Strategic Planning made easy by the use of AIM

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Abstract

Knowledge, which cannot be easily copied or replicated, is what gives a company an edge over competitors. But to maintain the edge a company must continually review, renew and assess what is required to stay ahead. This is true for commodity producers like market pulp producers as well as for speciality niche producers. But it is not always obvious what the best decisions are. Strategic planning is the general term used to cover the process of planning, capital allocation and higher level business decisions that will set the course of a company.

Strategic planning is not always a well-understood area of business planning and often the concepts presented to the workforce seem vague. AIM stands for Asset Investment Management and is a software tool developed to assist in the decision making process. This paper will show how business drivers can be evaluated in a logical way, how options can be compared and the operation of an industrial entity can be optimised for maximum cashflow. The paper will be illustrated with examples from a range of pulp and paper mills. The objective of this paper is to explain the importance of strategic planning and using examples, to demonstrate one strategic planning tool called AIM.

Introduction

The business climate in the infant years of the 21st century has challenged pulp and paper producers in many ways. Companies have become lean, automated in their processes, faced stiff competition from low cost regions in the commodity grades and have seen erosion of their profits due to the weakening United States dollar. A key challenge for any corporation is to determine, articulate and implement the most appropriate strategy to position itself competitively in the industry. Pulp and paper companies worldwide, in pursuit of the competitive advantage, have implemented various strategies. For example during the 1980s establishing a "global presence" was favoured mainly through acquisitions and mergers. This provided quick entry into key new markets and allowed companies to capitalise on growth opportunities. Other companies tried to change their product mix, while others diversified. In the 1990s the industry faced a fundamental shift where market growth changed by region and by product. SE Asia in particular saw high growth rates. There were also new developments with customer demands and the beginnings of synergies between the global companies. The environmental area in Europe and the United States (with the Cluster Rule) created demand for capital funding.

Against this backdrop, profitability is the key objective of any firm operating in a competitive industry like pulp and paper. To maintain profitability, the focus on the competitive edge is critical. It is knowledge which cannot be easily replicated or copied that gives one firm an edge over another. This is a dynamic process and a company must renew itself again and again. In the 21st century global economy, raw materials can be accessed easily and technology can be easily copied. A key competitive advantage for any company is the knowledge of its workers. This is true for commodity producers, like market pulp producers as well as for speciality niche producers. It is not always obvious what the best decisions to leverage knowledge and maintain the competitive advantage would be. The objective of this paper is to explain and emphasise the importance of strategic planning, and using the Carter Holt Harvey Tasman (CHH Tasman) example, to demonstrate one strategic planning tool called Asset Investment Management (AIM).

Strategic Planning

Strategic planning is the general term used to cover the process of planning, capital allocation and higher level business decisions that will set the future direction of a company. Successful companies throughout the world recognise the value of strategic planning to grow and maintain a competitive edge, and thus profitability. Strategy is about the plan to achieve an organisation's mission. It is about establishing differences, creating new strategic positions and possibly making trade-offs. It means being different from the competition, or performing similar activities in different ways. The essence of a successful strategy is to be different.

Strategic planning is not always a well-understood area of business planning, and often the concepts presented to the workforce seem vague. A planning model simulates a corporation's or a company's operations and indicates the optimum use of its resources for maximum cashflow. The strategic plan projects the financial impact of some new investment or a combined impact of a broad range of potential investments. There are a variety of ways a company can gain a competitive advantage. These can be categorised into four areas.

Cost leadership – where the strategy is to be the lowest cost producer of a product in the industry.

Diversification – the company seeks to be competitive in a number of business segments, some of which are not related. Differentiation – involves establishing a unique position in a particular business segment with unique products, delivery systems, and market approach or quality standards.

Focussed – the opposite of differentiation in that a company focuses on a very narrow band for its activities and products.

There are a variety of methods for strategic planning. Thirty years ago calculation of return on capital, net present values and internal rates of return were time consuming procedures. If, for instance, a project for a rebuild of a paper machine in one of the mills of a company had to be evaluated, a common approach was to look at this paper machine in isolation, consider it a "profit centre" and calculate return on capital employed by using transfer prices for raw materials, energy and average market prices for finished products. Effects on other production units in the company were often ignored, partly because of the complexity of determining those effects. Today, 30 years later, the evolution of computing technology has made available fast computers and powerful software that most staff members in the company, including the CEO, have access to and the ability to use. A calculation of cash flow, NPV and IRR is no longer time consuming. Powerful spreadsheet models can give fast and accurate information on the incremental contribution of the rebuild of the paper machine in one of the paper mills to the total result of the company.

In spite of the evolution of computer technology, the approach used 30 years ago still seems to be very common in the forest industry today. The allocation of capital to projects is still based on studies focussing on a structural change in isolation, using more or less arbitrary assumptions of costs and prices to calculate the economic effects on the entire company. The corporate management often expresses concerns about the low productivity of capital but is still reluctant to take advantage of available tools to get a better base for asset investment decisions. Contrary to this, CHH Tasman has taken the initiative in using leading edge software for their strategic planning.

Tasman Context

Carter Holt Harvey purchased the Tasman kraft mill in Kawerau in 2002. The mill consists of two fibrelines, two bleach plants, two pulp machines, supported by a recovery cycle consisting of two sets of evaporators, a strong black liquor oxidation plant, a single recovery boiler and causticising plant with two lime kilns. Figure 1 gives an overview of the processes.

CHH Tasman's business environment is changing and this is the first major driver. The change is both in terms of a difference in demand for the products driven by the market and a variation in the environmental discharge limits. The product demand change is driven by the Norske Skog Tasman newsprint mill, which also operates on the Kawerau site, and by the market pulp demands.

The second major driver for change is the desire to optimise production units to match market demands. The changes in the business environment have meant that a number of the unit operations need optimisation to get the best performance from the mill as a whole. Potential projects involve a wide cross section of operations in the mill.

A number of potential projects have been scoped to allow the Tasman operation to perform under the future business conditions. A few of the projects are stand-alone but most of them are interlinked and have consequences in more than one area of the plant. These inter-relationships make it difficult to determine the best overall mix of projects for Tasman.

he projects include oxygen delignification, washing, bleaching, pulp drying, recycle of bleaching filtrates, chloride removal from recovery precipitator ash, evaporation, causticising , chip handling, waste water treatment and chemical preparation.

Finding the scenario for implementation of the best combination of potential projects that gives the highest cash flow is not obvious. The conventional approach is to evaluate on a project-by-project basis to maximise the cash flow from each project. However, this does not necessarily give the best overall economic result considering all of the interrelationships and the sequenced implementation of these projects. This is where the Asset Investment Management (AIM) approach has been used.

