Dairy Australia Whey Model Documentation

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1. General overview

The Dairy Australia Whey Model ("The Model") provides users with an operational and commercial analysis of options for cheese whey. The Model provides indications of investment and operating costs, as well as the net value of operation and investment.

The Model allows users to set the background of milk supply and cheese production across a 10 year period. There are options for the user to choose from a range of cheese types or to enter their own. The volume and composition of whey is determined from the cheese production plan.

Users can select from a range of whey production options as well as whey by-products. There is also option for variation of the inputs for capital, labour, overheads, product yield, and utilities usage and cost.

Based on the input selections, the model runs detailed operational and financial calculations for a factory operation. These calculations emulate the operational and financial structure of an Australian dairy manufacturing business.

Monthly and annual calculations provide the basis for investment analysis as a standalone operation or in comparison with the either whey disposal to drain or sale of raw liquid whey as animal feed.

2. Disclaimer

The Model is a tool to provide a general understanding of the operational and economic issues surrounding whey utilisation. In its current form, The Model should not be used as the basis for investment or operational decisions.

Please note the following additional disclaimer:

While care has been taken in preparation of The Model, Dairy Innovation Australia Ltd And Xcheque Pty Ltd do not warrant or represent that The Model information, calculations, or output analysis contained ('Information') are accurate, reliable, complete or current. 'Information' refers to all material and information of all types in any and every part of The Model and its associated documentation.

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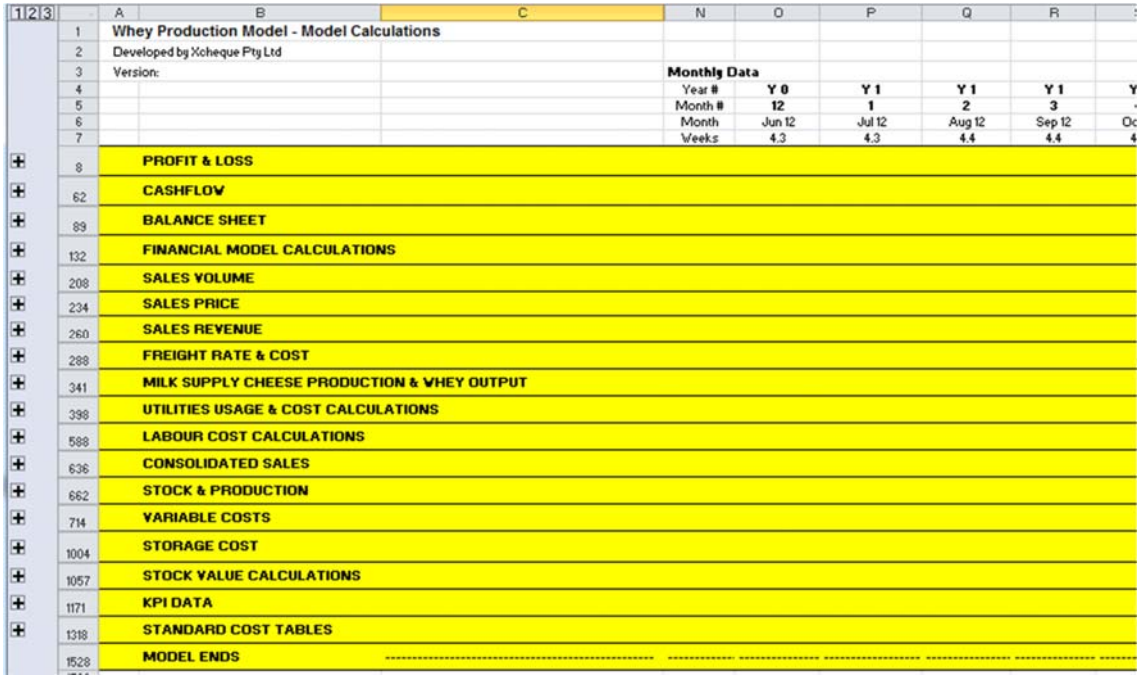
3. Model Worksheets

3.1 The Profit Model

The Profit Model is the core calculations and analysis for the whey model. This part of the model takes the input parameters and sets up monthly operational and financial calculations for an operating whey factory.

