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 (Mft²-3/8 in., Mft²-1/2-in., m³). 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 cost per cubic foot of panel product:
- **A**, a “slope” coefficient calculated by the program;
- **X**, an individual item cost on an input 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.

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**DATA REQUIREMENTS 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 proceeds each definition.
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. **CRES**, cost of resin in dollars per pound of resin.
7. **PRRF**, weight percent of face blend required to be resin (as a decimal).
8. **PRRC**, weight percent of core blend required to be resin (as a decimal).
10. **PWRF**, weight percent of face blend required to be wax (as a decimal).
11. **PWRC**, weight percent of core blend required to be wax (as a decimal).
12. **ODMC**, ovendry basis moisture content of wood coming out of dryer (as a decimal).
13. **PCTF**, weight percent of furnish material lost as dry fines but mostly recoverable as fines fuel (as a decimal).
14. **PCFF**, weight percent of product that is face furnish (as a decimal).
15. **PCCF**, weight percent of product that is core furnish (as a decimal).
16. **ODWP**, weight in pounds per solid cubic foot of finished product.
17. **FPMC**, ovendry basis moisture content of wood in finished product (as a decimal).
18. **PTLG**, width in inches of panel trims cut away along length of product.
19. **PTWD**, width in inches of panel trims cut away along width of product.
20. **PWSR**, weight percent of wood raw material that becomes green (wet screened) wood residue.
21. **CORM**, f.o.b.—mill value of any surplus residues (residue mix) in dollars per pound.
22. **CKWH**, cost of electricity in dollars per kilowatt-hour.
23. **BTUF**, average higher heating value of nonbark wood fuel residues in million British thermal units per pound.
24. **BTUB**, average higher heating value of bark residues in million British thermal units per pound.
25. **BTRD**, million British thermal units required at boiler or other heat recovery device per pound of water evaporated by wood dryer.
26. **BTRP**, million British thermal units required at boiler for press steam per cubic foot cut panel product.
27. **BTRT**, million British thermal units required at boiler for thaw pond per cubic foot cut panel product.
28. **BTRH**, kilowatt-hours of electricity required per cubic foot of cut panel product.
29. **PPWD**, width of pressed panel in inches (trimmed dimension).
30. **PPLG**, length of pressed panel in inches (trimmed dimension).
31. **SALE**, net sales value f.o.b. mill of product in dollars per solid cubic foot.
32. **PGAS**, price of natural gas in dollars per thousand cubic foot.
33. **POIL**, price of fuel oil in dollars per barrel.
34. **PWOD**, price of external (nonprocess residue) wood fuel in dollars per ton.
35. **PCOL**, price of coal in dollars per ton.
36. **BTUG**, million British thermal units per thousand cubic foot of natural gas.
37. **BTUO**, million British thermal units per barrel of oil.
38. **ITOP**, coded specification of how trims are to be handled (0 = trims recycled as furnish; 1 = trims used as fuel).
39. **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.

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**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.

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**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.

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**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

<table>
<thead>
<tr>
<th>Card No.</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-10</td>
</tr>
<tr>
<td>1</td>
<td>CCUF</td>
</tr>
<tr>
<td>2</td>
<td>PRRF</td>
</tr>
<tr>
<td>3</td>
<td>PCFF</td>
</tr>
<tr>
<td>4</td>
<td>CORM</td>
</tr>
<tr>
<td>5</td>
<td>BTRH</td>
</tr>
<tr>
<td>6</td>
<td>POIL</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>NET SALES VALUE</th>
<th>$/CU.FT.</th>
<th>$/MSF</th>
<th>3/8 IN. BASIS</th>
<th>1/2 IN. BASIS</th>
<th>5/8 IN. BASIS</th>
<th>$/CU.METER</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIABLE COSTS OF PRODUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WOOD ($ 0.2800/CU. FT.)</td>
<td>0.2859</td>
<td>$ 8.936</td>
<td>$ 11.914</td>
<td>$ 14.893</td>
<td>$ 10.097</td>
<td></td>
</tr>
<tr>
<td>WAX (1.0%, $ 0.12/LB.)</td>
<td>0.0438</td>
<td>1.368</td>
<td>1.823</td>
<td>2.279</td>
<td>1.545</td>
<td></td>
</tr>
<tr>
<td>ELECTRIC POWER ($ .020/KWH)</td>
<td>0.1200</td>
<td>3.750</td>
<td>5.000</td>
<td>6.250</td>
<td>4.237</td>
<td></td>
</tr>
<tr>
<td>DRYER HEAT (FUEL=$ 0.20/MM BTU)</td>
<td>0.0112</td>
<td>0.351</td>
<td>0.468</td>
<td>0.585</td>
<td>0.396</td>
<td></td>
</tr>
<tr>
<td>LESS RESIDUE VAL. ($ 48.00/BDU)</td>
<td>0.0000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>GROSS VARIABLE COST</td>
<td>1.3713</td>
<td>$ 42.853</td>
<td>$ 57.137</td>
<td>$ 71.421</td>
<td>$ 48.420</td>
<td></td>
</tr>
<tr>
<td>PROFIT CONTRIBUTION</td>
<td>1.6047</td>
<td>$ 50.197</td>
<td>$ 66.863</td>
<td>$ 83.579</td>
<td>$ 56.662</td>
<td></td>
</tr>
<tr>
<td>P. C. RATIO</td>
<td>53.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.) + 0.4705
VAR. COST/CU. FT. = 0.3647 \* (WAX COST/LB.) + 1.3275
VAR. COST/CU. FT. = 6.0000 \* (ELECTRICITY COST/KWH) + 1.2513
VAR. COST/CU. FT. = 0.0005 \* (PRICE OF COAL/TON) + 1.3624
VAR. COST/CU. FT. = 0.0133 \* (PRICE OF NAT. GAS/MCF) + 1.3594

**BOARD STATISTICS**

<table>
<thead>
<tr>
<th>LBS./CU.FT.</th>
<th>LBS./MSF</th>
<th>3/8 IN. BASIS</th>
<th>1/2 IN. BASIS</th>
<th>5/8 IN. BASIS</th>
<th>LBS./CU.METER</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROSS BOARD WEIGHT</td>
<td>38.150</td>
<td>1192.187</td>
<td>1589.585</td>
<td>1986.979</td>
<td>1347.076</td>
</tr>
<tr>
<td>WEIGHT OF WATER (90% M.C.)</td>
<td>3.150</td>
<td>98.437</td>
<td>131.250</td>
<td>164.062</td>
<td>111.226</td>
</tr>
<tr>
<td>OVEN DRY WGT. OF BOARD</td>
<td>35.000</td>
<td>1093.750</td>
<td>1458.334</td>
<td>1822.917</td>
<td>1235.850</td>
</tr>
<tr>
<td>WGT. OF RESINS (65% SOLIDS)</td>
<td>2.775</td>
<td>71.094</td>
<td>94.792</td>
<td>118.490</td>
<td>80.330</td>
</tr>
<tr>
<td>WGT. OF WAX (10% SOLIDS)</td>
<td>0.350</td>
<td>10.937</td>
<td>14.583</td>
<td>18.229</td>
<td>12.358</td>
</tr>
<tr>
<td>WEIGHT OF WOOD</td>
<td>32.375</td>
<td>1011.719</td>
<td>1348.959</td>
<td>1686.198</td>
<td>1143.161</td>
</tr>
</tbody>
</table>

