LᴀᴍLᴜᴍ: A Tool for Evaluating the Financial Feasibility of Laminated Lumber Plants

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Abstract

A spreadsheet-based computer program called LAMLUM was created to analyze the economics of value-added laminated lumber manufacturing facilities. Such failities manufacture laminations, typically from lower grades of structural lumber, then glue these laminations together to make various types of higher value laminated lumber products. This report provides the documentation for LAMLUM. LAMLUM may be downloaded from the USDA Forest Service, Forest Products Laboratory, website (www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr165/fpl_gtr165.html). Extensive screenshots from the program are presented in this documentation.

LAMLUM incorporates discounted cash flow analysis to determine under what conditions a laminated lumber plant might be profitable. LAMLUM can also be used to aid in payroll and employment planning. Break-even analysis is incorporated to calculate the maximum amount that may be paid for laminations while still returning the required rate of return on invested capital to owners.

Plant and equipment, raw materials, wages, administration costs, and working capital are linked to provide cash flow tables and summary financial measures for profitability analysis. A summary cash flow chart and a pie chart showing key cost categories simplify analysis. In addition to cash flows and basic financial measures, LAMLUM provides physical product flows with respect to both wood inputs and wood product outputs.

LAMLUM is structured so that users may easily perform a sensitivity analysis on revenues and key costs without going into the detailed assumptions. Cost contingency factors allow major cost categories to be changed independently of the sensitivity analysis. Products, species and grades, and lamination costs may be changed over time to allow for changing resource requirements or availability and thereby provide flexibility in planning. Extensive built-in annotation in the spreadsheet provides guidance and help. Built-in warnings and error messages help reduce input errors and inform users when and why their results might not be believable.

Keywords: laminated lumber, discounted cash flow analysis, project analysis, break-even analysis, financial analysis, profitability analysis, spreadsheet program.

Where to get more information: Study this manual to become familiar with the terminology and concepts used. For further general information or to obtain assistance with problems you may encounter while using this model, contact: E.M. (Ted) Bilek, USDA Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI, 53726–2398, email: tbilek@fs.fed.us, telephone: (608) 231–9507.

LAMLUM is intended to facilitate the evaluation of the economics of laminated lumber plants. While this model has undergone exhaustive testing to ensure its integrity, the Forest Service cannot guarantee its accuracy or suitability for use. This model relies on user-provided projections. Accuracy of data collection, data entry, and interpretation of results are the responsibility of the user. Neither the author nor the Forest Service will accept responsibility for financial losses that may result from the use of the model.

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LamLum: A Tool for Evaluating the Financial Feasibility of Laminated Lumber Plants

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Introduction

Laminated lumber is an engineered wood product with known physical properties. It is manufactured from laminations that are typically cut from lower grades of structural lumber. These laminations are then glued together to form various types of higher valued products with superior engineering properties. Laminated lumber products have minimum variability, making them easy to incorporate into engineering design and easy to build with. They provide opportunities to utilize species and grades that may otherwise be underutilized by adding value to them. This effectively expands wood supplies and can aid in forest conservation by reducing pressure on larger, more popular species and providing opportunities to perform forest health treatments to areas that otherwise would be too costly to treat.

This report describes the documentation for LamLum, an integrated spreadsheet model that was developed to analyze investments in laminated lumber plants. The model is available for downloading from the Forest Products Laboratory website (www.fpl.fs.fed.us documnts/fplgtr/fpl_gtr165/ fpl_gtr165.html). Sample data are presented that can be used to test the power and flexibility of the model. However, the results presented do not represent those of an actual laminated lumber plant, and users should enter their own data. The quality and accuracy of any given analysis will depend on the quality of the data.

The model should be of interest to anyone currently manufacturing laminated lumber or laminated lumber products. It should also be of interest to anyone considering investing in such a facility. The outputs produced from the model could form the core of a business plan for such investments. Components of the model may be used to minimize costs in specific areas. With LamLum, an analyst can determine how much can be paid for inputs while still providing a required rate of return.

LamLum is an integrated financial model designed to evaluate the economics of building and operating a laminated lumber plant over a 20-year planning period. It determines cash flows before-tax and finance, before tax, and after tax. The model calculates net present values and internal rates of return. It calculates maximum break-even lamination input costs to provide a specified after-tax rate of return. It also provides physical product flows. It can be used to aid in payroll and employment planning as well as in profitability and feasibility analysis.

LamLum is spreadsheet-based, created in Microsoft Excel (Redmond, Washington), giving it a familiar interface, making it flexible, and providing it with all the built-in power of spreadsheet applications. The model is organized around worksheets that may be easily replaced or updated, which renders the model modular. All inputs that are utilized by several worksheets are fully integrated so that inputs need to be changed only once to give updated costs and results, which helps to minimize data input errors. In this report, all data that must be input manually appear in boldface type on the worksheet screenshots; these data appear in blue type in the computer program. The screenshots appear at the end of this report.

Several inputs on the *FINANCIAL SUMMARY* worksheet allow the user to easily see the impacts of changed contingency assumptions or cost or revenue assumptions. The *FINANCIAL SUMMARY* worksheet also includes inputs that allow the user to do a full sensitivity analysis without leaving this page. The impacts of changing economic conditions or assumptions may be quickly and easily explored, with the results immediately seen in terms of net present values and internal rates of return. Summary built-in charts provide information at a glance regarding profitability and cash flows.

A basic understanding of discounted cash flow analysis is required for understanding the kinds of outputs provided by LamLum, their significance, and the reasons they change when certain variables are altered. Some understanding of accounting and depreciation is also helpful, but such knowledge is not essential for using this model.

LamLum is extensively annotated with comments in many spreadsheets. In this report, the Appendix shows inputs required to assemble a costing model. In the following paper, we describe the main features of LamLum, the structure of the model, and assumptions.

LamLum Features

The LamLum model includes the following features:

- Up to 10 laminations or lumber input grades, each with different costs and recoveries

- Up to 6 product output grades in addition to merchantable and unmerchantable residues

- Separate accounting for process equipment, land, and buildings

- Up to 8 types of rolling stock

- Straight-line or diminishing value depreciation methods or a user-specified custom rate

- Two methods for automatically calculating terminal values

- Option to purchase or lease land and buildings

- Flexibility in scheduling shifts and administrative requirements

- Flexibility in lamination input and output mixes over time

- Flexibility and power in entering product prices and input costs; prices or costs can be entered once and increase automatically with inflation or can be entered manually for each year

- Comprehensive financial analysis showing 20-year cash flows as well as net present values and internal rates of return

- Integrated sensitivity analysis factors to facilitate simple performance of a complex analysis

- Integrated contingency factors so that capital costs, direct production costs, fixed costs and overheads, or working capital may be adjusted separately from sensitivity analysis

- Extensive annotated notes, warnings, and error messages to guide inputs

- No macros, so model may be downloaded

LamLum Structure

The LamLum model consists of 18 worksheets and 2 charts:

- Three preliminary worksheets

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[1]Net present value (NPV) is the difference between the positive and negative cash flows of a project discounted to the present (that is, adjusted for interest) at the weighted average cost of capital (an interest rate, also known as the discount rate). If an NPV is positive, the project is earning a rate of return higher than the discount rate used to calculate the NPV. If an NPV is negative, the project is earning a rate of return lower than the discount rate used to calculate the NPV. Other literature may refer to this calculation as the net present worth (NPW) or the present net worth (PNW). All terms refer to the difference between the project benefits and costs when both are discounted at an appropriate rate. A project may have a negative NPV and still be "profitable" in terms of accounting. For example, a project earning a return of 7% on its invested capital would show a negative NPV if those cash flows were discounted at a rate greater than 7%.

[2]The internal rate of return is an interest rate that, when used to discount project cash flows, produces an NPV = $0.

- Two summary worksheets and two charts

- Three primary input assumptions worksheets

- Ten costing worksheets

The model's main structure is shown in Figure 1. Nine specialized costing worksheets feed into *Consolidated Operating Costs*. *Production Revenues, Laminations Costs & Conversions,* and *Consolidated Operating Costs* feed into the *CASH FLOW SUMMARY*. The numbers from the *CASH FLOW SUMMARY* are used to produce the *CASH FLOW CHART*. These numbers are also consolidated into present values in the *FINANCIAL SUMMARY*. The numbers from the *FINANCIAL SUMMARY* are used to produce the *SUMMARY PIE CHART*. Figure 1 does not include the preliminary worksheets or the general assumptions worksheet. The remainder of this section is a more detailed discussion of the contents of each worksheet.

Preliminary Worksheets

The three preliminary worksheets contain the *Title*, *Introduction*, and *Contents*. The *Title* page contains notes of changes since the last revision of the model. The *Introduction* contains some brief background to the model. The *Contents* page describes the worksheets.

Summary Worksheets

The Summary worksheets consist of the *FINANCIAL SUMMARY*, *SUMMARY PIE CHART*, *CASH FLOW CHART*, and *CASH FLOW SUMMARY*. In this report, the titles of these worksheets are set in capital letters and italics to distinguish these worksheets in the Excel workbook.

Financial Summary

The *FINANCIAL SUMMARY* worksheet consolidates the analysis results. It represents the bottom line, containing the final costs, calculated rates of return, and financial indicators in present value terms. It also contains the input variables for conducting a sensitivity analysis. Cost contingency variables allow the analyst to alter various categories of costs outside the sensitivity analysis. The key cost-of-capital variables contain the pre-tax required return premium on risk capital and the debt to total capital ratio. The optional summary laminations input cost may be used to test various break-even scenarios. (See section on Laminations Costs & Conversions for a description of how to run a break-even analysis.)

Tables in the *FINANCIAL SUMMARY* worksheet include Financial Indicators, Revenue & Cost Summary, Break-Even Summary, Sensitivity Analysis Scaling Factors and Cost Contingency Allowances, Costs of Capital, Discounted Costs and Profit (Loss) as Percentage of Sales, and Present Value of Throughput. The Financial Indicators table (Screenshot 1) includes net present values (NPVs)[1] and internal rates of return (IRRs).[2] The IRR values are shown both as nominal percentages, including inflation, and real
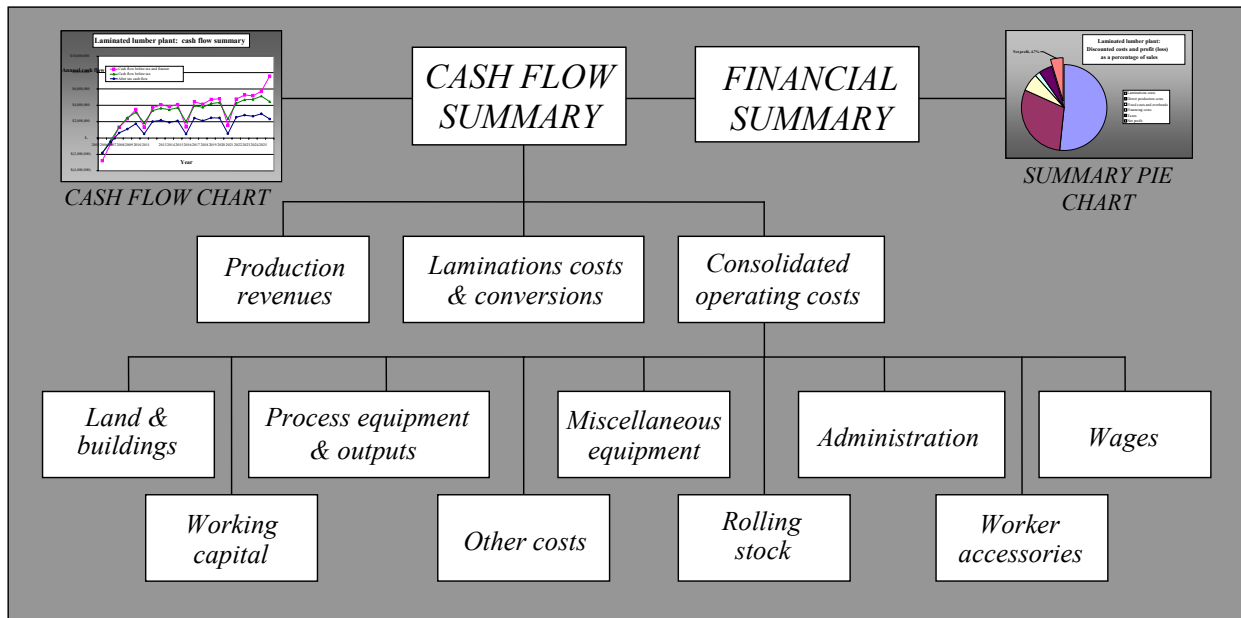
Figure 1—The structure of LAMLUM main worksheets.

percentages, not including inflation. Since NPV is identical in either real or inflation-adjusted terms, only one set of NPV figures is shown. Both NPVs and IRRs are shown before tax and finance, before tax, and after tax.[3]

The IRR seed is a variable to be entered by the analyst. It is a starting point for the IRR calculations of the program. If a series of cash flows has multiple IRRs, varying this seed may help to determine what they are. Multiple IRRs can occur if the project's net cash flows change signs more than once; for example, from negative to positive to back to negative.

The Revenue & Cost Summary table (Screenshot 2) contains present values of the revenue and all major cost categories. These present values are provided in terms of total dollars and dollars per unit (thousand board feet (MBF) of input). All costs are also given as a percentage of sales so that the user may see which cost categories are the most significant. The after-tax NPV represents after-tax profit (loss) over and above the owners' after-tax real weighted average cost of capital (WACC).[4] If the after-tax NPV = $0, then the real IRR will be equal to the after-tax real WACC. An NPV of $0 means that the owners are covering their costs and are earning exactly the interest rate they have required the project to pay them, no more and no less. This is a key concept for break-even analysis.

The Break-Even Summary table (Screenshot 3) contains the calculated break-even laminations cost. This represents the maximum average amount at the start-up of the project that could be paid for input laminations and sorting costs, while still providing the specified after-tax return on capital. The

break-even laminations cost calculation is only an approximation because of the circular relationship between working capital and costs. However, the optional summary laminations input cost can be used to determine how much can be paid for an individual input grade. The break-even values are provided at start-up (year 0) and at the end of the first year of operation (year 1).