Note that the Profit Model design and program structure represents Background IP provided to Dairy Australia by Xcheque Pty Ltd for the purpose of application in the whey model project. The content of this worksheet cannot be disclosed or distributed to a third party without the express written permission of Xcheque Pty Ltd.



The figure above shows the content and structure of the Profit Model. Columns D – M contain the Annual totals for the monthly data.

The key elements and assumptions in the Profit Model are:

- **Sales volume**: The quantity of product sold in each month of the year. This is based on the total whey volume and yield calculations for each product. These yields are set in the Reference Data worksheet

- **Sales Price:** The price for product sale based on the figure set in the Input Parameters worksheet. Currently the model only provides for a single price that is constant across the entire 10 year period of calculation. It would be possible to vary this with appropriate changes to the input method.

- **Sales Revenue:** Calculated from volume and price.

- **Freight Rate and Cost:** Freight rate from factory to customer is set in the Input Parameters worksheet along with the sales price. Freight cost equals the sales volume x freight rate.

- **Milk Supply Cheese Production & Whey Output:** The Input Parameters worksheet determines which cheeses are manufactured and the monthly volume. This module calculates the raw milk supply requirements for the projected cheese production based on the yield factors in the Reference Data worksheet.

  The milk requirement in each month is adjusted for the composition of the milk using the ratio of protein between actual month and the Reference Data standard of 3.3% w/v.

  Raw whey and other whey product output is calculated from the yield ratios provided in the Reference Data worksheet. These can be varied for each cheese product.

- **Utilities Usage & Cost Calculations:** This module applies usage factors for water, waste water, power, gas and caustic usage for each whey product and by product. These figures derive from the Utilities worksheet. Waste composition is derived from the whey product composition in the Reference Data worksheet (fat, protein, lactose).

  Water, waste water, gas, electricity and chemical cost are calculated from the usage calculations and the price data that is provided in the Input Parameters worksheet.

  Parallel utilities cost calculations are done for the whey product chosen, raw whey disposed to drain and raw whey sold for animal feed.

- **Labour Cost Calculations:** Semi-variable factory labour requirements are calculated for each product based on the scale of operation and the hours of production (affected by seasonality of milk supply).

  Shift premiums are applied according the calculated shift rota (5 day / day shift through to 7 day 24 hour operation).

  Process labour is assumed to be full time whereas packing labour is assumed to be casual hourly paid labour.

Other production staff (management, QA, Logistics) are set according the type of product and scale of operation.

Rates for staff salaries, shift premiums and on-costs, are set in the Input Parameters worksheet.

- **Consolidated Sales:** This brings the monthly whey product sales volume into a single structured table

- **Stock & Production:** Stock levels are set according to typical industry standards for whey product stocks.

  Monthly whey product production is calculated based on: Production = Closing Stock + Sales – Opening Stock.

- **Standard Cost Tables:** This provides individual bills of materials for the cost components of each whey product – auxiliary Materials, packaging, gas, electricity, water, waste disposal, chemicals, labour, transfer freight, warehouse receival, external laboratory, storage cost, overhead charge.

  A standard value for an average size factory (approx. 5000 tonnes cheese) has been selected as the default value. If the whey product is selected exact values are calculated within the profit model.

- **Variable Costs:** Cost is calculated for each variable cost parameter based on the selected whey product production and the standard cost table.

- **Storage Cost:** Storage cost is calculated on the basis of monthly stocks and the storage cost set in the standard cost table.

- **Stock Value Calculation:** Stock valuation is based on the monthly stock quantity average annual stock value. This has both a variable and a fixed overhead component.

- **Financial Model Calculations:** This module provides the base for the financial calculations:

  Accounts Receivable – based on monthly sales and the assumption of payment the following month

  Raw Material Stocks – picks up packaging, auxiliary material and chemical cost and assumes 2 months of raw material stock.