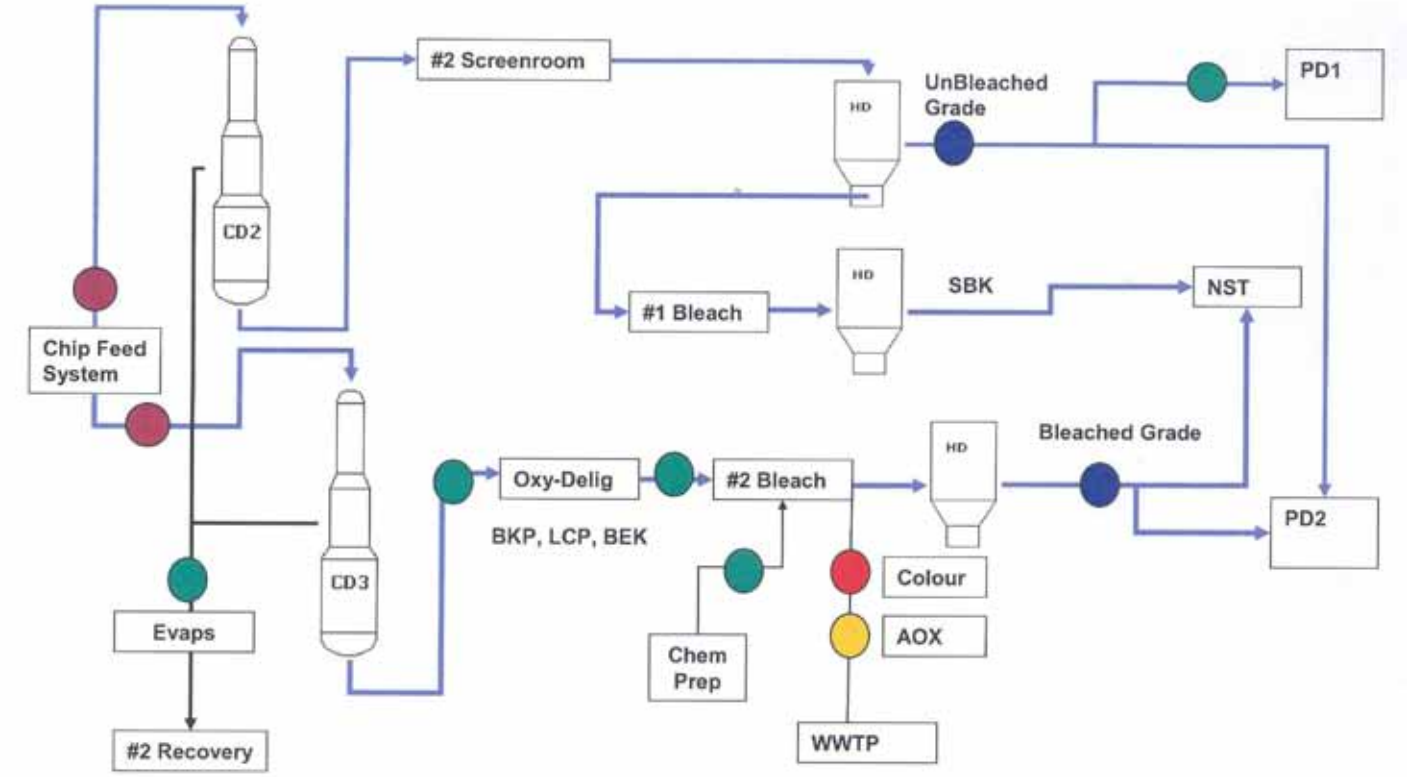

Figure 1 CHH Tasman Process Overview

A project decision matrix is shown in Figure 2 for 3 possible hypothetical project combinations – pulp dryer upgrade, bleached vs. unbleached, medium versus high capacity. It should be noted that cases and figures shown here are for illustration of the technique. The actual projects and figures are commercially sensitive. The evaluation of multiple scenarios consists of a portfolio of projects. In this case there are 3 projects. The capital cost for each project, as well as sensitivity to exchange rate, market prices and grade mix needs to be taken into account. Ultimately the aim is to identify the best business case. Because of the complexity involved another means of strategic planning was sought. This is where Asset Investment Management (AIM) was applied.

AIM – Asset Investment Management

AIM is a technique for strategic planning of an integrated industrial operation. Lars Samuelsson, a co-author of this paper, used this technique for the first time in the late 1980's, and it has been developed to its present form in practical use during about 15 years.

What does AIM do?

AIM optimises the operation of an industrial entity for maximum cash flow, while the plant is operated within the constraints for:

- Raw materials supply
- Production capacity
- Environment
- Potential markets

The focus is on the integrated entity. Most companies, even the largest ones, can be structured into parts forming integrated industrial entities. In these industrial entities, the operating units are truly integrated, for example, they may have a common wood basket, deliver competing products to the same geographical market, deliver products such as chips, pulp, paper, etc from one operating unit to another.

A change in one operating unit within the entity will most likely have a positive or negative effect on the other operating units, resulting in an effect on the economic result of the entire entity. An accurate evaluation of one capital project in the entity must focus on the entire entity. This focus on the entity means that a capital investment project in one of the operating units is not looked upon in isolation. One consequence of this approach is that no assumptions of transfer prices for internal delivery of products or energy within the entity have to be made. An entity can be a corporation like Weyerhaeuser or an operating unit such as CHH Tasman.