The Discounted Costs and Profit (Loss) as a Percentage of Sales table (not shown) consolidates figures from the Revenue & Cost Summary. It provides the input figures for the *SUMMARY PIE CHART,* which will be discussed later.

The Present Volume of Throughput table (not shown) comes from the *Laminations Costs & Conversions* worksheet. It is a discounted figure necessary to calculate accurate average unit costs.

The *FINANCIAL SUMMARY* worksheet contains input options for running a sensitivity analysis (Screenshot 4). The sensitivity analysis scaling factors may be changed from 100% to view the impact of changes in costs or revenues on NPVs, IRRs, and cash flows. For example, to see what happens if wage costs are 10% higher than the input figures, change the wage scaling factor to 110%. If wage costs are 10% lower than the input figures, change the wage scaling

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[3]Before-tax NPV is calculated using before-tax cash flows and a tax-adjusted after-tax weighted average cost of capital (WACC) for the tax rate. The formula to calculate the before-tax WACC is: Before-tax WACC = After-tax WACC/(1 − Tax rate).

[4]The cost of inflation is removed from a "real" cost of capital or interest rate. In contrast, a "nominal" rate includes inflation.
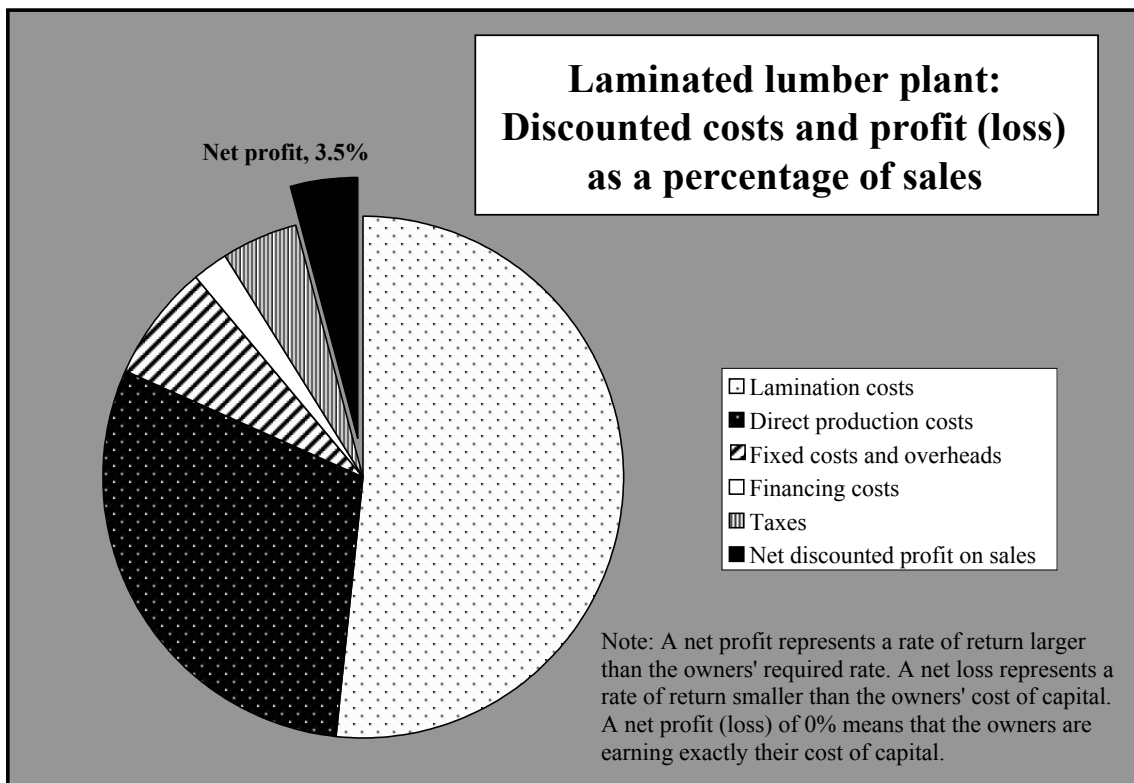
Figure 2—Sample printout of SUMMARY PIE CHART.

factor to 90%. To eliminate a cost, set its sensitivity analysis scaling factor to 0%.

Related to the sensitivity analysis scaling factors are the cost contingency allowances (Screenshot 4), which allow the user to provide an extra percentage over and above the given costs as an overrun allowance without having to adjust the scaling factors. The cost contingency allowances add a percentage to a cost category and are incorporated in the *Consolidated Operating Costs* worksheet. These cost contingency factors are provided to allow the scaling factors to be used for sensitivity analysis and not for ordinary cost estimation. If there is no doubt about the "best guess" cost input, then the contingency factor should be set to 0%.

The pre-tax required return premium on risk capital (Screenshot 5) is a rate above the bank's "safe" deposit interest rate. It allows the analyst to easily determine the impact of changing risk premiums on break-even input costs and profitability. The cost of capital is a function of the risk premium, "safe" deposit rate, borrowing rate, and debt/total capital ratio. It is set up in this way so that if bank interest rates change, the analyst does not have to remember to also change the cost of capital. It will automatically be adjusted to reflect new rates or new capital structures.

The "Debt/Total capital" input on the *FINANCIAL SUM-MARY* worksheet (Screenshot 5) allows the analyst to easily see the impact of changing the operation's financing on the

financial summary and the break-even costs. The costs of capital are on the worksheet simply for reference.

Summary Pie Chart

The *SUMMARY PIE CHART* graphs some cost and profit (loss) data from the *FINANCIAL SUMMARY* worksheet to enable the analyst to see at a glance those costs that are most significant. Figure 2 shows a sample graph.

The *SUMMARY PIE CHART* summarizes all cash flows for all years. The net profit or loss is expressed in terms of NPV. That is, it represents a return either greater or less than the owners' cost of capital. The example (Fig. 2) indicates that the owners are recovering all their costs, including interest and their required risk premium on their invested capital; they will also be earning an additional 3.8% on their sales over the life of the project.

Cash Flow Chart

The *CASH FLOW CHART* (Fig. 3) graphs the three main cash flows over the life of the project: before tax and finance, before tax, and after tax. The cash flow data are derived from the *CASH FLOW SUMMARY*.

Cash Flow Summary

The *CASH FLOW SUMMARY* is a combined 20-year pro-jection of capital costs, revenues, and annual expenses. The bottom-line Cash Flow Summary table shows the cash flows before tax and finance, before tax, and after tax. The Summary Cash Flow table shows the consolidated cash
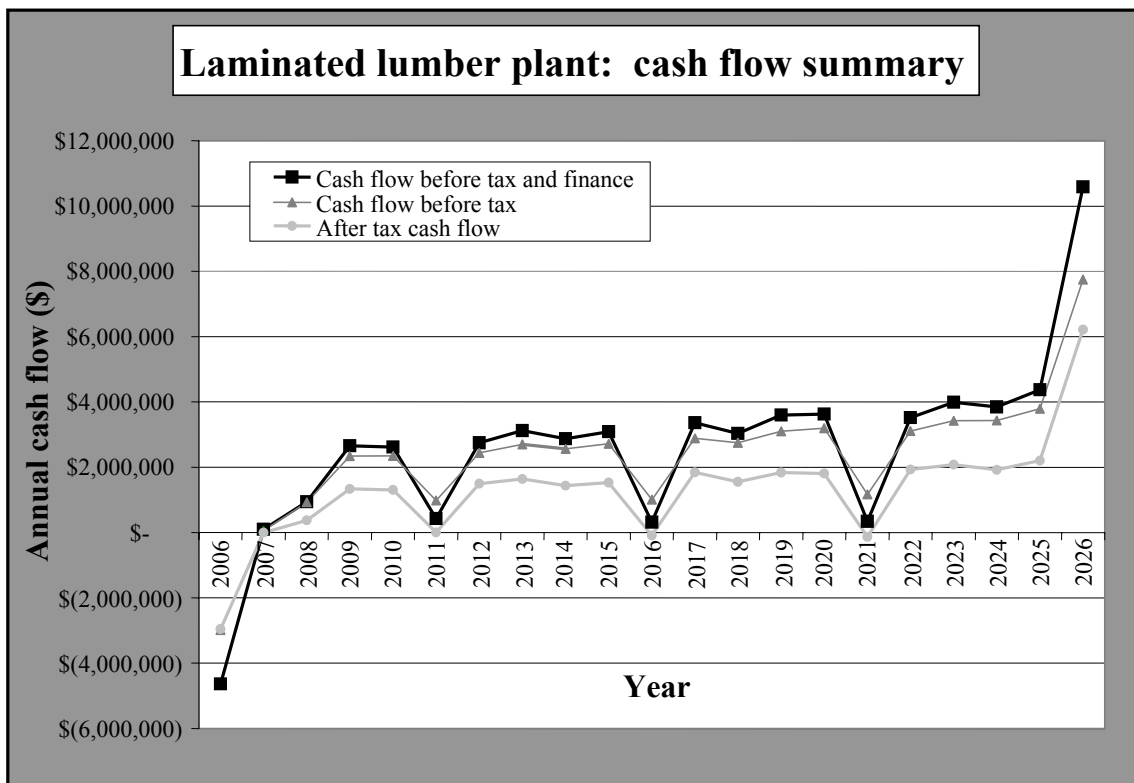
Figure 3—Sample printout of CASH FLOW CHART.

flows for each revenue and expense category by year. There is also a 20-year summary table of wood inputs and product outputs.

The main assumptions in this cash flow model are as follows:

- All cash flows occur at the end of each year.

- Year 0 represents the start of the project's operations.

- All cash expenses and all revenues will increase at the specified inflation rate.

- Depreciation expense will not increase with inflation.

- As miscellaneous and capital equipment wears out, it will be replaced with identical units that have increased in cost according to the specified inflation rate.

- If the taxable cash flow is negative in any given year, the owners have sufficient income from other sources to take a tax deduction in that year and will not have to carry the tax credit forward (which would reduce the total rate of return).

Screenshot 6 shows the first 6 years of the Summary Cash Flow table from a sample run.

Primary Input Assumptions Worksheets

The primary input assumptions worksheets feed into the *CASH FLOW SUMMARY* and consist of the

General Assumptions, Production Revenues, and *Laminations Costs Worksheets*.

General Assumptions

General assumptions are common assumptions among several worksheets. Some of these assumptions must be entered. Others are calculated based on the entered assumptions. Both types of assumptions are shown on the *General Assumptions* worksheet.

Although the general inputs must be individually entered, it is also possible to set them as a function of another worksheet. For example, an analyst may wish to do a survey of lamination prices, then set the price on this worksheet equal to an average quote or to the lowest price obtained.

The *General Assumptions* worksheet is divided into three major sections: entered general assumptions, calculated WACC, and system capacity.

Entered general assumptions

The entered general assumptions include interest rates, other general assumptions, and income and capital gains taxes.

Interest rates—such as rates charged for borrowing and lending and the inflation rate—are used to determine the WACC and interest paid on loans.

Other general assumptions include time to start-up, *ad valorem* (property) taxes, and terminal values. Time to start-up

affects mainly the land and buildings. *Ad valorem* (property) taxes apply to the land and buildings, miscellaneous equipment, and capital equipment. Terminal values have an impact on process equipment and rolling stock. Terminal values for land and buildings are entered separately. Terminal values may be either "book" or "current" values. Book values follow historic costs and depreciation schedules. Current values are based on the economic life of assets and change with inflation.

Taxes are divided into Federal and State rates. Social Security is levied only by the Federal government, and workers compensation is levied only by States.

Calculated weighted average cost of capital (WACC)

The weighted average cost of capital (WACC) is the cost of financing to the plant. This is the minimum rate of return that owners need to achieve on their investment. Financing consists of both equity and debt. Complex organizations may have several types of equity funding (e.g., common stock, preferred stock, etc.) as well as different types of debt funding (e.g., short-term debt, secured and unsecured bonds of varying terms). Each type of funding may have its own cost. In LamLum, all equity funding and all debt funding should each be consolidated. The cost of equity funding is calculated by adding a risk premium to a "safe" (e.g., bank deposit) rate. The cost of debt funding may be represented by a bank lending rate. The risk premium is an amount that owners would expect to earn over and above this "safe" investment rate for a laminated lumber project. The WACC may be expressed before and after tax. It may also be expressed as nominal (including inflation) and real (without inflation). These terms are defined as follows.

Before-tax nominal WACC: Before-tax rate of return, including inflation, that owners require on all before-tax cash flows.

Before-tax nominal WACC = (Bank deposit rate + Return on risk capital) × Equity % + Bank lending rate × Debt %

Before-tax real WACC: Before-tax rate of return, after inflation, that owners require on after-tax and finance cash flows.

$$\text{Before-tax real WACC} = \frac{1 + \text{Before-tax nominal WACC}}{1 + \text{Inflation rate}} - 1$$

After-tax nominal WACC: After-tax rate of return, including inflation, that owners require on after-tax cash flows.

After-tax nominal WACC = Before-tax nominal WACC × (1 − Tax rate)

After-tax real WACC: After-tax rate of return, after inflation, that owners require on after-tax cash flows.

$$\text{After-tax real WACC} = \frac{1 + \text{After-tax nominal WACC}}{1 + \text{Inflation rate}} - 1$$

Equity/total capital: Percentage of each piece of capital equipment that is financed with equity. This ratio increases over time as debt is paid off. When new equipment is purchased, the ratio decreases again. The ratio is calculated using the following formula:

$$\text{Equity/Total capital} = 1 - \frac{\text{Debt}}{\text{Total capital}}$$

System capacity

The basic unit of capacity is the operating shift. Assumed output is stated in terms of production/shift. Labor requirements and capital equipment operation are input on a per shift basis. The maximum number of shifts/year will depend on the number of days that can be worked by each shift. Labor costs will depend on the number of workers required, the hours/shift, and the number of operating days/year for each shift. The number of shifts required for full-time operation is determined in the Facility Full-Time Operation Shift Hours table (Screenshot 7).

