

Appendix A: Case Study

Company Background

Specialty Circuit Company,¹ a small circuit board manufacturer, employs 30 people in its British Columbia facility generating annual revenues close to \$500,000. On average, Specialty manufactures 100,000 square feet of circuit boards each year for a diverse array of customers and end uses. The company is committed to reducing the adverse environmental impacts of its operations.

Each year, Specialty prepares a pollution prevention plan to meet its commitment towards improved environmental performance. The firm's management policy statement includes specific, measurable goals to be met through improved operations. Previous efforts included the reduction by 50% of the firm's use and generation of hazardous materials through substitution with less hazardous cleaners. Some pollution prevention efforts – like the materials substitution – require relatively simple operating modifications, but others sometimes require the investment of capital funds. Specialty uses a Total Cost Assessment (TCA) methodology to evaluate investment Options in order to fully value the environmental benefits that may accrue.

Analysis Background

Specialty's current pollution prevention plan has targeted one of its non-product outputs, nitric acid, for elimination. Nitric acid is a toxic, hazardous chemical used by Specialty as a stripping solution to clean the stainless steel racks that carry the circuit boards through the baths and rinses of the plating process. When the circuit boards are submerged in the copper plating solution, the racks that hold them get plated as well. As a result, to prevent subsequent contamination of the various baths used in the plating process, the racks are cleaned after each cycle. Specialty uses nitric acid because the nature of stainless steel requires a powerful stripping material.

Prompted by the increasing costs of using and disposing of nitric acid and concerns about how the toxicity of the solution impacts worker safety, Angie, Specialty's production manager, began looking for opportunities to eliminate nitric acid from the workplace. After researching Options to the current nitric acid process, Angie found that a change in the racks themselves could obviate the need for the rack cleaning step. By switching to plastic-coated racks, Specialty could completely eliminate its use of nitric acid and

¹ This fictitious firm and accompanying case study are based on a report produced by the Pacific Northwest Pollution Prevention Resource Center entitled, "Analysis of Pollution Prevention and Waste Minimization Opportunities Using Total Cost Assessment: A Case Study in the Electronics Industry" published in September 1995. Details regarding the firm and the analysis have been substantially modified in order to demonstrate the various capabilities of the software.

simultaneously improve the quality of the plating process. The plastic-coated racks allow for a more even distribution of electric current which enables a more uniform plating depth.

Angie obtained quotes from several vendors, and, after considering the relative merits of each, settled on a \$18,500 set of copper-splined plastic-coated racks. The new racks will require some relatively minor structural work in the plating area expected to cost another \$2,000. Since the old stainless steel racks are still functional, Angie was able to find a potential buyer for them willing to pay \$1,200 for the set.

Estimating Costs

Because this investment would not affect any part of the production process prior to or subsequent to the plating process itself, Angie limited her analysis to costs within the plating process.

Current Plating Operations — Annual Operating Costs

To begin her assessment of the proposed investment, Angie first collected the following operating cost data for the current plating process:

Table 1. Annual Operating Costs of Current Pre-Press Operations

COST ITEMS	\$/YEAR
MATERIALS	
Nitric Acid	2,500
Storage Containers	4,500
Lost Materials - defects	12,500
LABOUR	
Maintenance, 20% FTE	6,000
Cleaning Operator, 70% FTE	21,000
NON-PRODUCT OUTPUT MANAGEMENT	
Disposal	4,500
REGULATORY COMPLIANCE	
Labeling	750
Testing	250
NON-DEDUCTIBLE ITEMS	
Reserves	1,000

Material costs were available from Specialty’s purchasing records, as were disposal costs paid to a recycler. Angie estimated the labour used to operate and perform maintenance on the nitric acid rinsing operation and the labour for labeling and testing the non-product output (expressed as full time equivalents, or FTE) based on her knowledge of the process. Due in part to the uneven conductivity of the stainless steel racks, a sizeable percentage of circuit board panels from each batch fail their electrical testing and have to be either reworked or scrapped. Angie estimated this loss based on the cost of producing the boards that are discarded. In addition, because of the toxic nature of nitric acid and potential problems associated with its use, Specialty had established a reserve fund to cover the contingent liability associated with cleaning up the site where the non-product output is handled.

