PLANT AND OPERATIONS MODELLING

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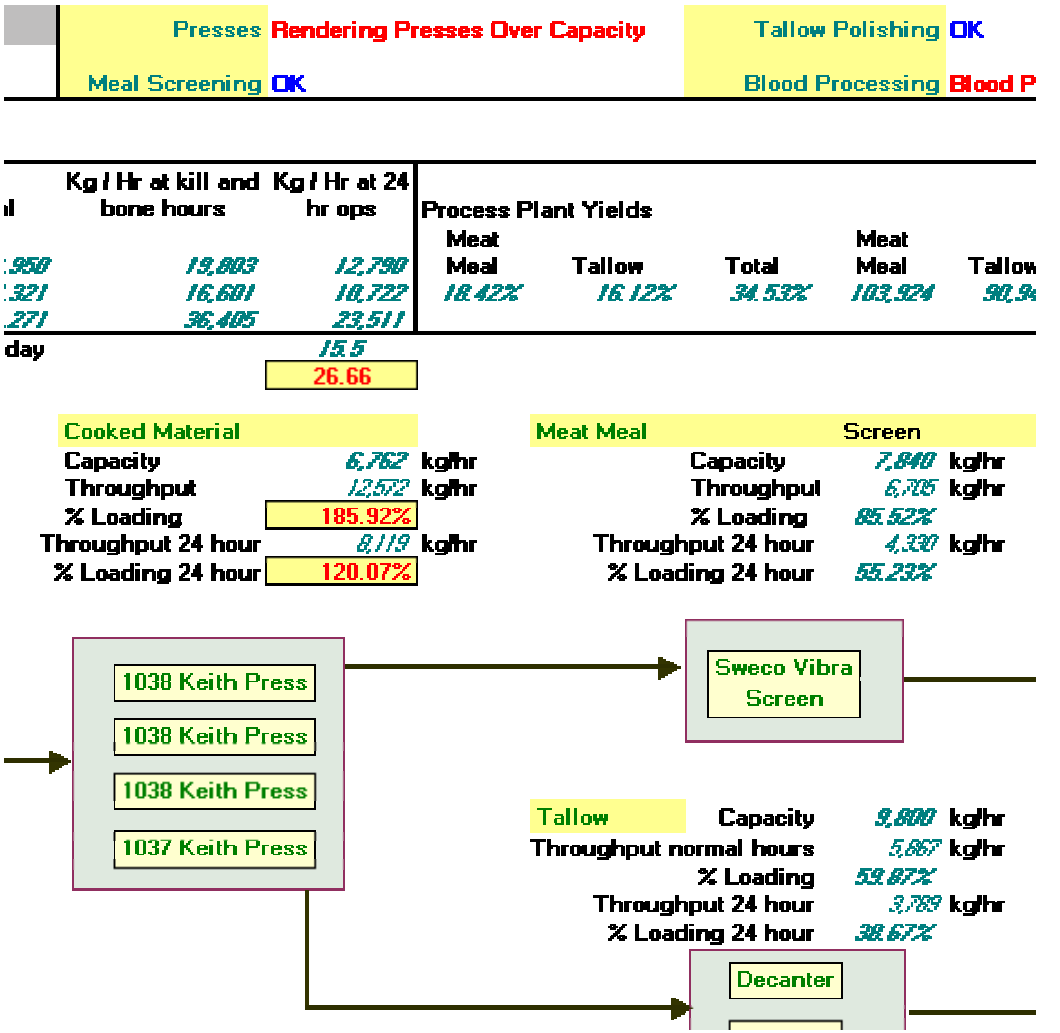
The Purposes of Modelling

- To achieve clearly defined objectives
- To test the operation of a plant and equipment and identify either the limits of equipment operation or to size equipment to achieve operating parameters
- To test different operating scenarios and review the effects on the business.