Capacity utilization determines how many laminations are processed, which depends on shift capacity, the facility full-time operation, the percentage of full-time operation utilized, and the efficiency of usage. The percentage of full-time operation utilized allows for an operation to not utilize its full-time capability. This might happen if there is a slower start-up process, perhaps as resource supplies dictate or as markets are developed. Sample entries for the first 6 years are shown in Screenshot 8.

Note that in industrial operations, ordinary full-time operation is commonly assumed to be somewhat less than the facility's stated capacity. This allows for additional downtime for maintenance and repairs and does not place unreasonable stress on the equipment.

Production Revenues

The *Production Revenues* worksheet contains the calculations for plant revenues. The worksheet takes the physical outputs from subsequent worksheets and converts these outputs into revenues based on the product prices specified here.

On this worksheet, the analyst must enter the first year's product prices and choose whether the product prices will be automatically adjusted for inflation or manually entered each year. If the analyst chooses to automatically adjust for inflation, prices are entered just once (Screenshot 9).

Manually entered prices must be entered for each year (Screenshot 10). Manually entered prices may be used, for example, if it is expected that per-unit product revenues will remain constant in nominal dollars or if they will change at a rate different than inflation.

Note that this feature can be used in a sensitivity analysis. For example, to see the difference between prices that are inflation-adjusted each year and constant prices with

inflation-adjusted costs, set all prices equal to those in the first year and click the assumption that plant revenues are manually entered. Checking the *SUMMARY PIE CHART* shows a net loss of 10.5% on each sales dollar. This may be compared with the profit of 4.1% with inflation-adjusted prices (Figure 2).

If neither option (adjust for inflation or enter manually) is selected or if both are selected, the default is manual entry and a warning is displayed.

The Revenue Summary, again shown with "inflation-adjusted revenues" (Screenshot 11), is the primary table calculated on the *Production Revenues* worksheet. In this report, the figures from the table that go into the *CASH FLOW SUMMARY* worksheet are shaded (these figures are highlighted in yellow in the program).

Laminations Costs & Conversions Worksheet

Up to 10 different lamination grades may be used on the *Laminations Costs & Conversions* worksheet. Each grade may have a different price and ratio of utilizable laminations, merchantable residue, and unmerchantable residue. To allow full flexibility, the mix of those lamination grades may be changed over time. The *Laminations Costs & Conversions* worksheet is divided into three major sections: summary tables, inputs, and other calculated tables.

Summary tables

The Present Values of Laminations Cash Flows table (Screenshot 12) contains the summary costing figures, expressed in terms of both total costs and unit costs in year 0 dollars. Note that costs are expressed as negative values and revenues as positive values.

The Summary Laminations Cash Flows table (Screenshot 13) contains the cash flows on which the Present Values table (Screenshot 12) is based. The Summary Physical Inputs and Outputs contain the wood inputs and outputs of the facility (Screenshot 13). Present volumes are calculated as well as present values so that break-even costs and revenues may be calculated.

The Laminations Costs by Grade table (Screenshot 14) provides more detail than the first summary table, showing the unit cost of laminations both for total volume and utilizable laminations. This table shows which lamination grade is the most cost-effective. In the example provided, although the cost of input laminations for the sub-economy grade is only $140/MBF compared with $160/MBF for the economy grade, better recoveries on the economy grade mean that the net cost of utilizable laminations is $188.06 for the economy grade and $280.49 for the sub-economy grade. In this example, the plant could save more than $90/MBF on utilizable laminations by using the more expensive economy grade for input.

Inputs

As with product prices, laminations input costs may be automatically adjusted for inflation or manually entered each year. The default is manual entry. In addition to these options, input tables include Laminations Input Costs, Laminations Input Species and Grade Mix, and Laminations Product Recoveries.

The Laminations Input Costs table is the primary input area for the costs of individual lamination grades (Screenshot 15). Laminations input costs may be automatically adjusted for inflation or manually entered, similar to the price data for the *Production Revenues* worksheet. If costs are inflation-adjusted, then only current costs need to be entered. If costs are manually entered, then costs for each year must be entered individually.

The break-even cost of laminations may be calculated by selecting to adjust laminations input costs for inflation and setting the present value of the laminations costs in this table equal to the "Optional Summary Laminations Input Cost" (on the *FINANCIAL SUMMARY* worksheet). This is described in more detail in the notes to the "Optional Summary Laminations Input Cost," cell A37, on the *FINANCIAL SUMMARY* worksheet.

The program accepts up to 10 different lamination grades. Lamination input grades may be divided by whatever is logical for the plant. This may be price, if different lamination grades have different prices. Or the input grades may be based on lamination quality (for example, species, defects, origin, sweep). This would make sense if different lamination input grades produce different outputs.

It is possible that the input mix may change over time. If the input percentages in any given year sum to less than 100%, a warning will appear. If the values sum to greater than 100%, an error message will appear. The table for input of lamination species and grade mix is shown in Screenshot 16.[5]

While input mixes may change over time, the product recoveries for each individual grade are fixed. Product recoveries must be provided for each input lamination grade (Screenshot 17). Note that if technology were expected to change significantly over time so that the proportions of utilizable laminations, merchantable residue, and unmerchantable residue would change, new input grade categories could be created and phased into the input grade mix.

Any percentages not assigned to individual products go by default to "Unmerchantable residue." While input grade

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[5]Note that no data are to be entered for the first year (2005) because of the built-in assumption that the plant is constructed and ready for operation at the end of the first year. The second year, 2006 in the example, is the first full year of the plant's operations.

mixes may change over time, an in-built assumption is that the product recoveries for a given laminations input grade will not change over time.

Calculated tables

Lamination inputs and utilization by grade are calculated and tabulated on the *Laminations Costs & Conversion* worksheet. The tables are Total Laminations, Utilizable Laminations, Merchantable Unprocessed Residue, and Unmerchantable Unprocessed Residue. All these tables are similar in appearance. The Total Laminations table is shown in Screenshot 18. The present volume is a discounted figure used in calculating the average per-unit costs.

The costs of the lamination inputs by lamination grade are also calculated and tabulated on the *Laminations Costs & Conversion* worksheet. These tables are Total Laminations Input Cost, Merchantable Unprocessed Residue Revenue, and Unmerchantable Unprocessed Residue Disposal Cost. These tables all have a similar appearance. The Total Laminations Input Cost table is shown in Screenshot 19.

Costing Worksheets

Ten costing worksheets cost out various parts of the laminations operation. They consist of a *Consolidated Operating Costs* worksheet and nine subsidiary worksheets. These costing worksheets draw on common inputs from the *General Assumptions* worksheet. Individual cost items are entered on the subsidiary worksheets. Outputs from the *Consolidated Operating Costs* worksheet are exported to the *CASHFLOW SUMMARY* worksheet.

Consolidated Operating Costs

The *Consolidated Operating Costs* worksheet summarizes the plant's operating costs. It consolidates information from the nine individual subsidiary costing worksheets, which provide detailed costs for various components of the laminated lumber operation. The *Consolidated Operating Costs* worksheet contains all costs apart from the costs of the laminations, which appear on the *Laminations Costs & Conversions* worksheet. The *Consolidated Operating Costs* worksheet includes capital costs, direct operating costs, financing, adjustments, and working capital. No assumptions are entered on this worksheet.

The present value of operating costs is calculated on the *Consolidated Operating Costs* worksheet. The present value of the operating costs is the amount that must be recovered, over and above laminations costs, over the project's life.[6] These summaries are shown in Screenshot 20.

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[6]The break-even cost of laminations is determined by dividing the after-tax net present value of operating costs by the present value of laminations input volume. This is done on the *FINANCIAL SUMMARY* worksheet.

The nine subsidiary costing worksheets that feed information into the *Consolidated Operating Costs* worksheet are as follows:

1. *Process equipment and outputs*
2. *Land & buildings*
3. *Miscellaneous equipment*
4. *Rolling stock*
5. *Wages*
6. *Administration*
7. *Worker accessories*
8. *Other costs*
9. *Working capital*

Consolidated operating costs also contain a Net Asset Value Summary table, which summarizes the net book value of the various asset classes, subtracting the balance of any outstanding loans to determine net asset values. This table is for management information purposes only. The numbers resulting from the calculations are not used on other worksheets.

Process Equipment

The *Process Equipment* worksheet accounts for costs involved with the main operating equipment of a lamination plant, such as trimming saws and presses. The purchase and operating costs for the equipment are entered on this worksheet. Plant output over time is also entered, in terms of the amount of plant throughput (MBF of utilizable laminations/hour) allocated to various products. Note that these percentages may change over time. Note also that any process plant output that is not allocated to merchantable products is automatically allocated to unmerchantable processed residue. Once the input data are entered, the annual physical inputs and outputs are calculated as well as the process equipment costs.

Land & Buildings

Land costs include both land and depreciable land improvements. However, land itself cannot be depreciated for tax purposes. Buildings do not include miscellaneous equipment, which is accounted for on another worksheet.

LamLum allows the user to select whether land and buildings are purchased or leased. If leased, then the lease cost is deductible in the year it occurs and there is no allowable depreciation. If purchased, then the interest component of any financing is deductible in addition to depreciation on the buildings and depreciable land improvements. The program automatically takes care of these aspects of purchase and lease.

A difference between miscellaneous equipment and real estate is that whereas miscellaneous equipment usually

declines in value over time, real estate usually holds its value and may increase in value. In terms of cash flow, this only matters at the end of the project when the terminal values of assets are incorporated into the cash flow, if the assets have been purchased. Terminal values are important to consider in the calculation of NPVs and IRRs. Terminal values of land and buildings must be accounted for using either "book" or "current" values. The book value is the historic cost, less the IRS-allowed depreciation.[7] The current value is the historic cost, plus inflation, less real depreciation. Real depreciation (for buildings only) is approximated in this program by using a straight-line rate based on the current estimated value of the asset and its economic life.

The *Miscellaneous Equipment* worksheet calculates cash flows for building contents and other miscellaneous equipment (if any). This worksheet is constructed so that as assets reach the end of their economic life, they are automatically replaced at their original cost, plus inflation. Terminal values are based on asset book values. Some inputs for the *Miscellaneous Equipment* worksheet come from the *General Assumptions* worksheet; others are provided on the worksheet.

Rolling Stock

The *Rolling Stock* worksheet calculates a 20-year cash flow statement for capital and operating costs associated with up to eight different types of rolling stock (forklifts, loaders, utility vehicles, etc.). The worksheet is similar to *Miscellaneous Equipment* in many ways, but it allows for such products as fuel, oil, and lubrication, which depend in part on how many hours/shift the equipment is operating.

The calculations depend on inputs. Some inputs are imported from the *General Assumptions* worksheet. Others that apply to only these costs are entered on this worksheet under "General entered assumptions" and "Entered assumptions by rolling stock type."

Wages

The *Wages* worksheet calculates the costs for hourly wage workers, using inputs from the *General Assumptions* worksheet, as well as some inputs that are entered on the *Wages* worksheet. Note: In calculating the wages expense, salaried employees should *not* be included as part of the crew. Salaried employees are included in the *Administration* worksheet.

The *Wages* worksheet is divided into three major sections: Summary tables, Assumptions, and Calculations. In the Summary tables, wages are broken down in two ways, by worker type and wage type (Screenshot 21). Total employment costs should be identical, regardless of whether they are calculated by worker or wage. These summary tables enable the analyst to see what types of wages costs have the greatest impact on total costs.

The Assumptions portion of the *Wages* worksheet is divided into five sections:

1. Employees required

2. Employees hired

3. Standard and available work hours

4. Base hourly wage rates plus allowances by worker type

5. Individual worker accessories

"Employees required" is the number of employees required per shift by employee type for each operating shift. It is possible to specify a different mix of employees for each shift. The Employees Required table is shown in Screenshot 22.

LAMLUM has built-in calculations to ensure that there are sufficient employees to perform the work required. Employees may work "standard hours" or overtime hours up to a user-specified maximum.

"Employees hired" is the number of employees actually hired by employee type for each year. The "over-worked" warning indicates that for at least one year and one employee type, not enough hours are available, even with overtime, to meet the shift requirements. To correct this, either the number of workers required needs to be reduced or the number of available hours needs to be increased in the Standard and Available Overtime Hours/Worker input table (in the *Assumptions* section below the Employees Required table on the *Wages* worksheet), or the number of employees hired in at least one year needs to be increased. For example, reducing the number of wood-handling workers from three to two in year 1 produces a deficit hours warning to allow more overtime (Screenshot 23).

To see in which year or years a deficit occurs, scroll down the worksheet to the wood handling workers in the Wages and Hours Calculation by Worker Type tables (Screenshot 24). These are individual tables that calculate the total employment cost and hours worked for each type of worker. For each worker type, if the number of hours required exceeds the standard hours available, overtime hours will be automatically charged. If more overtime hours are required than are available for the expected number of workers, then the total remaining available hours will be negative and a warning will appear. (Deficit hours are set in red type and highlighted in the program.)

In the example shown in Screenshot 24 for wood-handling workers, there is a deficit of 924 remaining available hours for the year 2005. If the number of wood-handling workers

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hired in 2005 is changed back from two to three (see Screenshot 23), the deficit warning is eliminated.

Alternatively, the available work hours can be increased to allow more overtime. The Standard Work Hours per Worker and Available Overtime Hours per Worker tables show the number of hours/year for which a worker will be paid ordinary hourly rates and the number of available hours for overtime work each year (Screenshot 25). Standard hours worked incorporates holidays and weekends as well as vacation days and allowable sick days. "Standard hours/shift" is imported from the *General Assumptions* worksheet. Implicit in the calculations is the assumption that if a worker is required to work more hours than the equivalent of one shift, then the work will be considered overtime. Available overtime hours/worker is the number of hours/year available for overtime. The standard shift hours plus the available overtime hours is the maximum number of available work hours. If any worker type exceeds this total, then a warning will appear in the Employees Required and Employees Hired tables (Screenshots 22 and 23, respectively).