  Accounts Payable – assumes suppliers other than employees are paid the month after production

  Tax Estimates – assumes 30% company tax. This can be adjusted in the Input Parameters worksheet. Includes carry forward losses and where relevant tax prepayment.

  Capital Purchase – assumes all capital (from the Input Parameters worksheet) is paid for in the year prior to the start of production.

Depreciation – assumes no depreciation (or capital gain) on land, 5% depreciation on buildings, 10% on other plant and equipment.

Capital Raising – The split of share equity and long term borrowings is set in the Input Parameters worksheet

Working Capital – interest income and cost is determined by the interest rates in the Input Parameters worksheet. This is split between cash in the bank, long term loans, and an overdraft facility.

The model does not currently provide for repayment of long term loans or dividends. Cash builds up in a cash account or if there are losses an increasing overdraft charge is incurred. This is not a realistic situation. The exact finance structure and management needs to be set up for each user.

- **Profit & Loss:** This provides a typical monthly and annual Income Statement split between revenue, variable cost, fixed costs, EBIT, interest income / expense and tax, Profit After Tax.
- **Cashflow:** This provides a typical monthly and annual Cashflow Statement split between cashflows from operating activities, cashflows from investing activities, and cashflows from financing activities.
- **Balance Sheet:** This provides a typical monthly and annual Balance Sheet split between current and non-current assets, current and non-current liabilities, and shareholder equity.
- **KPI Data:** This module collates the key operational and financial data from the Profit Model worksheet for easy access and reference in the Output Report worksheet.

3.2 Input Parameters

The input parameter worksheet is the primary location for user interaction with The Model. The input sheet comprises:

- **Cheese Production & Milk Supply:** The user sets here the basis for milk supply and cheese production.

  Cheese production can be based on the annual figures for cheese and milk supply; the milk supply and a % split between cheeses; or fixed data for monthly cheese production.

  The user may base the annual growth in cheese production on no growth; a constant % growth; or user data for annual growth.

  Milk supply can be based on an annual volume and three alternate seasonal supply curves (highly seasonal, typical southeast Australia, flat production); or user data for the milk supply curve. If fixed data for monthly cheese production is chosen the milk supply will be based on the cheese volume.

The monthly volume % and composition data for milk supply is entered in the Reference Data worksheet.

Note that the milk volume in the Input Parameter worksheet is an estimate only. More accurate calculation is done in the Profit Model based on the cheese production and Reference Data yield factors.

- **Whey Production & Sales Plan:** This section picks up the calculated monthly and annual production of whey products and by-products. This is also where the user selects the whey product that will be the primary basis of the profit model calculation.

  The by-product options are whey cream, permeate from whey protein membrane filtration, and whey from ricotta production. Selection of these by-products designates that they are to be sold rather than disposed of to drain.

  Whey product sales price and freight cost are entered in this section. The current model only allows for a single average price and cost across the whole 10 years of the model (= zero inflation assumption).

- **User Sales & Production Data Options:** In this section the user can set their own values for monthly and annual cheese production or the monthly distribution and composition of milk supply.

- **Capital Investment Decisions:** In this section the user determines what capital items are required for a particular whey product and the cost estimates for a small, medium, or large cheese factory. The factory sizing is based on full utilisation across all of the year and has the reference points: Small: 2000 tonnes; Medium: 5000 tonnes; Large 10,000 tonnes.

  The user can set partial or multiple numbers of each capital item to influence the quantity and cost of purchase (eg 0.5 silos would halve the cost).

  Setting a zero for a capital item designates that it already exists or is not required

  The whey product and whey by-product selection determines whether the capital cost of an item is picked up.

  The typical capital item values for small, medium and large factories are used as the basis for the total capital investment.

  The peak month of cheese production (across the whole 10 year period) determines the size of plant required.

