDED / CU. FT. CUT PANELS                    PB   67
      GRWD = GWOD * (1.0 + GRMC)                                              PB   68
      V (1,19) = GRWD                                                         PB   69
C *** CU. FT. OF ROUNDWOOD NEEDED / CU. FT. CUT PANELS                        PB   70
      CFRW = GWOD ~ (1.0 / (62.4 * SGRW))                                     PB   71
      V(l,20) = CFRW                                                          PB   72
C *** LBS. OF GENERATED DRY FUEL FINES AND TRIMS / CU. FT. CUT PANELS         PB   73
      IF (ITOP .EQ. 0) GRFF = ((GWTF - (0.5 * TMWT)) * (1.0 - PCTF))) - (GWTF- (0PB   74
     1.5 * TMWT)) + 0.5 * TMWT                                                PB   75
      IF (ITOP .EQ. 1) GRFF = (GWTF * (1.0/ (1.0 - PCTF)) - GWTF) + TMWT      PB   76
C *** PERM = THE NON-RENEWABLE FINES LOSS PERCENT (PERMANENTLY LOST)          PB   77
      PERM = 0.03                                                             PB   78
C *** LBS OF GENERATED DRY WOOD FUELS MINUS THE NON-RENEWABLE LOSS            PB   79
      GRWF = GRFF - (GRFF * PERM)                                             PB   80
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C ***  B.T.U.  VALUE OF DRIED WOOD FUELS / CU. FT. CUT PANELS                    PB  81
       CALL SUB1 (BTUF, ODMC, EBDF)                                              PB  82
       BTVF = GRWF * (1.0 + ODMC) * EBDF                                         PB  83
       V(1,29) = BTVF                                                            PB  84
C ***  POUNDS OF WET SCREENED WOOD RESIDUE FUEL (FROM DEBARKER)                  PB  85
       WTWR = GPWD * PWSR                                                        PB  86
C ***  B.T.U.  VALUE OF WET SCREENED WOOD RESIDUE / CU. FT. CUT PANEL            PB  87
       CALL SUB1 (BTUF, GRMC, EBWR)                                              PB  88
       BTWR = WTWR * EBWR                                                        PB  89
C ***  TOTAL B.T.U. VALUE OF GENERATED WOOD FUELS                                PB  90
       BTFR = BTVF + BTWR                                                        PB  91
C ***  B.T.U.  VALUE OF BARK / CU. FT. CUT PANELS                                PB  92
       CALL SUB1 (BTUR, WBMC, EBTB)                                              PB  93
       HTBK = PCTB * (SGBK / SGRW) * GRWD * EBTB                                 PB  94
       V (l,30) = BTBK                                                           PB  95
C ***  TOTAL FUEL VALUE GENERATED / CU. FT. CUT PANELS                           PB  96
       TPTG = BTFR + BTBK                                                        PB  97
C ***  WEIGHTED AVERAGE EFFECTIVE B.T.U. PER POUND OF RESIDUE MIX                PB  98
       ABTR = TBTG / (GRWF + WTWR + PCTB * GRWD * (SGBK / SGRW))                 PB  99
       V(l,3l) = TBTG                                                            PB 100
C ***  FUEL VALUE REQUIRED BY DRYER / CU. FT. CUT PANELS                         PB 101
       DBYH = (GWOD * GRMC - GWOD * ODMC) * BTRD                                 PB 102
       V(1,23) = DRYH                                                            PB 103
C ***  TOTAL FUEL VALUE REQUIRED, DRYER AND PROC, STEAM / CU. FT. PANELS         PB 104
       TBTR = DRYH + BTRP + BTRT + BTRH + BTRM                                   PB 105
       V(l.28) = TBTR                                                            PB 106
C ***  AUXF IS THE AVG.  PERCENT OF GENERATED B.T.U.'S THAT MUST COME            PB 107
C ***  FROM AUXILIARY OIL FUEL FOR B.T.U.'S GENERATED WITH WOOD FUELS            PB 108
       AUXF = 0.15                                                               PB 109
C ***  NET EXTERNAL FUEL B.T.U. REQUIRED / CU. FT. CUT PANEL                     PB 110
       FRQN = TBTR - (TBTG * (1.0 / (1.0 - AUXF)))                               PB 111
       IF (FRQN .LE. 0.0) FRQN = 0.0                                             PB 112
       V(1,32) = FRQN                                                            PB 113
       TCFR = 0.0                                                                PB 114
       TCPS = 0.0                                                                PB 115
       TCDH = 0.0                                                                PB 116
       FUEL = 0.0                                                                PB 117
       IF (FRQN .LE. 0.0) IFDP = 4                                               PB 118
       PF = 0.0                                                                  PB 119
       CALL SUB2 (BTUD, EBTO, 0)                                                 PB 120
       CALL SUB2 (BTUC, EBTC, l)                                                 PB 121
       CALL SUB2 (BTUG, EBTG, 2)                                                 PB 122
       CALL SUB2 (BTUW, EBTW, 3)                                                 PB 123
       P (1) = POIL * (EBTO ** - 1.0)                                            PB 124
       P (2) = PCOL * (EBTC ** - 1.0)                                            PB 125
       P (3) = PGAS * (EBTG ** - 1.0)                                            PB 126
       P (4) = PWOD + (1.0 - AUXF) * (EBTW ** - 1.0) + (POIL * AUXF * (EBTO ** - 1.0))  PB 127
C ***  FIND THE CHEAPEST AUXILIARY FUEL (OIL OR NAT. GAS)                        PB 128
       IF (P (1) .LT. P (3)) NAXF = 1                                            PB 129
       IF (P (31 .LT. P (1)) NAXF =3                                             PB 130
       IF (IFOP .EQ. 4) GO TO 40                                                 PB 131
C ***  FIND THE CHEAPEST EXTERNAL FUEL; OIL, COAL, GAS, OR WOOD PER BTU          PB 132