Hourly wages and workers' fixed costs are calculated in the Base Hourly Wage Rates Plus Allowances table (Screenshot 26). Adjustments for vacation pay, statutory holiday pay, sick leave, and other allowances are added as percentages of the unadjusted hourly wage rates. Annual fixed costs are added to the unadjusted rates as dollar amounts and include health insurance, liability insurance, labor accessories (from the next table), and other fixed costs. Retirement is calculated as a percentage of yearly wages.

Accessories used by individual workers are entered and tabulated in the Individual Worker Accessories and Costs table (Screenshot 27). Examples of accessories are ear muffs (hearing protection), gloves, hard hats, high-visibility vests, and safety boots These are annual costs that are totalled in the base Hourly Wage Rates Plus Allowances table (Screenshot 26).

The calculations portion of the *Wages* worksheet is divided into "shift hours required" and "ages and hours calculations by worker type." "Shift hours required" (Screenshot 28) computes the hours required by each employee type, depending on the number of operating shifts each year and the number of employees/shift required in each worker group. The program will allocate as many shifts as possible to first shift before moving to subsequent shifts.

Crew Accessories

The *Crew Accessories* worksheet (Screenshot 29) calculates the costs for gear used by the entire crew, rather than by individual workers. This gear includes safety equipment as well as loose tools. Implicit in the model is the assumption that the total cost of crew accessories will be required when the plant is first operational. Afterwards, an annual cost equal to the total cost divided by the expected life will be incurred.

Crew accessories are really part of miscellaneous equipment. That is, they should be capitalized and depreciated. However, the total cost of these tools is usually so small compared with the total job cost, that more accurate accounting for these capital costs should not significantly change the overall costs.

Administration

The *Administration* worksheet calculates the costs for administration expenses and salaried employees' earnings (Screenshot 30). Administration expenses include fixed yearly salaries, clerical expenses, other professional fees, yearly communication expenses, and other overheads. Inputs for the *Administration* worksheet are similar to those for *Wages*. In addition, there are fixed costs for communications, payroll, legal fees, and accounting.

Other Costs

The *Other Costs* worksheet is a template into which annual costs that are not otherwise included in the analysis may be incorporated. An example might be the cost for catering at a meeting or demonstration at the plant. These costs are entered on the basis of cost/day, along with the number of days/year for which the costs will be required.

Working Capital

Working capital is the funding needed to finance a firm's short-term assets; for example, cash on hand, accounts receivable, and inventory. Working capital is generally used to pay short-term liabilities, such as accounts payable, bank overdraft, and current portion of long-term debt.

The *Working Capital* worksheet calculates the amount of working capital required by year. In an accounting sense, working capital is defined as current assets minus current liabilities. Current assets represent short-term funds that are needed; cash on hand, accounts receivable, and inventory are usually the three largest components. The most common method of funding current assets is with current liabilities. Accounts payable and bank overdraft are the two most common forms.

Working capital could be calculated by making estimates of all current assets and subtracting estimates for all current liabilities from those estimates. The difficulty with this calculation is the circular relationship between laminations prices and inventory value, because inventory value is in part a function of the cost of the laminations in inventory. This makes the calculation of a break-even laminations price a circular one since working capital is a cost that must be recovered.

To overcome these difficulties, working capital is estimated in this model as a fixed percentage of estimated sales for the upcoming year. In addition, the specified debt-to-total capital ratio (from the *Financial Summary* worksheet) is used to estimate changes in short-term debt resulting from changes in working capital.

Built into the model is the assumption that invested working capital is recovered at the end of the 20-year planning period. Sample working capital calculations are shown in Screenshot 31.

If a contingency allowance on working capital was specified on the *Financial Summary* worksheet, it is incorporated in the *Consolidated Operating Costs* worksheet.

LamLum Assumptions

Incorporated into any model are critical assumptions that have a significant impact on the results. If those assumptions are reasonable, then the results of the model may be used as a reasonable guide. If those assumptions are not reasonable, then the model is worthless.

Like all models, LamLum has some in-built assumptions.

- The plant can obtain all the laminations it needs at the prices specified. In the model, prices and the laminations mix may change over time. However, implicit in the calculations is that the plant can obtain sufficient laminations to operate at capacity. If laminations will be limited, then plant capacity should be reduced within the model.

- Unless otherwise specified, inflation affects all variables equally (except for depreciation). Furthermore, all costs and revenues will increase annually at exactly the rate of inflation. If it is believed that some costs are increasing faster than others, they may be individually adjusted.

- Except for working capital (see below), all cash flows occur at the end of each year. This is a basic simplifying assumption that is common to most discounted cash flow analysis. In reality, cash flows occur throughout the year. However, the accuracy gained by trying to account for this is lost in all the other assumptions that must be made (for example, inflation rate, interest rates, salvage value, and repair and maintenance costs).

- Since working capital represents liquidity that must be available during the course of the year to finance operations, implicit in the model is the assumption that the annual working capital is required at the beginning of each year and that it is paid back at the end of the project planning horizon.

- The bank annual lending rate is used for all short- and medium-term borrowing. It does not apply to borrowing for land and buildings. A mortgage rate, which applies only to land and buildings, is entered separately.

- The bank annual lending rate is not affected by the amount of debt in the financial structure of the firm. While in reality, a bank or finance company would want a higher rate of return if financial gearing exceeds some amount, financing is commonly available for up to about 70% of the purchase price of a piece of capital equipment. Within reasonable gearing ranges, the loan interest rate should be approximately constant.

- Actual annual interest payments are probably less than those calculated in the model. They will decrease as the frequency of loan repayments increases because less loan principal is outstanding. Given the magnitude and length of the project, any discrepancies caused by this approximation will not be significant.

- Any tax losses are deductible in the year in which they occur. Implicit in this assumption is a further assumption that there is income from some other source against which tax losses may be deducted. As a result, losses are not carried forward for tax purposes. If losses do have to be carried forward until there are sufficient profits to offset them, this would lower the owners' rate of return.

- Technology is not a factor.

- The percentage of utilizable laminations, merchantable residue, and unmerchantable residue from any given grade will not change over time. If changing technology were a factor (for example, if anticipated improved recoveries were anticipated as a result of better technology in some future year), it would be possible to work around this assumption on the *Laminations Costs & Conversions* worksheet. To do this, an additional grade (for example, Economy grade II) could be incorporated with different conversions and be brought into the wood input mix in some later year.

- The inputs required by product on the *Process Equipment and Outputs* worksheet do not change over time. Although this does not allow for increasing efficiencies, a similar work-around is available to the problem of utilizable laminations described in the previous text. That is, if inputs changed significantly as a result of changing technology or improved efficiencies, then it would be possible to enter a new product (for example, Std. Lam header II) with a new set of inputs and incorporate the new product in the year in which these efficiencies are expected to begin.

Appendix—Laminated Lumber Plant User-Defined Inputs by Worksheet

Financial Summary Worksheet

The *FINANCIAL SUMMARY* worksheet contains all the "bottom line" information: net present values (NPVs), internal rates of return (IRRs), break-even lamination costs, and 20-year cash flows. In addition, it contains variable inputs to allow users to conduct a sensitivity analysis.

Plant name: Name of the plant.

Year: Operating year for costing. The year entered here is also referred to as year 0. Year 0 is right now, today. Year 1 is exactly 1 year from today. Year 2 is exactly 2 years from today, etc.

Other identifying run codes: Any other names or letters associated with the run to identify it.

IRR seed: Number that the program uses to begin its IRR calculations. A good place to start is 10%. If the cash flows on the *CASH FLOW SUMMARY* worksheet change signs more than once, then there may be multiple IRRs. In that case, experimentation with different IRR seeds may reveal an additional IRR.

Sensitivity analysis scaling factors: Percentages that may be varied up or down from 100% to test the sensitivity of the NPVs, rates of return, and break-even lamination costs to changes in various costs and revenues. Sensitivity analysis scaling factors may also be used in conjunction with the Excel "Goal Seek" algorithm to determine what percentage cost or revenue categories would need to change for the operation to just break even.[8]

Cost contingency allowances: Percentages that may be varied up or down from zero to allow for a cushion from the point estimates for various costs. While the cost contingency allowances work in a similar fashion to the sensitivity analysis scaling factors, they may be adjusted independently of the sensitivity analysis to allow for greater uncertainty regarding various costs.

Optional summary laminations input cost: Cost that may be used to calculate the true break-even laminations cost.

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[8]To do this, select the cell containing the value to break even (for example, after-tax NPV on the *FINANCIAL SUMMARY* worksheet). Then, go into "Goal Seek" on the "Tools" menu. Set the break-even value to $0 by allowing the cell containing the desired sensitivity percentage to vary. For example, in the sample provided, sales revenues would have to decline to 92% before the after-tax NPV declines to $0 and the owners would earn exactly their required rate of return on invested capital.

Alternatively, this cost may be used to quickly change all the lamination costs to see the impact on the financial indicators from changing laminations input costs. To use this cost, set the laminations costs on the Lamination Costs & Conversions worksheet equal to this cell. To find the true break-even laminations cost, set the laminations costs equal to this cell. Use the "Goal Seek" tool to set the "After-tax net profit (loss)" to $0 by changing the "Optional summary laminations input cost."

Make sure that the "Optional summary laminations input cost" is an absolute number and not a reference to another cell. Otherwise, you will not be able to calculate a break-even laminations cost using the "Goal Seek" function.

Pre-tax required return premium on risk capital: Nominal percentage (including inflation) that is appropriate for a plant in this industry and that is over and above the "safe" bank investment rate. It represents the risk that the owners bear by having funds invested in the forest products industry rather than in the bank. This percentage is added to the bank deposit rate and weighted (using the debt/total capital ratio) with the bank lending rate to give the nominal before-tax weighted average cost of capital.

Debt/total capital: Target debt ratio. The debt/total capital ratio is the percentage of assets and working capital that is financed with debt. There is a built-in assumption that this ratio decreases over time as debt is paid off. When new assets are purchased, the ratio increases again. There is also a built-in assumption that all outstanding debt will be paid at the end of the planning period. This number is important to determine debt, loan payments, and total equity capital. In turn, if the cost of debt differs from the cost of equity, the level of debt will have an impact on the WACC. This ratio affects the loans on land and buildings, miscellaneous equipment, capital equipment, and working capital. It also affects the before-tax nominal WACC, as the WACC is a mix of the cost of debt and the cost of equity.

Cash Flow Summary Worksheet

There are no inputs on the *CASH FLOW SUMMARY* worksheet.

General Assumptions Worksheet

The *General Assumptions* worksheet contains most of the general assumptions—assumptions that are used as inputs on more than one worksheet. Entering these assumptions here will change them automatically throughout the model. Most inputs are "Entered general assumptions;" some are "Calculated general assumptions."

Entered General Assumptions

Interest Rates

Annual bank deposit rate: Equivalent annual interest rate[9] received for savings at the bank. It is a nominal rate; that is, it includes inflation. The bank deposit rate is used in determining the owners' before-tax nominal WACC.

Annual bank lending rate: Basic commercial credit rate open to owners. The annual bank lending rate is an equivalent annual nominal rate. An average rate should be used here, reflecting both the short-term financing required for day-to-day operations and working capital and the longer-term financing required for capital equipment loans. The bank lending rate is used in the costs for miscellaneous equipment, capital equipment, and working capital. It is also used as the cost-of-debt component in determining the before-tax nominal WACC. A separate mortgage rate is used for land and buildings.

Bank financing charge: Percentage of loan amount paid up front, at the start of the loan. The bank financing charge is used at the origination of all loans (mortgages, miscellaneous equipment, capital equipment, and working capital).

Inflation rate: Forecast average annual rate of inflation for costs and revenues in the forest products industry. An appropriate inflation rate should be based on forecasts for the industry, rather than on general consumer products inflation. The inflation rate is important because it affects the real WACC. It also has an impact on real depreciation rates and capital equipment charge-out rates using the break-even capital costing method. Built into the model is the assumption that all cash costs and all revenues will increase at the specified inflation rate. Since bank interest rates generally incorporate inflation expectations, if the inflation rate is changed in a sensitivity analysis the bank interest rate should probably be changed as well.

Time to construct and start up (months): Time required to construct the laminations plant and make it operational. All start-up costs are compounded forward to the start-up date (year 0).

***Ad valorem* (property tax) mill rate ($/$1000):** Tax rate that applies to real property, miscellaneous equipment, and capital equipment. *Ad valorem* taxes are expressed as a mill rate, that is, $/$1000. For example, a mill rate of 32 represents an annual tax of $32 for every $1,000 of net asset value. *Ad valorem* taxes are levied on the current value of land and buildings and on the book value of miscellaneous equipment and capital equipment.

Electricity demand charges ($): Costs per kilowatt for electricity. These are fixed charges.

Electricity price ($/kWh): Price for electricity consumption.

Conversion from MBF (1,000 board feet) to tons: Conversion for softwood lumber is 1,000 board feet = 0.974 short tons. For hardwood lumber, 1,000 board feet = 1.680 short tons.[10]

Income and Capital Gains Taxes

Income taxes: Include State and Federal income taxes. State and Federal rates are additive. These numbers are important to determine the after-tax rate of return on cash flows. Income taxes apply to all earned income and to excess depreciation. That is, if an asset is sold for more than its book value but less than its historic cost, the difference is charged as ordinary income.

Capital gains taxes: Capital gains taxes apply to increases in asset values over and above their historic costs.