  The capital cost is based on linear interpolation between small, medium and large factory sizes or linear extrapolation for factories larger or smaller than this range.

  The “Applied User Adjustment” allows the user to set a capital value for each item that is higher or lower than The Model standards

  The Model capacity calculation provides for plant cleaning and routine downtime. It is also assumed that the investor will leave some room in the plant capacity for additional

unplanned growth or business interruption. This additional capacity factor is set by the user in the Capital Investment section. The current standard is 90% utilisation or 10% over capacity allowance.

- **Production Staffing:** Base annual salaries are set in this section for factory staff.

  On-costs are set in this section with the current base being 20.7% for superannuation, workcover, payroll tax, and long service leave.

  The Model also allows the user to set the hours for 4 different shift options and the shift cost premium. The cost premium allows for coverage of holidays and sick leave as well as penalties for shift and weekend work.

- **Finance & Overhead Assumptions:** A basic finance structure is established for The Model that provides for long term debt and shareholder equity. Interest rates can be set for cash deposits, long term loans, and an overdraft.

  Insurance is assumed to be a fixed % of capital investment

  Depreciation is split between the rate for buildings and the rate for plant and equipment

  The taxation rate can be set by the user

  Maintenance is assumed to be a % of capital investment. The user can select from low (3%), medium (6%), high (9%), or set their own % value.

  Quality assurance, sales and administration costs are assumed to be a % of whey product revenue. The user can select low, medium, or high standards. They can also set their own % value.

- **Utilities Parameters:** In this section prices are set for gas, electricity, water, trade waste and chemicals.

  Electricity charges allow for both peak and off peak tariffs as well as maximum demand charges

  Gas price is based on the contract range for small and large contract volumes.

  Trade waste price can be set for individual components or set as a % of Melbourne trade waste cost.

  Caustic price is set in The Model and acid cost is set as a % of this figure.

- **Back of the Envelope Calculation:** This provides a very rough estimate of the operating cost and return for each of the whey options. It is based on the operating cost estimates for an average sized factory.

  This should be used as a guide only. It does not accurately reflect the detailed calculations of the profit model.

3.3 Reference Data

The Reference Data worksheet holds the yield and composition factors for individual cheeses and whey products. The key elements of this worksheet are:

- **Cheese product composition:** Typical fat, protein, solids non-fat (SNF), salt and moisture composition of the cheese
- **Milk usage:** Standard volume of milk required to produce 1 Kg of cheese
- **Yield Loss:** Yield loss from milk to cheese – either as waste or as cheese product loss in offcuts and overweight product
- **Raw whey composition and volume:** The composition and volume of whey derived from each cheese
- **Standard whey product yield ratio:** Standards for the amount of each whey product and by-product relative to 1 litres of liquid raw whey.
- **Whey product composition:** The composition of each whey product and by-product as well as factors associated with their production and yield
- **Standard Milk Supply Curves:** Monthly ratio of milk supply and composition for the 3 standard milk supply curves and for the user data set. Note that the standard lactose and mineral composition of milk are base parameters of The Model.

3.4 Cheese Mass Balance

This worksheet provides a first principles mass balance that assists in developing the milk requirement composition and ratio of whey products for each type of cheese. It is a tool for the user only. The calculations and data here are not used directly in The Model calculations.

A method has been provided to set and select the parameters for different cheese types. Currently this includes: cheddar, mozzarella, Edam/Gouda, and a spare.

3.5 Utilities

This worksheet provides the utilities usage figures for whey products and by-products. This is based on the research by Dairy Innovation Australia and factory experience of Xcheque.

3.6 Output Report

The output report picks up the data in the KPI Data module of the Profit Model worksheet and provides a standard report for this data.

In this worksheet the user can select the financial base reference for the analysis. This is either a zero base, the value relative to disposal of whey to drain, and the value relative to sale of raw whey for animal feed.

A macro method has been provided that allows the user to extract any of the data from the model and populate a table of values. This allows the user to adjust input parameters systematically and generate a required trend based on volume, price, cost or some other input parameter.