**RAW MATERIAL REQUIREMENTS**

<table>
<thead>
<tr>
<th>REQ./CU.FT.</th>
<th>REQ./MSF</th>
<th>3/8 IN. BASIS</th>
<th>1/2 IN. BASIS</th>
<th>5/8 IN. BASIS</th>
<th>REQ./CU.METER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOOD (O. D. SPEC. GRAV. = .59)</td>
<td>37.757</td>
<td>1179.907</td>
<td>1573.210</td>
<td>1966.511</td>
<td>1333.200</td>
</tr>
<tr>
<td>POUNDS OF GREEN WOOD</td>
<td>67.963</td>
<td>2123.832</td>
<td>2831.778</td>
<td>3539.720</td>
<td>2399.760</td>
</tr>
<tr>
<td>CUB. FT. OF ROUNDWOOD</td>
<td>1.021</td>
<td>31.914</td>
<td>42.551</td>
<td>53.189</td>
<td>36.060</td>
</tr>
<tr>
<td>RESIN (LBS. SOLIDS/LIQUID)</td>
<td>2.371</td>
<td>74.079</td>
<td>98.772</td>
<td>123.465</td>
<td>83.703</td>
</tr>
<tr>
<td>WAX (LBS. SOLIDS)</td>
<td>0.365</td>
<td>11.397</td>
<td>15.196</td>
<td>18.995</td>
<td>12.877</td>
</tr>
</tbody>
</table>
### Fuel and Power Statistics in Million B.T.U.S

<table>
<thead>
<tr>
<th>Fuel Requirements</th>
<th>BTUS/CU.FT.</th>
<th>BTUS/MSF 3/8 IN.BASIS</th>
<th>1/2 IN. BASIS</th>
<th>5/8 IN. BASIS</th>
<th>BTUS/CU.METER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dryer Heat</strong></td>
<td>.047498</td>
<td>1.484323</td>
<td>1.979098</td>
<td>2.473871</td>
<td>1.677166</td>
</tr>
<tr>
<td><strong>Process Steam Press</strong></td>
<td>.019200</td>
<td>.600000</td>
<td>.800001</td>
<td>1.000000</td>
<td>.677952</td>
</tr>
<tr>
<td><strong>Thaw Pond</strong></td>
<td>.002000</td>
<td>.062500</td>
<td>.083333</td>
<td>.104167</td>
<td>.070620</td>
</tr>
<tr>
<td><strong>Heating</strong></td>
<td>.016000</td>
<td>.500000</td>
<td>.666667</td>
<td>.833333</td>
<td>.564960</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>.003200</td>
<td>.100000</td>
<td>.133333</td>
<td>.166667</td>
<td>.112992</td>
</tr>
<tr>
<td><strong>Total Fuel Required</strong></td>
<td>.087898</td>
<td>2.746823</td>
<td>3.662433</td>
<td>4.578037</td>
<td>3.103690</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wood Fuel Generated</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dry Fines/Trims (8.0%/2.0%)</strong></td>
<td>.023277</td>
<td>.727416</td>
<td>.969889</td>
<td>1.212360</td>
<td>.821922</td>
</tr>
<tr>
<td><strong>Wet Bark (12:1 Ratio of RDWD)</strong></td>
<td>.031196</td>
<td>.974865</td>
<td>1.299821</td>
<td>1.624775</td>
<td>1.101519</td>
</tr>
<tr>
<td><strong>Screened Wet Wood Residues</strong></td>
<td>.010886</td>
<td>.340184</td>
<td>.453579</td>
<td>.566974</td>
<td>.384381</td>
</tr>
<tr>
<td><strong>Total Fuel Generated</strong></td>
<td>.065359</td>
<td>2.042465</td>
<td>2.723289</td>
<td>3.404109</td>
<td>2.307822</td>
</tr>
<tr>
<td><strong>Auxiliary Fuel BTU</strong></td>
<td>.011534</td>
<td>.360435</td>
<td>.480580</td>
<td>.600725</td>
<td>.407263</td>
</tr>
<tr>
<td><strong>Net Fuel Requirement</strong></td>
<td>.011006</td>
<td>.343922</td>
<td>.458563</td>
<td>.573204</td>
<td>.308605</td>
</tr>
</tbody>
</table>

### Fuel and Power Required

<table>
<thead>
<tr>
<th>Requirement</th>
<th>REQ./CU.FT.</th>
<th>REQ./MSF 3/8 IN.BASIS</th>
<th>1/2 IN. BASIS</th>
<th>5/8 IN. BASIS</th>
<th>REQ./CU.METER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KWh Electric Power ($0.02/KWH)</strong></td>
<td>6.0000</td>
<td>187.500</td>
<td>250.000</td>
<td>312.500</td>
<td>211.860</td>
</tr>
<tr>
<td><strong>Tons Coal ($18.00/Ton)</strong></td>
<td>.000491</td>
<td>.015354</td>
<td>.020472</td>
<td>.025589</td>
<td>.017348</td>
</tr>
<tr>
<td><strong>MCF. Aux. Gas ($0.90/MCF.)</strong></td>
<td>.013257</td>
<td>.414293</td>
<td>.552391</td>
<td>.690489</td>
<td>.468118</td>
</tr>
</tbody>
</table>
APPENDIX B.—Listing of Long, or Documented, Version Data Deck

THIS DOCUMENTED VERSION OF THE PARVCOST DATA DECK

<table>
<thead>
<tr>
<th>COLUMN WIDTHS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WOOD RAW MATERIAL COST PER CUBIC FOOT</td>
<td>CCUF= .28</td>
</tr>
<tr>
<td>O. D. SPECIFIC GRAVITY OF THE WOOD RAW MATERIAL</td>
<td>SGRW= 0.59295</td>
</tr>
<tr>
<td>MOISTURE CONTENT O. D. BASIS OF THE GREEN WOOD RAW MATERIAL</td>
<td>GRMC= 8.0</td>
</tr>
<tr>
<td>RATIO OF BARK TO WOOD IN WOOD RAW MATERIAL</td>
<td>PCTB= .12</td>
</tr>
<tr>
<td>MOISTURE CONTENT O. D. BASIS OF GREEN BARK MATERIAL</td>
<td>WBMC= 1.00</td>
</tr>
<tr>
<td>O. D. SPECIFIC GRAVITY OF THE BARK</td>
<td>SGBK= 0.700</td>
</tr>
<tr>
<td>COST OF RESIN PER POUND IS</td>
<td>CRES= .38</td>
</tr>
<tr>
<td>PERCENT RESIN REQUIRED IN FACE IS</td>
<td>PRRF= .07</td>
</tr>
<tr>
<td>PERCENT RESIN REQUIRED IN CORE IS</td>
<td>PRRC= .05</td>
</tr>
<tr>
<td>COST OF WAX PER POUND OF WAX IS</td>
<td>CWAX= .12</td>
</tr>
<tr>
<td>PERCENT OF WAX REQUIRED IN FACE IS</td>
<td>PWRF= .01</td>
</tr>
<tr>
<td>PERCENT OF WAX REQUIRED IN CORE IS</td>
<td>PWRC= .01</td>
</tr>
<tr>
<td>MOIST. CONTENT WOOD OUT OF DRYER</td>
<td>ODMC= .06</td>
</tr>
<tr>
<td>THE RECOVERABLE PERCENT OF FINES LOSS (WEIGHT PERCENT OF WOOD RAW MATERIAL)</td>
<td>PCTF= .08</td>
</tr>
<tr>
<td>PERCENT OF PRODUCT IN FACE FURNISH</td>
<td>PCFF= .75</td>
</tr>
<tr>
<td>PERCENT OF PRODUCT IN CORE FURNISH</td>
<td>PCCF= .25</td>
</tr>
<tr>
<td>O.D. WT. OF PRESSED PANEL/CU. FT.</td>
<td>ODWP=35.0</td>
</tr>
<tr>
<td>MOIST. CONTENT OF WOOD IN PRODUCT</td>
<td>FPMC= .09</td>
</tr>
<tr>
<td>PANEL TRIMS ALONG LENGTH (INCHES)</td>
<td>PTLG= 1.5</td>
</tr>
<tr>
<td>PANEL TRIMS ALONG WIDTH (INCHES)</td>
<td>PTWD= 1.5</td>
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<tr>
<td>PERCENT OF WOOD RAW MATERIAL LOST AS GREEN RESIDUE, (RECOVERED AS FUEL)</td>
<td>PWSR= .05</td>
</tr>
<tr>
<td>VALUE F.O.B.-MILL PROCESS GENERATED WOOD AND BARK RESIDUES (AVERAGES/POUND)</td>
<td>CODR= 0.00</td>
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<tr>
<td>COST OF ELECTRICITY PER KWH.</td>
<td>CKWH= .020</td>
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<tr>
<td>BTU IN WOOD FINES AND RESIDUES (MILLION BTU/LB. O.D. HIGHER HEATING VALUE)</td>
<td>BTUf= .008500</td>
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<td>BTU IN BARK (MILLION BTU/LB. O.D. HIGHER HEATING VALUE)</td>
<td>BTUb= .009500</td>
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<tr>
<td>DRIER BTU DEMAND AT BOILER--MILLION BTU/LB. WATER EVAPORATED</td>
<td>BTRD= .001700</td>
</tr>
<tr>
<td>PROC. STEAM PRESS BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS</td>
<td>BTPR= .019200</td>
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<tr>
<td>THAW POND STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS</td>
<td>BTRT= .002000</td>
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<td>HEATING STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS</td>
<td>BTRH= .016000</td>
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<td>MISCELLANEOUS STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS</td>
<td>BTRM= .003200</td>
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<tr>
<td>ELECTRIC USAGE--KWH./CU. FT. PANELS</td>
<td>RKWH= 6.000</td>
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<tr>
<td>PRESSED PANEL WIDTH (INCHES)</td>
<td>PPWD= 48.0</td>
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<tr>
<td>PRESSED PANEL LENGTH (INCHES)</td>
<td>PPLG= 96.0</td>
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<tr>
<td>THE NET SALES VALUE (S/CU. FT.)</td>
<td>SALE= 2.976</td>
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<tr>
<td>AVERAGE ANTICIPATED PRICE OF NATURAL GAS PER MCF</td>
<td>PGAS= .90</td>
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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 1. 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 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 IOP3, 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 TO BE 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.