Calculated Weighted Average Cost of Capital (WACC)

Before-tax nominal WACC: Weighted average of (Bank deposit rate + Allowable return on risk capital) × Owners' equity percentage + Bank lending rate × Owner's debt percentage

Before-tax real WACC: $\dfrac{1 + \text{Before-tax nominal WACC}}{1 + \text{Inflation rate}} - 1$

After-tax nominal WACC:
Before-tax nominal WACC ×
    [1 − (Federal income tax rate + State income tax rate)]

After-tax real WACC: $\dfrac{1 + \text{After-tax nominal WACC}}{1 + \text{Inflation rate}} - 1$

Equity/Total capital: 1 − Target debt ratio

System Capacity

Total Shift Capacity

Costings based on amount of wood processed per standard operating shift.

Facility Full-Time Operation Shift Hours

Operating days/year: Number days/year that each shift will be operating when the yard is operating full-time. Note: While these values provide the inputs for the full-time operating capacity, the amount of capacity utilized is entered separately for each year. Operating days/year is used in the calculation of shift hours/year. These figures are ultimately

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[9]Rate that would be charged if payments were received or due only once, at the end of each year.

[10]Howard, J.L. 2003. U.S. timber production, trade, consumption, and price statistics, 1965–2001. Research Paper FPL-RP-615. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory.

used in calculations of wages, equipment costings, and production calculations.

Standard hours/shift: Number of hours that each shift will operate. This number is used to calculate the shift hours per year. Standard hours/shift is used in the calculation of shift hours/year. These figures are ultimately used in wages calculations, equipment costings, and production calculations.

Capacity Utilization

Percentage of full-time operation utilized: Percentages by year of what has been defined as the full-time operation of the facility. The numbers are used to calculate the number of shifts/year. They could be used to show that only one shift/year is operating at first, but that two, three, or more shifts are operating in later years.

Percentage of total operating capacity utilized: Percentages of the system full-time capacity operating capacity defined previously. These percentages are used to calculate the number of pieces and volume processed. They may be used to represent decreased efficiencies when the facility is new (that is, workers will be less efficient when they begin and more efficient as they gain more experience with the equipment and with working together).

Revenues & Outputs Worksheet

The *Revenues & Outputs* worksheet calculates the revenues and physical outputs produced by the plant. This worksheet combines the inputs provided in subsequent worksheets with the product prices entered here. The only inputs required on this worksheet are year 0 product output prices, prices that are identified by product output name. The prices are related to the start-up date of the plant.

Lamination Costs & Conversions Worksheet

The costs of the laminations and the associated products into which they may be manufactured are entered on the *Laminations Costs & Conversions* worksheet.

Wood input costs and recoveries: Basic inputs to the plant in the form of dimension lumber. Because trimmings and rejects may be included, merchantable and unmerchantable residue appear. The input lamination grade names, costs, and associated products are set here.

The wood input costs and recoveries may be set equal to the "Optional summary laminations input cost" on the *FINANCIAL SUMMARY* worksheet. This will reveal the impact of

changes in the laminations costs on NPVs and IRRs on the *FINANCIAL SUMMARY* by changing the "Optional summary laminations input cost" on that sheet. The "Goal Seek" function can be used to determine the maximum laminations input price required to break even. (See note on the *FINANCIAL SUMMARY* worksheet for more information.)

Wood input mix: Percentage mix over time of different grades of laminations. This mix may be constant or it may be varied if qualities or grades are expected to change over time.

Consolidated Operating Costs Worksheet

There are no user-defined inputs on the *Consolidated Operating Costs* worksheet. This worksheet consolidates the operating costs from all the subsidiary worksheets.

Process Equipment & Outputs Worksheet

The *Process Equipment & Outputs* worksheet provides the costing information for the process equipment that goes into the plant. It also provides output calculations, since the output will depend in large part on the process equipment. The user-defined inputs on this worksheet are broken down into various input tables.

Process equipment purchase costs: Basic costs to purchase equipment in the laminations plant and get it up and running. These costs are all capitalized and depreciated.

Operating costs (full time): Costs to operate the plant on a full-time basis. If the plant is operated less than full-time, these costs are pro-rated.

Plant input/output relationships: Input/output relationships in terms of throughput and electricity.

Process equipment recovery periods and depreciation method: Depreciable life of the process equipment. It should be expressed in terms of years using Internal Revenue Service (IRS) guidelines. The Modified Accelerated Cost Recovery System (MACRS), which has been used for most business assets placed in service after 1986, consists of two depreciation systems: the General Depreciation System (GDS) and Alternative Depreciation System (ADS). Some assets may be depreciated using either the GDS or the ADS. The two systems allow different depreciable lives and different methods.[11]

The depreciable life, combined with the depreciation method chosen, will determine the depreciation expense taken each year. The economic life in years should also be specified for the process equipment. The economic life is the effective operating life of the equipment, after which the equipment will be automatically replaced. Any gain or loss on salvage will be automatically calculated.

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[11]For detailed information, see IRS Pub. 946, "How to Depreciate Property," at www.irs.gov/publications/p946/index.html

The salvage value of the process equipment should be in year 0 dollars. It will be adjusted automatically for inflation.

The entered depreciation code will determine the depreciation method used for tax purposes. The codes are as follows:

DB   Declining balance (GDS)
SLA   Straight-line accelerated (GDS)
SLADS   Straight-line (ADS)
SLEL   Straight-line (economic life)
K   "K"ustom

Note that the last two depreciation methods, SLEL and K, may not be allowed by the IRS for tax purposes. Both of these methods may be used for management purposes. K may also be used in place of the other methods if allowable depreciation write-offs are modified.

Process plant output: Products produced and percentage of total output going into each product over time.

Additional inputs required by product: Additional inputs (glue, hardware, etc.) required by each output product of the plant.

Land & Buildings Worksheet

The *Land & Buildings* worksheet provides the costing information for the real estate portion of the project. The user-defined inputs on this worksheet are broken down into various input tables.

General Assumptions

Some general assumptions are imported. Those that the user must provide on this worksheet are as follows:

Mortgage term (years): Number of years to use in the calculation of the mortgage payment.

Annual bank mortgage rate: Interest rate charged by the bank on mortgages for land and buildings.

Land

Initial bare land purchase price ($/acre): Cost of land, including non-deductible improvements. Such improvements include public utility initial clearing and grading land improvements as specified in Rev. Rul. 72-403, 1972-2 C.B. 102 (IRS. 2000. How to depreciate property. Pub. 946. p. 90, Table B-1.)

Land area required (acres): Land area required for laminated lumber plant.

Real annual increase (decrease) in land value (%): Input that allows for increases or decreases in land prices that are faster than inflation. The real increase (decrease) is in addition to inflation. If land changes in value at the same rate as does inflation, then this value should be zero.

Annual land lease cost ($/acre): This figure is not needed if the land is purchased.

Annual R&M expense (% current capital value): Expense for repairs and maintenance on land (ploughing, fire protection, etc.).

Annual insurance expense (% current capital value): Expense for property insurance on land.

Buildings

Initial building purchase/construction cost ($): Cost to purchase or construct the building.

Real annual increase (decrease) in building value (%): Input that allows for increases or decreases in building values that are faster than inflation. The real increase (decrease) is in addition to inflation. If buildings change in value at the same rate as does inflation, then this value should be zero.

Annual building lease cost ($): This figure is not needed if the building is purchased.

Annual R&M expense (% current capital value): Expense for repairs and maintenance on buildings.

Annual insurance expense (% current capital value): Expense for property insurance on buildings.

Payment method: Land and buildings may be either purchased or leased. Select method by a check (√) or an "x."

Depreciable land improvements: Depreciable land improvements include roading, fences, water system, and other improvements. The IRS allows depreciation expense using either straight-line or declining-balance depreciation on depreciable land improvements. If declining-balance depreciation is used, then the maximum allowable declining-balance factor is 150%.

Buildings: IRS allows only straight-line depreciation over either 39 or 50 years to be used for buildings.

Miscellaneous Equipment Worksheet

Miscellaneous equipment includes all the long-term assets that go into a project that are not real estate or process equipment. These assets might include computers and peripheral equipment, office machinery, office furniture and fixtures, etc. The inputs required on the *Miscellaneous Equipment* worksheet are as follows:

Insurance (% replacement cost): Insurance for miscellaneous equipment.

No. required: Number of machines of each type that are needed.

Cost/unit: Year 0 cost for miscellaneous equipment.

Annual R&M percentage of straight-line depreciation: Repairs and maintenance as a percentage of straight-line depreciation taken over the economic life of the asset.

GDS life (years): Life of miscellaneous equipment using the GDS. GDS values come from IRS tables. For example, see IRS. 2000. How to depreciate property. Pub. 946.

ADS life (years): Life of miscellaneous equipment using the ADS. ADS values come from IRS tables. For example, see IRS Pub. 946.

Economic life (years): Actual estimated useful life of miscellaneous equipment. The economic life may be greater or less than the depreciable life allowed by the IRS. The asset will be automatically replaced at the end of its economic life. The replacement price will be the original cost plus an inflation adjustment.

Salvage estimate: Estimated value, in year 0 dollars, at the end of the economic life. The salvage estimate is used for current value calculations, which are automatically increased for inflation.

Depreciation method: Code for depreciation method used. The methods and codes are the same as those used for buildings. Note that the depreciation codes under individual equipment items may be entered separately. However, they are presented in boldfaced type because they are linked to the depreciation method input in the general entered assumptions. The depreciation method used will usually be the same for all types of miscellaneous equipment. For tax purposes, miscellaneous equipment may be depreciated using either straight-line or declining-balance depreciation. The depreciation codes follow:

DB   Declining-balance (will automatically switch to straight-line depreciation if the latter offers higher write-off)
SLA   Straight-line (MACRS life, accelerated)
SLADS   Straight-line (ADS)
SLEL   Straight-line (economic life)[12]
K   "K"ustom[13]

Declining-balance factor: Percentage used in declining-balance depreciation. A maximum of 200% is currently allowed with miscellaneous equipment. Using a declining-balance factor of 200% allows a faster write-off and greater tax savings, provided that there is sufficient offsetting revenue. The IRS also allows a factor of 150%.

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[12]Straight-line depreciation over an asset's economic life is not an IRS-approved method.

[13]IRS would only approve "K"ustom depreciation if it followed an IRS-approved method.

Rolling Stock Worksheet

Rolling stock is the additional machinery and equipment (forklifts, trucks, etc.) used in the laminated lumber plant. Some assumptions on the *Other Equipment* worksheet are imported. Others are entered. The entered assumptions are divided between general entered assumptions, that is, assumptions that apply to all pieces of other equipment, and assumptions that apply to individual equipment types.

General Entered Assumptions

Depreciation method: Code for depreciation method used. The methods and codes are the same as for miscellaneous equipment. (See section on Miscellaneous Equipment Worksheet.) Note that the depreciation codes under the individual pieces of capital equipment may be entered separately. However, they are presented in boldfaced type because they are linked to the depreciation method input in the General Entered Assumptions. The depreciation method used will usually be the same for all pieces of capital equipment. For tax purposes, capital equipment may be depreciated using either straight-line or declining-balance depreciation.

Rolling stock insurance (% purchase): Cost to insure equipment.

Diesel fuel cost ($/gallon): Cost for diesel fuel (not including road-use taxes).

Oil cost ($/gallon): Cost for oil.

Terminal values: Valuation method for assets at end of 20-year planning period. Terminal values may be either current or book. Current values use asset economic life and consider inflation. Book values are based on the asset historic costs and selected depreciation method.

Entered Assumptions

There are a number of entered assumptions by capital equipment type. These assumptions may be either entered individually on this worksheet, or they may be copied and pasted from the *Capital Equipment Library* worksheet at the end of the workbook. The entered assumptions are as follows:

System description name: Identification of the combination of equipment used.

Expected average productivity (pieces/shift or MBF/shift): Base input processing productivity expected from given combination of capital equipment.

Other equipment name: Name of equipment used.

Initial cost: Year 0 cost of equipment. Note that the replacement cost of the equipment will be increased for inflation.

GDS life (years): Depreciable life of equipment under GDS. (See IRS Pub. 946.)

ADS life (years): Depreciable life of equipment under ADS. (See IRS Pub. 946.)

Economic life (hours): Practical operating life of equipment in hours. The expected operating life is used in calculating repair and maintenance costs. The economic life in hours divided by the economic life in years provides an economic constant hours/year. If equipment use exceeds this rate, then repairs and maintenance will be increased.

Economic life (years): Practical operating life of equipment in years. The expected operating life is used in calculating repairs and maintenance costs. It is also used to determine the year or years in which the equipment will be replaced.

Salvage estimate: Used for current value calculations and to determine capital gains or losses when the equipment is sold. The salvage estimate is the estimated value, in year 0 dollars, at the end of the economic life of the equipment. These values are automatically increased for inflation.

Fuel consumption (gal/h): Rate of fuel consumption. The rate of fuel consumption, combined with cost of fuel and operating hours, provides the total fuel cost.

Oil & lube (% fuel): Oil and lube cost as a percentage of total fuel cost.

Other annual costs ($/year): Any other annual costs.

Avg. annual R&M (%): Average annual repairs and maintenance (R&M) as an estimated percentage of economic life depreciation. Repairs and maintenance will be increased if the equipment is used for more hours than its average annual economic rate (economic life (hours) divided by economic life (years)). R&M will be decreased if the equipment is used for fewer hours than its average annual economic rate.

Depreciation method: Code for depreciation method used. The methods and codes are the same as those for Rolling Stock. Note that the depreciation codes under the individual pieces of capital equipment may be entered separately. However, they are presented in boldfaced type because they are linked to the depreciation method input in the General Entered Assumptions. The depreciation method used will usually be the same for all pieces of capital equipment. For tax purposes, capital equipment may be depreciated using either straight-line or declining-balance depreciation.

Declining-balance factor: Percentage used in declining-balance depreciation. With other equipment, a maximum of 200% is currently allowed. This is known as "double declining-balance depreciation." Using a declining-balance factor of 200% allows a faster write-off and greater tax savings, provided that there is sufficient offsetting revenue. The IRS also allows a factor of 150%.

No. used: Number of pieces of capital equipment of each type used.