The outputs of The Model are currently quite rudimentary because it is only in specific user applications that the required detail can be specified.

Note in particular that return on investment calculation is based on either EBIT or EBITD. Neither of these is an accurate calculation of return. A proper return calculation requires the user to set the finance structure they are going to operate under. This will then generate a proper cash flow and investment return calculation.

Additional notes from whey model training by Brooke - 9 August 2012

Model Driver

Ideally, when making commercial decisions, the decisions should be driven by sales. There is no point making 1,000 tonnes of powder, when there is only demand for 700 tonnes.

However, in a lot of big dairy, it doesn't actually work that way. The available milk is set and the processor must establish what they can do with that milk in order to make the most money. This is not ideal. The cheese makers this model is aimed at are likely to be driven by cheese sales.

The model, therefore, is driven by sales. Although this is a whey model, the people who use this are not whey makers. They are cheese makers. As a result, the model is driven by cheese sales, as this is what they know (vs. Whey sales, as this is what they don't know).

Client inputs cheese production, deciding on curve, flat or custom, or inputs milk supply, deciding on curve flat or custom. When inputting cheese, they need to specify tonnes cheese per year for each cheese type. When inputting milk, they need to specify annual milk available and then what percent is used for each cheese type across the year.

The "Use Own Data" option:

If the client decides their milk supply doesn't match the curve and/or composition of the defaults available (highly seasonal, typical southeast, flat production) then they have the option of inputting their own data. This is inputted into a table below the tables referring to the whey production. Alternatively, if I want to make this new supply curve and composition another option for the long term (for example Bega would like to input their data), then I can put it into the "Reference Data" tab. To make it a selection on the inputs page, then I will need to insert a new option between group 3 and group 4. This will ensure the range that the function is searching within will remain correct, and will expand to accommodate the extra data. I will then have to figure out how to change the bullet selection on the input page. The other option is to put the new data into a table, identical to the default tables, but below the group 4 data. This will ensure the data is not within the range the search function is looking in. Then, when you want to use it, simply copy the data into the "Own Data" matrix and the model will pick it up. This is a simpler way of keeping data for safe keeping, but avoiding the need to adjust the model.

When you may want to do this:

- There is a specific composition/curve you want to keep for safe keeping
- The client standardises their milk. At the moment, the model doesn't account for milk standardisation and milk permeate. But, if the client does this, it will affect the model and therefore needs to be taken into account. Input the standardised milk composition in the "Use Own Data" matrix and the model will take care of the rest. Note: it won't take into account milk permeate production.

Sales and Stock Assumptions – Potential Problem for the Model?

The sales and stock component of the model is based on the equation

Sales = opening stock + production – closing stock

Assumptions on the stock have been made:

1. Liquid products – 1 day of stock will be held = 1/30 x monthly production
2. Dry products – 1 month of stock will be held = 1 x monthly production

If client wants to do something different / doesn't agree with these assumptions, the model will need to be adjusted to accommodate this. For example, if the client produces cheese/whey seasonally yet wants to sell powder flat, then the sales will need to be specified in a flat manner vs. Flowed through as it currently is (i.e. every month they sell the previous month's production regardless).

However, these assumptions are probably quite true. The client will likely want to get the powder off their hands ASAP for the cash and due to these products being commodities, then that should be easy enough to achieve.

Sales and Freight

The sales price on the input page is $/kg. Be that kg of liquid whey of 3% TS, or whey of 9% TS or powder. The price (in general) will increase with solids so rather specifying $/TS and TS – just go straight for the $/kg because this is what cheese makers will see and understand.

If the freight cost is 0, this is assuming the buyer is supplying / paying for the freight. Often, this will be reflected in the sales price e.g. sales = 0.02 $/kg, freight = 0 $/kg OR sales = 0.04 $/kg, freight = 0.02 $/kg -> either or, it works out the same.

Milk, Cheese and Whey Separations

This section is a lot for reference but has also determined overall ratios of cheese: whey and whey compositional variance across the year.

