Meat technology update

3/07 – June 2007

Tracking Rendering Costs

A survey of rendering costs found that:

- **The cost of rendering ranged from $130 to $265 per tonne of finished product, with an average cost of $210 per tonne.**
- **Energy costs accounted for most of the variability in costs between plants.**
- **Energy costs were from $23 to $112 per tonne of product with an average cost of $68 per tonne.**
- **The variation in energy costs was due the type of fuel used.**

The study included development of a model for calculating rendering KPIs and tracking costs. The model makes it possible to closely track inputs and outputs.

Rendering operations are generally assumed to be a profitable part of abattoir operations; however, it may be difficult to separate all the rendering costs from other costs in an integrated abattoir—and, in some cases, management focus may be on revenue from rendering rather than profit. In addition, abattoir renderers may not assign a value to raw materials, and this may exaggerate the apparent profitability of rendering operations.

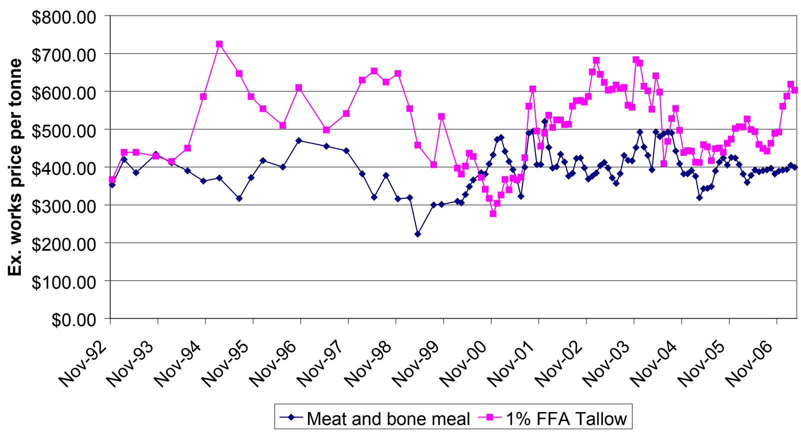

Figure 1: Historical prices of meat meal and tallow

Meat & Livestock Australia has investigated some of the costs of rendering at several rendering plants. The conclusion from these investigations was that it costs between $130 and $265 to produce one tonne of rendered product. These costs do not include a value assigned to raw material or transport costs.

This Meat Technology Update discusses some of the findings of the MLA investigation and a model for tracking costs which was developed as part of the project.

The products of rendering contribute about 3 to 7% to the revenue from cattle and sheep processing. The value of rendered products fluctuates from month to month, but, in general, prices have changed little in the last 15 years—as illustrated in Figure 1. During this time costs have gone up.

For example, prices have increased by 45% according to changes in the CPI. Rendered products, such as tallow and meat meal, are sold on the fats and oils and protein commodity markets, and renderers cannot increase prices as costs go up. To maintain profitability the renderer's only option is to reduce costs. With this in mind, the MLA project was aimed at assessing current costs of rendering, and identifying opportunities for cost control and reduction.

Where are the costs?

The major costs of rendering are labour, interest and depreciation, repairs and maintenance, and energy. Other costs, such as environmental and transport, can be significant capital and/or operating costs, particularly for renderers not associated with abattoirs. These costs are not consistently incurred across the industry, and they were not included in the MLA report of typical costs.

The average cost of rendering, excluding environmental and transport costs, was $210 per tonne of finished product—according to the MLA investigation. The range of costs was from $130 to $265 per tonne of finished product. The most variable cost element was energy. The other costs were generally similar at different plants.

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Energy costs varied from $23 to $112 per tonne of finished product, with an average cost of about $68 per tonne. The lowest energy cost applies to renderers that use sawdust or wood chip to fire boilers. Coal adds about 50% to fuel costs, and delivered gas is the most expensive.

The average labour cost was about $32 per tonne of rendered product. Costs ranged from about $19 to $58 per tonne of product. Labour costs were affected by the type of rendering systems. Plants with batch cookers were at the high end of the labour cost range, and continuous plants at the lower end of the cost range. Labour costs are also affected by the working hours of the plant and how shifts can be arranged to reduce costs. The range of labour costs is also due to the small numbers of staff employed in rendering plants.

The average cost of repairs and maintenance (R&M) was about $48 per tonne of rendered product. The range of costs was from $43 to $63 per tonne of product. The difference in R&M costs was mainly due to the age of plant, with older plants costing more to maintain.

Interest and depreciation is the other major cost. The average cost of interest and depreciation was about $52 per tonne of product, with a range of $40 to $65 per tonne.

The relative costs of energy, labour, R&M and interest and depreciation are shown in Figure 2.