Total operating hours/shift: Number of hours/shift that all equipment in this category is operating. If there are two or more identical pieces of equipment in any category, then enter the total number of hours for all pieces of equipment in that category (for example, if two identical loaders are each operating for 7 hours during each shift, then enter "14" for loaders in Hours/shift).

Wages Worksheet

The *Wages* worksheet contains the inputs and calculations for wage costings for hourly wage earners. It does not contain information or calculations for salaried employees, whose earnings are calculated on the *Administration* worksheet. The inputs on the Wages worksheet are divided into five input tables:

1. Worker type and employees required

2. Employees hired

3. Standard work hours and available overtime hours/worker

4. Base hourly wage rates plus allowances by worker type

5. Individual worker accessories costs

Worker Type and Employees Required

Worker type: Worker classification required for the yard (scaler, grader, equipment operator, etc.).

Employees required (no./shift): Number of employees of each worker type required for each operating shift. Note that only whole numbers are allowed in this entry; that is, no fractions should be entered for part-time employees. The number of worker hours required will depend on the number of employees required, number of hours/shift, and number of shifts/year.

Employees Hired

"Employees hired" constitutes the actual number of employees hired of each worker type by year. If the number of employees hired of any worker type for any year is less than is actually required, a warning will appear. If a warning does appear, then the user should scroll down to the individual worker categories to determine in what year or years more workers are required. The only way to eliminate this warning is to hire more workers in the appropriate years, or to increase the maximum work days/year or the maximum work hours/day.

Important: Hiring additional employees may reduce the total wages bill. Depending on how much money extra employees are paid for working overtime and what the fixed costs are per employee, it may be possible to reduce the total wages bill by hiring additional workers in some years. These numbers are worth experimenting with. Alternatively, use the Excel "Solver" algorithm to minimize total wages costs.

Standard Work Hours and Available Overtime

"Standard work hours/worker" calculates the number of hours for which workers will earn adjusted hourly wage rates. The required inputs are as follows:

Days/year: Usually 365.

Less holidays: 10 statutory holidays—New Year's Day, Martin Luther King Jr.'s Birthday, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day, and Christmas Day.

Less weekend days: Although workers may be required to work on weekends or on more than 5 days/week, these are days for which an employee will be paid an overtime allowance.

Less vacation days (optional): Worker annual vacation days.

Less allowed sick days (optional): Expected days that workers will not work because of illness.

"Available overtime hours/worker" calculates the number of hours that workers could earn their adjusted hourly wage rate plus an overtime allowance. The required inputs are as follows:

Maximum work days/year: Number of days worker could potentially work.

Maximum work hours/day: Maximum time worker could possibly work. The Base Hourly Wage Rates Plus Allowances by Worker Type input table calculates ordinary base rates, overtime, and annual fixed costs. The required inputs are as follows:

Unadjusted hourly wage rates: Base hourly rates stipulated on paychecks.

Statutory holiday pay: Percentage applied to unadjusted hourly wage rates to account for paid holidays.

Vacation pay: Percentage applied to unadjusted hourly wage rates to account for paid vacation days.

Sick leave: Percentage applied to unadjusted hourly wage rates to account for paid sick leave.

Retirement: Percentage applied to unadjusted hourly wage rates to account for payments to worker retirement funds.

Other allowances: Percentage applied to unadjusted hourly wage rates to account for any other worker allowances.

Hourly overtime factor: Percentage applied to adjusted hourly wage rates for overtime hours worked.

Base Hourly Wage Rates Plus Allowances

"Annual fixed costs/employee" calculates the fixed costs associated with hiring each employee. The fixed costs, in terms of dollars, are as follows:

Health insurance: Charges for worker health insurance paid by the firm.

Liability insurance: Liability insurance carried by the firm.

Labor accessories: Worker accessories paid for by the firm. Note that this amount is imported from the Individual Worker Accessories Costs input table described below.

Other fixed costs: Any additional fixed costs/employee.

Crew Accessories Worksheet

The *Crew Accessories* worksheet contains general accessories for the crew, which include fire and safety equipment. Although these accessories would be itemized and depreciated as miscellaneous equipment for accounting purposes, they are likely to constitute only a small proportion of total costs.

First aid equipment: Crew safety equipment.

Fire equipment: All fire tools—pumps, extinguishers, etc.

Other equipment: Any miscellaneous equipment.

Loose tools: Single number quantifying the value of miscellaneous loose tools.

Tool and equipment operating life: Estimate for tool and equipment life to calculate an annual allowance.

Administration Worksheet

The *Adminstration* worksheet contains costs that account for such administrative costs as salaried employees and clerical expense. Inputs required are as follows:

Salaried employees hired: Total number of salaried employees each year by employee classification.

Clerical employees hired: Total number of clerical employees each year by employee classification.

Clerical hours required: Number of clerical hours each year by employee classification.

Fixed costs/salaried employee (year 0): Fixed cost calculations for each salaried employee classification. These calculations require the input of ordinary salary, a perks percentage (such as company vehicle), health insurance, liability insurance, and other costs. All costs are in year 0 dollars.

Costs/clerical employee (year 0): Yearly clerical expense calculations. Require the input of unadjusted hourly wages and holiday pay, vacation pay, sick leave, and other allowances, all as a percentage of unadjusted hourly wages; retirement as a percentage of yearly wages; and health insurance, liability insurance, and other costs as lump sums. All costs are in year 0 dollars.

Payroll & other clerical expenses: Cost/employee to prepare payroll and other miscellaneous clerical expenses.

Other professional fees: Accounting, legal, and other professional fees.

Communications expenses: Any communications expenses, including telephone, fax, cell phones, and Internet service.

Other overheads expenses ($/year): Utilities, other insurance, bank overdraft charges, etc.

Other Costs Worksheet

The *Other Costs* worksheet is a catch-all for costs that have not been entered elsewhere. These costs are entered individually.

Working Capital Worksheet

The only user-defined variable on the *Working Capital* worksheet is Working Capital Percent of Sales. This is the percentage of sales that working capital represents.

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FINANCIAL INDICATORS	Net present value	Nominal IRR	Real IRR
Before tax & finance	$ 3,857,805	33.3%	29.5%
Before tax	$ 7,661,568	43.1%	38.9%
After tax	$ 7,297,222	27.1%	23.4%
		IRR seed =	10.0%

Screenshot 1. Financial Indicators table for *FINANCIAL SUMMARY* worksheet.

REVENUE & COST SUMMARY	After-tax PV	$/MBF (input)	Pct. of sales	Pct. of total costs
Sales revenue	$ 210,327,955	$ 278.31	100.0%	103.6%
Less: variable costs				
Laminations costs	(112,530,675)	(148.90)	-53.5%	55.4%
Direct production costs	(62,938,610)	(83.28)	-29.9%	31.0%
Total variable costs	(175,469,285)	(232.18)	-83.4%	86.4%
Subtotal: operating margin	$ 34,858,670	$ 46.13	16.6%	17.2%
Less: fixed costs and overheads				
Plant and equipment at cost less salvage	(7,452,816)	(9.86)	-3.5%	3.7%
Administration and overheads	(8,145,395)	(10.78)	-3.9%	4.0%
Total fixed costs	$ (15,598,211)	$ (20.64)	-7.4%	7.7%
Net present value before financing and tax	$ 19,260,459	$ 25.49	9.2%	9.5%
Less: financing and working capital				
Net loan cost	(141,383)	(0.19)	-0.1%	0.1%
Working capital cost	(3,283,703)	(4.35)	-1.6%	1.6%
Total financing costs	(3,425,086)	(4.53)	-1.6%	1.7%
Net present value before tax	$ 15,835,373	$ 20.95	7.5%	7.8%
Less: total taxes	(8,538,150)	(11.30)	-4.1%	4.2%
After-tax net present value (NPV)	$ 7,297,222	$ 9.66	3.5%	3.6%
Note: to calculate the true break-even laminations cost, either iteratively or using Goal Seek, set the After-tax net present value (above) to $0 by changing the optional summary laminations input cost, below.				

Screenshot 2. Revenue & Cost Summary table from *FINANCIAL SUMMARY* worksheet.

BREAK-EVEN SUMMARY	Year 0 value	Year 1 value
Optional summary laminations input cost ($/MBF)	$ **165.84**	$ 170.82
Calculated break-even laminations cost ($/MBF input)	$ 165.76	$ 170.73
Weighted average laminations cost ($/MBF input)	$ 165.84	$ 170.82

Screenshot 3. Break-Even Summary table from *FINANCIAL SUMMARY* worksheet.

SENSITIVITY ANALYSIS SCALING FACTORS	
Sales revenues	**100.0%**
Laminations costs	**100.0%**
Land & bldg.	**100.0%**
Misc. equipment	**100.0%**
Equipment & other inputs	**100.0%**
Rolling stock cost	**100.0%**
Wages	**100.0%**
Crew accessories	**100.0%**
Administration	**100.0%**
Other costs	**100.0%**
Working capital	**100.0%**

COST CONTINGENCY ALLOWANCES	
Capital costs	**10%**
Direct production costs	**15%**
Fixed costs and overheads	**10%**
Working capital	**10%**

Screenshot 4. Sensitivity analysis scaling factors and cost contingency allowances from *FINANCIAL SUMMARY* worksheet.

KEY COST-OF-CAPITAL VARIABLES			
Pre-tax required premium on risk capital	**15.00%**		
Debt/Total capital	**40.0%**		

COSTS OF CAPITAL[†]			
Nominal equity cost of capital	21.0%	
Nominal before-tax weighted average cost of capital	16.6%	
Nominal after-tax weighted average cost of capital	9.5%	
Real after-tax weighted average cost of capital	6.3%	

[†] Imported from the Gen. Assumptions worksheet

Screenshot 5. Key cost-of-capital variables from *FINANCIAL SUMMARY* worksheet.

SUMMARY CASH FLOW TABLE	2006	2007	2008	2009	2010	2011
				Year		
PLANT AND EQUIP. CASH FLOWS						
Plant and equipment costs	(2,456,603)	-	(106,090)	(136,591)	(247,612)	(2,347,270)
Contingency allowance	(245,660)	-	(10,609)	(13,659)	(24,761)	(234,727)
Salvage values		-	21,218	32,782	22,510	81,265
Terminal values						
Net capital cash flows	$ (2,702,263)	$ -	$ (95,481)	$ (117,468)	$ (249,863)	$ (2,500,732)
PRODUCT SALES						
Processed primary products		11,292,442	16,283,701	21,564,273	22,211,201	22,877,537
Merchantable residues		61,875	85,490	108,269	111,517	114,863
Subtotal: net sales		$ 11,354,317	$ 16,369,191	$ 21,672,542	$ 22,322,718	$ 22,992,400
PRODUCTION COSTS						
Laminations input cost		(6,063,671)	(8,590,482)	(11,173,198)	(11,508,394)	(11,853,646)
Direct production costs						
Equipment operating costs		(2,242,277)	(3,124,713)	(4,065,168)	(4,166,877)	(4,307,679)
Wages and worker accessories	(8,509)	(774,537)	(1,098,754)	(1,470,622)	(1,495,970)	(1,509,915)
Unmerchantable residues disposal		(65,593)	(89,750)	(112,453)	(115,826)	(119,301)
Contingency allowance	(1,276)	(462,869)	(647,715)	(848,206)	(867,800)	(891,563)
Subtotal: direct production costs	$ (9,786)	$ (3,545,275)	$ (4,960,932)	$ (6,496,449)	$ (6,646,474)	$ (6,828,459)
Annual fixed & overhead costs						
Annual land lease cost	(20,000)	(43,074)	(45,254)	(47,543)	(49,949)	(52,477)
Annual building lease cost	-	-	-	-	-	-
Land and buildings repairs and maintenance		(3,321)	(3,375)	(3,428)	(3,481)	(3,533)
Administration		(386,429)	(397,932)	(516,277)	(565,093)	(581,912)
Other costs		(2,575)	(2,652)	(2,732)	(2,814)	(2,898)
Insurance costs	(4,385)	(79,267)	(74,669)	(75,563)	(76,103)	(85,115)
Ad valorem (property) taxes	(21,453)	(31,992)	(23,987)	(20,150)	(19,636)	(49,553)
Contingency allowance	(4,584)	(54,666)	(54,787)	(66,569)	(71,708)	(77,549)
Subtotal: fixed costs and overheads	$ (50,422)	$ (601,325)	$ (602,656)	$ (732,263)	$ (788,783)	$ (853,036)
Operating income (loss)	$ (60,208)	$ 1,144,046	$ 2,215,122	$ 3,270,632	$ 3,379,068	$ 3,457,260
Working capital cash flow	$ (1,873,462)	$ (827,454)	$ (875,053)	$ (107,279)	$ (110,497)	$ (113,812)

Screenshot 6 (continued on next page). First 6 of 20 years of cash flows from *CASH FLOW SUMMARY* worksheet.