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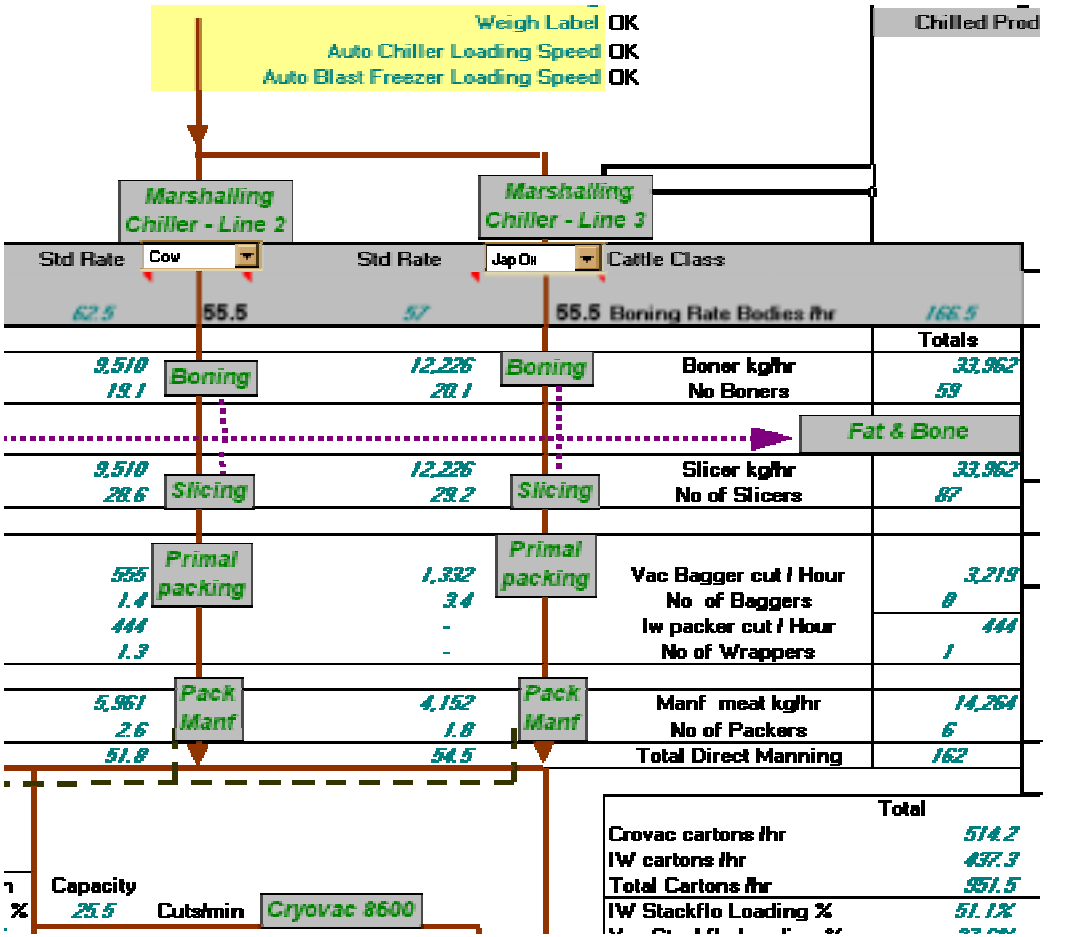
Types of Modelling

- Essentially the modelling of business operations by ProAnd fall into two broad categories.
  - Cost Modelling and Economic Modelling
  - Mass Balance or Plant Operations Modelling
- These may be combined to provide a more extensive model identifying physical, resources and cost elements and including the drivers of the business.



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Cost Modelling

- This type of modelling essentially allows a plant (particularly one that is being considered for construction) to be modelled over a range of variables Including:
  - Different plant arrangements (one or two process lines, different chiller requirements etc)
  - Look at the effects of different shift and work arrangements
  - The effects of changing productivity, the substitution of equipment for labour etc
  - Changes to the cost drivers of the business, overheads, power and utility charges, wages and on costs etc.
  - Determine the broader economic returns of an investment to the community and associated employment growth.
- Generally the outputs of the model are the costs of operation in gross and unit terms for each of the scenarios.
- This data can then be used as benchmarking input to compare the plant operations with other industry operators and the plant operations competitively evaluated

Mass Balance Modelling

- This type of model looks at the physical operations of the business and balances the physical movements of products though each of the process stages. Typically this allows the plant to be tested for:
  - Production bottlenecks caused by plant sizing or incorrect planning
  - Labour requirements and labour balancing in the plant operations
  - Raw material input requirements
  - Mass and volumes of plant outputs including waste and by product streams.
- Combined Models - While the models are often constructed to suit a particular purpose it is always possible to link the inputs and outputs of the model types to provide a composite model providing both mass balance and cost structure.