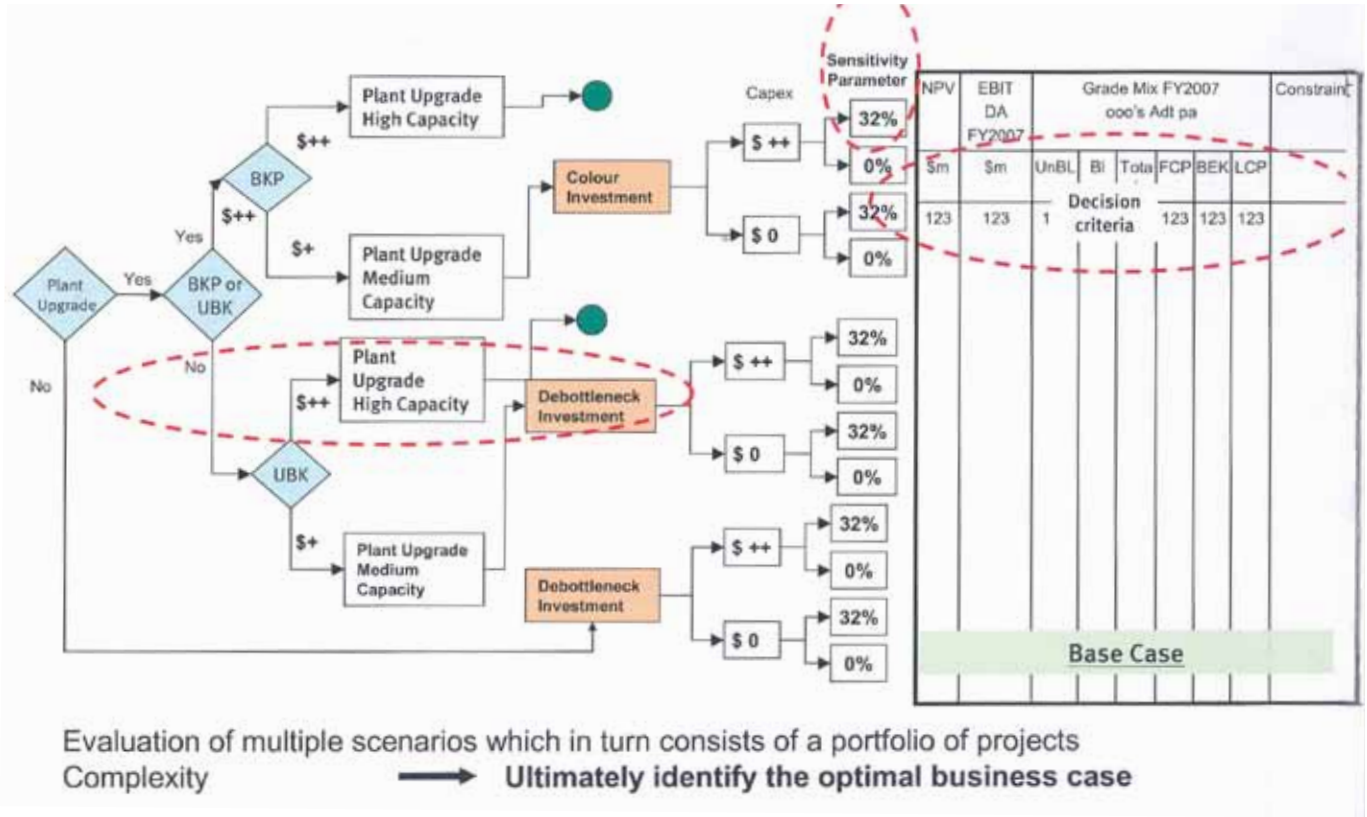

Figure 2 Project Decision Case Studies

AIM has had various applications including:

- Forestry – determining the optimal location for a new pulp mill for different wood supply options and plantation strategies.
- Paper Mill – evaluation of incremental contribution of existing paper machines assuming different options for development of other integrated pulp and paper operations in the company.
- Wood Products – evaluation of optimal strategic plan involving various wood products, including lumber, plywood, LVL, OSB and MDF.
- Market study – optimisation of the product mix of wood products and pulp and paper in a large pulp and paper company.
- Major industries in the international forest industry have used AIM for a variety of strategic studies, most recently the study by Carter Holt Harvey of the Tasman kraft pulpmill.

How does AIM work?

AIM is a mathematical tool used to describe an entire industrial entity, in this case the CHH Tasman pulpmill, from wood supply to customers/markets. It includes:

- Constraints for available resources
- Process mass balances
- Variable and fixed operating costs
- Sales revenue.

AIM uses a macro system for automated evaluation of scenarios. The hardware required is a standard computer, and the software is Microsoft Excel® with an add-in for optimisation, What'sBest!® from Lindo Systems, INC. All modelling, data entries and results presentations are completed in Excel® spreadsheets and graphs. This makes AIM very user friendly and cost effective. A detailed analysis of a multitude of scenarios can be conducted fast and at a degree of detail that would not be feasible with the traditional spreadsheet methods. Several scenarios can be evaluated in a sequence and the results can automatically be organised in a collector file in which the different scenarios can be further analysed and compared.

Model Structure

An AIM model consists of three basic elements:

- The optimiser, which is an Excel spreadsheet. During optimization, operating conditions in the entire entity will automatically be adjusted to values ensuring that no constraint for raw material supply, production capacities, potential markets, environmental and political limitations will be violated. These operating conditions also give the highest possible economic result for the entity.
- A database for entry data and results for each scenario to be analysed, also an Excel® spreadsheet. The database is used to describe the resources available to the entity as well as the conditions under which the entity will operate.
- Operating procedures or macros coded in Visual Basic® and VBA®. Figure 3 illustrates the model structure.

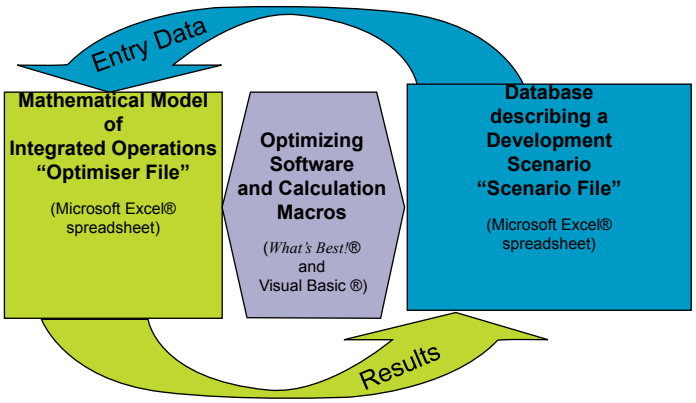

Figure 3 AIM Model Structure

Scenarios consist of a portfolio of projects implemented in sequence during the planning period, typically at least 10 years and preferably 15 – 20 years. Timing and permutation of projects have an impact on the results of an evaluation. Each scenario file contains a spreadsheet called the "Scenario generator", used to create scenarios with different combinations and permutations of projects. The functions in Excel, some specifically designed for AIM modelling, make the creation of scenarios a simple process. The scenario generator makes it possible to manage studies with many projects, and simplifies the systematic evaluation of different options.

To build an AIM model takes about the same amount of time as it takes to build a traditional spreadsheet model. One advantage is that once a model has been built, it can be used for evaluation of a multitude of scenarios. The evaluation process is quickly accomplished. A comparison of various alternative capital investment plans for an entity over a period of 10 years can be done in minutes. This makes the evaluation step very cost effective. A detailed sensitivity analysis as well as quantatative risk analysis can also be included.

Team Approach

Each company's operations are truly unique so a model of that industrial entity must by definition be unique. So although software can be purchased, a strategic planning model cannot be bought "off the shelf". A company with good internal information systems will have an easier task because the data needed for the model is probably available in an existing system, for example the standard corporate cost system. Model building is typically a team effort that requires key staff members' knowledge and experience of their operation. Successful modelling efforts follow time proven project management practices including the designation of a project sponsor and a project manager. It is imperative that there is support from the company's top management. Without that support and commitment the strategic planning exercise is doomed. The kiss of death is to stress the technical aspects of the model at the expense of the issues that the model had been designed to address. It is also a mistake to oversell the capabilities of the model. Even the word "model" scares some – perhaps calling it a "tool for planning" is sufficient. However, the potential benefits from using a planning tool far outweigh the effort to pull all of the needed data together. The team members and the company gain confidence in the outputs by being involved. This ensures that the connections between unique company knowledge, possible projects and scenario development can be made and become integrated into the model before there is any evaluation of scenarios. It is a dynamic, interactive task for the team that simply uses the model as a tool in the strategic planning for the industrial operation.

