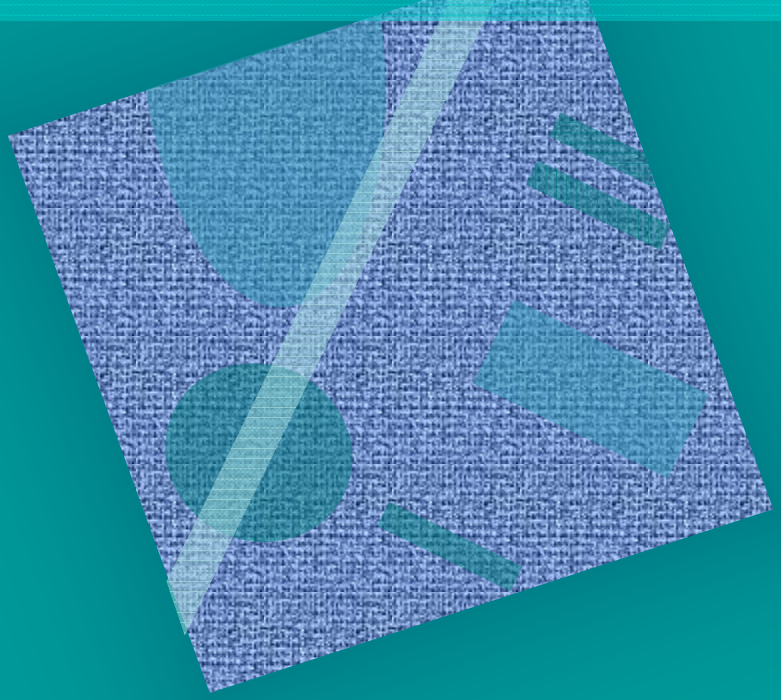
RMAA Congress Stellenbosch 2008



INDUSTRY BENCHMARK PRESENTATION

Vereniging - Association

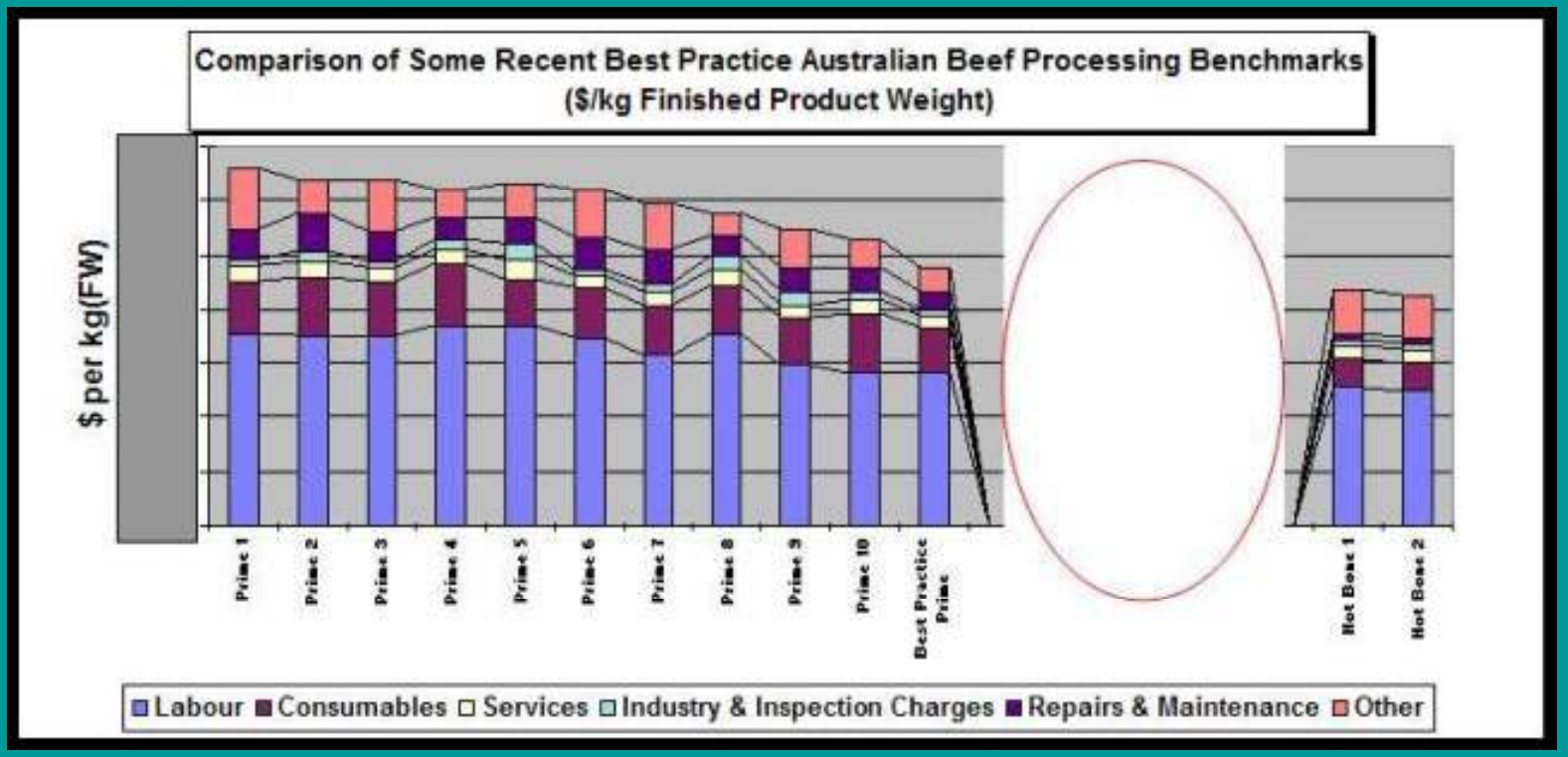
Competitive Performance

- ProAnd Australia involved in performance assessment and benchmarking of meat processing operations since 1994.
- Low unit cost operations in the **integrated** meat sector can be defined by:
  - A focus on processing of specific livestock (for example; heavy carcases from medium to long grain fed livestock, yearling animals specifically targeted for the Australian domestic market, manufacturing meat from cows and bulls).
  - Stable production volumes.
  - Focus on obtaining good returns for co-product items.
- Application of the principles of economy of scale seem only to be relevant when the previous conditions are in place.

Comparative Cost Benchmarks

- Comparative Benchmarks are based on Finished Weight of beef produced.
- Competitive Benchmarks are compiled by putting together the best performance results from beef processing plants in the database for the last five year period.
- The best performing integrated beef processing plant in the current database has overall costs of some $A1.05 per kg (FW).
- The average carcase weight for the plants included in the database is 286 kg.
  - Labour includes all operation and overhead labour.
  - Consumables include all packaging, chemicals, etc
  - Services include cost of fuel, electricity, water and effluent.
  - Industry & inspection charges include all levies and AQIS costs.
  - Repairs and maintenance included labour, materials and contracted costs.
  - Other includes all administrative functions including licensing and insurance, etc and handling procurement and selling of meat products.
  - Capital charges (interest/depreciation) are not included.