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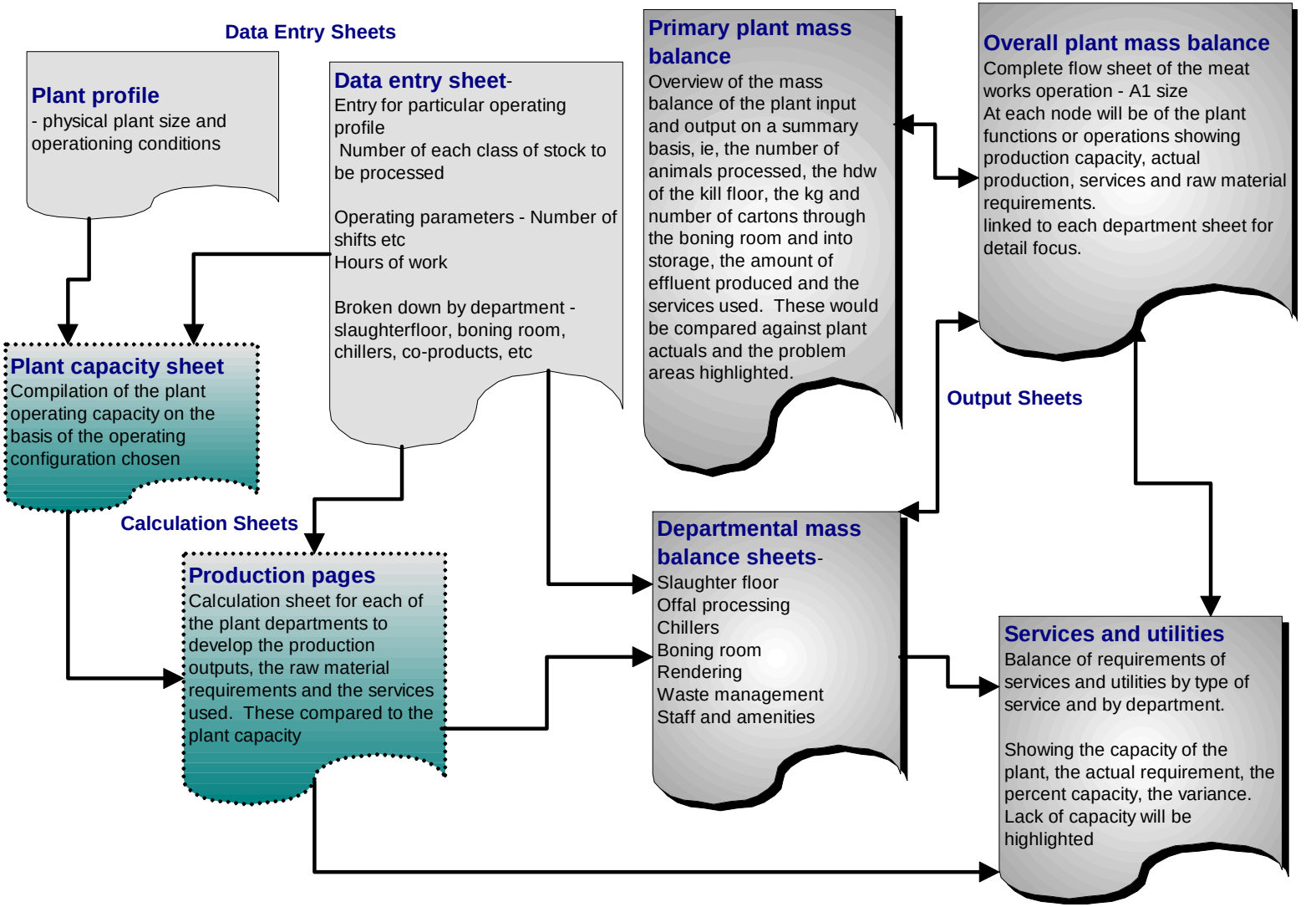
Model Structures

- The structures of the models follow essentially the same patterns and comprise:
- Data entry sheets that allow the user to change parameters of the operation, throughput, hours of work etc
- Data tables that schedule the underlying operation of the plant, manning schedules, labour productivity, plant depreciation etc.
- Calculation sheets.
- Output sheets either in tabular or more graphically in process flow form.

Typical Model Structure



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The Limitations of the Models

- In general terms modelling takes a simplified approach to the operation of a plant or company so that the number of variables are limited and the outputs of the model focused on particular aspects of the plant operations
- The more complex the model (number of inputs and outputs) the more specific it is to a particular plant and the less universal its application.
- The outputs are only as good as all of the data entered into the model - particularly the base data provided by the company to build the data reference tables.

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The Advantages of Modelling a Business or Particular Operation

- The model allows different variables to be altered to build scenarios of plant operation and test the scenario outcomes without interfering with plant operations or physically constructing a plant.
- A model allows the least cost model of construction and / or operation to be determined.
- A model allows plant bottlenecks to be identified and solutions evaluated and quantified.
- The process of acquiring the information for the reference tables and modelling the outputs focuses the business on the detail of its' operation
- The outcome of the total developing the model and testing operating and configuration scenarios allows the business to identify operating cost imbalances and revenue opportunities.