Profitability

Profitability is a key objective of any firm operating in a competitive environment. The basis for strategic and investment planning is the maximisation of shareholder wealth. The financial returns must meet or exceed the so-called "hurdle rates" which companies have established for their operations. One of the challenges is the dynamic nature of most businesses. Companies must therefore continuously review their business strategies to respond to changes in the market place. A clear advantage of the AIM technique is the ability to continue using it and developing it for new scenarios. The financial evaluation embedded in AIM is based on maximising cash flow. This is a consistent approach that objectively measures the cash generating potential and capital requirement of the range of projects or a scenario. The basic components used in the cash flow analysis are:

- Production volumes
- Product mix
- Product pricing
- Operating costs
- Fixed investment
- Working capital

The financial returns should be compared on a free cash flow basis, i.e. before financial items such as depreciation or interest charges are deducted. This eliminates the impact of financing arrangements and makes the results directly comparable for each scenario. The estimates can be in constant or nominal dollars which both have their advantages and disadvantages. Using constant dollars will eliminate speculation about future inflation. When nominal dollars are used, the financial returns are quite sensitive to the inflation assumptions.

The profitability is estimated by measuring the value of the free cash flows. The most common indicators are Net Present Value (NPV), which tells the present value of the free cash flow using various discount rates. Any scenario with a positive NPV using the "hurdle" discount rate can be considered for further analysis. Typically, environmental projects would have a negative effect on NPVs whereas productivity or efficiency improvement projects have a positive effect. Another common indicator of profitability is the Internal Rate of Return (IRR). This is the rate at which the NPV of the scenario is zero. Consequently, if the IRR exceeds "the hurdle rate", the basis for further project development exists. Other common measures of profitability are payback period and Return on Investment (ROI). As well as base case scenario evaluation, which usually contains the most realistic expectations about the cash flow variables, several sensitivity analyses are needed to understand the main financial risks of the project. One way to assess the risk is to look at the sensitivity of the IRR to changes in key project variables, such as production output, operating costs, product selling price and investment requirement. Most projects are extremely sensitive to selling prices and consequently the basic selling price assumptions will have a great impact on the financial viability of the project. AIM can be configured to use any measure of profitability the company is familiar with. For CHH Tasman, NPV was used as the criteria of profitability.

The capital requirements of most pulp and paper projects are usually very large. To successfully finance these investments requires careful planning and a thorough evaluation of project alternatives. The value of AIM as a strategic planning tool is the systematic approach that is used to define projects and assumptions.

In the traditional approach, an integrated industrial operation in the forest industry might be represented by a mass balance such as Figure 4. Here inputs equal outputs. However, in the AIM approach, inputs do not have to equal outputs. For each unit operation within the industrial entity, the constraints are defined. For example as shown in Figure 5 although the mill may only need 3,000 tonnes of logs per day, the total log market available to the entity may be 8,000 tonnes. Similarly the total chip market, the total range of products that can be made and the total volume of the market may be inputs.

Therefore, an important difference between a traditional spreadsheet model and an AIM model is that the AIM model uses available resources (wood, production capacity, potential markets) as entry data whereas a traditional spreadsheet model uses estimated consumption of wood, estimated output from operations and estimated deliveries to markets to calculate financial results. An AIM model determines by optimisation, using the availability of resources as constraints, for example what the optimal use of wood is, what the optimal capacity utilisation is, and what the optimal distribution of finished products is, to achieve the maximum financial result for the entire integrated operation. The AIM model focuses on the industrial entity, and optimises the use of available resources for maximum generation of profit. The economic result obtained in this way is a measure of the potential economic performance of the industrial entity.