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<td>18.0</td>
<td>0.10</td>
<td>5.00</td>
<td>15.0</td>
<td>28.0</td>
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<td>1.5</td>
<td>1.9</td>
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<td>0.01</td>
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<td>0.03</td>
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<td>0.28</td>
<td>0.0025</td>
<td>0.80</td>
<td>0.12</td>
<td>1.00</td>
<td>0.700</td>
<td>0.38</td>
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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

PARTICLEBOARD VARIABLE COST PROGRAM: PARVCOST

BY
PETER J. INCE
AND
GEORGE B. HARPOLE
U. S. FOREST PRODUCTS LAB., USDA
MADISON, WISCONSIN 53705
MARCH, 1977

PARVCOST IS A FORTRAN PROGRAM DESIGNED TO ASSIST
DEVELOPMENT OF ECONOMIC AND FINANCIAL ANALYSIS OF PARTICLEBOARD
MANUFACTURING SYSTEMS. PARVCOST CALCULATES COSTS AND
REQUIREMENTS OF WOOD, CHEMICALS AND ENERGY PER UNIT OF
FINISHED BOARD PRODUCT. IT ESTIMATES SENSITIVITY OF FINISHED
PRODUCT COSTS TO CHANGES IN UNIT COSTS OF ENERGY AND RAN
MATERIALS. IT ALSO COMPUTES WEIGHT STATISTICS FOR THE
FINISHED PRODUCT AND THE PROFIT CONTRIBUTION RATIO FOR
GIVEN PRODUCT VALUES.

PARVCOST PROGRAM INPUT REQUIRES ESTIMATES OF (1) SPECIFIC
GRAVITY AND MOISTURE CONTENT OF WOOD, BARK AND Pressed PANEL,
(2) MARKET PRICES OF WOOD, CHEMICALS, RESIDUES, BARK,
FUEL, ELECTRICITY AND THE FINISHED BOARD PRODUCT, (3) RATIO
OF BARK TO WOOD IN ROUNDWOOD, (4) PROCESS FINES LOSS PERCENT
AND WIDTH OF EDGING TRIMS, (5) FINISHED PANEL SIZE, PERCENT
FACE AND CORE FURNISH, AND PERCENTAGES OF CHEMICALS NEEDED
IN FURNISH, (6) B.T.U. VALUE OF RESIDUES, BARK AND FUEL,
(7) B.T.U. REQUIREMENTS PER CUBIC FOOT OF OUTPUT FOR PROCESS
STEAM AND ALSO ELECTRICITY REQUIREMENTS.

KEY TERMS

PER UNIT OF OUTPUT •• (PER UNIT OF PRODUCT, PER CUBIC FOOT
CUT PANELS, OR PER CUBIC FOOT OF CUT PANEL PRODUCT)
EXCEPT FOR BOARD WEIGHT STATISTICS, PER UNIT OF OUTPUT
ALWAYS REFERS TO THE GROSS MATERIAL REQUIREMENTS OR
COSTS OF INPUTS PER UNIT OF FINISHED BOARD PRODUCT
OUTPUT AND INCLUDE THE QUANTITIES OR COSTS OF ALL
MATERIALS LOST FROM THE FINISHED PRODUCT OUTPUT AS
TERMS OR RESIDUE BOARD WEIGHT STATISTICS ARE ABSOLUTE
STATISTICS WHICH DO NOT INVOLVE PROCESSING WEIGHT LOSSES.
SENSITIVITY OF UNIT VARIABLE COST •• THE SENSITIVITY OF THE
UNIT VARIABLE COST (COST PER CUBIC FOOT OF OUTPUT) TO THE
COSTS OF WOOD, RESIN, WAX ELECTRICITY, AND FUEL ARE
EXPRESSED IN THE FORM OF LINEAR EQUATIONS. THESE
EQUATIONS APPLY ONLY TO THE SENSITIVITY OF GROSS VARIABLE
COST PER CUBIC FOOT OF FINISHED PRODUCT OUTPUT.

ALPHABETICAL LISTING AND DEFINITIONS OF PROGRAM VARIABLES

'INPUT' MEANS THE VARIABLE IS AN INPUT VARIABLE
AND HENCE OCCURS ALSO IN THE DATA DECK

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'INTERNAL' MEANS THE VARIABLE IS USED STRICTLY WITHIN THE PROGRAM AND APPEARS ONLY FOR THE PURPOSES OF CALCULATION OR CLARIFICATION.

'OUTPUT' MEANS THE VARIABLE WILL APPEAR AS PART OF THE PRINTED OUTPUT (A FEW VARIABLES ARE BOTH 'INPUT' AND 'OUTPUT').

'SUB1' MEANS THE VARIABLE IS USED WITHIN SUBROUTINE 'SUB1'.

'SUB2' MEANS THE VARIABLE IS USED WITHIN SUBROUTINE 'SUB2'.

A1-A5...(OUTPUT) SENSITIVITY ANALYSIS FIRST ORDER COEFFICIENTS OR 'SLOPE' TERMS IN THE LINEAR EQUATIONS RELATING NET VARIABLE COST TO THE COST, ON AN INPUT BASIS OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER, AND FUEL.