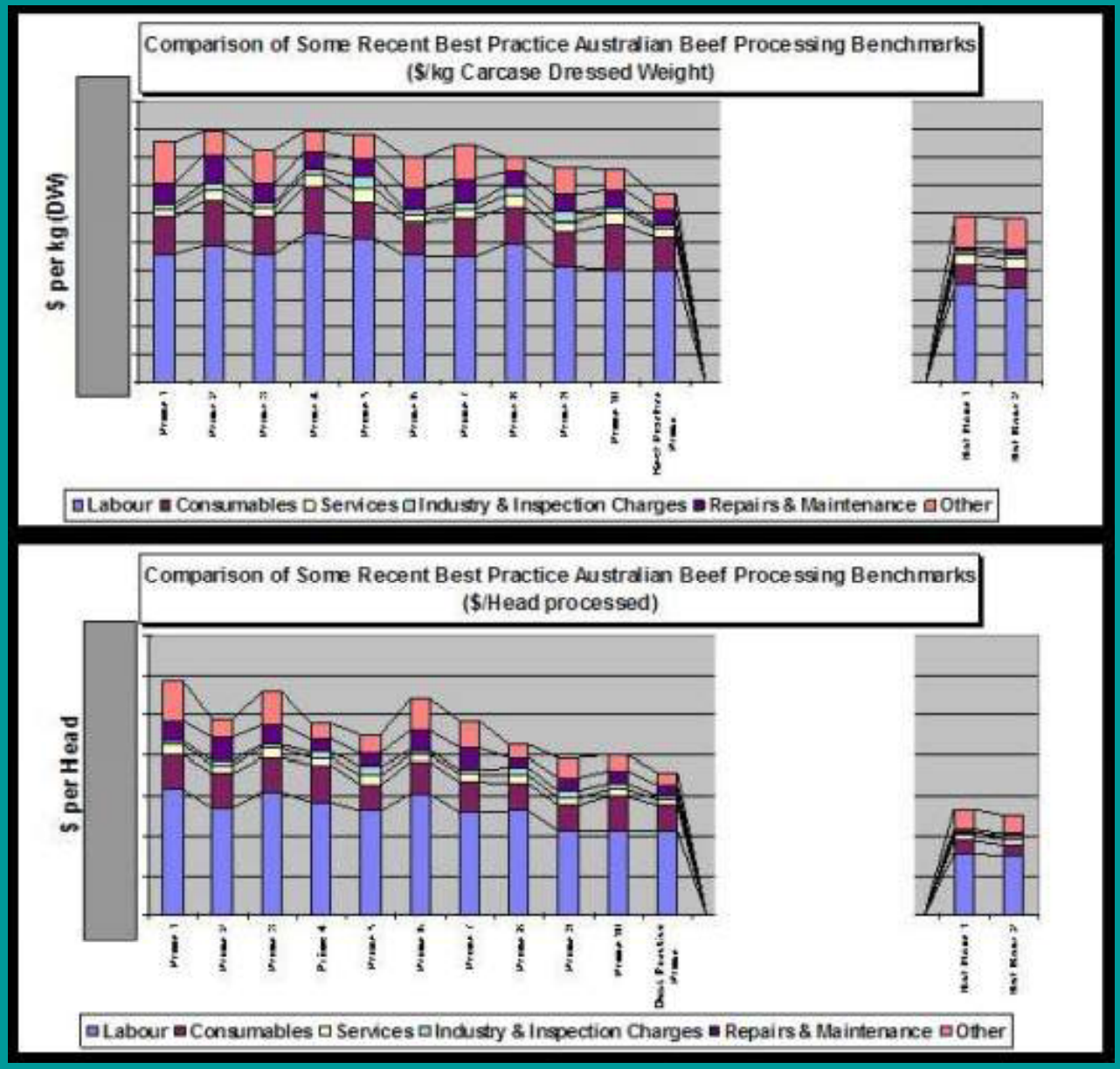
Comparison with Recent Plant Data



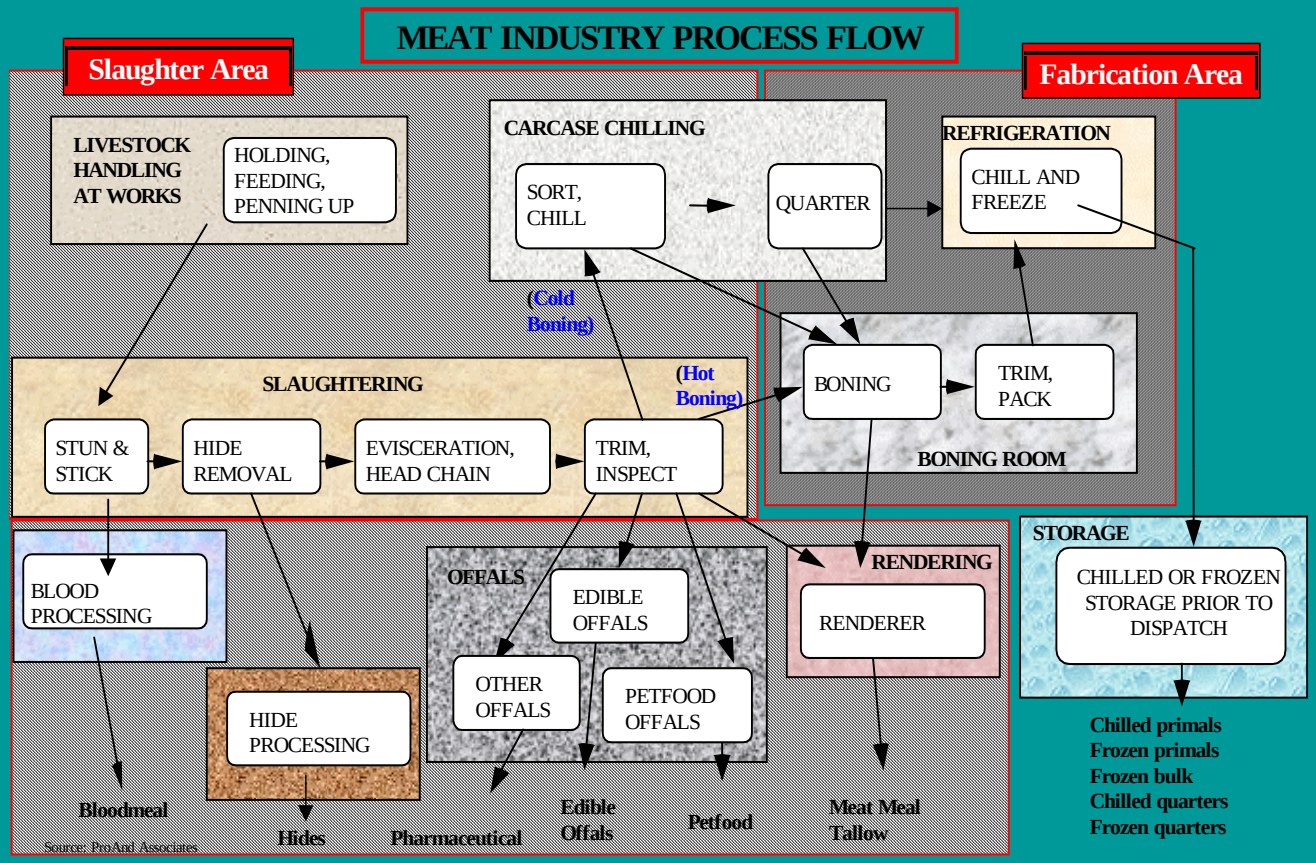
- Processing costs vary from $A0.82-1.30/kgFW.
- Hot boning operations exhibit significantly lower costs.
- Best Practice Prime operators vary around $A0.95-1.05/kgFW

Recent Plant Data

- The Dressed Weight and Per head analyses show different relationships.
- Dressed weight is impacted by different yield results.
- The per head comparison is impacted by carcase weight.