EXAMPLES

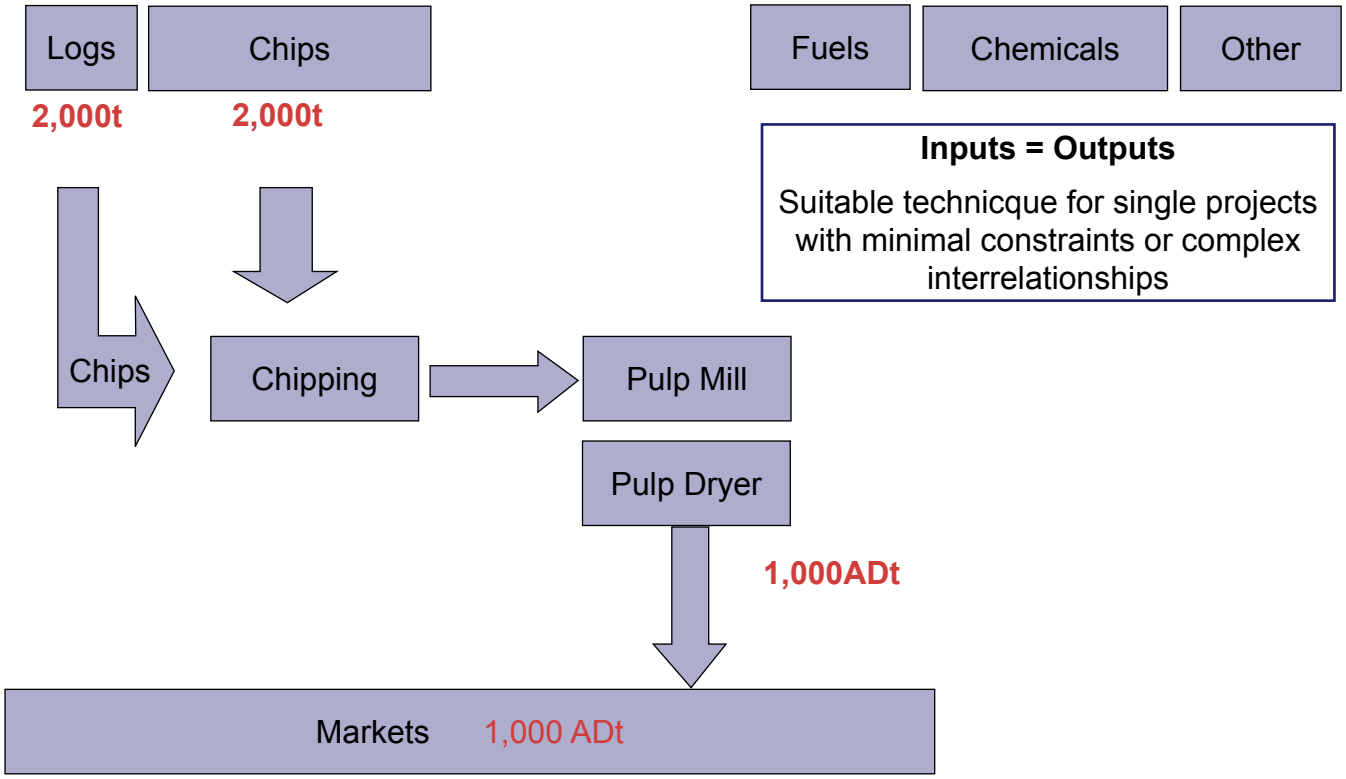

Figure 4 Typical Mass Balance: Conventional Approach

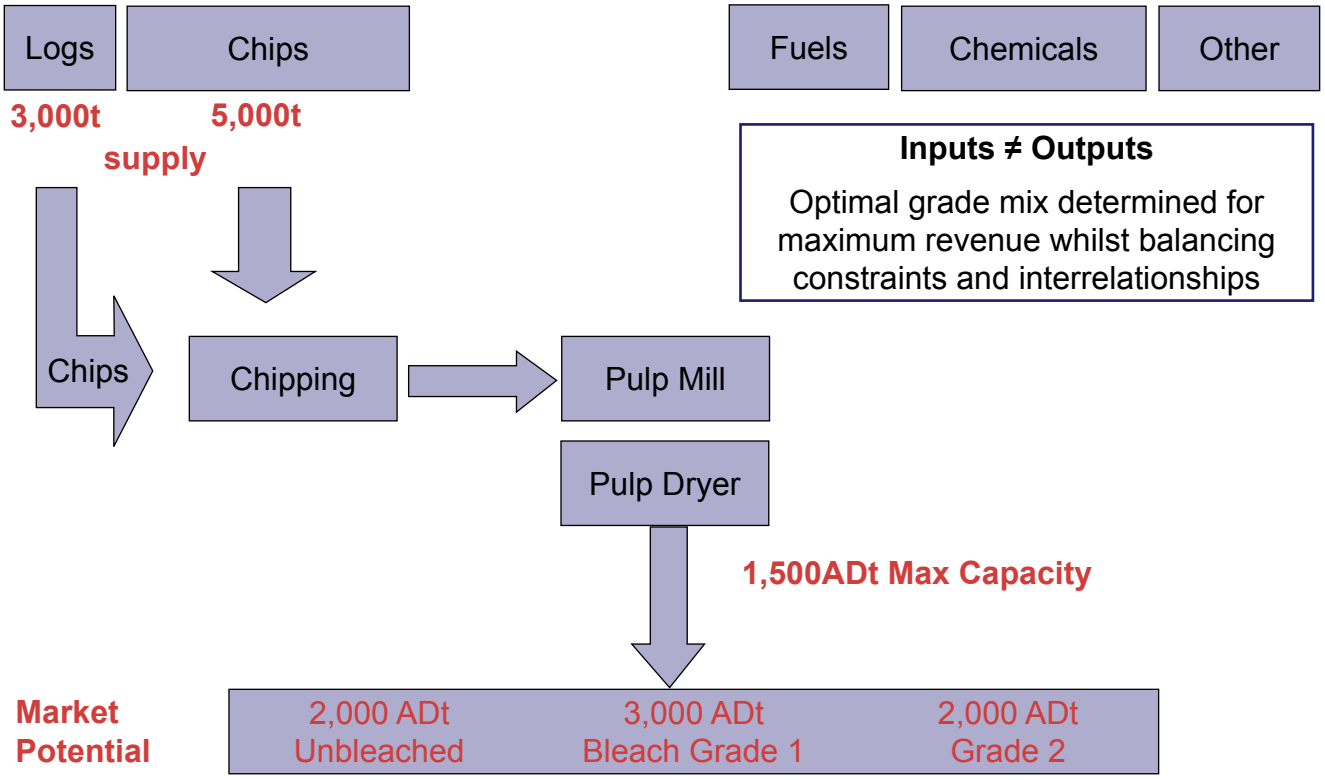

Figure 5 AIM Approach

Pulping	Power	Steam	Chips	Chemicals	Other V/Costs	BLS	Rate
Pulp grade	kWh/ADt	GJ/ADt	m3/ADt	$/ADt	$/ADt	t/ADt	ADt/Day
BKP - Before rebuild	385	7.4	4.100	$160.00	$15.00	1.200	800
BKP - After rebuild	385	7.4	4.000	$150.00	$15.00	1.100	1,200
HWP	285	7.4	3.400	$155.00	$15.00	1.300	1,300
Transportation of Hogfuel from Studmill, $/t	$5.00						
Hogfuel to landfill, 00$/t	$5.00						
Pulp operation	BKP	Slush					
Available operating time, h	8,600	8,600					
Fixed operating cost, k00$	$7,000	$8,000					
Ramp-Up after rebuild	Start year (SY)	SY + 1	SY + 2	SY + 3			
Production rate, % of change	70%	90%	95%	100%			

Table 1 Typical AIM Data Entry

For example entry data for the wood supply for each year of the planning period might include:

- Volumes of logs from each source (forest, sawmill, etc) in cubic metres (m^3).
- Price of logs from each source, in dollars per cubic metre ($/$m^3$).
- Inventory in days.
- Credit in days.

Another example is entry data for the key pulping inputs, shown in Table 1. These might include:

- Power use by grade in kW h/Air Dried ton (Adt) of product
- Steam by grade in GJ/ADt
- Chip use by grade in m3/ADt
- Chemical cost in $/ADt
- Other variable costs in $/ADt
- Recovery boiler load defined as tonnes of black liquor solids/ADt.
- Production rate for each grade as ADt/d.
- Additional information might include transportation of hog fuel to land fill, or to a hog boiler.
- Available operating time per annum and the fixed operating costs for the unit operation.

A scenario is a plan for implementation of one or more projects at specific points in time during the planning period. In some scenarios over a dozen individual projects were specified. Potential projects can be placed on a time scale to form sequences with different implementation times for the projects. By evaluating these scenarios and comparing the results, the best implementation scenario can be identified. Tables are set up for entry data for projects. For example, if a rebuild of a pulp dryer was to take place during the planning period, entry data tables must allow for description of the pulp dryer before and after the rebuild. It also has to allow for description of how the rebuild work will be done, and what the capital expense will be, i.e. what year, how much down time, ramp up of capacity after the rebuild, how the capital will be spent. The scenarios also include information describing the business environment and the potential changes that can be anticipated during the planning period.

The results from running the scenarios using the optimising software, can be shown in tabular or graphical form.
Figure 6 is an example of AIM outputs showing the production rate by grade during the course of the planning period. For example, the grade mix changes in 2005 when an environmental constraint will reduce the output of one grade and increase another. The power of AIM is that scenarios are easy to set up and run sequentially to move towards the best combination of projects to generate maximum cash flow.

Maximising cash flow is the target function for AIM. This can be expressed in different ways and in Figure 7 Net Present Values (NPV) is used. The incremental effects of a specific event, such as projects implemented in 2002 to 2004 to address an environmental constraint reduce the cash flow through this period. By using AIM, a more extensive sensitivity analysis can be carried out than would be feasible with traditional evaluation methods. The outputs from AIM can be plotted against mill limitations, such as the recovery boiler and against total mill output.