Plastic-Coated Racks — Investment Costs

Next, Angie assembled investment costs for purchased equipment (Table 2).

Table 2. Investment Costs for the Plastic-Coated Racks

INVESTMENT COST ITEMS	\$
PURCHASED EQUIPMENT	
Set of racks	18,500
MATERIALS	
Structural	2,000
CONSTRUCTION & INSTALLATION	
Downtime	5,000
In-house labour	150
START-UP/TRAINING	
Manufacturing trials	200
CONTINGENCY	
Set-aside fund	2,000

The costs of the materials and equipment are simply those quoted by the vendor. Angie estimated her in-house labour costs and the cost of downtime that would be associated with the installation. Costs of testing the new racks were similarly estimated based on expected labour required, and, as a contingency, a set-aside fund was budgeted for any unforeseen problems with the conversion.

Plastic-Coated Racks — Operating Costs

Angie's analysis of operating costs with the new racks was fairly simple because nitric acid and its associated costs would be completely eliminated. Therefore, the purchase and container costs as well as the non-product output management and regulatory costs all disappear. The only costs that remain are those for labour and the cost of the scrapped boards.

In terms of labour, operating labour costs will fall sharply – from 70% FTE to 40% – because operators will no longer have to take the time at the end of each plating cycle to clean the racks that carry the boards. Maintenance costs, however, are expected to increase to 33% FTE since the new racks will have to be recoated twice each year according to vendor estimates.

The single biggest savings from the investment would be the reduction of defective parts produced by the plating process. Based on data from other companies that had switched to plastic-coated racks and based on the nature of Specialty's process, Angie estimated that the investment would reduce the defect rate by two-thirds. In addition, Angie included the one-time revenue from the sale of the old equipment.

Table 3. Operating Costs for the Plastic-Coated Racks

OPERATING COST ITEMS	\$/YEAR
MATERIALS	
Lost materials - defects	4,200
LABOUR	
Maintenance, 33% FTE	10,000
Cleaning operator, 40% FTE	12,000
REVENUES	
Sale of Old Equipment (Year 1 only)	1,200

Developing Financial Parameters

After estimating all relevant investment and operating costs, Angie developed a list of financial parameters necessary for the analysis:

Income Taxes

Specialty is a profitable operation subject to both federal and provincial income taxes. However, as a small business and a manufacturer, Specialty is eligible for certain reductions that lessen its overall income tax burden. Angie wanted to be sure to apply an accurate tax rate to the income in the analysis to ensure she did not understate or overstate the expected cash flows from the investment.

Since Specialty's total taxable capital is under the \$15 million threshold, Specialty's accountant told Angie that the firm was eligible for Canada's and British Columbia's Small Business Deduction. Similarly, as a manufacturer, Specialty was also eligible for Canada's Manufacturing and Processing Deduction.

These tax reductions are calculated based on the standard income tax rates of:

Federal Tax	= 38%
Provincial Tax Abatement	= 10%
Federal Surtax	= 4%
BC Provincial Tax	= 16.5%

Capital Cost Allowance

Through conversations with Specialty's accountant who consulted Environment Canada, Angie found that the cost of the racks themselves in the context of a pollution prevention investment were eligible for the Accelerated Capital Cost Acceptance Program. The cost of the racks could therefore be depreciated at an accelerated rate, thus reducing Specialty's tax burden in the early years of the investment. Discussions with the vendor of the racks indicated that Angie could expect a five-year life and a relatively low (\$2,000) salvage value. The new structural materials required for the racks, however, were of a sturdy construction that would enable them to appreciate in value (by 10%) – net of inflation – during their lifetime due to a strong secondary market. These materials would be depreciated as standard manufacturing equipment.

Since the remainder of the initial investment costs would be relatively small and were considered to be ancillary to the equipment purchase cost, these other costs would not be treated as capital expenditures for tax purposes and would be expensed.

Other Parameters

Specialty typically performs analyses based on projections of expected inflation. At the time, Canada's inflation had been running at close to 3%, and the economy was steady, so Angie used this value for her analysis. The costs of disposing of the nitric acid, however,

had been rising more quickly in recent years. To account for this expected cost increase in the future (if the switch to plastic-coated racks were not made), Angie applied an escalation, on top of expected inflation, of 5% to Specialty's non-product output disposal costs. In addition, the resale value of the old equipment would not rise before Year 1 when it was to be sold, so Angie applied a -3% escalation to offset the Option's inflation and thus hold the cost constant in nominal dollars.