SUMMARY CASH FLOW		Year									
TABLE (continued)		2006		2007		2008		2009		2010	2011
Net capital cash flows	$	(2,702,263)	$	-	$	(95,481)	$	(117,468)	$	(249,863) $	(2,500,732)
Operating income (loss)		(60,208)		931,382		1,915,339		2,882,746		2,979,545	3,045,752
Working capital cash flow		(1,873,462)		(827,454)		(875,053)		(107,279)		(110,497)	(113,812)
Cash flow before tax and finance	$	(4,635,933)	$	103,927	$	944,806	$	2,657,999	$	2,619,185 $	431,207
FINANCING CASH FLOWS											
New borrowing (loan principal)		1,661,756		300,892		360,637		93,647		139,226	980,294
Bank financing fees		(9,802)		(3,009)		(3,606)		(936)		(1,392)	(9,803)
Loan interest payments				(165,556)		(177,673)		(193,970)		(181,880)	(172,888)
Loan principal repayments				(180,151)		(198,123)		(215,049)		(229,688)	(249,392)
Loan principal balloon repayment											
Subtotal: financing cash flows	$	1,651,954	$	(47,823)	$	(18,765)	$	(316,309)	$	(273,735) $	548,212
Cash flow before tax	$	(2,983,979)	$	56,104	$	926,040	$	2,341,690	$	2,345,450 $	979,419
NON-CASH ADJUSTMENTS											
Depreciation expense				(615,527)		(434,776)		(354,276)		(341,149)	(345,414)
Taxable gain (loss) on salvage				-		(14,782)		5,782		(28,642)	(250,368)
Taxable gain (loss) on terminal values											
Subtotal: non-cash adjustments			$	(615,527)	$	(449,558)	$	(348,494)	$	(369,791) $	(595,782)
Taxable cash flows	$	(70,010)	$	147,290	$	1,284,502	$	2,339,345	$	2,426,482 $	2,267,279
CAPITAL GAINS TAXES											
Capital gain (loss) on land & buildings sale											
Federal capital gains tax											
State capital gains tax											
Subtotal: capital gains taxes											
INCOME TAXES											
Federal income taxes		23,103		(48,606)		(423,886)		(771,984)		(800,739)	(748,202)
State income taxes		7,001		(14,729)		(128,450)		(233,935)		(242,648)	(226,728)
Subtotal: income taxes	$	30,104	$	(63,335)	$	(552,336)	$	(1,005,919)	$	(1,043,387) $	(974,930)
After-tax cash flow	$	(2,953,874)	$	(7,230)	$	373,704	$	1,335,771	$	1,302,063 $	4,489

Screenshot 6 (continued). First 6 of 20 years of cash flows from *CASH FLOW SUMMARY* worksheet.

Facility full-time operation shift hours		Plant			
		operating		Shift hours/	
		days/year		year	
	Shift 1	**250**		2,000	
	Shift 2	**250**		2,000	
	Shift 3	**250**		2,000	
	Shift 4	-		-	
Standard hours/shift		**8.0**	Shift hrs./year	6,000	
Maximum shift hours/day		24	Shifts/year	750	
			Full time operating days/year	250.0	

Screenshot 7. Facility Full-Time Operation Shift Hours table from *General Assumptions* worksheet.

	Year					
Process capacity utilization	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Percent of full-time operation utilized		50%	70%	90%	90%	90%
Shifts/year		375	525	675	675	675
Shift 1		250	250	250	250	250
Shift 2		125	250	250	250	250
Shift 3		-	25	175	175	175
Shift 4		-	-	-	-	-

Screenshot 8. Process capacity utilization factors for first 6 of 20 years from *General Assumptions* worksheet.

ASSUMPTIONS						
	Inflation-adjusted	Manually entered				
Process plant revenues are…	**x**		(tick one)			
Because you chose 'Inflation-adjusted,' only the first year's. product prices will be used below.						
Product Prices (Costs) ($/unit)						
	Year					
	2006	*2007*	*2008*	*2009*	*2010*	*2011*
Std. LamHeaders (lineal ft.)	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
LamLumber (MBF)	$ 350.00	$ 250.00	$ 250.00	$ 250.00	$ 250.00	$ 250.00
LamTrusses (units)	$ 75.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00	$ 200.00
LamPosts (units)	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00
---------	$ -	$ -	$ -	$ -	$ -	$ -
---------	$ -	$ -	$ -	$ -	$ -	$ -
Merchantable processed residue (tons)	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
Unmerchantable processed residue (tons)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)

IMPORTANT! Because you chose 'Inflation-adjusted,' any price entries beyond the first year will be ignored.

Screenshot 9. Process plant revenues automatically adjusted for inflation for first 6 of 20 years from *Production Revenues* worksheet.

	Inflation-adjusted	Manually entered					
Process plant revenues are...		**x**	(tick one)				
Because you chose 'Manually entered,' you MUST enter product prices for each year below.							
Product Prices (Costs) ($/unit)							

					Year		
	2006	2007	2008	2009	2010	2011
Std. LamHeaders (lineal ft.)	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
LamLumber (MBF)	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00	$ 350.00
LamTrusses (units)	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00	$ 75.00
LamPosts (units)	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00
---------	$ -	$ -	$ -	$ -	$ -	$ -
---------	$ -	$ -	$ -	$ -	$ -	$ -
Merchantable processed residue (tons)	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
Unmerchantable processed residue (tons)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)	$ (5.00)

IMPORTANT! Because you chose 'Manually entered,' make sure that you enter product prices for EACH year.

Screenshot 10. Process plant revenues manually adjusted for first 6 of 20 years from *Production Revenues* worksheet.

			Year			
REVENUE SUMMARY	2006	2007	2008	2009	2010	2011
Primary products sales revenues						
Std. LamHeaders (lineal ft.)		$ 3,992,317	$ 5,756,921	$ 7,623,808	$ 7,852,522	$ 8,088,098
LamLumber (MBF)		7,300,125	10,526,780	13,940,465	14,358,679	14,789,439
LamTrusses (units)		-	-	-	-	-
LamPosts (units)		-	-	-	-	-
---------		-	-	-	-	-
---------		-	-	-	-	-
Subtotal: primary products sales		$ 11,292,442	$ 16,283,701	$ 21,564,273	$ 22,211,201	$ 22,877,537
Merchantable residues sales						
Merchantable processed residue		$ 4,514	$ 6,510	$ 8,621	$ 8,880	$ 9,146
Merchantable unprocessed residue		57,361	78,980	99,648	102,638	105,717
Subtotal: merchantable residues		$ 61,875	$ 85,490	$ 108,269	$ 111,517	$ 114,863
Total product sales		$ 11,354,317	$ 16,369,191	$ 21,672,542	$ 22,322,718	$ 22,992,400
Unmerchantable residues disposal						
Unmerchantable processed residue		$ (3,386)	$ (4,882)	$ (6,466)	$ (6,660)	$ (6,859)
Unmerchantable unprocessed residue		(65,593)	(89,750)	(112,453)	(115,826)	(119,301)
Total residue disposal costs		$ (68,979)	$ (94,633)	$ (118,919)	$ (122,486)	$ (126,161)

Screenshot 11. Revenue Summary for first 6 of 20 years from *Production Revenues* worksheet.

PRESENT VALUES OF LAMINATIONS CASH FLOWS			
	Total	$/unit	
Present value of laminations input costs	$ (112,530,675)	$ (148.90)	per MBF
Present value of merchantable unprocessed residue	$ 974,877	$ 10.00	per ton
Present value of unmerchantable unprocessed residue	$ (1,101,453)	$ (5.00)	per ton
Present value of net cost of utilizable laminations	$ (112,657,251)	$ (262.31)	per MBF

Screenshot 12. Present Values of Laminations Cash Flows table from *Laminations Costs & Conversions* worksheet.

		———— Year ————				
SUMMARY LAMINATIONS CASH FLOWS	*Present value*	*2007*	*2008*	*2009*	*2010*	*2011*
Total laminations input cost	$ (112,530,675)	$ (6,276,335)	$ (8,890,264)	$ (11,561,084)	$ (11,907,916)	$ (12,265,154)
Merchantable unprocessed residue revenue	$ 974,877	$ 57,361	$ 78,980	$ 99,648	$ 102,638	$ 105,717
Unmerchantable unprocessed residue disposal cost	$ (1,101,453)	$ (65,593)	$ (89,750)	$ (112,453)	$ (115,826)	$ (119,301)
Net cost of utilizable laminations	($112,657,251)	$ (6,284,568)	$ (8,901,034)	$ (11,573,888)	$ (11,921,105)	$ (12,278,738)
SUMMARY PHYSICAL INPUTS AND OUTPUTS	*Present volume*					
Total wood inputs (MBF)	755,736	41,294	56,515	70,994	70,994	70,994
Utilizable laminations (MBF)	429,475	22,500	31,500	40,500	40,500	40,500
Merchantable unprocessed residue (tons)	97,488	5,569	7,445	9,119	9,119	9,119
Unmerchantable unprocessed residue (tons)	220,291	12,736	16,920	20,582	20,582	20,582

Screenshot 13. Summary Laminations Cash Flows and Summary Physical Inputs and Outputs tables from *Laminations Costs & Conversions* worksheet.

LAMINATIONS COSTS BY GRADE (Year 0 dollars)	Present value of total cost	Less: PV of merch. residue	Plus: PV of unmerch. residue	NPV of total cost	Present volume of input laminations (MBF)	Present volume of utilizable laminations (MBF)	Cost of input laminations ($/MBF)	Net cost of utilizable laminations ($/MBF)
Economy grade	$ (24,328,905)	$ 86,169	$ (64,626)	$ (24,307,363)	147,448	125,331	$ (165.00)	$ (193.95)
Sub-economy grade I	(88,201,770)	888,709	(1,036,827)	(88,349,888)	608,288	304,144	(145.00)	(290.49)
Sub-economy grade II	-	-	-	-	-	-	-	-
Lam Species-Grade 4	-	-	-	-	-	-	-	-
Lam Species-Grade 5	-	-	-	-	-	-	-	-
Lam Species-Grade 7	-	-	-	-	-	-	-	-
Lam Species-Grade 8	-	-	-	-	-	-	-	-
Lam Species-Grade 9	-	-	-	-	-	-	-	-
Lam Species-Grade 10	-	-	-	-	-	-	-	-
Total or weighted average	$ (112,530,675)	$ 974,877	$ (1,101,453)	$ (112,657,251)	755,736	429,475	$ (148.90)	$ (262.31)

Screenshot 14. Laminations Costs by Grade table from *Laminations Costs & Conversions* worksheet.

LAMINATIONS INPUT COSTS ($/MBF)						
		———— Year ————				
Lamination input grade name	*Present value*	*2007*	*2008*	*2009*	*2010*	*2011*
Economy grade	$ 165.00	$ 165.00	$ 165.00	$ 165.00	$ 165.00	$ 165.00
Sub-economy grade I	$ 145.00	$ 145.00	$ 145.00	$ 145.00	$ 145.00	$ 145.00
Sub-economy grade II	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84
Lam Species-Grade 4	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84
Lam Species-Grade 5	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84
Lam Species-Grade 7	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84
Lam Species-Grade 8	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84
Lam Species-Grade 9	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84
Lam Species-Grade 10	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84	$ 165.84

Because you ticked the box stating that the laminations input costs are inflation-adjusted, these present value costs will be adjusted automatically.

Screenshot 15. Laminations Input Costs table from *Laminations Costs & Conversions* worksheet.

LAMINATIONS INPUT SPECIES AND GRADE MIX

Lamination input grade name	2006	2007	2008	2009	2010	2011
Economy grade		20%	25%	30%	30%	30%
Sub-economy grade I		80%	75%	70%	70%	70%
Sub-economy grade II					0%	0%
Lam Species-Grade 4						
Lam Species-Grade 5						
Lam Species-Grade 7						
Lam Species-Grade 8						
Lam Species-Grade 9						
Lam Species-Grade 10						
Total		100%	100%	100%	100%	100%

Screenshot 16. First 6 of 20 years of laminations species and grade mix inputs from *Laminations Costs & Conversions* worksheet.

LAMINATIONS PRODUCT RECOVERIES

Lamination input grade name	Utilizable laminations	Merchantable residue	Unmerchantable residue	Total
Economy grade	85%	6%	9.0%	100.0%
Sub-economy grade I	50%	15%	35.0%	100.0%
Sub-economy grade II	65%	15%	20.0%	100.0%
Lam Species-Grade 4			-	-
Lam Species-Grade 5			-	-
Lam Species-Grade 7			-	-
Lam Species-Grade 8			-	-
Lam Species-Grade 9			-	-
Lam Species-Grade 10			-	-

Screenshot 17. Laminations product recoveries from *Laminations Costs & Conversions* worksheet.

TOTAL LAMINATIONS (MBF)

Lamination input grade name	Present volume	2007	2008	2009	2010	2011
Economy grade	147,448	5,294	9,265	14,294	14,294	14,294
Sub-economy grade I	608,288	36,000	47,250	56,700	56,700	56,700
Sub-economy grade II	-	-	-	-	-	-
Lam Species-Grade 4	-	-	-	-	-	-
Lam Species-Grade 5	-	-	-	-	-	-
Lam Species-Grade 7	-	-	-	-	-	-
Lam Species-Grade 8	-	-	-	-	-	-
Lam Species-Grade 9	-	-	-	-	-	-
Lam Species-Grade 10	-	-	-	-	-	-
Total	755,736	41,294	56,515	70,994	70,994	70,994

Screenshot 18. First 5 of 20 years of total laminations calculations from *Laminations Costs & Conversions* worksheet.

TOTAL LAMINATIONS INPUT COST

Lamination input grade name	Present value	2007	2008	2009	2010	2011
Economy grade	$ (24,328,905)	$ (899,735)	$ (1,621,773)	$ (2,577,229)	$ (2,654,546)	$ (2,734,182)
Sub-economy grade I	(88,201,770)	(5,376,600)	(7,268,491)	(8,983,855)	(9,253,371)	(9,530,972)
Sub-economy grade II	-	-	-	-	-	-
Lam Species-Grade 4	-	-	-	-	-	-
Lam Species-Grade 5	-	-	-	-	-	-
Lam Species-Grade 7	-	-	-	-	-	-
Lam Species-Grade 8	-	-	-	-	-	-
Lam Species-Grade 9	-	-	-	-	-	-
Lam Species-Grade 10	-	-	-	-	-	-
Total	$ (112,530,675)	$ (6,276,335)	$ (8,890,264)	$ (11,561,084)	$ (11,907,916)	$ (12,265,154)

Screenshot 19. First 5 of 20 years of total laminations input cost calculations from *Laminations Costs & Conversions* worksheet.