ABTR....(INTERNAL) AVERAGE EFFECTIVE B.T.U. PER POUND OF RESIDUES.

AUXF....(INTERNAL) THE PERCENT OF TOTAL WOOD AND AUXILIARY FUEL ON A B.T.U. BASIS WHICH MUST BE AUXILIARY FUEL REQUIRED TO BURN WOOD OR BARK FUEL (AUXF IS ASSIGNED A VALUE BY THE PROGRAM).

AUXI....(OUTPUT) UNITS OF AUXILIARY FUEL REQUIRED (BARRELS OF OIL OR MCF OF NATURAL GAS) PER CUBIC FOOT OF CUT PANEL PRODUCT.

AVH....(SUB1) AVAILABLE HEAT OF WOOD FUEL (BTU'S PER POUND).

B1-B5.... (OUTPUT) SENSITIVITY ANALYSIS CONSTANTS IN THE LINEAR EQUATIONS RELATING NET VARIABLE COST TO THE COST, ON AN INPUT BASIS OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER, AND FUEL.

BAUX.... (OUTPUT) B.T.U.S SUPPLIED BY AUXILIARY FUEL PER CU. FT. CUT PANEL PRODUCT.

BTBK....(OUTPUT) B.T.U. VALUE OF THE BARK FUEL GENERATED PER CUBIC FOOT OF CUT PANEL PRODUCT.

BTEF.... (SUB2) MILLION EFFECTIVE B.T.U. PER UNIT OF FUEL FOR NON-RESIDUE FUELS.

BTFR.... (INTERNAL) MILLION EFFECTIVE B.T.U.'S IN PROCESS WOOD RESIDUE FUEL PER CUBIC FOOT CUT PANELS.

BTFU.... (SUB2) B.T.U. VALUE OF FUEL PER UNIT OF FUEL IN MILLION B.T.U. PER FUEL UNIT.

BT+CCCC0+N-0T+00TP0T+ M+LL+ONS OF BCTC0C -+- +-E+ +T T+E B0+LE-

BTRH....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER FOR HEATING STEAM PER CUBIC FOOT OF CUT PANEL PRODUCT.

BTRM....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER FOR MISCELLANEOUS PURPOSES PER CUBIC FOOT OF CUT PANEL PRODUCT.

BTRP.... (INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER FOR THE PRESS PER CUBIC FOOT OF CUT PANEL PRODUCT.

BTRT.... (INPUT + OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER FOR THE THAN POND PER CUBIC FOOT OF CUT PANEL PRODUCT.

BTUB....(INPUT) HIGHER HEATING VALUE IN MILLIONS OF B.T.U. PER POUND OF OVEN DRY BARK FUEL.

BTUC....(INPUT) HIGHER HEATING VALUE OF COAL IN MILLION B.T.U. PER TON OF COAL.

BTUE....(SUB1) EFFECTIVE B.T.U.'S PER POUND OF WOOD OR BARK RESIDUES FUEL.
BTUF.... (INPUT) HIGHER HEATING VALUE IN MILLIONS OF B.T.U. PER POUND OF OVEN DRY FINES FUEL
BTUG....(INPUT) HIGHER HEATING VALUE OF NAT. GAS IN MILLION B.T.U. OF NATURAL GAS
BTUO....(INPUT) HIGHER HEATING VALUE OF OIL IN MILLION B.T.U. PER BARREL OF OIL
BTUW....(INPUT) HIGHER HEATING VALUE OF EXTERNAL WOOD FUEL IN MILLION B.T.U. PER TON OF WOOD FUEL
BTVF....(INTERNAL) EFFECTIVE B.T.U. VALUE OF FINES PER CUBIC FOOT OF CUT PANEL PRODUCT
BTWR.... (OUTPUT) MILLION EFFECTIVE B.T.U.'S IN WET WOOD RESIDUES PER CUBIC FOOT CUT PANELS
CAUX.... (OUTPUT) THE COST OF AUXILIARY FUEL PER CUBIC FOOT OF CUT PANEL PRODUCT
CCUF....(INPUT) THE COST OF WOOD RAW MATERIAL PER CUBIC FOOT OF WOOD RAW MATERIAL
CFRW....(OUTPUT) CUBIC FEET OF WOOD RAW MATERIAL REQUIRED PER CUBIC FOOT OF CUT PANEL PRODUCT
CKWH....(INPUT+OUTPUT) COST OF ELECTRICITY PER KILOWATT-HOUR
COBT....(OUTPUT) THE COST OF FUEL PER MILLION AVERAGE EFFECTIVE B.T.U.
CORM.... (INPUT) F.O.B.-MILL MARKET VALUE OF THE RESIDUE MIX PER POUND OF RESIDUES
CORR....(INTERNAL) WEIGHT OF RESINS REQUIRED BY PROCESS FOR CORE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)
CORW....(INTERNAL) WEIGHT OF WAX REQUIRED BY PROCESS FOR CORE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)
CRES.... (INPUT+OUTPUT) THE COST OF RESIN PER POUND OF RESIN
CWAX.... (INPUT+OUTPUT) THE COST OF WAX PER POUND OF WAX
DHL.... (SUB1) DRY GAS HEAT LOSS PERCENT OF AVAILABLE HEAT
DMCT.... (SUB1) DRY BASIS MOISTURE CONTENT OF WOOD OR BARK FUEL
DRYH.... (OUTPUT) FUEL VALUE REQUIRED BY DRYER IN MILLION EFFECTIVE B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT
ERDF.... (INTERNAL) MILLION EFFECTIVE B.T.U.'S PER POUND OF PROCESS DRY WOOD RESIDUE FUEL
EBTB....(INTERNAL) THE EFFECTIVE B.T.U.'S PER POUND OF BARK FUEL
EBTC....(INTERNAL) MILLION EFFECTIVE B.T.U. PER TON OF COAL
EBTG.... (INTERNAL) MILLION EFFECTIVE B.T.U. PER MCF OF NAT. GAS
EBTO....(INTERNAL) MILLION EFFECTIVE B.T.U. PER BARREL OF OIL
EBTW.... (INTERNAL) MILLION EFFECTIVE B.T.U. PER TON OF EXTERNAL (NON-PROCESS RESIDUE) WOOD FUEL
EBWR....(INTERNAL) MILLION EFFECTIVE B.T.U.'S PER POUND OF PROCESS WET WOOD RESIDUE FUEL
EFF.... (SUB1) EFFICIENCY PERCENT OF AVAILABLE HEAT
FACR.... (INTERNAL) WEIGHT OF RESINS REQUIRED BY PROCESS FOR FACE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)
FACT.... (INTERNAL) NUMBER OF POUNDS PER BONE-DRY-UNIT
FACW.... (INTERNAL) WEIGHT OF WAX REQUIRED BY PROCESS FOR FACE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)
FPMC....(INPUT+OUTPUT) MOISTURE CONTENT OF THE WOOD IN THE
FINISHED PRODUCT (PERCENT O.D. BASIS)

FPSZ....(INTERNAL) FINISHED PANEL SIZE IN SQUARE INCHES

FRQN....(OUTPUT) NET FUEL VALUE REQUIRED IN MILLION EFFECTIVE
B.T.U. PER CU. FT. OF CUT PANEL PRODUCT

FUEL....(OUTPUT) THE UNITS OF EXTERNAL NON-RESIDUE FUEL (BARRELS,
TONS, OR MCF) REQUIRED PER CUBIC FOOT OF CUT PANEL
PRODUCT

GBA....(OUTPUT) GROSS BOARD WEIGHT OF PANELS PER CUBIC FOOT
OF PANEL (IN POUNDS)

GMCT....(SUB1) GREEN BASIS MOISTURE CONTENT OF WOOD OR BARK FUEL

GRFF.... (INTERNAL) POUNDS OF PROCESS WOOD FUEL FINES AND TRIMS
GENERATED PER CU. FT. OF CUT PANEL PRODUCT

GRMC....(INPUT) MOISTURE CONTENT OF WOOD FURNISH RAW MATERIAL
BEFORE ENTERING PROCESS (% O.D.)