Finally, based on a number of factors including the opportunity cost of the investment capital (i.e., the return Specialty could achieve with the funds if the investment were not made), the uncertainty of the investment, and inflation, Angie chose a conservative 15% discount rate for converting future cash flows into 1997 dollars.

Performing an Analysis Using P2/FINANCE-BC

Angie decided to assess the profitability of the plastic-coated racks investment by using P2/FINANCE-BC. A step-by-step description of the analysis follows. The reader is referred to relevant sections of this Guide for further information. Data reports for this analysis are found at the end of this Appendix.

P2/FINANCE-BC evaluates the profitability of investments on a stand-alone basis or by comparing the costs of a base, or business-as-usual, case with one or more alternatives. In order to analyse the financial profitability of the plastic-coated racks, Angie needs to create new "Options" in P2/FINANCE-BC, one Option that represents the continued use of the stainless steel racks (the base case) and one that represents the costs associated with the purchase and use of the plastic-coated racks (the alternative).

Stainless Steel Racks

Creating the New Option

After installing P2/FINANCE-BC (Please see Section 1.2 for directions), Angie opens the program. She chooses the *Create a New Option* button the Main screen; when prompted, she enters the name 'Stainless Steel Racks' for the Option which represents the business-as-usual case.

Defining Year of Investment

Angie is now on the *Cost Inventory* page of P2/FINANCE-BC. The next step is to define the year of the investment. Her base case, 'Stainless Steel Racks,' does not require an investment, so she skips this step.

Developing the Cost Inventory

Next, Angie begins to select the items from the P2/FINANCE-BC cost list that are relevant to her Option, 'Stainless Steel Racks.' Since there are no investment costs associated with the base case, Angie does not need to consider the Investment Costs list. She therefore selects the *Operating Costs* radio button, located in the upper right hand corner of the page. As the investment involves only one process, Angie limits the cost inventory by selecting Process 1 from the *Process* pull down box. She double clicks **Raw Materials** and **Storage** in the DIRECT MATERIALS cost category to add them to the Option cost list.

The screenshot shows the 'Cost Inventory' application window with the following details:

- Tabbed Interface:** 'Investment Costs', 'Operating Costs' (selected), 'Analysis'.
- Option:** 'Stainless Steel Racks' (dropdown), 'Investment occurs at end of year' (checkbox).
- Buttons:** 'New...', 'Copy...', 'Delete' (under Option); 'New...', 'Copy...', 'Delete' (under Investment occurs at end of year).
- Radio Buttons:** 'Show/Edit' section with 'Investment Cost List' (unselected) and 'Operating Cost List' (selected).
- Process:** 'Process 1' (dropdown).
- Cost Category:** 'ALL CATEGORIES' (dropdown).
- Item List:** A list box containing 'Process 1', 'Direct Materials', 'Catalysts', 'Raw Materials', 'Solvents', 'Storage', 'Transport', and 'Direct Labour'. 'Process 1' is highlighted.
- Buttons:** 'Make Changes to Cost Lists...' (dashed border).
- Show:** 'Tailored List and Other Included Items' (selected radio button), 'Complete List' (unselected radio button).
- Footer:** '» = Item included in current project Double-click to change status', 'Report' button, 'Press F1 for Help'.

Angie decides to tailor the cost inventory for Specialty's lost materials costs so she opens the *Make Changes to Cost List* dialog box by clicking the *Make Changes to Cost List* button. Angie selects the *New* button under the cost item list box to create the cost item **Lost Materials - defects**.

While in the *Make Changes* screen, she also renames **Process 1** to **Plating Process** by clicking on the *Rename* button under the Process drop down box. (For more information on the *Make Changes to Cost List* dialog box, see Section 3.3.3.)

Defining Option Parameters

Angie now moves to the *Operating Costs* page by clicking on the *Operating Costs* tab. Her next step is to define the Option parameters located in the Option Parameters box on the top right corner of the page. Angie sets the Option lifetime, tax rates, and inflation rates in this box. She first changes the Option lifetime to 5 years because the fast-paced industry of circuit board manufacture makes projecting much further into the future difficult. She sets the tax rate by clicking the *Tax Rates* button to enter the income tax module. The first screen of the module has as defaults the current (1997) tax rates for Canada and British Columbia. Since these rates are valid for Specialty and no other income taxes apply, Angie does not change or enter any values.