In earlier investigations of rendering costs, energy costs were relatively minor contributors to total rendering costs. In 1980 the cost of energy was about 6–8% of the total cost of production of tallow and meat meal compared with about 32% of total costs reported in the recent MLA investigation. R&M have not changed significantly: accounting for about 20% of total costs in 1980; and about 22% in the MLA study.

The comparison between the cost of rendering in 1980 and the MLA study illustrates how costs have been reduced to some extent by lower-cost renderers in the last 25 years. The total cost of rendering in 1980 was about $75 to $107 per tonne of finished product. In the same time the CPI has increased by 143%, which makes the equivalent 2006 costs $182 to $260 per tonne. The 2006 costs according to the MLA study were $130 to $265 per tonne.

The other message from the comparison between 1980 and 2006 costs is that energy costs have increased as a proportion of total rendering costs. The contribution of labour costs has reduced significantly, due to the introduction of more automated rendering systems, retrofitting of automated systems to older plants, and better utilisation of plant capacity.

The rendering model

A model for calculating rendering costs was developed as part of the MLA study of rendering costs. The model calculates key performance indicators including:

- revenue per tonne of raw material;
- revenue per tonne of output;
- estimated and actual yield of rendered product;

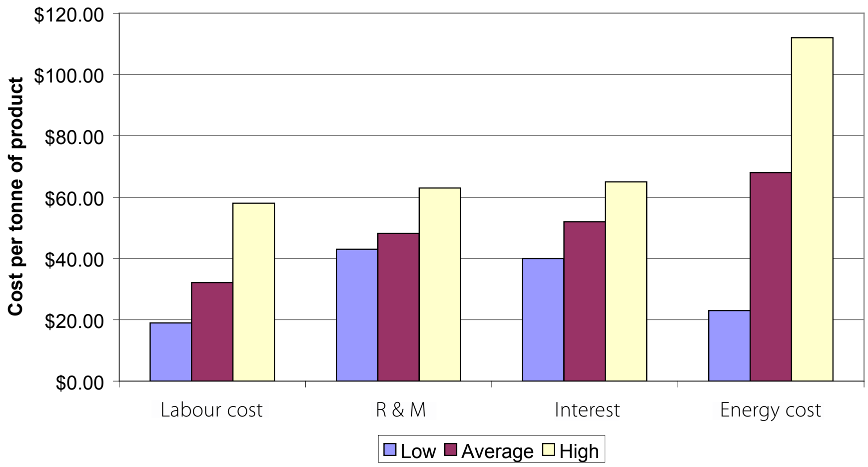

Figure 2: Relative contribution of rendering costs

- labour, interest, freight, energy, and environmental costs per tonne of output; and
- total cost per tonne of output.

The model also calculates costs per kg of hot dry carcase weight. An example of the output page of the model is shown in Figure 3. Table 1 shows extracts from the output page of the model.

Table 1: A sample of data from the outputs page of the Cost of Rendering Model

	Calculated costs or outputs	Actual costs or outputs
Input/Output Benchmarks		
Cost/tonne of raw material	$64.49	
Revenue/tonne raw material	$294.95	
Revenue/tonne output	$514.62	$505.47
Operations Benchmarks		
Tonnes output/man-hour	0.974	0.992
Labour cost/tonne output	$26.73	$26.25
Total staff cost/tonne output	$31.53	$30.97
Energy cost/tonne output	$75.19	$73.86
Total cost/tonne output	$171.80	$168.74
Total cost/kg hot dressed weight	$0.0628	
Production Benchmarks		
Meat meal production	522 tonnes	570 tonnes
Tallow production	635 tonnes	636 tonnes
Yield	57%	58%

Note: Data in this table is for illustration and is not derived from a specific rendering plant.

The model provides a means of tracking rendering costs and benchmarking KPIs between plants. It should assist in identifying opportunities for cost reduction and quantifying changes in costs as a result of cost-reduction initiatives.

The reliability of outputs of the model depends on the quality of the inputs. Renderers can enter their own data, particularly for known data such as labour costs and revenue from product, but the model also includes default data, for example yields from rendering beef raw material. The data inputs used to calculate KPIs are divided into financial and operating costs, plant and equipment, and raw material inputs.