GRWD.... (OUTPUT) POUNDS OF GREEN WOOD RAM MATERIAL REQUIRED
PER CU. FT. OF CUT PANEL PRODUCT

GRWF.... (INTERNAL) POUNDS OF PROCESS WOOD FUEL FINES AND TRIMS
AVAILABLE (AFTER DEDUCTION OF THE NON-RENEWABLE LOSS)
PER CUBIC FOOT OF CUT PANEL PRODUCT

GWOD.... (OUTPUT) POUNDS OF OVEN DRY WOOD REQUIRED PER CUBIC
FOOT OF CUT PANEL PRODUCT

GWOO....(INTERNAL) GROSS OVEN DRY WEIGHT OF PARTICLEBOARD
OUTPUT PER CUBIC FOOT OF CUT PANEL PRODUCT (IN POUNDS)

GWTF.... (INTERNAL) GROSS POUNDS OF FURNISH (WOOD PLUS ANY
RECYCLED TRIMS) PER CUBIC FOOT CUT PANEL PRODUCT

HHL.....(SUB1) HYDROGEN HEAT LOSS PERCENT OF AVAILABLE HEAT

HHTV.... (SUB1) THE HIGHER HEATING VALUE OF A WOOD OR BARK FUEL
IN B.T.U.S PER POUND

IFOP....(INTERNAL) INTEGER OPTION VARIABLE SPECIFYING THE TYPE OF
FUEL BEING USED: OIL, COAL, NAT. GAS OR WOOD

IOP1.... (INPUT) AN OPTION VARIABLE TO SPECIFY THE KIND OF
OUTPUT TO BE DELIVERED IN COLUMN TWO OF THE PRINTOUT

IOP2.... (INPUT) AN OPTION VARIABLE TO SPECIFY THE KIND OF
OUTPUT TO BE DELIVERED IN COLUMN THREE OF THE PRINTOUT

ITOP....(INPUT) AN OPTION VARIABLE TO SPECIFY WHETHER OR NOT
TRIMS WILL BE RECYCLED AS FURNISH (0=RECYCLED, 1=TRIMS
USED AS FUEL)

NAxF.... (INTERNAL) AN OPTION VARIABLE TO CONTROL THE TYPE OF
AUXILIARY FUEL BEING USED (1 FOR OIL, 2 FOR NATURAL GAS)

NCOP....(INPUT) AN OPTION VARIABLE TO CONTROL THE NUMBER OF
COPIES OF PRINTED OUTPUT (1 TO 10)

NOPT....(INPUT) AN OPTION VARIABLE TO CONTROL THE WIDTH OF
THE PRINTED OUTPUT (3 OR 5 COLUMNS OF DATA)

ODMC.... (INPUT) MOISTURE CONTENT OF THE WOOD COMING OUT OF THE
DRYER (% O.D.)

ODWP.... (INPUT+OUTPUT) THE OVEN DRY WEIGHT OF THE PRESSED PANELS
PEW CUBIC FOOT OF PANEL (IN POUNDS)

ODWW.... (OUTPUT) THE OVEN DRY WEIGHT OF WOOD AFTER PRESSING
IN A CUBIC FOOT OF PRESSED PANEL (IN POUNDS)

P.....(INTERNAL) PRICE OF FUEL PER EFFECTIVE B.T.U.

PCCF.... (INPUT) PERCENT OF THE PRODUCT THAT IS CORE FURNISH

PCFF.... (INPUT) PERCENT OF THE PRODUCT THAT IS FACE FURNISH
PCOL....(INPUT) PRICE OF COAL IN DOLLARS PER TON
PCON....(OUTPUT) THE PROFIT CONTRIBUTION AS THE NET SALES VALUE
MINUS THE VARIABLE COSTS OF PRODUCTION PER CUBIC FOOT
OF CUT PANEL PRODUCT
PCRA....(OUTPUT) THE PROFIT CONTRIBUTION RATIO (RATIO OF THE
PROFIT CONTRIBUTION TO NET SALES VALUE)
PCTB....(INPUT+OUTPUT) VOLUME RATIO OF BARK TO WOOD IN THE
ROUNDWOOD RAW MATERIAL EXPRESSED AS A DECIMAL
PCTF.... (INPUT+OUTPUT) THE RECOVERABLE PERCENT FINES-LOSS IN
CUTTING AND CHIPPING OF RAW WOOD (PERCENT OF RAW WOOD)
PCTR....(SUB1) PERCENT EXCESS AIR IN RESIDUE FUEL COMBUSTION
(ASSIGNED A VALUE OF 40% BY THE PROGRAM)
PCTT....(OUTPUT) PERCENT OF PARTICLEBOARD OUTPUT THAT IS CUT
AWAY AS TRIMS
PERM.... (INTERNAL) A PERCENT OF THE FINES GENERATED THAT IS
PERMANENTLY LOST (NON-RECOVERABLE LOSS-NOT TO BE
CONFUSED WITH 'PCTF')
P.F ......... (INTERNAL) COST OF EXTERNAL PURCHASED FUEL, EXCLUDING
AUXILIARY FUEL PER CU. FT. CUT PANELS
PGAS.....(INPUT) PRICE OF NATURAL GAS IN DOLLARS PER MCF
POIL.....(INPUT) PRICE OF OIL IN DOLLARS PER BARREL
PPLG .....(INPUT) THE LENGTH OF THE CUT PANEL PRODUCT IN INCHES
PPWD....(INPUT) THE WIDTH OF THE CUT PANEL PRODUCT IN INCHES
PR ...... (OUTPUT) THE PERCENT IS RESIN, BY WEIGHT
PRRC.... (INPUT) THE REQUIRED RESIN WEIGHT PERCENT OF CORE FURNISH
PRRF.... (INPUT) THE REQUIRED RESIN WEIGHT PERCENT OF FACE FURNISH
PTLG.... (INPUT) THE WIDTH IN INCHES OF THE STRIP OF TRIMS CUT
AWAY ALONG THE PANEL LENGTH (AVERAGE FIGURE)
PTWD....(INPUT) THE WIDTH IN INCHES OF THE STRIP OF TRIMS CUT
AWAY ALONG THE PANEL WIDTH (AVERAGE FIGURE)
PW ......(OUTPUT) THE PERCENT IS WAX, BY WEIGHT
PWOD....(INPUT) PRICE OF EXTERNAL WOOD FUEL IN DOLLARS PER TON
PWRC....(INPUT) THE REQUIRED WAX PERCENT OF CORE FURNISH
PWRF.... (INPUT) THE REQUIRED WAX PERCENT OF FACE FURNISH
PWSR....(INPUT) THE PERCENT OF GREEN WOOD RAW MATERIAL WHICH IS
LOST AS SCREENED WET RESIDUES IN THE PROCESS FROM THE
DEBARKER TO THE DRYER BUT WHICH MAY BE RECOVERED AS
'WET SCREENED' WOOD FUEL
RDWC.....(OUTPUT) THE COST OF WOOD RAW MATERIAL PER CUBIC FOOT
OF CUT PANEL PRODUCT
RESR.....(OUTPUT) MARKET VALUE OR REALIZATION FOR EXCESS RESIDUES
(ASSUMES EXCESS RESIDUES ARE MARKETED IN A MIX WITH
AMOUNTS OF EACH RESIDUE TYPE PROPORTIONAL TO AMOUNTS
PRODUCED) PER CU. FT. CUT PANEL PRODUCT
RESV..... (OUTPUT) MARKET VALUE OF RESIDUE MIX PER BONE-DRY-UNIT
(2400 POUNDS)
RKWH.... (INPUT+OUTPUT) THE REQUIRED KILOWATT-HOURS OF ELECTRICITY
PER CUBIC FOOT OF CUT PANEL PRODUCT
SALE..... (INPUT+OUTPUT) THE NET SALES VALUE OF THE CUT PANEL
PRODUCT PER CUBIC FOOT
SGBK.. (INPUT) THE OVEN DRY SPECIFIC GRAVITY OF THE BARK