By-Products

Whey permeate is considered a by product of WPC liquid and WPC powder production. At the moment, WPC permeate will go down the drain regardless if you check it as a product or not (bug in the model). The final model will reflect that when the WPC liquid or powder is chosen as the product, then whey permeate will be produced. If the user does NOT check the by product box next to whey permeate, then the model assumes you have NO buyer for the permeate, and therefore you will need to dispose of it down the drain which will ultimately incur a trade waste cost. If the uses DOES check the by product box next to whey permeate, then the model assumes you DO have a buyer for the permeate, and therefore will treat is as another product, incurring no trade waste costs.

If you check the box next to whey permeate (indicating you will sell whey permeate) but you are not producing WPC liquid or powder, then the sales volume will automatically be zero as the model will pick up that you are not producing any and therefore cannot sell any.

Whey cream can also be switch on/off via check box as a sales option. Currently, the model assumes that either you sell the whey cream (if you check the box) or if you don't check the box, then the

whey cream will be taken away at zero cost. The option of trade waste is not available as it would breach consent / waste water regulations.

Variable Costs

The variable costs work off the standard cost tables within the "Profit Models" tab. The model assumption is that these costs do not change over the 10 year period. CPI is not taken into account, nor is it taken into account with sales (i.e. cancel each other out). However, if the client thinks that other factors will impact on these costs over the 10 year period, then the standard cost tables will need to be modified – not recommended.

At the moment, there is not effect of scale on usage efficiency of energy, water of chemicals. The data a gathered had no indication of scale on the power, gas, water and chemical use in terms of efficiency. It would be assumed that the larger the plant, the more efficient they will be in terms of resource use. The model is currently not taking this concept into account.

Note: energy, water and chemical use is based on the extra resources required for whey processing. This doesn't take into account the resources used for the cheese side of the process.

Trade Waste

Jon has calculated trade waste based on litres of waste whey equivalent. This includes:

- Whey losses to drain
- Whey permeates (WPC and D40 liquid or powder production)

The waste whey equivalent's composition is used to find BOD and COD for trade waste cost analysis purposes.

City West Water (Melbourne) is the baseline for trade waste cost. The client can change these costs based on percent of Melbourne's costs. The minimum and maximum costs across a few regions have also been provided in order to give perspective to them.

Another scenario when the client may choose to vary percent of Melbourne is if they foresee future increases to trade waste cost (in excess of CPI). For example, a "trade waste tax" is implemented which automatically will cause all trade waste costs to increase by 15%. In this case, a client who is located in Melbourne would input 115% into the "% of Melbourne Benchmark" box to account for this new tax.

Electricity and Gas

Within the profit model, under the utilities usage and cost calculations section, the "% peak electricity" is a function of shift pattern, as determined by size of the plant. For example, if the plant ran on a 5 day / 12 hour shift pattern throughout the year, then the % peak electricity will be 100%. This is due to the fact that the plant will not operate outside of these hours and therefore will not use any off-peak electricity. Likewise, 5 day / 24 hour shifts = 50%, 7 day / 24 hour shift = 35.7%. If throughout the year the plant has a combination of shift patterns, then the model will take this into account.

Gas price is based on the contract which is based on the planned volume of gas required.

Chemicals

Acid cleaning cost is currently based on percent of caustic wash. For example, default is set at 20% which is similar to saying (if on a 5 day shift) caustic is every day, while acid is once a week. However, whey products have high mineral content and therefore will likely need more frequent acid cleans (vs. Milk).

Standard Cost Tables

These are situated within the profit model. These costs are the basis of the "Back of the Envelope" calculations on the top of the input page which have been designed to help the client with initial decisions. The tables will pull detailed costs for the product that has been selected, and for the products not selected, it use default mid-sized plant costs.

The profit and loss section of the profit model will pull from this standard cost table ONLY the information for the product that has been selected (i.e. accurate details).