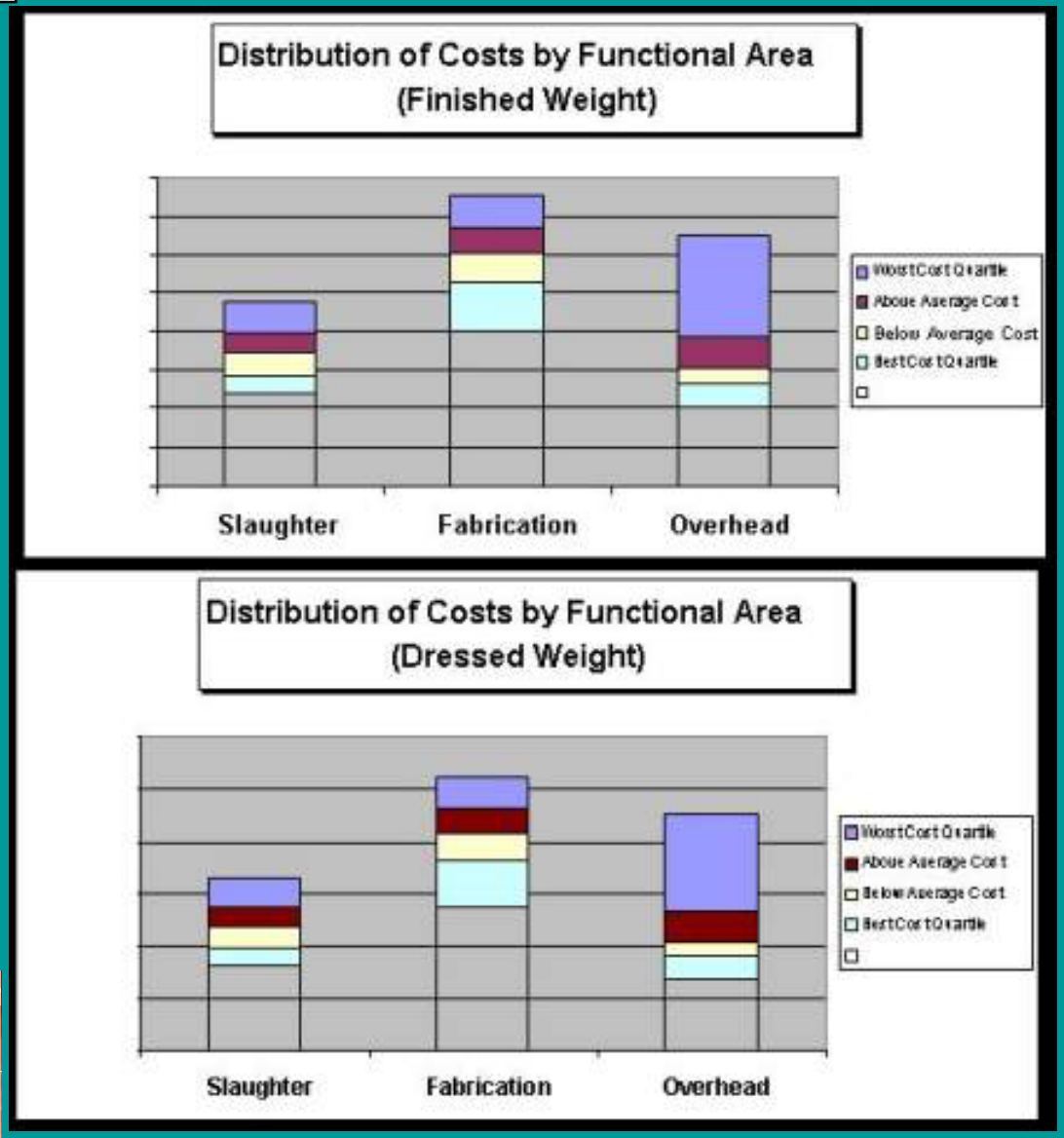


Definition of Functional Areas



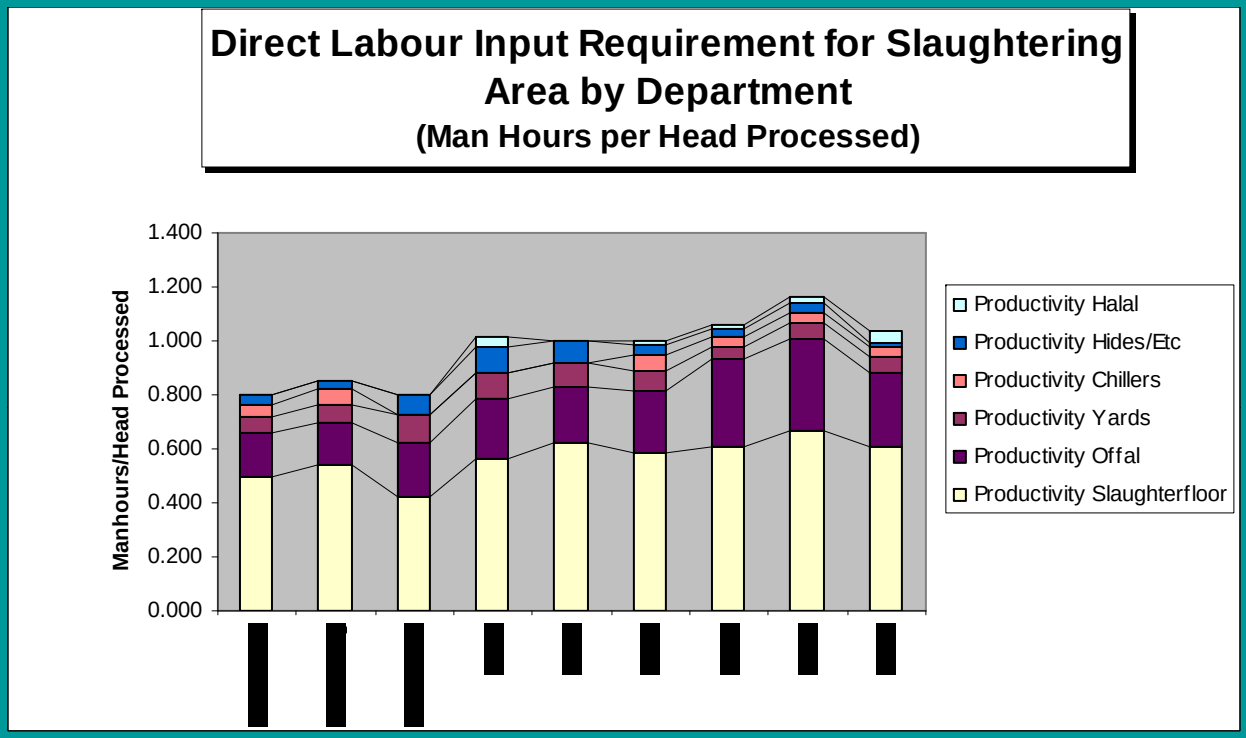
- **Slaughter Area functions** include yards, slaughtering, chiller delivery, edible offal recovery and packing, pet-food recovery and processing of rendering material.
- **Fabrication functions** include, quartering, carcase load out, delivery to the boning room, boning, frozen and chilled carton handling, carton preparation and delivery and load out.
- **Overhead functions** include all activities not included above (eg Administration, laundry, stores, maintenance, livestock procurement, QA, sales, etc).