SGRW... (INPUT+OUTPUT) THE OVEN DRY SPECIFIC GRAVITY OF THE WOOD RAW MATERIAL

SHL . . . . (SUB1) SENSIBLE HEAT LOSS (HEAT LOSS DUE TO MOISTURE) PERCENT OF AVAILABLE HEAT

T1 . . . . (SUB1) TEMPERATURE OF RESIDUE FUELS AND FURNACE AIR BEFORE COMBUSTION IN DEGREES FAHRENHEIT

T2 . . . . (SUB1) STACK GAS TEMPERATURE FOR COMBUSTION OF RESIDUE FUELS IN DEGREES FAHRENHEIT

TBTR.... (OUTPUT) TOTAL FUEL VALUE REQUIRED BY DRYER AND PROCESS STEAM, MILLION B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT

TCRE.... (OUTPUT) TOTAL COST OF RESIN PER CUBIC FOOT OF CUT PANEL PRODUCT

TCWx.... (OUTPUT) TOTAL COST OF WAX PER CUBIC FOOT OF CUT PANEL PRODUCT

THL..... (SUB1) TOTAL HEAT LOSS PERCENT OF AVAILABLE HEAT

TITL.... (INPUT+OUTPUT) AN ALPHANUMERIC ARRAY FOR THE PRINTED OUTPUT TITLE WHICH MAY BE SPECIFIED IN THE DATA DECK

TMWT..... (INTERNAL) POUNDS OF TRIMS GENERATED PER CUBIC FOOT OF CUT PANEL PRODUCT

TNCV..... (OUTPUT) THE GROSS VARIABLE COST OF ENERGY AND RAW MATERIALS FOR THE PRODUCTION PROCESS PER CUBIC FOOT OF CUT PANEL PRODUCT

TRES.... (OUTPUT) TOTAL WEIGHT OF RESIN REQUIRED IN POUNDS PER CUBIC FOOT OF CUT PANEL PRODUCT

TRMS.... (INTERNAL) SQUARE INCHES OF TRIM LOSS PER PANEL

TWAX....(OUTPUT) TOTAL WEIGHT OF WAX REQUIRED IN POUNDS PER CUBIC FOOT OF CUT PANEL PRODUCT

V(I, J). (OUTPUT) TWO DIMENSIONAL ARRAY FOR STORAGE OF OUTPUT VARIABLES AND CONVERSION TO MSF AND CUBIC METER BASIS

WBMC.... (INPUT) THE MOISTURE CONTENT OF THE BARK (PERCENT OVEN DRY BASIS)

WOR . . . . (OUTPUT) WEIGHT OF RESINS IN THE PANELS (IN POUNDS PER CUBIC FOOT OF PRESSED PANEL)

WOW...... (OUTPUT) WEIGHT OF WATER IN THE PANELS (IN POUNDS PER CUBIC FOOT OF PRESSED PANEL)

WTWD.... (SUB1) WEIGHT OF DRY FUEL PER POUND OF GREEN OR WET WOOD OR BARK FUEL

WTWR.... (INTERNAL) POUNDS OF WET WOOD RESIDUES GENERATED PER CUBIC FOOT OF CUT PANEL PRODUCT

WWX...... (OUTPUT) WEIGHT OF WAX IN THE PANELS (IN POUNDS PER CUBIC FOOT OF PRESSED PANEL)
C ***  B.T.U. VALUE OF DRIED WOOD FUELS / CU. FT. CUT PANELS  
CALL SUB1 (BTU, ODMC, EBDF)  
BTVF = GRWF • (1.0 + ODMC) • EBDF  
V(1,29) = BTVF  
P(1) = PCOL  
CALL SUB2 (BTUW, EBTW, 3)  
CALL SUB2 (BTUC, EBTC, 1)  
CALL SUB2 (BTUD, EBTO, 0)  
PF = 0.0  
DO 10 I = 2,4  
K = IFOP + 1  
DO 10 I = 2,4  
IF (P(I) LT. P(K)) K = I  
10 CONTINUE  
Pf = P(K) • FRQN  
C ***  CALCULATE UNITS OF EXTERNAL FUEL REQUIRED, BBL, OIL, MCF, NAT. GAS  
C ***  GAS, TONS COAL OR TONS WOOD EXCLUDING AUXILIARY OIL  
C ***  IF (IFOP_EQ. 0) FUEL = FRQN • (EBTO • • • • 1.0)  
C ***  IF (IFOP_EQ. 1) FUEL = FRQN • (EBTC • • • • 1.0)  
C ***  IF (IFOP_EQ. 2) FUEL = FRQN • (EBTG • • • • 1.0)  
C ***  IF (IFOP_EQ. 3) FUEL = (FRQN - (AUXF • FRQN)) • (EBTW • • • • 1.0)  
C ***  WEIGHTED AVERAGE COST PER MILLION EFFECTIVE B.T.U. OF FUEL  
C ***  IF (IFOP_EQ. 0) COBT = P(1) • (FRQN • (BTBTR • (BTBK • (WBMC • EBTBK)) • FRN))  
C ***  IF (IFOP_EQ. 1) COBT = P(2) • (FRN / (BTBK • (FRN)) • FRN) • (EBTF / (1.0 - AUXF))  
C ***  IF (IFOP_EQ. 2) COBT = P(3) • (FRN / (BTBK • (FRN)) • FRN) • (EBTF / (1.0 - AUXF))  
C ***  AUXILIARY FUEL REQUIRED IF ONLY WOOD FUEL (EXCL. RESIDUES) IS USED  
C ***  IF (IFOP_EQ. 3) AUXF = (AUXF • (1.0 - AUXF)) • (FRN / (BTBK • (FRN)) • FRN) • (EBTF / (1.0 - AUXF))  