As mentioned earlier, Specialty is eligible for tax deductions as a small business and a manufacturer. Angie clicks on the Small Business Tax Deduction check box and then on the corresponding button to enter the next screen.

Small Business Tax Deduction	
<p>The Small Business Tax Deduction is available to CCPCs with taxable capital under the upper threshold indicated below and applies to active business income less than the indicated income threshold.</p> <p>The values initially loaded under default thresholds and tax rate changes were those that were in place for British Columbia and Canada in 1996. Users should verify that the values are still valid.</p>	
<p>Parameters for Calculation of Eligible Income</p> <p>Firm's Total Taxable Capital C\$ <input type="text" value="12.00"/> Million</p> <p>Firm's Total Active Business Income C\$ <input type="text" value="400,000"/></p>	<p>Default Thresholds</p> <p>Taxable Capital Initial Threshold C\$ <input type="text" value="10.00"/> Million</p> <p>Taxable Capital Upper Threshold C\$ <input type="text" value="15.00"/> Million</p> <p>Active Business Income Threshold C\$ <input type="text" value="200,000"/></p>
<p>Tax Rate Changes for Eligible Small Business Income</p> <p>Federal Tax Rate Lowered by <input type="text" value="16.00"/> %</p> <p>Provincial Tax Rate Lowered by <input type="text" value="7.50"/> %</p>	
<p><input type="button" value="Return to Main Tax Screen"/></p>	
<p><i>Press F1 for Help.</i></p>	

Angie enters Specialty's total taxable capital of \$12 million. She then enters the average expected value of the firm's total active business income during the life of the Option, exclusive of Option income. The default thresholds and tax rate changes already loaded in P2/FINANCE-BC are valid for Specialty, so Angie does not change them. When she clicks on the *Return* button, she is prompted to confirm she wants to make changes, which she does. She notices that the Net Effective Tax Rate on the Income Taxes screen has dropped from 45.62% to 38.57% due to the Small Business Deduction.

Specialty is also eligible for the Manufacturing and Processing (M&P) Deduction, so Angie clicks on the check box and then on the corresponding button to enter the M&P screen.

Manufacturing & Processing Tax Deduction	
<p>The M&P Tax Deduction is available for corporations that derive a percentage of their gross revenue above the threshold indicated below from Manufacturing and Processing sources.</p> <p>The values initially loaded under default threshold and tax rate change were those that were in place for Canada in 1996. Users should verify that the values are still valid.</p>	
<p>Parameters for Calculation of Eligible Income</p> <p>Firm's % Gross Revenue from M&P <input type="text" value="80.00"/> %</p> <p>Firm's % Active Business Income from M&P <input type="text" value="80.00"/> %</p> <p>Firm's Total Active Business Income C\$ <input type="text" value="400,000"/></p>	<p>Default Threshold</p> <p>M&P Gross Revenue Eligibility Threshold <input type="text" value="10.00"/> %</p> <hr/> <p>Tax Rate Change for Eligible M&P Income</p> <p>Federal Tax Rate Lowed by <input type="text" value="7.00"/> %</p>
<p><input type="button" value="Return to Main Tax Screen"/> Press F1 for Help.</p>	

Angie enters the percentages of Specialty's revenue and active business income that, by the tax rules, are considered M&P. Since she already entered the firm's total active business income in the Small Business screen, it appears in the data box already and she need not re-enter it. Again, she does not need to change the default threshold or tax rate change since both are still valid. She returns to the Income Tax screen to find that the Net Effective Tax Rate has fallen further to 35.07%. She then clicks the OK button to exit the module. She is prompted to confirm she want to change the tax rates.

To complete the Option Parameter section, she sets the default inflation rate for the analysis to 3%. (For more information on Option Parameters, see Section 4.3.)

Entering Costs

Angie is now ready to enter cost data for the 'Stainless Steel Racks' Option. The bottom half of the *Operating Costs* page is a spreadsheet containing the cost items marked on the *Cost Inventory* page.