Rendering Key Performance Indicators - Output Page

Buttons to Access Data Entry Forms for the Model

1 Define / Update Finance and Operating Cost

2 Define / Update Plant & Equipment

3 Beef Yield Calculator

4 Define Raw Material Input

5 Print Data Input and KPI's

Date of Benchmark	39197	
Benchmark Period (Weeks)	4	
Input / Output Benchmarks	**Calculated**	
$Cost / Tonne Raw Material	$64.49	
$ Revenue / Tonne Raw Material	$294.95	
Input / Output Benchmarks	**Calculated Output**	**ActualOutput**
$ Revenue/Tonne Output	$514.62	$505.47
Raw Material Cost / Tonne Output	$112.52	$110.53
Operations Benchmarks		
Processing Staff Only Labour Hours	**Calculated Output**	**ActualOutput**
Tonnes Output / Manhour	0.974	0.992
Lab Cost / Tonne Output	$26.73	$26.25
Total Plant Staff Labour Hours		
Tonnes Output / Manhour	0.779	0.793
Lab Cost / Kg HDW	$0.0115	
Lab Cost / Tonne Output	$31.53	$30.97
Financial Measures		
R&M / KG HDW	$0.0119	
R&M / Tonne Output	$32.47	$31.89
Interest & Depn /KG HDW	$0.01	
Interest & Depn / Tonne Output	$32.47	$31.89
Freight Costs		
Freight / KG HDW	$0.0000	
Freight / Tonne Output	$0.00	$0.00

	Results For BenchMark Period	**Tonnes Per Day**
Benchmark Model Inputs		
Tonnes Raw Material Processed	2066.796	103.3398
Tonnes Output Material - Actual Shipped	**ActualOutput**	
Meat Meal	570.0	28.50
Tallow	636.0	31.80
Blood Meal	0.0	0.00
Total	1,206.0	60.30
Yield on Shipped Material	58.35%	
Tonnes Output Material - Calculated	**Calculated Output**	
Meat Meal	522.29	26.11
Tallow	635.04	31.75
Blood Meal	27.24	1.36
Total	1,184.6	59.23
Yield on Calculated Output	57.31%	
Total processing Costs	**Calculated Output**	**ActualOutput**
Total Cost /KG HDW	$0.0628	
Total Cost / Tonne Output	$171.80	$168.74
Environmental Costs		
Environmental Costs / KG HDW	$0.0000	
Environmental / Tonne Output	$0.13	$0.13
Energy Used		
Gj Energy Used /KG HDW	0.0011	
Gj Energy Used per Tonne Output	3.101	3.046
Energy Cost /Kg HDW	$0.0275	
Energy Cost / Tonne Output	$75.19	$73.86
Hot Water Energy Recovered, Mj / KG HDW	0.19973	
Energy Cost / Gigajoule	$22.88	

Figure 3: Output page of Costs of Rendering Model

The financial and operating costs include the following inputs:

- **Raw material costs –** While abattoir renderers may not put a value on raw materials, the model allows separate raw material values to be assigned to each of: slaughter floor material, fat, bone and blood. It also allows for values to be assigned to raw materials brought in from other sites.
- **Plant labour costs –** Labour costs can be itemised as: managerial, supervisory, department staff, engineering, administrative and other. This allows different pay rates to be assigned to a range of staff that contribute to rendering operations. The outputs are separated into rendering plant labour costs and other contributing staff costs.
- **Finance and overheads** – This group of inputs includes: interest and depreciation; repairs and maintenance costs split into labour and materials; and other expenses such as consumables and transport. The model includes defaults for these values, but renderers should enter their own data to improve the reliability of the outputs.
- **Service costs** – These costs include: water, energy (electricity, gas, coal or other energy source), and effluent disposal. The data required for these inputs can be derived direct from invoices for utilities, but it may be necessary to estimate a proportion of invoiced amounts to be assigned to rendering.
- **Product revenues** – This input includes the values of: meat meal, tallow, blood meal, and other products—for the period being reviewed.

The plant and equipment inputs are used to calculate energy recovered from hot water generation from waste heat; and yields from blood processing. The inputs include the type and capacity of three classes of rendering systems (batch, continuous dry, and continuous wet rendering), and data on hot water recovery. Blood processing parameters can also be entered to calculate yields from blood.

Rendering yields or raw material inputs include tables of expected yields of raw material from different types of stock, and the estimated yield of tallow and meat meal as a percentage of hot carcase weight. These tables can be modified according to the expected yields at the rendering plant. If the expected yields are not available, default yields from a beef yield calculator can be used. The yields from the calculator can be adjusted for the percentage of each item of potential raw material, including boning room material, which is consigned to rendering. When kill data are entered, the model calculates yields of rendered product; and the output includes a comparison between actual yield and expected yield.

Raw material inputs can include quantities of material received from outside sources and the expected yields from this material.

Examples of cost savings

Rendering is a capital- and energy-intensive process, and has cost structures that are difficult to change in the short to medium term. In the longer term, capital investment in boilers that can run on the most economical fuel sources, provides the best opportunity for cost reductions. Decisions on what boiler fuel to use will be dependent on what is available in a particular area. In addition, renderers may have a preference for the simple and clean operation of gas-fired boilers; and, in many cases, the costs of boiler maintenance, ash disposal and other costs are not factored into operations as a discrete cost.