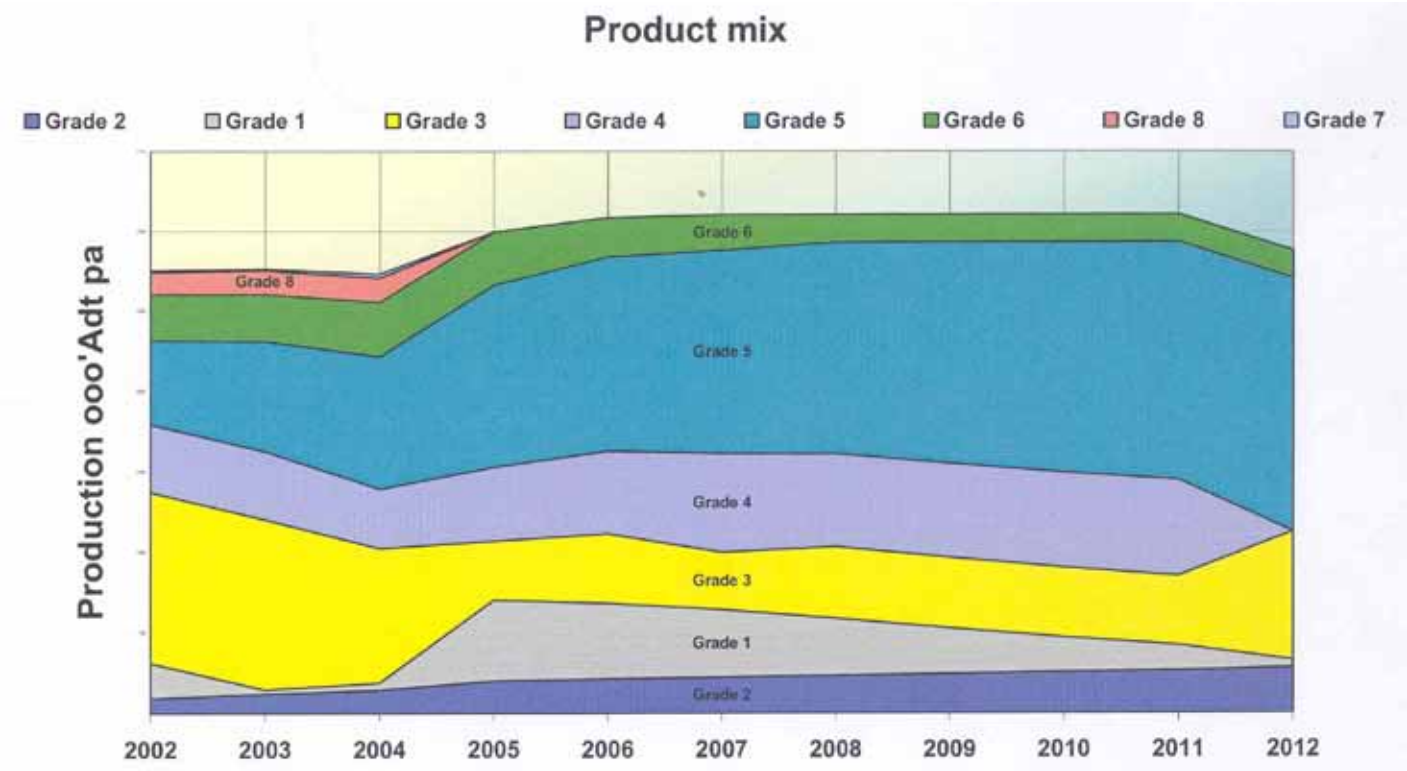

Figure 6 Example of AIM Outputs

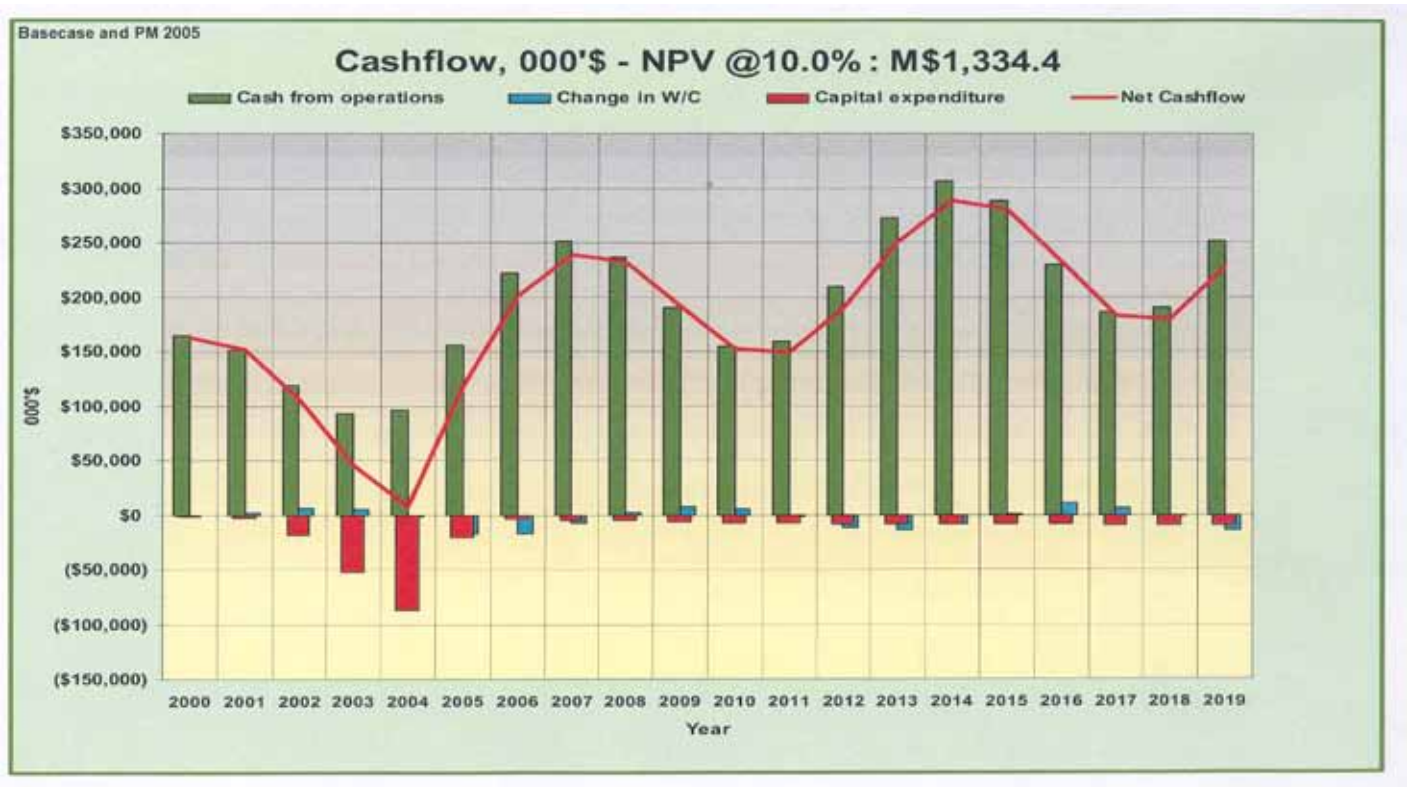

Figure 7 Typical Cash Flow Results

Figure 8 uses the Tasman example of various plant upgrades that effect the NPV and mill output. Clearly the case with the maximum NPV close to the mill recovery boiler limit is the option that should be developed further.