	Esc %	Year 1 Cost	Year 2 Cost	Year 3 Cost	Year 4 Cost	Year 5 Cost
Plating Process						
Direct Materials						
Lost Materials - defects	0.00	12,500	12,500	12,500	12,500	
Raw Materials	0.00	2,500	2,500	2,500	2,500	
Storage	0.00	4,500	4,500	4,500	4,500	
Direct Labour						
Maintenance	0.00	6,000	6,000	6,000	6,000	
Operating	0.00	21,000	21,000	21,000	21,000	
Non-Product Output Management						

Angie enters costs once, in the cell corresponding to the first year the cost is incurred. P2/FINANCE-BC automatically extends that cost to following years. She can terminate the cost in a later year by entering zero, or she can change it to another dollar amount. Costs are automatically inflated by the program when computing reports, so Angie should always enter her costs on this page without accounting for inflation. She also enters an escalation of 5% for disposal costs to account for anticipated increases. All costs entered in P2/FINANCE-BC should be fully burdened costs; specifically, materials costs should include taxes and fees, labour costs should include indirect costs when appropriate.

Plastic-Coated Racks

Creating the New Option

Angie returns to the *Cost Inventory* page to create the alternative Option. She chooses the *New* button under the *Option* drop down box and, when prompted, names the Option ‘Plastic-Coated Racks’ and then chooses *Create*. ‘Plastic-Coated Racks’ is now the active Option. To access ‘Stainless Steel Racks’ or any other Option, Angie can click on the *Option* drop down box and select the Option she wants.

Defining Year of Investment

The Option ‘Plastic-Coated Racks’ requires an initial investment for the cost of the equipment, as well as installation, start-up, and contingency. All of these investments will occur before the system is up and running, so they are Year 0 investments. The default investment year is Year 0, so Angie does not need to create new investment years.

Developing the Cost Inventory

Much as she did for the ‘Stainless Steel Racks’ Option, Angie selects relevant cost items for her cost lists. This new Option will impact the same process as the base case (Stainless Steel Racks); Angie therefore uses the same Plating Process that she used before. This Option, however, includes investment costs as well as operating costs. Angie selects the Investment Cost list radio button. She selects **Process Equipment** in the PURCHASED EQUIPMENT cost category, **Structural** in the MATERIALS cost category, and so on.

She then selects the Operating Costs radio button and chooses the relevant operating cost items.

Defining Option Parameters

Now that the cost inventory is complete, Angie moves to the Investment Costs page. She sets the Option parameters just as she did for ‘Stainless Steel Racks,’ but this time she must also define Capital Cost Allowance (CCA) methods for the investments.

	Cost (\$)	Salvage (\$)	Equipment Life	CCA
Plating Process				
Purchased Equipment				
Process Equipment	18,500	2,000	5	Class 24
Materials				
Structural	2,000	2,200	5	Class 43
Construction and Installation				
Downtime	5,000			Expensed
In-house Labour	150			Expensed
Start-up and Training				
Manufacturing Trials/Variance	200			Expensed

P2/FINANCE-BC comes loaded with many standard CCA classes. Since Angie is going to use only standard rates, she does not need to enter the CCA module. If she did need to create a new CCA method, she would click the CCA button to access the CCA module. (For more information on CCA and the CCA module, see Section 4.3.3.)

Entering Cost Data

Angie is now ready to enter cost data for the ‘Plastic-Coated Racks’ Option. She enters the relevant data on the bottom of the Investment Costs page. She enters costs, salvage values, and equipment lives based on her estimates and discussions with the vendor. Only the equipment itself and the structural materials will be depreciated, all other investment cost items will be expensed. To change the depreciation method for these cost items, Angie chooses the Expensed option from the popup menu that appears when she tabs to the CCA box.