PB 81  
PB 82  
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PB 159  
PB 160
IF (IFOP .GE. 3 .AND. NAXF .EQ. 3) AUXI = AUXF • TBTR • (EBTG • - 1.0)  \( \text{PB 161} \)
V (1, 35) = AUXI  \( \text{PB 162} \)
C  \( \text{PB 163} \)
B.T.U.S SUPPLIED BY AUXILIARY FUEL PER CU. FT. CUT PANEL
IF (NAXF .EQ. 1) BAUX = AUXI • EBTG  \( \text{PB 164} \)
IF (NAXF .EQ. 3) BAUX = AUXI • EBTG  \( \text{PB 165} \)
V (1, 37) = BAUX  \( \text{PB 166} \)
C  \( \text{PB 167} \)
CALCULATE COST OF AUXILIARY FUEL PER CU. FT. CUT PANEL
IF (NAXF .EQ. 1) CAUX = AUXI • POIL  \( \text{PB 168} \)
IF (NAXF .EQ. 3) CAUX = AUXI • PGAS  \( \text{PB 169} \)
C  \( \text{PB 170} \)
TOTAL COST OF PURCHASED FUEL PER CU. FT. CUT PANEL
C  \( \text{PB 171} \)
TCR = CAUX + PF
TCRH = (DRYH / TBTR) • TCR
TCPS = TCRH - TCDH
IF (IFOP .EQ. 4) GO TO 50
C  \( \text{PB 172} \)
RESIDUE REALIZATION IF EXCESS RESIDUES ARE AVAILABLE
C  \( \text{PB 173} \)
RESR = (TBTR • (1.0 - AUXF) - TBTG) • (ABTR • - 1.0) • CORM
C  \( \text{PB 174} \)
WEIGHTED AVERAGE COST PER B.T.U.
IF (NAXF .EQ. 1) COBT • POIL • (EBTO • - 1.0) • AUXF
IF (NAXF .EQ. 3) COBT = PGAS • (EBTG • - 1.0) • AUXF
C  \( \text{PB 175} \)
CONTINUE
C  \( \text{PB 176} \)
FACT = APPX.
POUNDS PER BONE DRY UNIT OF PROCESS RESIDUES
FACT = 2400.0
C  \( \text{PB 177} \)
RESV = VALUE OF PROCESS RESIDUES / BDU
RESV = VALUE OF PROCESS RESIDUES / BDU
FACT  \( \text{PB 178} \)
CONTINUE
C  \( \text{PB 179} \)
ANALYSIS OF SENSITIVITY OF NET VARIABLE COST TO THE COST, ON AN
INPUT BASIS, OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER, AND FUEL
C  \( \text{PB 180} \)
SENSITIVITY TO ROUNDWOOD COST (ROUNDWOOD COST/CU. FT. = X )
C  \( \text{PB 181} \)
TNVC = (CFRW) + (CCUF) + (TNVC - RDWC) (Y = A • X + B)
C  \( \text{PB 182} \)
A1 = CFWR
B1 = TNVC - RDWC
C  \( \text{PB 183} \)
SENSITIVITY TO RESIN COST (RESIN COST/LB. = X )
C  \( \text{PB 184} \)
TNVC = (TRES) + (CRES) + (TNVC - TCRE) (Y = A • X + B)
C  \( \text{PB 185} \)
A2 = TRES
B2 = TNVC - TCRE
C  \( \text{PB 186} \)
SENSITIVITY TO WAX COST (WAX COST/LB. = X )
C  \( \text{PB 187} \)
TNVC = (TWAX) + (CWAX) + (TNVC - TCWX) (Y = A • X + B)
C  \( \text{PB 188} \)
A3 = TWAX
B3 = TNVC - TCWX
C  \( \text{PB 189} \)
SENSITIVITY TO ELECTRIC POWER COST (COST/KWH = X )
C  \( \text{PB 190} \)
TNVC = (RKWH) + (CKWH) + (TNVC - TCKW) (Y = • X + B)
C  \( \text{PB 191} \)
A4 = RKWH
B4 = TNVC - TCKW
C  \( \text{PB 192} \)
SENSITIVITY TO FUEL COST (PRICE OF FUEL/FUEL UNIT = X )
IF (IFOP .EQ. 0) A5 = TNVC - FUEL • POIL
IF (IFOP .EQ. 1) B5 = TNVC - FUEL • PCOL
IF (IFOP .EQ. 2) B5 = TNVC - FUEL • PGAS
IF (IFOP .EQ. 3) B5 = TNVC - FUEL • PWOD
A5 = FUEL
A6 = AUXI
B6 = TNVC - CAUX
C  \( \text{PB 193} \)
CONTINUE
C  \( \text{PB 194} \)
DETERMINE OUTPUT VARIABLES
C  \( \text{PB 195} \)
DO 60 M = 1, 37
C  \( \text{PB 196} \)
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)= 52.083333 * 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)= 52.083333 * 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)=52.083333 * V(1,M)  PB 252
V(S,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=1,1.60)  PB 265
70 FORMAT(1.325X,20A4//)  PB 266
IF (NOPT .EQ. 3) WRITE(6,80) (TITL(I),I=1,1.60)  PB 267
80 FORMAT(7,3(20A4//))  PB 268
WRITE(6,90)  PB 269
90 FORMAT(32X,'$/CU.FT.'  PB 270
IF (IOP1 .EQ. 0) WRITE (6,100)  PB 271
100 FORMAT(*,44X,'/MSF 3/4 IN. BASIS')  PB 272
IF (IOP1 .EQ. 1) WRITE (6,110)  PB 273
110 FORMAT(*,44X,'/MSF 1/4 IN. BASIS')  PB 274
IF (IOP1 .EQ. 2) WRITE (6,120)  PB 275
20 FORMAT(*,44X,'/MSF 3/4 IN. BASIS')  PB 276
IF (IOP1 .EQ. 3) WRITE (6,130)  PB 277
30 FORMAT(*,44X,'/MSF 5/8 IN. BASIS')  PB 278
IF (IOP1 .EQ. 4) WRITE (6,140)  PB 279
140 FORMAT(*,44X,'/MSF 1/2 IN. BASIS')  PB 280
IF (IOP2 .EQ. 0) WRITE (6,150)  PB 281
150 FORMAT(*,44X,'/1/2 IN. BASIS')  PB 282
IF (IOP2 .EQ. 1) WRITE (6,160)  PB 283
160 FORMAT(*,66X,'/1/4 IN. BASIS')  PB 284
IF (IOP2 .EQ. 2) WRITE (6,170)  PB 285
170 FORMAT(*,66X,'/3/4 IN. BASIS')  PB 286
IF (IOP2 .EQ. 3) WRITE (6,180)  PB 287
180 FORMAT(*,66X,'/5/8 IN. BASIS')  PB 288
IF (IOP2 .EQ. 4) WRITE (6,190)  PB 289
190 FORMAT(*,66X,'/CUBIC METER')  PB 290
IF (NOPT .EQ. 0) WRITE(6,200) (V(1,1),I=1.5)  PB 291
200 FORMAT(*,84X,'$/CUBIC METER')  PB 292
1 NET SALES VALUE,17x,'$/F7.4,7x,3(','$',F9.3,8x),',',',3('$',F9.3,9X),',',',3('F9.3//')  PB 293
IF (NOPT .EQ. 3) WRITE(6,210) (V(1,1),I=1.5)  PB 294
210 FORMAT('NET SALES VALUE',17x,'$',F7.4,7x,3(','$',F9.3,8x),',',',3('F9.3//')  PB 295
IF 9,3 / ) WRITE(6,220)  PB 296
WHITE(6,220)  PB 297
220 FORMAT('VARIABLE COSTS OF PRODUCTION')  PB 298
IF (NOPT .EQ. 0) WRITE(6,230) CCUF,  PB 299
1(V(1,2),I=1.5),PR,CRES,(V(1,3),I=1.5)  PB 300
1,PW,CWAX,(V(1,4),I=1.5),CKWH,(V(1,5),I=1.5),COBT,(V(1,6),I=1.5),  PB 301
2COBT,(V(1,7),I=1.5),RESV,(V(1,8),I=1.5),(V(1,9),I=1.5),  PB 302
3(V(1,10),I=1.5),PCRA  PB 303
IF (NOPT .EQ. 3) WRITE(6,240) (V(1,2),I=1.3),PR,CRES,(V(1,3),I=1.3)  PB 304
1,PW,CWAX,(V(1,4),I=1.3),CKWH,(V(1,5),I=1.3),COBT,(V(1,6),I=1.3),  PB 305
2COBT,(V(1,7),I=1.3),RESV,(V(1,8),I=1.3),(V(1,9),I=1.3),  PB 306
3(V(1,10),I=1.3),PCRA  PB 307
230 FORMAT(2x,'WOOD : ($F6.4,'/CU.FT.'),8x,'$',F7.4,7x,3(','$',F9.3,8x),',',',3('F9.3//')  PB 308
13x,'RESIN(',F4.1,'% ',S',F4.2,'/LB.'),7x,F7.4,8x,3(F9.3,9x),F9.3/  PB 309
23x,'WAX : (F4.1,'% ',S',F4.2,'/LB.'),9x,F7.4,8x,3(F9.3,9x),F9.3/  PB 310
33x,'ELECTRIC POWER($',F5.3,'/KWH.'),4x,F7.4,8x,3(F9.3,9x),F9.3/  PB 311
53x,'DRIER HEAT(=FUEL*$',F5.3,'/MM BTU'),1x,F7.4,8x,3(F9.3,9x),F9.3/  PB 312
53x,'PROC.STEAM(=FUEL*$',F5.3,'/MM BTU'),1x,F7.4,8x,3(F9.3,9x),F9.3/  PB 313
63x,'LESS RESIDUE(=FUEL+$',F5.6,'/BDU'),1x,F7.4,8x,3(F9.3,9x),F9.3/  PB 314
81 PROFIT CONTRIBUTION,13x,'$',F7.4,7x,3(','$',F9.3,8x),',',',3('F9.3//')  PB 315
85x,'P.RATIO,20x,F4.1,'%',/)  PB 316
200 FORMAT('WOOD : ($F7.4,7x,'$',F9.3,8x),F9.3/  PB 317
13x,'RESIN(',F4.1,'% ',S',F4.2,'/LB.'),7x,F7.4,8x,3(F9.3,9x),F9.3/  PB 318
93x 'WET BARK (' , F3.2 , ' / RATIO OF WOOD ')' , F8.6 , 8x , F9.6 , 9x , F9.6/ PB 478
93x 'SCREENED WET WOOD RESIDUES ' , 4x , F8.6 , 8x , F9.6 , 9x , F9.6/ PB 479
17x 'TOTAL FUEL GENERATED' , 6x , F8.6 , 8x , F9.6 , 9x , F9.6/ PB 480
2 ' AUXILIARY FUEL BTU' , 12x , F8.6 , 8x , F9.6 , 9x , F9.6/ PB 481
3 'NET FUEL REQUIREMENT' , 12x , F8.6 , 8x , F9.6 , F9.6/ PB 482
WRITE (6, 580) PB 483