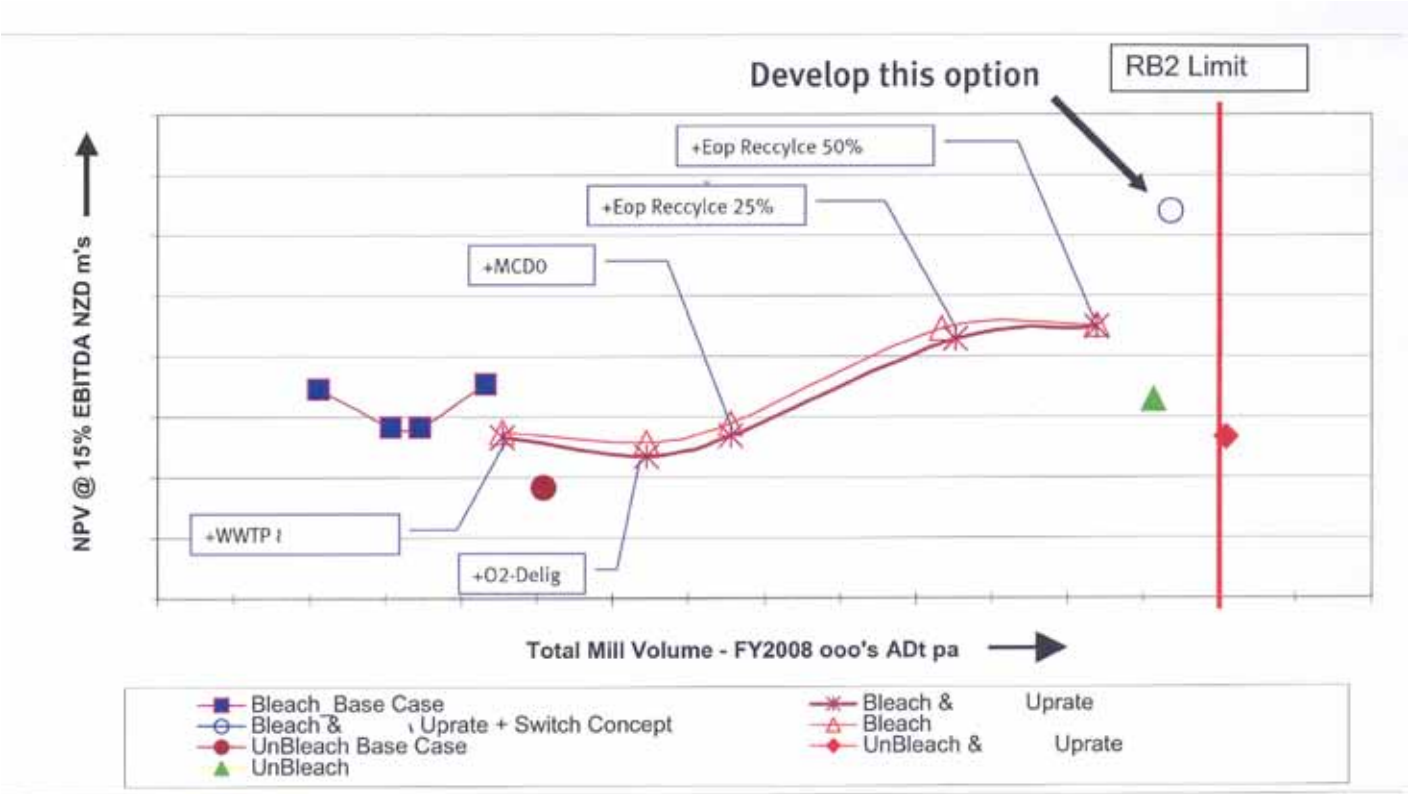

Figure 8 – NPV versus Total Mill Volume

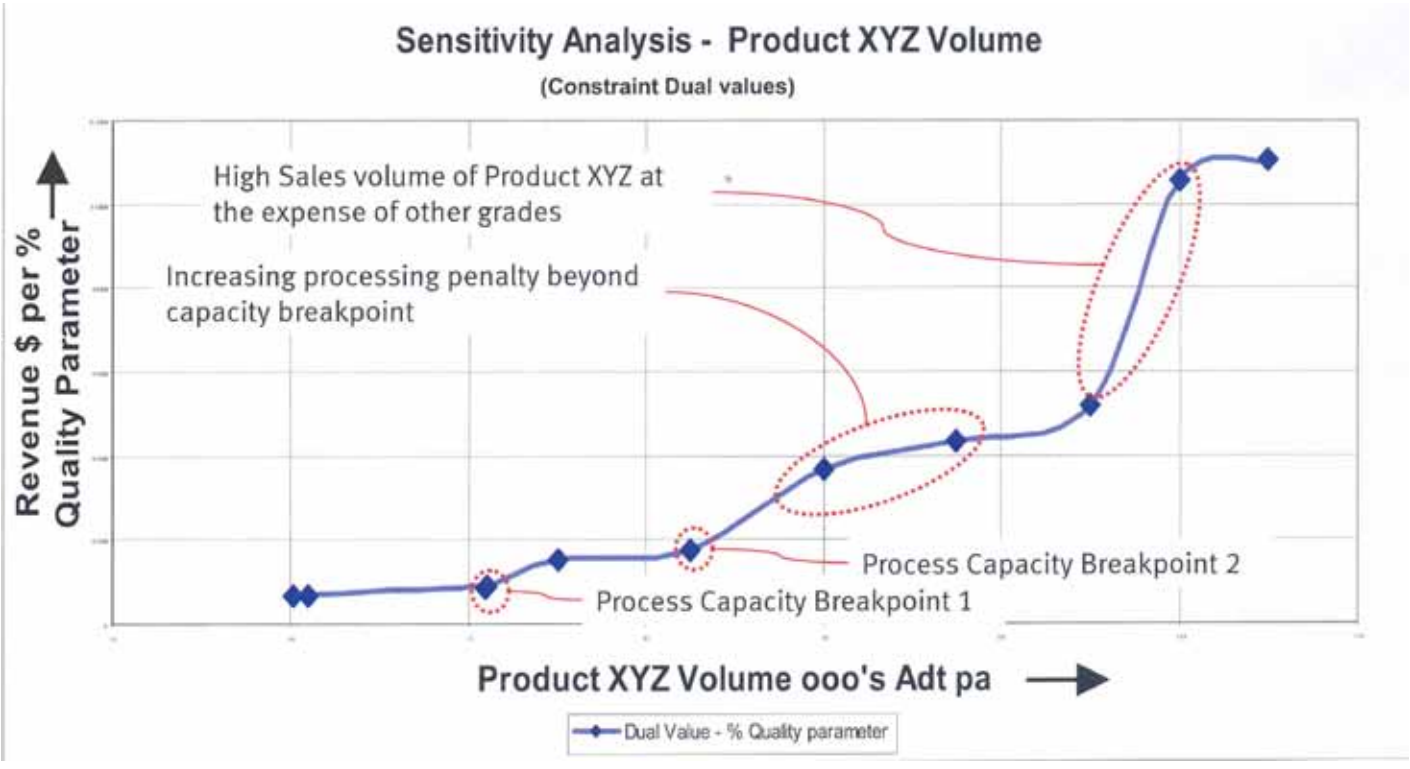

Figure 9 AIM Output Example – Dual Values

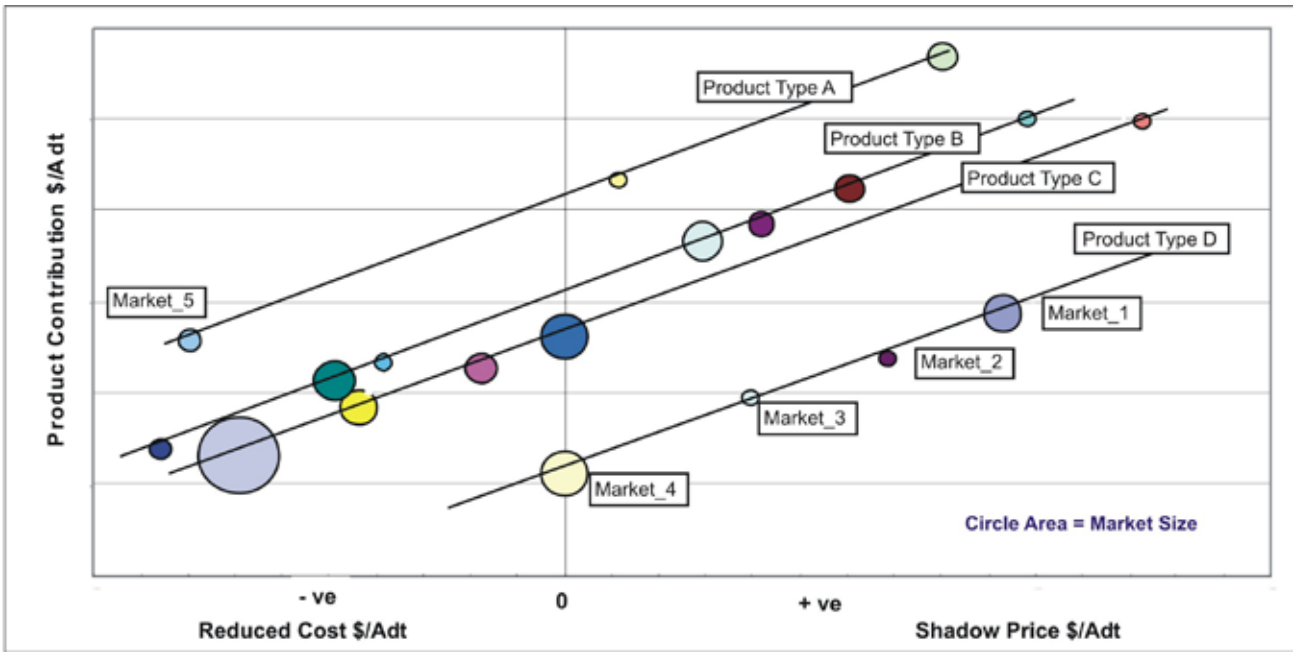

Figure 10. AIM Sensitivity Analysis – Reduced Cost & Shadow Price

By specifying confidence in key entry data, such as cost development for raw materials, and price development for finished products, the AIM model can generate a statistical distribution for key results, such as the incremental IRR for a new paper machine. Risk analysis can be conducted, and the probability to meet a certain hurdle rate for capital spending can be calculated. Normally, confidence is entered in the form of standard deviation, assuming the error in forecasting a certain cost element follows a statistical normal distribution. This kind of entry data will be generated by "expert input" for example as a response to the question "what price level for pulp will be exceed with a probability of 80%"? The AIM model can then produce an answer such as "the hurdle rate of 21% can be exceeded with a probability of 30%."

AIM can be used for analysis of dual values. The dual value of a constraint is the rate of change of the target function if the constraint is relaxed. Dual values can provide valuable sensitivity information, for example, it could indicate to the owner when it would be good business to pay up to a certain value for wood from a supplier. The dual value of a "raw material" constraint is often referred to as the shadow price because it foretells the price you should be willing to pay for that item. Another example is – increasing the potential market volume for product ABC would increase earnings by $269 per ton of pulp, or increasing machine availability is worth $xyz per hour.

Dual values can be used for sensitivity analysis. Figure 9 shows revenue, in this case, expressed as dollars per change in quality versus product volume. Each point on the plot is a dual value constraint.

A similar technique for constraint analysis can be used to determine the maximum the company is prepared to pay to make a change. The purpose is to identify, for example, the most valuable raw material sources, and the most profitable products to the markets and how much one would pay to relax the constraints (increase sources for raw materials, increase markets for finished products). This is a logical part of a strategic planning and budgeting exercise.