SUMMARY PRESENT VALUES OF OPERATING COSTS						
	Total after tax PV	$/MBF input				
Present value of the operating costs (yr. 0 dollars)	$ (85,057,882)	$ (112.55)				
	After-tax				Year	
	present value	2007	2008	2009	2010	2011
Weighted average break-even mfg. cost recovery	$ (85,057,882)	$ (4,787,071)	$ (6,748,083)	$ (8,731,292)	$ (8,993,231)	$ (9,263,028)
BOTTOM LINE OPERATING COST SUMMARY						
CASH COSTS BEFORE TAX & FINANCING	$ (4,635,933)	$ (4,977,440)	$ (6,539,004)	$ (7,459,925)	$ (7,802,277)	$ (10,302,898)
CASH COSTS BEFORE TAX	$ (2,983,979)	$ (5,025,263)	$ (6,557,770)	$ (7,776,234)	$ (8,076,012)	$ (9,754,687)
AFTER TAX CASH COSTS	$ (2,953,874)	$ (2,903,610)	$ (3,892,067)	$ (4,431,445)	$ (4,638,170)	$ (6,113,951)

Screenshot 20. Present values and first 5 of 20 years of Consolidated Operating Costs summary tables from *Consolidated Operating Costs* worksheet.

		Year				
WAGES SUMMARY BY WORKER TYPE		2007	2008	2009	2010	2011
Wood handling		$ (273,365)	$ (380,236)	$ (511,112)	$ (507,928)	$ (504,113)
Wood processing		(232,645)	(340,414)	(445,772)	(459,041)	(472,707)
Wood finishing		(140,605)	(206,110)	(275,403)	(283,576)	(291,993)
Rolling stock operators		(77,017)	(102,969)	(144,237)	(148,535)	(141,334)
Other		(48,714)	(66,768)	(91,773)	(94,496)	(97,301)
Total employment cost		$ (772,345)	$ (1,096,497)	$ (1,468,297)	$ (1,493,575)	$ (1,507,449)
WAGES SUMMARY BY WAGE TYPE						
Hourly wages (standard shift hours)		$ (342,685)	$ (531,408)	$ (660,490)	$ (722,647)	$ (819,092)
Overtime wages		(256,287)	(313,299)	(480,469)	(430,863)	(330,755)
Subtotal: hourly wages		$ (598,972)	$ (844,707)	$ (1,140,959)	$ (1,153,510)	$ (1,149,846)
Retirement		(17,969)	(25,341)	(34,229)	(34,605)	(34,495)
Social Security		(37,136)	(52,372)	(70,739)	(71,518)	(71,290)
Medicare		(8,685)	(12,248)	(16,544)	(16,726)	(16,673)
Unemployment insurance - Federal		(728)	(1,064)	(1,288)	(1,344)	(1,456)
Unemployment insurance - State		(5,733)	(8,379)	(10,143)	(10,584)	(11,466)
Workers' compensation insurance		(29,949)	(42,235)	(57,048)	(57,676)	(57,492)
Other fixed costs		(73,173)	(110,150)	(137,347)	(147,613)	(164,730)
Subtotal: overheads for hourly employees		$ (173,373)	$ (251,790)	$ (327,338)	$ (340,065)	$ (357,603)
Total employment cost		$ (772,345)	$ (1,096,497)	$ (1,468,297)	$ (1,493,575)	$ (1,507,449)

Screenshot 21. First 5 of 20 years of wages summaries from *Wages* worksheet.

EMPLOYEES REQUIRED (No./shift)				
Worker type	First shift	Second shift	Third shift	Fourth shift
Wood handling	3	3	3	3
Wood processing	4	4	4	4
Wood finishing	3	3	3	3
Rolling stock operators	1	1	1	1
Other	1	1	1	1
Total	12	12	12	12
Note: max. operators needed/shift	5			

Screenshot 22. Employees Required table from *Wages* worksheet.

EMPLOYEES HIRED (No./year)		Year				
Worker type		*2006*	*2007*	*2008*	*2009*	*2010*
Wood handling		3	5	6	7	8
Wood processing		4	5	7	7	7
Wood finishing		4	5	6	6	6
Rolling stock operators		1	2	2	2	3
Other		1	2	2	2	2
Total		13	19	23	24	26
Over-worked warnings. See individual worker catagory calculations below if any of these warnings appear.						
Wood handling						
Wood processing						
Wood finishing						
Rolling stock operators						
Other						

Screenshot 23. First 5 of 20 years of employees hired inputs from *Wages* worksheet.

		Year				
Wood handling		*2007*	*2008*	*2009*	*2010*	*2011*
Hourly wages (standard shift hours)		$ 78,046	$ 200,777	$ 248,258	$ 298,048	$ 350,521
Overtime wages		161,961	100,814	160,158	100,943	38,153
Subtotal: hourly wages		$ 240,007	$ 301,590	$ 408,416	$ 398,991	$ 388,674
Retirement		7,200	9,048	12,252	11,970	11,660
Social Security		11,160	18,699	25,322	24,737	24,098
Medicare		3,480	4,373	5,922	5,785	5,636
Unemployment insurance - Federal		112	280	336	392	448
Unemployment insurance - State		882	2,205	2,646	3,087	3,528
Workers' compensation - State		12,000	15,080	20,421	19,950	19,434
Fixed costs		11,247	28,962	35,797	43,016	50,636
Total employment cost/worker		$ 286,089	$ 380,236	$ 511,112	$ 507,928	$ 504,113
Individual employee calculations						
Annual total hours worked		4,500	2,520	2,700	2,314	2,025
Shift 1 hours worked		2,000	2,000	2,000	2,000	2,000
Shift 2 hours worked		1,000	520	700	314	25
Shift 3 hours worked		-	-	-	-	-
Shift 4 hours worked		-	-	-	-	-
Standard hours worked		1,888	1,888	1,888	1,888	1,888
Overtime hours worked		2,612	632	812	426	137
Total remaining available hours		(924)	1,056	876	1,262	1,551
Weighted average hourly base wages		$ 20.67	$ 21.27	$ 21.92	$ 22.55	$ 23.21
Hourly overtime wages		$ 31.00	$ 31.90	$ 32.87	$ 33.83	$ 34.81
Total hourly wages (standard shift hours)		$ 39,023	$ 40,155	$ 41,376	$ 42,578	$ 43,815
Total overtime wages		80,981	20,163	26,693	14,420	4,769
Subtotal: yearly wages		$ 120,003	$ 60,318	$ 68,069	$ 56,999	$ 48,584
Retirement		3,600	1,810	2,042	1,710	1,458
Social Security		5,580	3,740	4,220	3,534	3,012
Medicare		1,740	875	987	826	704
Unemployment insurance - Federal		56	56	56	56	56
Unemployment insurance - State		441	441	441	441	441
Workers' compensation insurance		6,000	3,016	3,403	2,850	2,429
Other fixed costs		5,624	5,792	5,966	6,145	6,329
Total employment cost/worker		$ 143,044	$ 76,047	$ 85,185	$ 72,561	$ 63,014
WARNING! Your total remaining available hours for at least one year is negative.						
You should either reduce the number of workers required, hire more workers in these years or increase your maximum yearly hours/employee.						

Screenshot 24. First 7 of 20 years of wages and hours calculations for wood handling workers from *Wages* worksheet.

STANDARD WORK HOURS PER WORKER		AVAILABLE OVERTIME HOURS PER WORKER	
Days/year	365	Maximum work days/year	298
Less: Holidays	10	Maximum work hours/day	12
Less: weekend days	104	Maximum work hours/year	3,576
Less: vacation days (optional)	10	Less: standard shift hours/year	1,888
Less: allowed sick days (optional)	5	Maximum overtime hours/year	1,688
Available workdays	236		
Standard hours/shift	8		
Standard shift hours/year	1,888		

Screenshot 25. Standard Work Hours per Worker and Available Overtime Hours per Worker tables from _Wages_ worksheet.

BASE HOURLY WAGE RATES PLUS ALLOWANCES BY WORKER TYPE (Year 0 dollars)				Rolling stock operators	Other
	Wood handling	Wood processing	Wood finishing		
Unadjusted hourly wage rates	$ 18.00	$ 11.00	$ 9.00	$ 15.00	$ 9.00
Adjustments					
Statutory holiday pay	4.1%	4.1%	4.1%	4.1%	4.1%
Vacation pay	4.1%	4.1%	4.1%	4.1%	4.1%
Sick leave	2.1%	2.1%	2.1%	2.1%	2.1%
Other allowances	1.0%	1.0%	1.0%	1.0%	1.0%
Total hourly adjustments	$ 2.02	$ 1.23	$ 1.01	$ 1.68	$ 1.01
Adjusted first shift gross hourly wage rates	$ 20.02	$ 12.23	$ 10.01	$ 16.68	$ 10.01
Second shift hourly premium	$ 0.15	$ 0.15	$ 0.15	$ 0.15	$ 0.15
Third shift hourly premium	$ 0.25	$ 0.25	$ 0.25	$ 0.25	$ 0.25
Fourth shift hourly premium	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30
Hourly overtime factor	1.5	1.5	1.5	1.5	1.5
Retirement	3.0%	3.0%	3.0%	3.0%	3.0%
Annual fixed costs/employee					
Health insurance	$ 2,400	$ 2,400	$ 2,400	$ 2,400	$ 2,400
Liability insurance	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Labor accessories (from below)	$ 101	$ 114	$ 101	$ 143	$ 30
Other fixed costs	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Total annual fixed costs/employee	$ 5,501	$ 5,514	$ 5,501	$ 5,543	$ 5,430

Screenshot 26. Base Hourly Wage Rates Plus Allowances by Worker Type table from _Wages_ worksheet.

INDIVIDUAL WORKER		——— Quantity required (units/year) ———				
ACCESSORIES AND COSTS	Wood handling	Wood processing	Wood finishing	Rolling stock operators	Other	Cost/item
Ear muffs G4		1	1	1	1	$ 12.87
Hard hat	1	1	1	1	1	$ 16.98
Hard hat	1	1	1	1	1	$ 16.98
Hi-vis vest	2	2	1	3		$ 12.95

Screenshot 27. Individual Worker Accessories and Costs table from *Wages* worksheet.

		——————Year——————				
SHIFT HOURS REQUIRED CALCULATION		2007	2008	2009	2010	2011
Total shift hours						
Shift 1		2,000	2,000	2,000	2,000	2,000
Shift 2		1,000	2,000	2,000	2,000	2,000
Shift 3		-	200	1,400	1,400	1,400
Shift 4		-	-	-	-	-
Total shifts/year		375	525	675	675	675
Operating hours/year		3,000	4,200	5,400	5,400	5,400
Shift hours required by employee group						
Wood handling		9,000	12,600	16,200	16,200	16,200
Wood processing		12,000	16,800	21,600	21,600	21,600
Wood finishing		9,000	12,600	16,200	16,200	16,200
Rolling stock operators		3,000	4,200	5,400	5,400	5,400
Other		3,000	4,200	5,400	5,400	5,400
Total shift hours		36,000	50,400	64,800	64,800	64,800

Screenshot 28. First 5 of 20 years of shift hours required calculations from *Wages* worksheet.

	DESC.	Quantity	$/ITEM	2005 TOTAL $
First aid equipment				
	Stretcher	1	$ 324.44	$ 324
	Blankets	2	56.84	114
5-Person First Aid Kit		1	65.56	66
1-Person First Aid Kit		2	25.00	50
				-
				-
Fire equipment				
	4lb Axe	2	$ 59.77	120
	Atlas #2 Shovel	5	37.77	189
				-
	1kg Extinguisher	2	57.86	116
	Rega Fire Pump	2	265.77	532
				-
	SUB-TOTAL: First aid and fire equipment			$ 1,509

	DESC.	Quantity	$/ITEM	2005 TOTAL $
Other equipment				
				$ -
				-
				-
	SUB-TOTAL: Other equipment			$ -
	Loose tools			$ 7,000
SUBTOTAL: UNADJUSTED WORKER ACCESSORIES				$ 8,509
	Scaling factor adjustment			$ -
SUBTOTAL: ADJUSTED WORKER ACCESSORIES				$ 8,509
	AVERAGE REPLACEMENT LIFE (YEARS)			4
	AVERAGE ANNNUAL REPLACEMENT COST			$ 2,127

Screenshot 29. *Crew Accessories* **worksheet.**

SUMMARY ADMINISTRATION COSTS		Year				
		2007	2008	2009	2010	2011
Fixed yearly salaries		(268,490)	(276,485)	(356,791)	(367,420)	(378,368)
Clerical wages		(63,967)	(65,856)	(101,703)	(138,156)	(142,241)
Payroll & other clerical expenses		(1,030)	(1,061)	(1,093)	(1,126)	(1,159)
Other professional fees		(4,120)	(4,244)	(4,371)	(4,502)	(4,637)
Yearly communications expense		(10,012)	(10,312)	(11,146)	(11,480)	(11,825)
Other overheads		(38,810)	(39,975)	(41,174)	(42,409)	(43,681)
TOTAL		$ (386,429)	$ (397,932)	$ (516,277)	$ (565,093)	$ (581,912)

Screenshot 30. First 5 of 20 years of summary costs from *Administration* worksheet.

WORKING CAPITAL CALCULATIONS						
		Year				
	2006	2007	2008	2009	2010	2011
Working capital required						
Gross working capital realized (required)	$ (1,703,148)	$ (2,455,379)	$ (3,250,881)	$ (3,348,408)	$ (3,448,860)	$ (3,552,326)
Marginal working capital realized (required)	$ (1,703,148)	$ (752,231)	$ (795,503)	$ (97,526)	$ (100,452)	$ (103,466)
Terminal working capital value						
Financing						
Net new borrowing (principal repayment)	681,259	300,892	318,201	39,011	40,181	41,386
Bank financing charges	(6,813)	(3,009)	(3,182)	(390)	(402)	(414)
Total loan interest payment	-	(68,126)	(98,215)	(130,035)	(133,936)	(137,954)
Loan principal balloon repayment						
Subtotal: net financing cash flows	$ 674,446	$ 229,758	$ 216,804	$ (91,415)	$ (94,157)	$ (96,982)
Net marginal working capital realized (required)	$ (1,028,701)	$ (522,474)	$ (578,699)	$ (188,941)	$ (194,609)	$ (200,448)

Screenshot 31. First 6 of 20 years of working capital calculations from *Working Capital* worksheet.