580 FORMAT( 'FUEL AND POWER REQUIRED' , 6x , 'REQ. / CU.FT.' ) PB 484
IF(IOPl .EQ. 0) WRITE (6, 390) PB 485
IF(IOPl .EQ. 1) WRITE (6, 400) PB 486
IF(IOPl .EQ. 2) WRITE (6, 410) PB 487
IF(IOPl .EQ. 3) WRITE (6, 420) PB 488
IF(IOPl .EQ. 4) WRITE (6, 430) PB 489
IF(IOPl .EQ. 5) WRITE (6, 440) PB 490
IF(IOPl .EQ. 6) WRITE (6, 450) PB 491
IF(IOPl .EQ. 7) WRITE (6, 460) PB 492
IF(IOPl .EQ. 8) WRITE (6, 470) PB 493
IF(IOPl .EQ. 9) WRITE (6, 480) PB 494
IF(IOPl .EQ. 10) WRITE (6, 490) PB 495
IF(IOPl .EQ. 11) WRITE (6, 500) PB 496
IF(IOPl .EQ. 12) WRITE (6, 510) PB 497
IF(IOPl .EQ. 13) WRITE (6, 520) PB 498
IF(IOPl .EQ. 14) WRITE (6, 530) PB 499

600 FORMAT( 'BBL. OIL ($' , F6.2 , ' / BBL.)' , 9x , F8.6 , 8x , F9.3 , 9x , F9.6 ) PB 500
13/)
610 FORMAT( 'BBL. OIL ($' , F6.2 , ' / BBL.)' , 9x , F8.6 , 8x , 3 (F9.6 , 9x) , F9.6 ) PB 512
620 FORMAT( 'TONS WOOD ($' , F8.6 , ' / TON)' , 9x , F8.6 , 8x , F9.3 , 9x , F9.6 ) PB 513
630 FORMAT( 'MCFS. GAS ($' , F6.2 , ' / MCF.)' , 9x , F8.6 , 8x , 3 (F9.6 , 9x) , F9.6 ) PB 514
640 FORMAT( 'TONS WOOD ($' , F6.2 , ' / TON)' , 9x , F8.6 , 8x , 3 (F9.6 , 9x) , F9.6 ) PB 515
650 FORMAT( 'BBL. OIL ($' , F6.2 , ' / BBL.)' , 9x , F8.6 , 8x , F9.3 , 9x , F9.6 ) PB 516
660 FORMAT( 'TONS COAL ($' , F6.2 , ' / TON)' , 9x , F8.6 , 8x , 3 (F9.6 , 9x) , F9.6 ) PB 517
670 FORMAT( 'MCFS. GAS ($' , F6.2 , ' / MCF.)' , 9x , F8.6 , 8x , 3 (F9.6 , 9x) , F9.6 ) PB 518
680 FORMAT( 'TONS WOOD ($' , F6.2 , ' / TON)' , 9x , F8.6 , 8x , 3 (F9.6 , 9x) , F9.6 ) PB 519
9F(NOPT .EQ. 3 .AND. NAXF .EQ. 1) WRITE (6, 700) POIL, (V (I,35), I=1, 3) PB 520
9F(NOPT .EQ. 3 .AND. NAXF .EQ. 3) WRITE (6, 701) PGAS, (V (I,35), I=1, 3) PB 521
996 CONTINUE PB 528
999 CONTINUE PB 529
WRITE (6, 1000) PB 530
1000 FORMAT( '1' ) PB 531

SUBROUTINE SUB1 (HHTV, DMCT, BTUB)

93x THIS SUBROUTINE CALCULATES THE EFFECTIVE HEATING VALUE OF
93x WOOD TYPE FUELS AT A GIVEN MOISTURE CONTENT ASSUMING A FLUE GAS
93x TEMPERATURE OF 400 DEGREES FAHRENHEIT, 40% EXCESS AIR
93x WEIGHT OF WOOD PER LB. OF GREEN OR WET WOOD FUEL
93x
PCTR=0.40 SUB1 2
T=68.0 SUB1 3
T2=400.0 SUB1 4
9
9 UNITS OF DEGREES FAHRENHEIT, 400% EXCESS AIR

C *** HEAT LOSS PERCENT DUE TO MOISTURE (CALLED SENSIBLE HEAT LOSS, SHL)
SHL=(GMCT - (1090.7 - T1 + 0.455 * T2)) / (1090.7 - T1 + 0.455 * T2) / HHTV
HHTV=DML+1/0.45T
C *** HEAT LOSS PERCENT DUE TO DRY GAS HEAT LOSS
C *** OTHER (MISCELLANEOUS) HEAT LOSS PERCENT = 5 PERCENT
C *** TOTAL HEAT LOSS PERCENT
THL=SHL + DHL + 0.05
C *** EFFICIENCY PERCENT
EFF=1.00 - THL
IF(EFF .LT. 0.0) EFF=0.0

-25-
FURNACE BLACKOUT OCCURS AT GREEN M.C. GREATER THAN 68 PERCENT

IF (GWCT .GT. 0.88) EFF=0.0

AVAILABLE HEAT PER POUND

AVH=WTWD - HHTV

EFFECTIVE BTU’S PER POUND

IF (BTUE .LT. 0.0) BTUE=0.0

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)

THIS SUBROUTINE CALCULATES THE EFFECTIVE HEATING VALUE OF THE

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