Finance and Overhead Assumptions

Maintenance cost as % of capital investment – the low option 3% is very low. It would be amazing if you had this. If the user has opted to use second hand equipment, it is advised that this maintenance percent should be high.

Quality assurance materials as % of revenue – these are the materials required for quality testing etc. E.g. lab / testing materials, costs for external testing.

Admin as % of revenue – this is the incremental costs associated with processing whey.

If the user inputs a depreciation figure higher than 10%, the model may freak and (later in the 10 year period) begin to show negative depreciation (nonsense). Jon has fixed this.

It is assumed that payment of accounts will be made after 30 days (accounts receivable).

NPV and IRR need to be added.

Capital Investment Decisions

In order to size the equipment, the model looks at production across each month across the 10 years and sizes each piece according to the largest production month. I.e. max year x max month -> annualise (i.e. flat production) to determine capacity.

The % utilisation at maximum production figure that is required to be inputted is basically a question of how much leeway the client wants to factor in when the plant is running flat out. This would include breakdowns, stuff-ups, slow start-ups etc. This does not include cleaning as cleaning is considered a necessary part of the process.

At the moment, capital costs have been estimated for small, medium and large plants. Extra large is planned to be included at a later stage.

Production Staffing

The production capacity will determine the production hours for any given month, and will therefore determine the shift pattern.

Packing rate is based on an 8 hour shift, unless the packing rate is less than 1 tonne/hour. If this were the case, the staff would pack at 1 tonne/hour and only work for as many hours as required. The packing crew is assumed casual.

The liquid operators would be expected to run pasteurisers, clarifiers and membranes. Powder operators would run the dryer.

The shift labour premiums include annual leave (4 weeks), overtime, sick leave, people to come in to cover sick leave of others, public holidays (2 weeks). Overall, approximately 6/52 weeks in every year need covering and these premiums will cover this cost. Jon is confident in these figures.

If a powder product has been selected, then the client will automatically require a dryer (for obvious reasons). In addition to a dryer, further staff will also be automatically required. These include a production manager, a quality assurance person, and a logistics coordinator. These people would work a 5 day/8 hour shift and would therefore only ever get a shift premium of 1.33 (independent of what shift pattern the rest of the plant is doing).

The pay the user inputs for each staff member is the member's base salary. This doesn't include shift premium or oncost's. The model will automatically include these within the model.

Additional notes by Brooke from discussion 18th December 2012

- The model assumes cheese is produced from cow milk.
- Whey produced is based on cheese production as input by the user. There is no option to buy in extra whey.
- The model doesn't account for milk standardisation. It assumes that the natural variation of milk composition remains and allows the cheese production and whey production to vary with it. If a plant does do this, then the user can input the cheese milk composition into the "Use Own Data" matrix.
- If a UF plant is used for milk standardisation, then the user can again use the "Use Own Data" matrix to input the standardised cheese milk composition. However, the model does not take into account the impact the milk permeate from the UF plant has on trade waste costs nor does it have an option to use it as an input in downstream processes.
- In the profit model, it is assumed that for liquid whey products, stock will be held for 1 day before selling. For dry whey products, stock will be held for 1 month before selling.
- The user has the option of changing the sale price for each whey product. The price is for $ / kg regardless of solids. There are default prices in the model that are comparable to US market prices in Oct 2012.
- The user has the option of changing the freight cost in the model. If the cost is 0, it is assuming the buyer is supplying / paying for the freight. Often this will be reflected in the sales price e.g. sales = 0.02 $ / kg, freight = 0 $ / kg OR sales = 0.04 $ / kg, freight = 0.02 $ / kg -> both situations are equivalent.
- In lieu of the model calculating an entire mass balance for each cheese type, ratios of raw whey to cheese have been used. The following ratios of Raw whey L / kg cheese have been used; cheddar – 8.7, mozzarella – 8.9, Gouda – 10.1, Edam – 10.1, white mould – 7.
- Whey products and by-products also use ratios of product to raw whey. The following ratios of Product kg / kg raw whey have been used; Liquid whey – raw – 1.00, liquid whey – pasteurised & clarified – 0.97, liquid whey – demineralised – 0.38, liquid whey – protein concentrate – 0.19, whey powder – 0.068, demin whey powder – 0.064, whey protein powder – 0.020, whey permeate – 0.76, whey cream – 0.0084.
- The user has the option of selling whey permeate (if they are producing WPC liquid or powder) and can check the box next to this by-product to indicate this intention. If the box is not checked (i.e. the producer does not have a buyer) then the model assumes that the whey permeate will go down the drain and contribute to the producers trade waste cost.
- The user has the option of selling whey cream and can check the box next to this by-product to indicate this intention. If the box is not checked (i.e. the producer does not have a buyer) then the model assumes that the whey cream will be removed from site at zero cost. The option of trade waste is not available as it would breach consent / waste water regulations.
- Variable costs, such as gas, waste, storage and labour, are assumed to not change over the 10 year period. CPI is not taken into account, nor is it taken into account with sales (i.e. cancel each other out).
- Variable costs are based on the extra resources required for whey processing. This doesn't take into account the resources used for the cheese side of the process.