       IFOP = 0                                                                  PB 133
       K = IFOP + 1                                                              PB 134
       DO 10 I = 2,4                                                             PB 135
       IF (P (I) .LT. P(K)) K = I                                                PB 136
    10 CONTINUE                                                                  PB 137
       IFOP = (K - 1)                                                            PB 138
C ***  TOTAL COST OF EXTERNAL FUEL PER CU. FT. CUT PANEL                         PB 139
       PF = P (K) * FRQN                                                         PB 140
C ***  CALCULATE UNITS OF EXTERNAL FUEL REQUIRED, BBL, OIL, MCF, NAT,            PB 141
C ***  GAS, TONS COAL OR TONS WOOD (EXCLUDING AUXILIARY OIL)                     PB 142
       IF (IFOP .EQ.  0) FUEL = FRQN * (EBTO ** - 1.0)                           PB 143
       IF (IFOP .EQ. 1) FUEL = FRQN * (EBTC ** - 1.0)                            PB 144
       IF (IFOP .EQ. 2) FUEL = FRQN * (EBTG *** 1.0)                             PB 145
       IF (IFOP .EQ. 3) FUEL = (FRQN - (AUXF * FRQN)) * (EBTW ** - 1.0)          PB 146
C ***  WEIGHTED AVERAGE COST PER MILLION EFFECTIVE B.T.U. Of FUEL                PB 147
       IF (IFOP .EQ.  0) COBT = P (1) * ((FRQN / TBTR) + ((TBTR - FRQN) / TBTR) * AUXF)  PB 148
       IF (IFOP .EQ. 1) COBT = P (2) * ((FRQN / TBTR) + ((TBTR - FRQN) / TBTR) * AUXF)  PB 149
       IF (IFOP .EQ. 2) COBT = P (3) * ((FRQN / TBTR) + ((TBTR - FRQN) / TBTR) * AUXF)  PB 150
       IF (IFOP .EQ. 3) COBT = P (4) * FRQN / TBTR + P (1) ~ ((TBTR - FRQN) / TBTR) * AUXF  PB 151
       RESR = 0.0                                                                PB 152
    40 CONTINUE                                                                  PB 153
       V (1, 33) = FUEL                                                          PB 154
C ***  CALCULATE AUXILIARY FUEL NEEDED (AUXI) PER CU. FT. CUT PANEL              PB 155
C ***  UNITS OF AUXILIARY FUEL REQUIRED TO BURN RESIDUES                         PB 156
       IF (NAXF .EQ.  1) AUXI = (AUXF / (1.0 - AUXF)) * TBTG * (EBTO ** - 1.0)   PB 157
       IF (NAXF .EQ.  3) AUXI = (AUXF / (1.0 - AUXF)) * TBTG * (EBTG ** - 1.0)   PB 158
C ***  AUXILIARY FUEL REQUIRED IF ONLY WOOD FUEL (INCL. RESIDUES) IS USED        PB 159
       IF (IFOP .GE. 3 .AND. NAXF .EQ. 1) AUXI = AUXF * TBTR * (EBTO ** - 1.0)   PB 160
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      IF (IFOP .GE. 3 .AND. NAXF .EQ. 3) AUXI = AUXF * TBTR * (EBTG ** - 1.0)   PB 161
      V (1, 35) = AUXI                                                          PB 162
C *** B.T.U.S SUPPLIED BY AUXILIARY FUEL PER CU. FT. CUT PANEL                  PB 163
      IF (NAXF .EQ. 1) BAUX = AUXI * EBTO                                       PB 164
      IF (NAXF .EQ. 3) BAUX = AUXI * EBTG                                       PB 165
      V (1, 37) = BAUX                                                          PB 166
C *** CALCULATE COST OF AUXILIARY FUEL PER CU. FT. CUT PANEL                    PB 167
      IF (NAXF .EQ. 1) CAUX = AUXI * POIL                                       PB 168
      IF (NAXF .EQ. 3) CAUX = AUXI * PGAS                                       PB 169
C *** TOTAL COST OF PURCHASED FUEL PER CU. FT. CUT PANEL                        PB 170
      TCFR = CAUX + PF                                                          PB 171
      TCDH = (DRYH / TBTR) * TCFR                                               PB 172
      TCPS = TCFR - TCDH                                                        PB 173
      IF (IFOP .WE. 4) GO TO 50                                                 PB 174
C *** RESIDUE REALIZATION IF EXCESS RESIDUES ARE AVAILABLE                      PB 175
      RESR = (TBTR * (1.0 - AUXF) - TBTG) * (ABTR ** - 1.0) * CORM              PB 176
C *** WEIGHTED AVERAGE COST PER B.T.U.                                          PB 177
      IF (NAXF .EQ. 1) COBT * POIL * (EBTO ** - 1.0) * AUXF                     PB 178
      IF (NAXF .EQ. 3) COBT = PGAS * (EBTG ** - 1.0) * AUXF                     PB 179
   50 CONTINUE                                                                  PB 180
C *** FACT = APPROX. POUNDS PER BONE DRY UNIT OF PROCESS RESIDUES               PB 181
      FACT = 2400.0                                                             PB 182
C *** RESV = VALUE OF PROCESS RESIDUES / BDU                                    PB 183
      RESV = CORM * FACT                                                        PB 184
C *** COST OF ROUNDWOOD / CU. FT. CUT PANELS                                    PB 185
      RDWC = CFRW * CCUF                                                        PB 186
      V (1, 2) = RDWC                                                           PB 187
C *** COST OF ELECTRICITY                                                       PB 188
      TCKW = RKWH * CKWH                                                        PB 189
C *** TOTAL NET VARIABLE COST / CU. FT. CUT PANELS                              PB 190
      TNVC = RDWC + TCRE + TCWX + TCKW + TCPS + RESR + TCDH                     PB 191
C *** PROFIT CONTRIBUTION AND RATIO TO SALES VALUE                              PB 192
      PCON = SALE-TNVC                                                          PB 193
      PCRA = PCON/SALE                                                          PB 194
      V(1, 5) = TCKW                                                            PB 195
      V(1, 6) = TCDH                                                            PB 196
      V(1, 7) = TCPS                                                            PB 197