Energy

Of the four major rendering costs of labour, R&M, interest and depreciation, and energy, energy is the most variable between plants, and probably offers the most opportunities for cost reductions. Recovery of heat from cooking vapours to heat water, is an important cost saving at abattoir rendering plants. According to the Eco-Efficiency Manual for Meat Processing[1] about 15% of the energy input to a dry rendering plant can be recovered in the form of 80°C water. Compared with direct water heating using a natural gas heater, there is a saving of about $2.30 per kL of hot water—if water is heated to 75°C with heat recovered from rendering, then further heated to 84°C with steam from a natural gas-fired boiler.

However, the cost saving to the combined abattoir and rendering operations due to recovery of heat from cooking vapours to make hot water is not clear cut. The MLA investigation of costs reported that heat recovery by condensing vapours is done with varying degrees of success, depending on hot water holding capacity and the ability of the plant to use hot water. Other inefficiencies in heat recovery are due to insufficient cooling water, air in vent lines, excessive back pressure in the vent lines, and insufficient heat transfer capacity.

Excess heat can also be used to preheat raw material before the main rendering cooker, thereby increasing the theoretical capacity of the plant. Abattoir rendering plants that take in raw material from outside sources can make more hot water than can be used in the abattoir and could use the excess heat to preheat raw material. However, if the increased capacity of the plant is not used to reduce other costs, for example by reducing the number of shifts, the savings are limited to the energy needed to increase the sensible heat of the raw material.

Other options for the use of waste heat include its use in evaporators to concentrate and recover fat and protein from liquid waste streams such as stick water from wet rendering systems, polisher discharge, and raw material bin drainings.

Added water

The function of rendering is to melt fat and remove water. The amount of energy required is directly related to the water content of the raw material, particularly in a dry rendering system. Added water can be up to 35% in gut material, and blood may contain over 50% added water. For the example of rendering KPIs shown in Figure 3 and Table 1, 10% added water in raw material would add energy costs of about $15 per tonne of finished product to the rendering cost of $171 per tonne. In addition, added water may incur higher labour costs due to reduced plant capacity and may affect product quality.

The costs of rendering in a continuous wet rendering system may appear to be less sensitive to added water, but extra water in raw material increases product loss in stick water. Ten percent added water in raw material can result in a loss of about 1% of product in stick water from wet rendering systems.

Labour costs

According to the MLA investigations of rendering costs, labour cost is a relatively minor cost, averaging about 15% of total costs. Opportunities for further reductions in labour costs are probably limited. The staff requirement to run a rendering plant is generally low, typically 2 to 3 people per shift for a single rendering process with blood processing. Plants may need to work two or three shifts. Staffing levels are also related to the type and age of the process, with batch cookers without automation requiring more staff than continuous plants. In this situation it is difficult to reduce labour in discrete amounts since reducing staff from 3 to 2 requires a 50% increase in productivity.

Repairs and maintenance

Repair and maintenance costs attract attention because they are associated with interruptions in production, and tend to be large and irregular. Costs are difficult to contain because, with longer running hours, R&M is often carried out after processing and at weekends, with increased labour costs. In the MLA report on rendering costs, it is suggested that R&M costs can be reduced by better planning of maintenance scheduling. This needs an understanding of wear rates, which can be derived from monitoring equipment during scheduled maintenance. If wear rates and likely failure points can be predicted, rectification can be scheduled, rather than occurring as an unexpected event. Industry-derived information on equipment wear and failure under a range of operating parameters, could assist plants to better plan R&M.

Further information

[1] Eco-Efficiency Manual for Meat Processing (2002). Published by Meat and Livestock Australia

Contact us for additional information

Meat Industry Services is supported by the Australian Meat Processor Corporation (AMPC) and Meat & Livestock Australia (MLA).

Brisbane:
Food Science Australia
PO Box 3312
Tingalpa DC QLD 4173

Ian Eustace
T +61 7 3214 2117
F +61 7 3214 2103
M 0414 336 724
Ian.Eustace@csiro.au

Neil McPhail
T +61 7 3214 2119
F +61 7 3214 2103
M 0414 336 907
Neil.McPhail@csiro.au

Alison Small
T +61 7 3214 2109
F +61 7 3214 2103
M 0409 819 998
Ali.Small@csiro.au

Sydney:
Bill Spooncer
PO Box 181
KURMOND NSW 2757
T +61 2 4567 7952
F +61 2 4567 8952
M 0414 648 387
bill.s@bigpond.net.au

Adelaide:
Chris Sentance
PO Box 178
FLAGSTAFF HILL SA 5159
T +61 8 8370 7466
F +61 8 8370 7566
M 0419 944 022
chrisfss@ozemail.com.au