Using the AIM approach for strategic planning is a practical means to develop a reliable plan for development of an industrial entity. It has proven to be a very cost effective and reliable method of capital allocation. This approach can be used to quickly evaluate a variety of "what if" scenarios and is a worthwhile management tool.

Further sensitivity analysis can be carried out with shadow price and reduced cost. For shadow price, the dual value foretells the net increase in earnings ($/Adt) if the customer product volume were to be increased. The earnings impact is calculated given the prevailing constraints for the optimal grade mix i.e. marginal fibre cost, incremental capacity limitations, customer product tradeoffs, etc.

For reduced cost, the dual value foretells the amount ($/Adt) by which the cost of production would have to be reduced to make the customer product profitable.

The combined dual values for the product mix may be plotted as product contribution versus the reduced cost and shadow price as depicted in Figure 10.

Whilst Product type A that is sold into Market 5 has a higher contribution than Product type D that is sold into Market 3, it is better business to sell more of D into Market 3 as the resultant net earnings would be greater. This phenomena is somewhat counter intuitive as traditional logic suggests that maximising the sales volume of higher contribution products would be the better business decision! However, in this instance Product type A has associated production penalties, which contribute to an environmental constraint. If product A was introduced into the Market 5 mix then the overall mill output would reduce and hence lower net earnings. This illustrates the powerful capability of the AIM tool to simultaneously evaluate raw material constraints, production capacity limitations and market returns, etc. giving greater insight into the business.

Conclusion

Strategic planning is an important process for planning, capital allocation and making higher level business decisions that set the future direction of a company. It is not always a well-understood area of business planning. Asset Investment Management, AIM, is a strategic planning tool that allows a company to identify an optimal business case even in very complex situations. AIM optimises the industrial entity for maximum cash flow while operating within the constraints for raw materials, capacity of unit operations, environmental constraints and potential markets. The focus is on the total integrated entity whether a single company or a multiple site corporation.