      V(1, 8) = RESR                                                            PB 198
      V(1, 9) = TNVC                                                            PB 199
      V(1, 10) = PCON                                                           PB 200
      V(1, 24) = BTRP                                                           PB 201
      V(1, 25) = BTRT                                                           PB 202
      V(1, 26) = BTRH                                                           PB 203
      V(1, 27) = BTRM                                                           PB 204
      V(1, 36) = BTWR                                                           PB 205
      IF (ITOP .EQ. 0) PCTT = 0.5 * PCTT                                        PB 206
C ***                                                                           PB 207
C *** ANALYSIS OF SENSITIVITY OF NET VARIABLE COST TO THE COST, ON AN            PB 208
C *** INPUT BASIS, OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER, AND FUEL           PB 209
C ***                                                                           PB 210
C *** SENSITIVITY TO ROUNDWOOD COST (ROUNDWOOD COST/CU. FT. = × )               PB 211
C *** TNVC = (CFRW) * (CCUF) + (TNVC - RDWC)      (Y = A * × + B)               PB 212
      A1 = CFRW                                                                 PB 213
      B1 = TNVC - RDWC                                                          PB 214
C *** SENSITIVITY TO RESIN COST (RESIN COST/LB. = × )                           PB 215
C *** TNVC = (TRES) * (CRES) + (TNVC - TCRE)      (Y = A * × + B )              PB 216
      A2 = TRES                                                                 PB 217
      B2 = TNVC - TCRE                                                          PB 218
C *** SENSITIVITY TO WAX COST (WAX COST/LB. = × )                               PB 219
C *** TNVC = (TWAX) * (CWAX) + (TNVC - TCWX)      (Y = A * × B)                 PB 220
      A3 = TWAX                                                                 PB 221
      B3 = TNVC - TCWX                                                          PB 222
C *** SENSITIVITY TO ELECTRIC POWER COST (COST/KWH = × )                        PB 223
C *** TNVC = (RKWH) * (CKWH) + (TNVC - TCKW)      (Y = * X + B)                 PB 224
      A4 = RXWH                                                                 PB 225
      B4 = TNVC - TCKW                                                          PB 226
C *** SENSITIVITY TO FUEL COST (PRICE OF FUEL/FUEL UNIT = × )                   PB 227
      IF (IFOP .EQ. 0) B5 = TNVC - FUEL * POIL                                  PB 228
      IF (IFOP .EQ. 1) B5 = TNVC - FUEL * PCOL                                  PB 229
      IF (IFOP .EQ. 2) B5 = TNVC - FUEL * PGAS                                  PB 230
      IF (IFOP .EQ. 3) B5 = TNVC - FUEL * PWOD                                  PB 231
      A5 = FUEL                                                                 PB 232
      A6 = AUXI                                                                 PB 233
      B6 = TNVC - CAUX                                                          PB 234
      IF (IFOP .EQ. 0 .OR. IFOP .EQ. 2) A5=A5+A6                                PB 235
      IF (IFOP .EQ. 0 .OR. IFOP .EQ. 2) B5=B5-CAUX                              PB 236
C ***                                                                           PB 237
C *** DETERMINE OUTPUT VARIABLES                                                PB 238
C ***                                                                           PB 239
      DO 60 M = 1, 37                                                           PB 240
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      IF (IOP1 .EQ. 0)  V(2,M)= 31.25 * V(1,M)                          PB    241
      IF (IOP1 .EQ. 1)  V(2,M)= 20.833333 * V(1,M)                      PB    242
      IF (IOP1 .EQ. 2)  V(2,M)= 62.5  * V(1,M)                          PB    243
      IF (IOP1 .EQ. 3)  V(2,M)= 52.08333 * V(1,M)                       PB    244
      IF (IOP1 .EQ. 4)  V(2,M)= 41.6667 * V(1,M)                        PB    245
      IF (IOP2 .EQ. 0)  V(3,M)= 41.6667 * V(1,M)                        PB    246
      If (IOP2 .EQ. 1)  V(3,M)= 20.833333 * V(1,M)                      PB    247
      IF (IOP2 .EQ. 2)  V(3,M)= 62.5 * V(1,M)                           PB    248
      IF (IOP2 .EQ. 3)  V(3,M)= 52.08333 * V(1,M)                       PB    249
      IF (IOP2 .EQ. 4)  V(3,M)= 35.31 * V(1,M)                          PB    250
      IF (NOPT .EQ. 3)  GO TO 60                                        PB    251
      V(4,M)=52.08333 * V(1,M)                                          PB    252
      V(5,M)=35.31 * V(1,M)                                             PB    253
   60 CONTINUE                                                          PB    254
      IF (NOPT .NE. 3) J=5                                              PB    255
      IF (NOPT .EQ. 3) J=3                                              PB    256
      PR=100.0*PR                                                       PB    257
      PW=100.0*PW                                                       PB    258
      FPMC=100.0*FPMC                                                   PB    259
      PCRA=100.0*PCRA                                                   PB    260
      PCTF=100.0*PCTF                                                   PB    261
      PCTT=100.0*PCTT                                                   PB    262
      DO 998 K=1.10                                                     PB    263
      IF (K .GE. (NCOP + 1)) GO TO 999                                  PB    264