- There is no effect of scale on usage efficiency of energy, water of chemicals. The data a gathered had no indication of scale on the power, gas, water and chemical use in terms of efficiency. It would be assumed that the larger the plant, the more efficient they will be in terms of resource use. The model is currently not taking this concept into account.
- Trade waste is based on whey losses to drain, whey permeate from WPC UF plant (if the producer is not selling it) and whey permeate from D40 NF plant.
- City West Water (Melbourne, Victoria) is the baseline for trade waste cost calculations. The user has the option of increasing or decreasing trade waste costs based on percent of Melbourne's prices. For example, if it is believed that the future trade waste costs are going to increase (in excess of CPI), then the user can input 115% to account for a 15% increase in costs.
- The model will automatically calculate the required shift pattern for the plant size. The amount of peak / off-peak electricity that is used is based on the shift pattern. The following peak electricity percentages have been used for each shift pattern; 5 day / 12 hour = 100%, 5 day / 24 hour = 50%, 7 day / 24 hour = 35.7%.
- The "Back of the Envelope Calculation" is a rough estimate of costs based on a what size? mid-sized plant. The selected product in "Whey Production & Sales Plan" will give a more detailed estimate of costs in the back of the envelope calculation using figures based on the size of plant that is being investigated.
- It is assumed that payment of accounts (accounts receivable) will be made after 30 days.
- Capital estimates are between plant sizes of 2,000 and 15,000 tonnes cheese per year. Plant sizes exceeding these limits will be out of range of the capital estimates.
- Capital will be sized according to the largest production month across the 10 year period.
- The percent utilisation at maximum production figure is a measure of how much leeway the client wants to factor in when the plant is a maximum production. This includes breakdowns, slow start-ups etc. But does not include CIP as this is considered a necessary part of the process.
- Production staffing is based on the shift pattern that was mentioned earlier.
- Packing crew is assumed to be casual staff and will work for an 8 hour shift unless the packing rate is less than 1 tonne/hour where the packing staff will only work for as many hours required packing at 1 tonne/hour.
- It is assumed that the liquid operators would be expected to run pasteurisers, clarifiers and membranes. Powder operators would run the dryer.
- The shift labour premiums include annual leave (4 weeks), overtime, sick leave, people to come in to cover sick leave of others, public holidays (2 weeks). Overall, approximately 6/52 weeks in every year need covering and these premiums will cover this cost.
- Further staff is assumed to be required when a powder product is picked. These include a production manager, a quality assurance person, and a logistics coordinator. These people would work a 5 day/8 hour shift and would therefore only ever get a shift premium of 1.33 (independent of what shift pattern the rest of the plant is doing).
- The pay the user inputs for each staff member is the member's base salary. This doesn't include shift premium or oncost's. The model will automatically include these within the model.