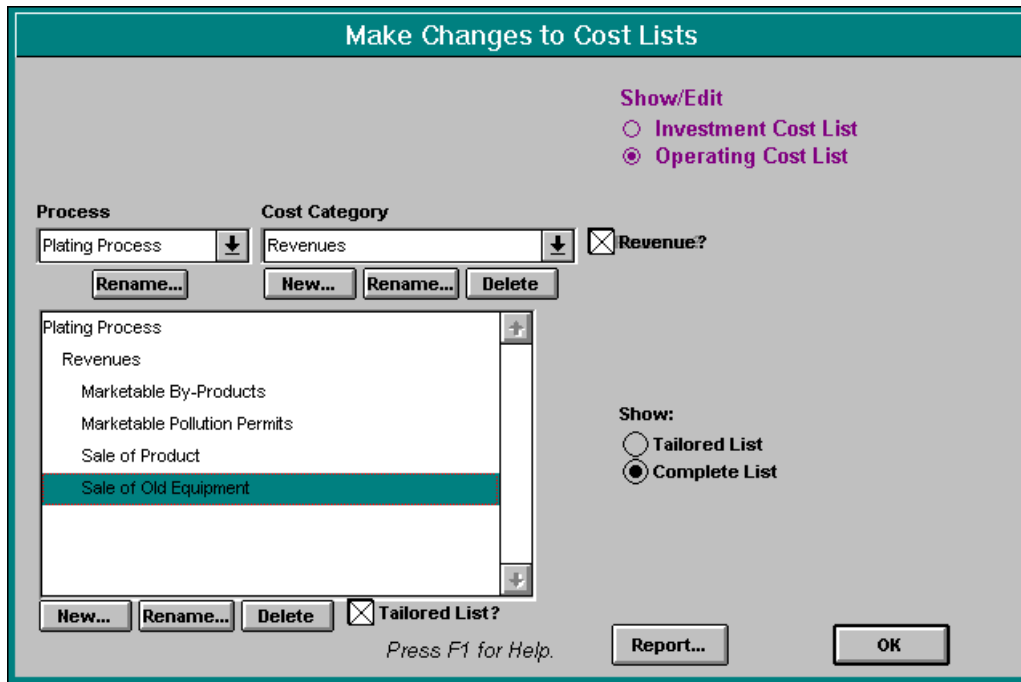
For the purchased equipment, she wants to accelerate the depreciation using ACCA. The structural materials will be depreciated using the standard method for manufacturing equipment. Since she is unsure of what CCA class these two items belong to, she hits the F1 key to access the Help module. She uses the Search function to find CCA Rates. From the list she chooses Class 24 as the ACCA method for the set of new racks and Class 43 for the structural materials.

She then switches to the *Operating Costs* page and fills in the appropriate cost information on the spreadsheet on the bottom of the page, much as she did for ‘Stainless Steel Racks.’

One difference in this Option is that due to the sale of the old equipment, the new Option will have a one-time revenue. To account for this revenue, Angie returns to the *Cost Inventory* page and clicks on the *Make Changes to Cost Lists* button. In the *Make Changes to Cost Lists* dialog box, she selects REVENUES in the Cost Category box. She then clicks on the *New* below the cost items list box to create a new cost item – **Sale of Old Equipment** – in the REVENUES category.

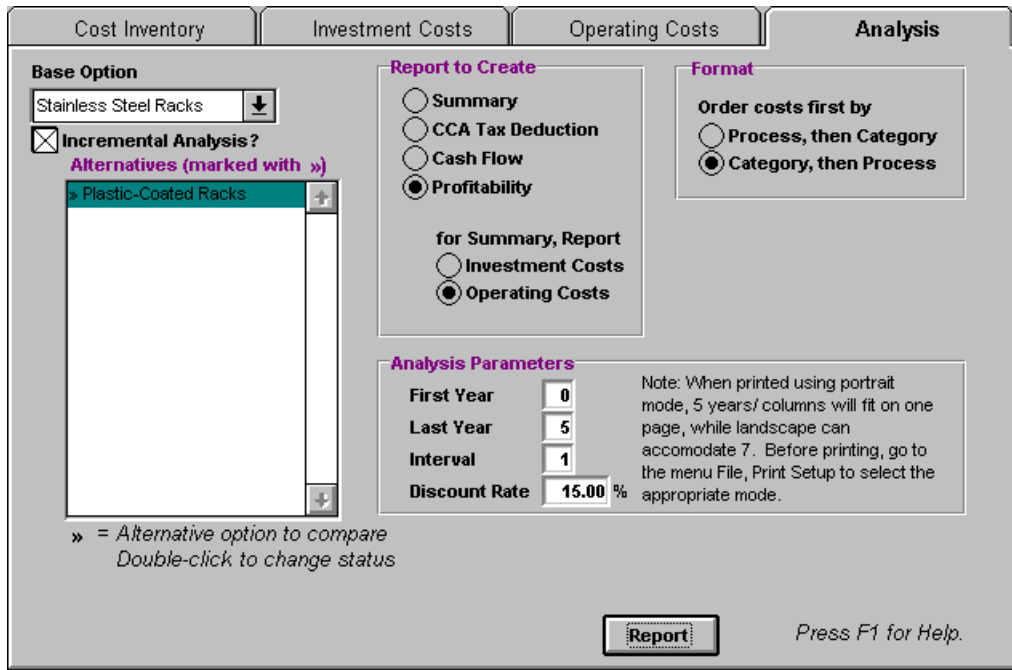
P2/FINANCE-BC recognises all items in the REVENUES category as having the opposite sign as regular cost items. Note that the Revenue check box is checked when this category is selected. When she returns to the Operating Cost page, Angie can simply enter the revenue as a positive number, just like a regular cost item.