      IF (NOPT .NE. 3) WRITE(6,70)  (TITL(I),I=1,60)                    PB    265
   70 FORMAT('1',3(25×,20A4/)///)                                       PB    266
      IF (NOPT .EQ. 3) WRITE(6,80)  (TITL(I),I=1,60)                    PB    267
   80 FORMAT('1',3(20A4/)///)                                           PB    268
      WRITE(6,90)                                                       PB    269
   90 FORMAT(' ',32×,'$/CU.FT.')                                        PB    270
      IF (IOP1 .EQ. 0) WRITE (6,100)                                    PB    271
  100 FORMAT('+',44×,'$/MSF 3/8 IN. BASIS')                             PB    272
      IF (IOP1 .EQ. 1) WRITE (6,110)                                    PB    273
  110 FORMAT('+',44×,'$/MSF 1/4 IN. BASIS')                             PB    274
      IF (IOP1 .EQ. 2) WRITE (6,120)                                    PB    275
   20 FORMAT('+',44×,'$/MSF 3/4 IN. BASIS')                             PB    276
      IF (IOP1 .EQ. 3) WRITE(6,130)                                     PB    277
   30 FORMAT('+',44×.'$/MSF 5/8 IN. BASIS')                             PB    278
      IF (IOP1 .EQ. 4) WRITE (6,l40)                                    PB    279
  140 FORMAT('+'.44×,'$/MSF 1/2 IN. BASIS')                             PB    280
      IF (IOP2 .EQ. 0) WRITE (6,150)                                    PB    281
  150 FORMAT('+',44×.'1/2 IN. BASIS')                                   PB    282
      If (IOP2 .EQ. 1) WRITE (6,160)                                    PB    283
  160 FORMAT('+',66×.'1/4 IN. BASIS')                                   PB    284
      IF (IOP2 .EQ. 2) WRITE (6,170)                                    PB    285
  170 FORMAT('+',66×, '3/4 IN. BASIS')                                  PB    286
      IF (IOP2 .EQ. 3) WRITE (6,180)                                    PB    287
  180 FORMAT('+',66×, '5/8 IN. BASIS')                                  PB    288
      IF (IOP2 .EQ. 4) WRITE (6,190)                                    PB    289
  190 FORMAT('+',66×, '$/CUBIC METER')                                  PB    290
      IF (NOPT .EQ. 0) WRITE(6,200) (V(I,1),I=1,5)                      PB    291
  200 FORMAT('+',84×,'5/8 IN. BASIS',5×,'$/CU.METER'/                   PB    292
     1' NET SALES VALUE',17×,'$',F7.4,7×,3('$',F9.3,8×),'$'S',F9,.3/)   PB    293
      IF (NOPT .EQ. 3) WRITE(6,210) (V(I,1),I=1,3)                      PB    294
  210 FORMAT('NET SALES VALUE',l7×, '$',F7.4,7×,'$',F9,3,8×,'$',        PB    295
     1F9.3/)                                                            PB    296
      WHITE(6,220)                                                      PB    297
  220 FORMAT(' VARIABLE COSTS OF PRODUCTION ')                          PB    298
      IF (NOPT .EQ. 0) WRITE(6,230)  CCUF,                              PB    299
     1(V(I,2),I=1,5),PR,CRES,(V(I,3),I=1,5)                             PB   299A
     1,PW,CWAX,(V(I,4),I=1,5), CKWH,(V(I,5), I=1,5),COBT,(V(I,6),I=1,5),PB    300
     2COBT,(V(I,7),I=l,5),RESV, (V(I,8),I=l,5),(V(I,9),I=l,5),          PB    301
     3(V(I,l0),I=1,5),PCRA                                              PB    302
      IF (NOPT .EQ. 3)WRITE(6,240)(V(I,2),I=1,3),PR,CRES,(V(I,3),I=l,3) PB    303
     1;PW,CWAX;(V(I,4),I=1,3),CKWH,(V(I,5),I=1,3),COBT,(V(I,6),I=1,3),  PB    304
     2COBT,(V(I,7),I=1,3),RESV,(V(I,8),I:1,3),(V(I,9),I=l,3),           PB    305
     3(V(I,10),I=1,3),PCRA                                              PB    306
  230 FORMAT(' ',2×,'WOOD ($,F6.4,'/CU.FT.)',8×,'$',                    PB    307
     lF7.4,7×,3('$',F9.3,8×),'$',F9.3/                                  PB   307A
     13×, 'RESIN(',F4.1,'%,$',F4.2,'/LB.)',7×,F7.4,8×,3(F9.3,9×),F9.3/  PB    308
     23×, 'WAX (',F4.l,'%,$',F4.2,'/LB.)',9×,F7,4,8×,3(F9.3,9×),F9.3/   PB    309
     33×, 'ELECTRIC POWER($',F5.3,'/KWH)',4×,F7.4,8×,3(F9.3,9×),F9.3/   PB    310
     53×, 'DRYER HEAT(FUEL=$',F5.3,'/MM BTU)',l×,F7.4,8×,3(F9.3,9X),F9.3/PB    311
     53×, 'PROC.STEAM(FUEL=$',F5.3,'/MM BTU)',l×,F7.4,8×,3lF9,3,9X),F9.3/PB    312
     63×, 'LESS RESIDUE VAL.($',F6.2,'/BDU) ',1×,F7.4,8×,3(F9.3,9×),F9.3/PB    313
     77×, 'GROSS VARIABLE COST' ,7×,'$',F7.4,7×,3('$',F9.3,8×),'$',F9.3// PB    314
     81 PROFIT CONTRIBUTION', 13×, '$',F7.4,7×,3('$',F9.3,8×),'$',F9.3/  PB    315
     83×, ' P.C.RATIO', 20×,F4.l, '%',/)                                PB    316
  200 FORMAT(' ',2×,'WOOD',26×,'$',F7.4,7×,'$',F9.3,8×,'$',F9.3/         PB    317
     13×, 'RESIN(',F4.l,'%, $',F4.2,'/LB.)',7×,F7,4,8×,F9.3,9×,F9.3/    PB    318
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     23×, ' WAX (' , F4.1, ' %, $ ', F4.2, ' / LB.) ' , 9×, F7.4, 8×, F9.3, 9×, F9.3/      PB     319
     33×, ' ELECTRIC POWER ($', F5,3, ' / KWH) ' ,4×, F7.4, 8×, F9.3, 9×, F9.3/             PB     320
     53×, ' PROC.STEAM(FUEL=$', F5.3, ' / MM BTU) ' , 1×, F7.4, 8×, F9.3, 9×, F9.3/        PB     321
     53×, ' DRYER HEAT (FUEL=$', F5.3, ' / MM BTU) ' , 1×, F7.4, 8×, F9.3, 9×, F9.3/       PB     322
     63×, ' LESS RESIDUE VAL. ($ ' , F6.2, ' / BDU) ' , 1×, F7.4, 8×, F9.3, 9×, F9.3/      PB     323
     77×, ' GROSS VARIABLE COST ' , 7×, ' $ ' , F7.0, 7×, ' $ ' , F9.3, 8×, ' $ ' , F9.3 / /PB     324
     8' PROFIT CONTRIBUTION ' , 13×, ' $ ' , F7.4, 7×, ' $ ' , F9.3, 8×, ' $ ' , F9.3/      PB     325
     93×, 'P . C. RATIO ' . 2 0 × , F 4 . l , '%' , / )                                     PB     326
      WRITE (6, 250)                                                                        PB     327
250 FORMAT ( ' SENSITIVITY OF GROSS VARIABLE COST PER CU. FT. OF FINISHEPB     328
     1D PRODUCT OUTPUT ' /)                                                                 PB     329
      WRITE (6, 270) A1, B1, A2, B2, A3, B3, A4, B4                                         PB     330
270 FORMAT( ' ' , 8×, ' VAR. COST/CU. FT. = ' , F7.4, ' « (WOOD COST / CU. FT.) + PB     331
     l ' , F7.4/                                                                            PB     332
     29×, ' VAR. COST / CU. FT. = ' , F7.4, ' « (RESIN COST / LB,) + ' , F7.4/          PB     333
     39×, ' VAR. COST / CU. FT. = ' , F7.4, ' « (WAX COST / LB.) + ' , F7.4/            PB     334
     49×, ' VAR. COST / CU. FT. = ' , F7.4, ' « (ELECTRICITY COST / KWH) + ' , F7.4)PB     335
      IF (IFOP .EQ. 0) WRITE (6, 271) A5, B5                                            PB     336
      IF (IFOP .EQ. 1) WRITE (6, 272) A5, B5                                            PB     337
      IF (IFOP .EQ. 2) WRITE (6, 273) A5, B5                                            PB     338
      IF (IFOP .EQ. 3) WRITE (6, 274) A5, B5                                            PB     339
      IF (IFOP .EQ. 0 .OR. IFOP .EQ. 2) GO TO 275                                       PB     340
      IF (NAXF .EQ. 1) WRITE (6, 271) A6, B6                                            PB     341
      IF (NAXF .EQ. 3) WRITE (6, 273) A6, B6                                            PB     342
275 CONTINUE                                                                            PB     343
271 FORMAT( ' ' , 8×, ' VAR. COST / CU. FT. = ' , F7.4, ' * (PRICE OF OIL / BBL.) +PB     344
     1 ' , F7.4)                                                                        PB     345
272 FORMAT( ' ' , 8×, ' VAR. COST / CU. FT. + ' , F7.4, ' * (PRICE OF COAL / TON) +PB     346
     1 ' , F7.4)                                                                        PB     347
273 FORMAT( ' ' , 4×, ' VAR. COST / CU. FT. = ' , F7.4, ' * (PRICE OF NAT. GAS/MC PB     348
     1 F ) + ' , F7.4)                                                                  PB     349
274 FORMAT( ' ' , 8×, ' VAR. COST / CU. FT. ' , F7.4, ' * (PRICE OF FUELWOOD / TOPB     350
     1 N ) + ' , F7.4)                                                                  PB     351
     WRITE (6, 280)                                                                     PB     352
280 FORMAT( ' 0BOARD STATISTICS ' , 13×, ' LBS. / CU. FT. ' )                           PB     353
      IF (IOP1 .EQ. 0) WRITE (6, 290)                                                   PB     354
290 FORMAT( ' + ' , 43×, ' LBS. / MSF 3 / 8 IN.BASIS ' )                                PB     355
      IF(IOP1 .EQ. 1) WRITE (6, 300)                                                    PB     356
300 FORMAT( ' + ' , 43×, ' LBS. / MSF 1 / 4 IN.BASIS ' )                                PB     357
      IF(IOP1 .EQ. 2) WRITE (6, 310)                                                    PB     358
310 FORMAT( ' + ' , 43×, ' LBS. / MSF 3 / 4 IN.BASIS ' )                                PB     359
      IF(IOP1 .EQ. 3) WRITE (6, 320)                                                    PB     360
320 FORMAT( ' + ' , 43×, ' LBS. / MSF 5 / 8 IN.BASIS ' )                                PB     361
      IF(IOP1 .EQ. 4) WRITE (6, 330)                                                    PB     362
330 FORMAT( ' + ' , 43×, ' LBS. / MSF 1 / 2 IN.BASIS ' )                                PB     363
      IF(IOP2 .EQ. 0) WRITE (6, 150)                                                    PB     364
      IF(IOP2 .EQ. 1) WRITE (6, 160)                                                    PB     365
      IF(IOP2 .EQ. 2) WRITE (6, 170)                                                    PB     366
      IF(IOP2 .EQ. 3) WRITE (6, 180)                                                    PB     367
      IF(IOP2 .EQ. 4) WRITE (6, 340)                                                    PB     368
340 FORMAT( ' + ' , 67×, ' LBS. / CU. METER ' )                                         PB     369
      IF(NOPT .EQ. 0) WRITE (6, 350)                                                    PB     370
350 FORMAT( ' + ' , 84×, ' 5 / 8 IN. BASIS ' ,5x, ' LBS. / CU. METER ' )                PB     371
      IF(NOPT .EQ. 0) WRITE (6, 360)(V(I,11), I = 1 , 5 ), FPMC, (V(I,=12), I=1,5), PB     372
     1(V(I,l3),I=1,5), P R ,(V(I;14), I=1,5), PW,( V ( I , 1 5 ), I=1,5),               PB     373
     2(V(I,l7),I=1,5)                                                                   PB     374
      IF(NOPT .EQ. 3) WRITE (6, 370) (V(I, 11), I=1,3), FPMC, (V(I,12), I=1,3),         PB     375
     1(V(I,13),I=1,3), PR, (V(I,14), I=1,3), PW, (V(I,15), I=1,3),                      PB     376
     2(V(I,17),I=1,3)                                                                   PB     377
360 FORMAT( ' ', 2×, ' GROSS BOARD WEIGHT ' , 12×, F8.3, 8×, 3 (F9.3, 9×), F9.3/       PB     378
     13×, ' WEIGHT OF WATER ( ' , F4.l, ' % M.C. ) ' , 3×, F8.3, 8×, 3 (F9.3, 9×), F9.3/ PB     379
     23×, ' OVEN DRY WGT. OF BOARD ' , 8×, F8.3, 8×, 3 (F9.3, 9×), F9.3/                PB     380
     35×, ' WGT. OF RESINS ( ' , F4.l, ' % SOLIDS) ' , F8.3, 8×, 3 (F9.3, 9×), F9.3/    PB     381
     45×, ' WGT. OF WAX ( ' , F4.1, ' % SOLIDS) ' , 3×, F8.3, 8×, 3 (F9.3, 9×), F9.3/   PB     382
     55×, ' WEIGHT OF WOOD ' , 13×, F8.3, 8×, 3 (F9.3, 9×), F9.3/ )                     PB     383
370 FORMAT( ' ' , 2×, ' GROSS BOARD WEIGHT ' , 12×, F8.3, 8×, F9.3, 9×, F9.3/          PB     384
     13×, ' WEIGHT OF WATER ( ' , F5.1, ' % M. C. ) ' , 2×, F8.3, 3×, F9.3, 9×, F9.3/   PB     385
     23×, ' OVEN DRY WGT. OF BOARD ' , 8×, F8.3, 8×, F9.3, 9×, F9.3/                    PB     386
     35×, ' WGT. OF RESINS ( ' F4.1, ' % SOLIDS ) ' ,F8.3, 8×, F9.3, 9×, F9.3/          PB     387
     45×, ' WGT. OF WAX ( ' , F4.l, ' % SOLIDS ) ', 3×, F8.3, 8×, F9.3, 9×, F9.3/       PB     388