She returns to the Operating Costs page to enter the final piece of data – \$1,200 for the sale of the old racks. Because this is a one-time revenue and not an annual one, Angie enters 0 in the Year 2 cell next to the 1,200. The \$0 is carried forward to subsequent years, therefore the \$1,200 revenue will be counted only in year one. Finally, because the value of the revenues will not increase with inflation, Angie enters a -3% escalation to keep the value constant (i.e., to offset the effect of inflation).



Generating Reports

As a final step, Angie analyses the profitability of the 'Plastic-Coated Racks' Option. Entering the Analysis page, Angie defines the first year for the analysis (0), last year (5), an interval (1) to report each year's cash flow, and the company's discount rate of 15%.



Because Angie wants to compare the profitability of Specialty’s current business scenario to the Plastic-Coated Racks scenario, she selects the *Incremental Analysis* check box. Angie selects ‘Stainless Steel Racks’ in the *Option* drop down box and ‘Plastic-Coated Racks’ in the *Alternative Option* list box. Using the radio buttons, Angie can choose the type of report produced (Summary, Tax Deduction, Cash Flow and Profitability) and the costs and revenues included (investment costs, operating costs). Angie can also alter how cost items are organised within reports, either first by process and then category, or by category then process. (For more information on Reports, see Section 6.4.)

The Summary Report depicts the Option as it was defined in the cost screens without performing any calculations; it simply lists the parameters and cost data she entered. The investment cost summary report lists the amount (in Year 0 dollars) of the investment and the operating cost summary lists the cost or revenue data (also in Year 0 dollars) for each cost item.

The CCA Tax Deduction Report displays the investment items and calculates any relevant tax deductions during each year of the Option’s life. For each investment item, this report lists the CCA method chosen, the purchase cost (in the first year of investment) or undepreciated capital cost (in subsequent years) of the investment (in Year

Please note: normally assets are pooled by asset-class and in practice, a given purchase (after deducting CCA) will be added to the UCC of the relevant class at the end of the year. P2/FINANCE-BC will employ similar concepts but will assume that each asset constitutes its own class. Therefore the calculation is performed as if the class were empty when the asset is purchased and empty again once the asset is sold.

Directory: CASESTUD		CASH FLOW ANALYSIS				
07/22/1997						
ALT - Reference Option						Page 1
ALT: Plastic-Coated Racks						
Reference: Stainless Steel Racks						
=====						
INCOME TAX CALCULATION	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5

Revenues		1,200				
- Operating Costs (Savings)		-27,830	-28,906	-30,037	-31,222	-32,464
- Initial Expensed Costs		7,350				
- Capital Cost Allowance		4,925	9,760	4,982	250	
+ CCA Recapture						3,736
+ Non-Deductible Expenses		-1,030	-1,061	-1,093	-1,126	-1,159
+ 75% of Capital Gain						413

= Taxable Income		15,725	18,085	23,962	29,846	35,454
Income Tax		5,515	6,342	8,404	10,467	12,433
=====						
CASH FLOW CALCULATION						

Revenues		1,200				
- Operating Costs (Savings)		-27,830	-28,906	-30,037	-31,222	-32,464
- Income Tax		5,515	6,342	8,404	10,467	12,433
- Initial Investment Costs	27,850					
+ Working Capital Recovery						
+ Salvage Value						4,869