     55×, ' WEIGHT OF WOOD ' , 13×, F8.3, 8×, F9.3, 9×, F9.3/)                          PB     389
      WRITE (6, 380)                                                                    PB     390
380 FORMAT( ' RAW MATERIAL REQUIREMENTS ' , 4×, ' REQ. / CU. FT. ' )                    PB     391
      IF(IOP1 .EQ. 0) WRITE (6, 390)                                                    PB     392
390 FORMAT( ' + ' , 43×, ' REQ. / MSF 3 / 8 IN.BASIS ' )                                PB     393
      IF(IOP1 .EQ. 1) WRITE (6, 400)                                                    PB     394
400 FORMAT( ' + ' , 43×, ' REQ. / MSF 1 / 4 IN. BASIS ' )                               PB     395
      IF(IOP1 .EQ. 2) WRITE (6, 410)                                                    PB     396
410 FORMAT( ' + ' , 43×, ' REQ. / MSF 3 / 4 IN.BASIS ' )                                PB     397
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      IF(IOP1.EQ. 3) WRITE (6, 420)                                                PB  398
420   FORMAT( ' + ', 43×, ' REQ. / MSF 5 / 8 IN.BASIS ' )                          PB  399
      IF(IOP1  .EQ.  4) WRITE (6, 430)                                             PB  400
430   FORMAT( ' + ', 43×, ' REQ. / MSF 1 / 2 IN.BASIS ' )                          PB  401
      IF(IOP2.EQ.  0) WRITE (6, 150)                                               PB  402
      IF(IOP2.EQ.  1) WRITE (6, 160)                                               PB  403
      IF(IOP2.EQ.  2) WRITE (6, 170)                                               PB  404
      IF(IOP2.EQ.  3) WRITE (6, 180)                                               PB  405
      IF(IOP2.EQ.  4) WRITE (6, 440)                                               PB  406
440   FORMAT( ' + ',67×, ' REQ. / CU. METER ' )                                    PB  407
      IF(NOPT.EQ. 0) WRITE (6, 450)                                                PB  408
450   FORMAT( ' + ', 84×, ' 5 / 8 IN.  BASIS ', 5×, ' REQ. / CU. METER ' )         PB  409
      IF(NOPT.EQ. 0)  WRITE (6, 460) SGRW, (V (I, 18), I=1,5), (V (I,19), I=l,5),  PB  410
     1(V (I,20), I=1,5), (V (I, 21), I=1,5), (V (I,22), I=1,5)                     PB  411
      IF(NOPT .EQ.  3) WRITE (6, 470) SGRW, (V (I, 18), I=1,3), (V (I,19), I=1,3), PB  412
     1(V (I,20), I=1,3), (V(I,21), I=1,3), (V (I,22), I=1,3)                       PB  413
460   FORMAT( ' ' , 2×, ' WOOD (O. D. SPEC. GRAV. = ' , F4.2, ' ) ' ,/             PB  414
     15×, ' POUNDS OF O.D. WOOD  ' , 7×, F8.3, 8×, 3 (F9.3, 9×), F9.3/             PB  415
     25×, ' POUNDS OF GREEN WOOD  ' , 7×, F8.3, 8×, 3 (F9.3, 9×), F9.3/            PB  416
     35×, ' CU.  FT.  OF ROUNDWOOD  ' , 7×, F8.3, 8×, 3 (F9.3, 9×), F9.3/          PB  417
     43×, ' RESIN (LBS. SOLIDS / LIQUID) ' , 4×, F8.3, 8×, 3 (F9.3, 9×), F9.3/     PB  418
     53×, ' WAX (LBS. SOLIDs) ' , 13×, F8.3, 8×, 3 (F9.3, 9×), F9.3/)              PB  419
470   FORMAT( ' ' , 2×, WOOD (O. D. SPEC. GRAV. = ' , F4.2, ' ) ' ,/               PB  420
     15×, ' POUNDS OF O.D. WOOD  ' , 7×, F8.3, 8×, F9.3, 9×, F9.3/                 PB  421
     25×, ' POUNDS OF GREEN WOOD  ' , 7×, F8.3, 8×, F9.3, 9×, F9.3/                PB  422
     35×, ' CU. FT.  OF ROUNDWOOD  ' , 7×, F8.3, 8×, F9.3, 9×, F9.3/               PB  423
     43×, ' RESIN  (LBS.  SOLIDS / LIQUID) ' , 4×, F8.3, 8×. F9.3, 9×, F9.3/       PB  424
     53×, ' WAX  (LBS.  SOLIDS) ' , 13×, F8.3, 8×, F9.3, 9×, F9.3/)                PB  425
      WRITE (6, 480)                                                               PB  426
480   FORMAT( ' 1FUEL AND POWER STATISTICS IN MILLION B.T.U.S ' /                   PB  427
     130×, ' BTUS / CU.FT. ' )                                                     PB  428
      IF(IOP1  .EQ. 0) WRITE (6, 490)                                              PB  429
490   FORMAT( ' + ', 43×, ' BTUS / MSF 3 / 8 IN.BASIS ' )                          PB  430
      IF(IOP1  .EQ. 1) WRITE (6, 500)                                              PB  431
500   FORMAT( ' + ', 43×, ' BTUS / MSF l / 4 IN.BASIS ' )                          PB  432
      IF(IOP1  .EQ. 2) WRITE (6, 510)                                              PB  433
510   FORMAT( ' + ', 43×, ' BTUS / MSF 3 / 4 IN.BASIS ' )                          PB  434
      IF(IOP1  .EQ. 3) WRITE (6, 520)                                              PB  435
520   FORMAT( ' + ', 43×,' BTUS / MSF 5 / 8 IN.BASIS ' )                           PB  436
      IF(IOP1  .EQ. 4) WRITE (6, 530)                                              PB  437
530   FORMAT( ' + ', 43×, ' BTUS / MSF l / 2 IN.BASIS ' )                          PB  438
      IF(IOP2  .EQ. 0) WRITE (6, 150)                                              PB  439
      IF(IOP2  .EQ. 1) WRITE (6, 160)                                              PB  440
      IF(IOP2  .EQ. 2) WRITE (6, 170)                                              PB  441
      IF(IOP2  .EQ. 3) WRITE (6, 180)                                              PB  442
      IF(IOP2  .EQ. 4) WRITE (6, 540)                                              PB  443
540   FORMAT( ' + ', 67×, ' BTUS / CU.METER ' )                                    PB  444
      IF(NOPT  .EQ. 0) WRITE (6, 550)                                              PB  445
550   FORMAT( ' + ', 84×, ' 5 / 8 IN. BASIS ', 5×, ' BTUS / CU.METER ' )           PB  446
      IF(NOPT  .EQ. 0) WRITE (6, 560) BTRD, (V (I,23), I=1,5), (V (I,24), I=1,5),  PB  447
     1(V (I,25), I=1,5), (V (I,26), I=1,5), (V (I,27), I=1,5), (V (I,28), I=1,5),  PB  448
     2PCTF, PCTT, (V (I,29), I=l,5), PCTB, (V (I,30), I=1,5), (V (I,36), I=1,5),   PB  449
     3(V (1,31), I=1.5), (V (I,37), I=1,5), (V (1,32), I=1,5)                      PB  450
      IF(NOPT .EQ. 3) WRITE (6, 570) BTRD, (V (I,23), I=1,3), (V (I,24), I=1,3),  PB  451
     l(V (I,25), I=1.3), (V (I,26), I=1,3), (V (I,27), I=1,3), (V (I,28), I=1,3),  PB  452
     2PCTF, PCTT, (V (I,29), I=1,3), PCTB, (V (I,30), I=1,3), (V (I,36), I=1,3),   PB  453
     3(V (I,31), I=1,3), (V (I,37), I=1,3), (V (I,32), I=1,3)                      PB  454
560   FORMAT( ' FUEL REQUIREMENTS ' / 3×, ' DRYER HEAT ' / 3×, ' ( ' , F8.6, ' BTUS / LB.WPB  455
     1ATER EVAP.) ' , l×, F8.6, 8×, 3 (F9.6, 9×), F9.6/                            PB  456
     23×, '  PROCESS STEAM ' / 7×, ' PRESS ', 21×, F8.6, 8×, 3 (F9.6, 9×), F9.6/   PB  457
     37×, '  THAW POND ' , 17×, F8.6, 8×, 3 (F9.6, 9×, F9.6/                       PB  458
     47×, '  HEATING ' , 19×, F8.6, 8×, 3 (F9.6, 9×), F9.6/                        PB  459
     57×, '  MISCELLANEOUS ' , 13×, F8.6, 8×, 3 (F9.6, 9×), F9.6/                  PB  460
     610×, ' TOTAL FUEL REQUIRED ' , 4×, F8.6, 8×, 3 (F9.6, 9×), F9.6/ /           PB  461
     7 ' WOOD FUEL GENERATED ' / 3×, ' DRY FINES / TRIMS ( ' , F4.1, ' % / ' , F4.1, ' %) ' ,  PB  462
     82×, F8.6, 8×, 3 (F9.6, 9×), F9.6/                                            PB  463
     93×,  ' WET BARK ( ' , F3.2, ' 1) RATIO OF RDWD)  ' , F8.6, 8×, 3 (F9.6, 9×), F9.6/  PB  464
     93×,  ' SCREENED WET WOOD RESIDUES ' , 4×, F8.6, 8×, 3 (F9.6, 9×), F9.6/       PB  465
     17×,  ' TOTAL FUEL GENERATED', 6×, F8.6, 8×, 3 (F9.6, 9×), F9.6/ /             PB  466
     2' AUXILIARY FUEL BTU  ' , 12×, F8.6, 8×, 3 (F9.6, 9×), F9.6/ /               PB  467
     3' NET FUEL REQUIREMENT ' , 12×, F8.6, 8×, 3 (F9.6, 9×), F9.6/ / )            PB  468
570   FORMAT( FUEL REQUIREMENTS ' / 3×, ' DRYER HEAT ' / 3×, ' ( ' , F8.6, ' BTUS / LB.W PB  469
     1ATER EVAP.) ' , 1×, F8.6, 8×, F9.6, 9×, F9.6 / 3×, ' PROCESS STEAM ' /        PB  470
     27×,  '  PRESS ', 21×, F8.6, 8×, F9.6, 9×, F9.6/                               PB  471
     37×,  ' THAW POND ' , 17×, F8.6, 8×, F9.6, 9×, F9.6/                          PB  472
     47×,  ' HEATING ' , 19×, F8.6, 8×, F9.6, 9×, F9.6/                            PB  473
     57×,  ' MISCELLANEOUS ' , 13×, F8.6, 8×, F9.6, 9×, F9.6/                      PB  474
     610×, ' TOTAL FUEL REQUIRED ' , 4×, F8.6, 8×, F9.6, 9×, F9.6//                PB  475
     7' WOOD FUEL GENERATE ' / 3×, ' DRY FINES / TRIMS ( ' , F4.1, ' % / ' , F4.1, ' % ) ' ,  PB  476
     82×,F8.6, 8×, F9.6, 9×, F9.6/                                                 PB  477
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     93×, ' WET BARK ( ' , F3.2, ' : 1 RATIO OF WOOD) ' , F8.6, 8×, F9.6, 9×, F9.6/      PB     478
     93×, ' SCREENED WET WOOD RESIDUES ' , 4×, F8.6, 8×, F9.6, 9×, F9.6/                 PB     479
     17×, ' TOTAL FUEL GENERATED ' , 6×, F8.6, 8×, F9.6, 9×, F9.6//                      PB     480
     2 ' AUXILIARY FUEL BTU ' , 12×, F8.6, 8×, F9.6, 9×, F9.6//                          PB     481
     3 ' NET FUEL REQUIREMENT ' , 12×, F8.6, 8×, F9.6, 9×, F9.6//)                       PB     482
       WRITE (6, 580)                                                                    PB     483
 580 FORMAT( ' FUEL AND POWER REQUIRED ' , 6×, ' REQ. / CU.FT. ' )                       PB     484
       IF(IOP1 .EQ. 0) WRITE (6, 390)                                                    PB     485
       IF(IOP1 .EQ. 1) WRITE (6, 400)                                                    PB     486
       IF(IOP1 .EQ. 2) WRITE (6, 410)                                                    PB     487
       IF(IOP1 .EQ. 3) WRITE (6, 420)                                                    PB     488
       IF(IOPl .EQ. 4) WRITE (6, 430)                                                    PB     489
       IF(IOP2 .EQ. 0) WRITE (6, 150)                                                    PB     490
       IF(IOP2 .EQ. 1) WRITE (6, 160)                                                    PB     491
       IF(IOP2 .EQ. 2) WRITE (6, 170)                                                    PB     492
       IF(IOP2 .EQ. 3) WRITE (6, 180)                                                    PB     493
       IF(IOP2 .EQ. 4) WRITE (6, 440)                                                    PB     494
       IF(NOPT .EQ. 0) WRITE (6, 450)                                                    PB     495
       IF(NOPT .EQ. 0) WRITE (6, 590) CKWH, (V (I,34), I=l,5)                            PB     496
       IF(NOPT .EQ. 3) WRITE (6, 600) CKWH, (V (I,34), I=1,3)                            PB     497
 590 FORMAT( ' 0KWH. ELECT. POWER ($ ' , F4.3, ' / KWH) ' , 3×, F8.4, 8×, 3 (F9.3, 9×),  PB     498
     lF9.3/)                                                                           PB     499
 600 FORMAT( ' 0KWH. ELECT. POWER ($ ' , F4.3, ' / KWH) ' , 3×, F8.4, 8×, F9.3, 9×, F9. PB     500
     13/)                                                                              PB     501
       IF(NOPT .EQ. 0 .AND. IFOP .EQ. 0) WRITE (6, 610) POIL, (V (I,33), I=l, 5)       PB     502
       IF(NOPT .EQ. 0 .AND. IFOP .EQ. 1) WRITE (6, 620) PCOL, (V (I,33), I=l, 5)       PB     503
       IF(NOPT .EQ. 0 .AND. IFOP .EQ. 2) WRITE (6, 630) PGAS, (V (I,33), I=l, 5)       PB     504
       IF(NOPT .EQ. 0 .AND. IFOP .EQ. 3) WRITE (6, 640) PWOD, (V (I,33), I=1, 5)       PB     505
       IF(NOPT .EQ. 3 .AND. IFOP .EQ. 0) WRITE (6, 650) POIL, (V (I,33), I=1, 3)       PB     506
       IF(NOPT .EQ. 3 .AND. IFOP .EQ. 1) WRITE (6, 660) PCOL, (V (I,33), I=1, 3)       PB     507
       IF(NOPT .EQ. 3 .AND. IFOP .EQ. 2) WRITE (6, 670) PGPS, (V (I,33), I=l, 3)       PB     508
       IF(NOPT .EQ. 3 .AND. IFOP .EQ. 3) WRITE (6, 680) PWOD, (V (I,33), I=l, 3)       PB     509