= After-Tax Cash Flow	-27,850	23,515	22,564	21,633	20,755	24,900
Discounted Cash Flow @15.00%	-27,850	20,448	17,062	14,224	11,867	12,380
=====						

0 dollars), the amount depreciated each year, the salvage value, the CCA recapture or terminal loss, and taxable capital gain or loss at the end of the equipment’s life if the lifetime is within the analysis reporting years. The report shows only the amount initially expensed for items that are “expensed.” The report then summarises the total CCA, recapture (or loss), expenses, and gains accrued for each year and calculates the amount of the tax deduction. In this report, the net investment-related tax deduction is determined as CCA plus expenses less capital gains and CCA recapture.

The cash flow report depicts the flows of the analysis over time and allows Angie to see the calculations clearly. Cash flow reports include the effects of inflation and escalation.

The Cash Flow Analysis report is the basis for calculating the Option’s profitability and is separated into two sections: Income Tax Calculation and Cash Flow Calculation. For the Income Tax Calculation, the first line lists the Option’s revenues and the next lists operating costs or savings. These costs appear negative if the alternative Option has lower operating costs than the reference Option. Next, initially expensed costs and CCA are subtracted because Revenue Canada allows amortisation of capital investments over time through CCA tax breaks. Then, the CCA recapture and capital gain, when applicable, is added. Finally, any items from the operating cost inventory that are not tax-deductible (like the contributions to reserves for contingent liabilities in this case) are

added back to calculate the Taxable Income. These items are added at this point because they are included in the operating costs line item and therefore were already subtracted from the tax calculation. Since these items, unlike all other operating costs, are not deductible, the software has to add them back. The income tax rate developed in the Income Tax module is applied to calculate Income Tax.

The Cash Flow Calculation starts with Option revenues and subtracts the operating costs (or adds the operating savings as above). The total income taxes calculated in the first section of the report are then subtracted. Then, other costs and revenues associated with the investment are included: Investment Costs and Salvage Value. The result of these operations is the After-Tax Cash Flow. The After-Tax Cash Flow is then discounted, using the discount rate Angie entered, to calculate the Discounted Cash Flow for each year.

As the last step, Angie selects the *Profitability Report* radio button to generate a profitability analysis of the investment (shown below). This report calculates three indicators of profitability: Net Present Value (NPV), Internal Rate of Return (IRR), and Discounted Payback. NPV is the sum of the discounted cash flows. An option with an NPV of zero provides a return equal to the discount rate. Therefore, any Option with a negative NPV is unprofitable (i.e., provides a return below the discount rate), and any Option is with a positive NPV is profitable. Since the five-year NPV is \$48,131, this Option is profitable.

Directory: CASESTUD	PROFITABILITY ANALYSIS SUMMARY					07/23/1997
						Page 1
=====						
ALT - Reference Option						
ALT: Plastic-Coated Racks						
Reference: Stainless Steel Racks						
FINANCIAL ANALYSIS						
	Cumulative to:	Year 0	Year 1	Year 2	Year 3	Year 4
						Year 5

Net Present Value @ 15.00%		-27,850	-7,402	9,660	23,884	35,751
Internal Rate of Return (%)		N/A	N/A	41.64	63.23	72.24

Discounted Payback @ 15.00%		1.43 years				
NONFINANCIAL ANALYSIS						
	Non-quantified Benefits			Strategic Considerations		
	_____			_____		
	_____			_____		
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IRR is the discount rate that makes the NPV of the discounted cash flows equal to zero. The IRR can thus be compared to the company’s discount rate or to the IRR calculated for other Options. If the IRR is higher than the company’s discount rate, then the Option is profitable. Since Angie entered a discount rate of 15%, and the IRR in Year 5 is 77.28%, the Option is profitable.

Lastly, Discounted Payback measures the time it will take Specialty Circuit Company to break even on the investment. Payback calculations often do not incorporate the time value of money through discounting. However, P2/FINANCE-BC calculates Discounted Payback, a method that includes inflation, escalation, and discounting. As shown in the Profitability Report, the discounted payback for the Plastic-Coated Racks system is 1.43 years. Thus, all financial indicators show that this investment is profitable.