       IF(NOPT .EQ. 0 .AND. NAXF .EQ. 1) WRITE (6, 690) POIL, (V (I,35), I=1, 5)       PB     510
       IF(NOPT .EQ. 0 .AND. NAXF .EQ. 3) WRITE (6, 691) PGAS, (V (I,35), I=1, 5)       PB     511
 610 FORMAT( ' BBL. OIL ($ ' , F6.2, ' / BBL.) ' , 9×, F8.6, 8×, 3 (F9.6, 9×), F9.6)   PB     512
 620 FORMAT( ' TONS COAL ($ ' , F6.2, ' / TON) ' , 9×, F8.6, 8×, 3 (F9.6, 9×), F9.6)   PB     513
 630 FORMAT( ' MCF. GAS ($ ' , F6.2, ' / MCF.) ' , 9×, F8.6, 8×, 3 (F9.6, 9×), F9,6)   PB     514
 640 FORMAT( ' TONS WOOD ($ ' , F6.2, ' / TON) ' , 9×, F8.6, 8×, 3 (F9.6, 9×), F9.6)   PB     515
 650 FORMAT( ' BBL. OIL ($ ' , F6.2, ' / BBL.) ' , 9×, F8.6, 8×, F9.6, 9×, F9.6)       PB     516
 660 FORMAT( ' TONS COAL ($ ' , F6.2, ' / TON) ' , 9×, F8.6, 8×, F9.6, 9×, F9.6)       PB     517
 670 FORMAT( ' MCF. GAS ($ ' , F6.2, ' / MCF.) ' , 9×, F8.6, 8×, F9.6, 9×, F9.6)       PB     518
 680 FORMAT( ' TONS WOOD ($ ' , F6.2, ' / TON) ' , 9×, F8.6, 8×, F9.6, 9×, F9.6)       PB     519
       IF(NOPT .EQ. 3 .AND. NAXF .EQ. 1) WRITE (6, 700) POIL, (V (I,35), I=1, 3)       PB     520
       IF(NOPT .EQ. 3 .AND. NAXF .EQ. 3) WRITE (6, 701) PGAS, (V (I,35), I=1, 3)       PB     521
 690 FORMAT( ' RBL. AUX. OIL ($ ' , F5.2, ' / BBL.) ' , 5×, F8.6, 8×, 3 (F9.6, 9×), F9. PB     522
     16)                                                                               PB     523
 691 FORMAT( ' MCF. AUX. GAS ($ ' , F5.2, ' / ' MCF.) ' , 5×, F8.6, 8×, 3 (F9.6, 9×), F9. PB     524
     16)                                                                               PB     525
 700 FORMAT( ' BBL. AUX. OIL ($ ' , F5.2, ' / BBL.) ' , 5×, F8.6, 8×, F9.6, 9×, F9.6)  PB     526
 701 FORMAT( ' MCF. AUX. GAS ($ ' , F5.2, ' / MCF.) ' , 5×, F8.6, 8×, F9.6, 9×, F9.6)  PB     527
 998 CONTINUE                                                                          PB     528
 999 CONTINUE                                                                          PB     529
       WRITE (6, 1000)                                                                 PB     530
1000 FORMAT( ' 1 ' )                                                                   PB     531
       SUBROUTINE SUB1 (HHTV, DMCT, BTUB)                                              SUB1     1
C ***                                                                                  SUB1     2
C ***          THIS SUBROUTINE CALCULATES THE EFFECTIVE HEATING VALUE OF               SUB1     3
C *** WOOD TYPE FUELS AT A GIVEN MOISTURE CONTENT ASSUMING A FLUE GAS                   SUB1     4
C *** TEMPERATURE OF 400 DEGREES FAHRENHEIT, 40% EXCESS AIR                            SUB1     5
C ***                                                                                  SUB1     6
       PCTR=0.40                                                                       SUB1     7
       T1=68.0                                                                         SUB1     8
       T2=400.0                                                                        SUB1     9
C ***  GREEN BASIS MOISTURE CONT. (OR LBS. WATER / LB. FUEL)                           SUB1    10
       GMCT=DMCT / (1.0 + DMCT)                                                        SUB1    11
C ***  WEIGHT OF WOOD PER LB. OF GREEN OR WET WOOD FUEL                                SUB1    12
       WTWD=1.0-GMCT                                                                   SUB1    13
C ***  HEAT LOSS PERCENT DUE TO MOISTURE (CALLED SENSIBLE HEAT LOSS, SHL)              SUB1    14
       HHTV=HHTV * 10.0 ** 6                                                           SUB1    15
       SHL=(GMCT * (1090.7 - T1 + (0.455 * T2) ) ) / ( (1.0 - GMCT) * HHTV)            SUB1    16
C ***  HYDROGEN HEAT LOSS PERCENT                                                      SUB1    17
       HHL=0.54 * (1090.7 - T1 + (0.455 * T2) ) / HHTV                                 SUB1    18
C ***  DRY GAS HEAT LOSS PERCENT                                                       SUB1    19
       DHL=( (T2 - T1) * (1.429 * (PCTR) + 1.52) ) / HHTV                              SUB1    20
C ***  OTHER (MISCELLANEOUS) HEAT LOSS PERCENT = 5 PERCENT                             SUB1    21
C ***  TOTAL HEAT LOSS PERCENT                                                         SUB1    22
       THL=SBL + BBL + DHL + 0.05                                                      SUB1    23
C ***  EFFICIENCY PERCENT                                                              SUB1    24
       EFF=1.00 - THL                                                                  SUB1    25
       IF(EFF .LT. 0.0) EFF=0.0                                                        SUB1    26
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C ***  FURNANCE BLACKOUT OCCURS AT GREEN M.C.  GREATER THAN 68 PERCENT
      IF (GWCT .GT. 0.88) EFF=0.0
C ***  AVAILABLE HEAT PER POUND
      AVH=WTWD * HHTV
C ***  EFFECTIVE BTU'S PER POUND
      BTUE=AVH * EFF
      IF (BTUE .LT. 0.0) BTUE=0.0
C ***  MILLION EFFECTIVE BTU'S PER POUND OF FUEL
      BTUE=BTUE/10.0 ** 6.0
      HHTV=HHTV/10.0 ** 6.0
      RETURN
      SUBROUTINE SUB2 (BTFU, BTEF, IFOP)
C ***  THIS SUBROUTINE CALCULATES THE EFFECTIVE HEATING VALUE OF THE
C ***  VARIOUS FUELS ON  THE BASIS OF A SIMPLE PERCENT EFFICIENCY LOSS
      IF(IFOP .EQ. 0)  BTEF=0.80 * BTFU
      IF(IFOP .EQ. 1)  BTEF=0.80 * BTFU
      IF(IFOP .EQ. 2)  BTEF=0.87 * BTFU
      IF(IFOP .EQ. 3)  BTEF=0.65 * BTFU
      RETURN
      END
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SUB1   27
SUB1   28
SUB1   29
SUB1   30
SUB1   31
SUB1   32
SUB1   33
SUB1   34
SUB1   35
SUB1   36
SUB1   37
SUB     1
SUB     2
SUB     3
SUB     4
SUB     5
SUB     6
SUB     7
SUB     8
PB    532
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