Quartile Analysis



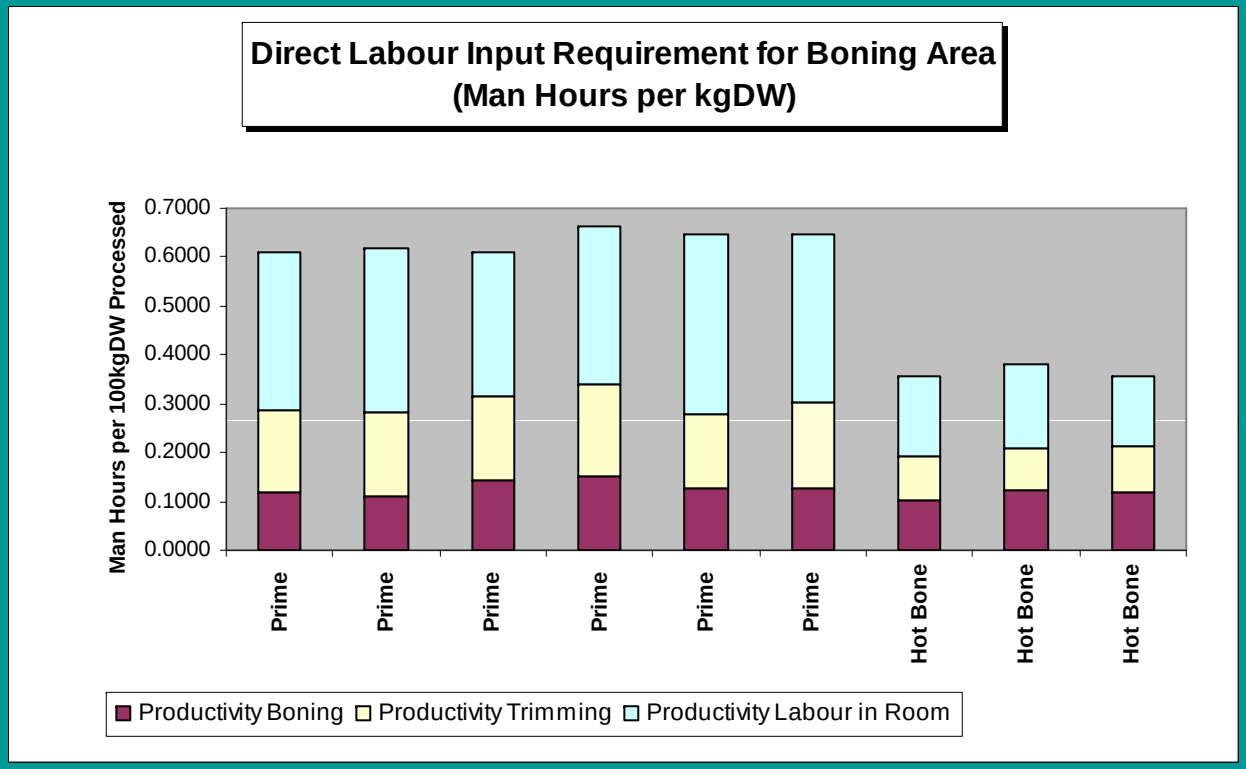
- These Charts provide an indication of the best, below average, above average and worst cost quartiles There is a wide variation in the costs encountered particularly in Overheads and in the poorer quartiles. Competitive plants should have the majority of indicators in the best quartile region.

Slaughter Area Labour Resource Requirements



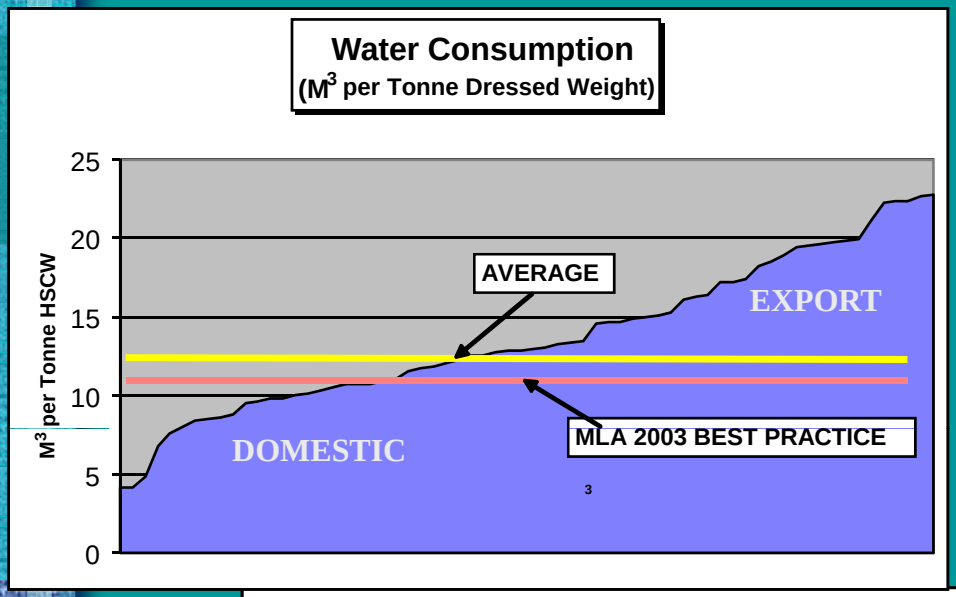
- As a wider range of cattle stock types are processed then the overall slaughter area productivity deteriorates. Offal productivity depends on the range of offal recovered and the range of specifications packed.
- Halal requirements impact at some plants

Fabrication Area Labour Resource Requirements

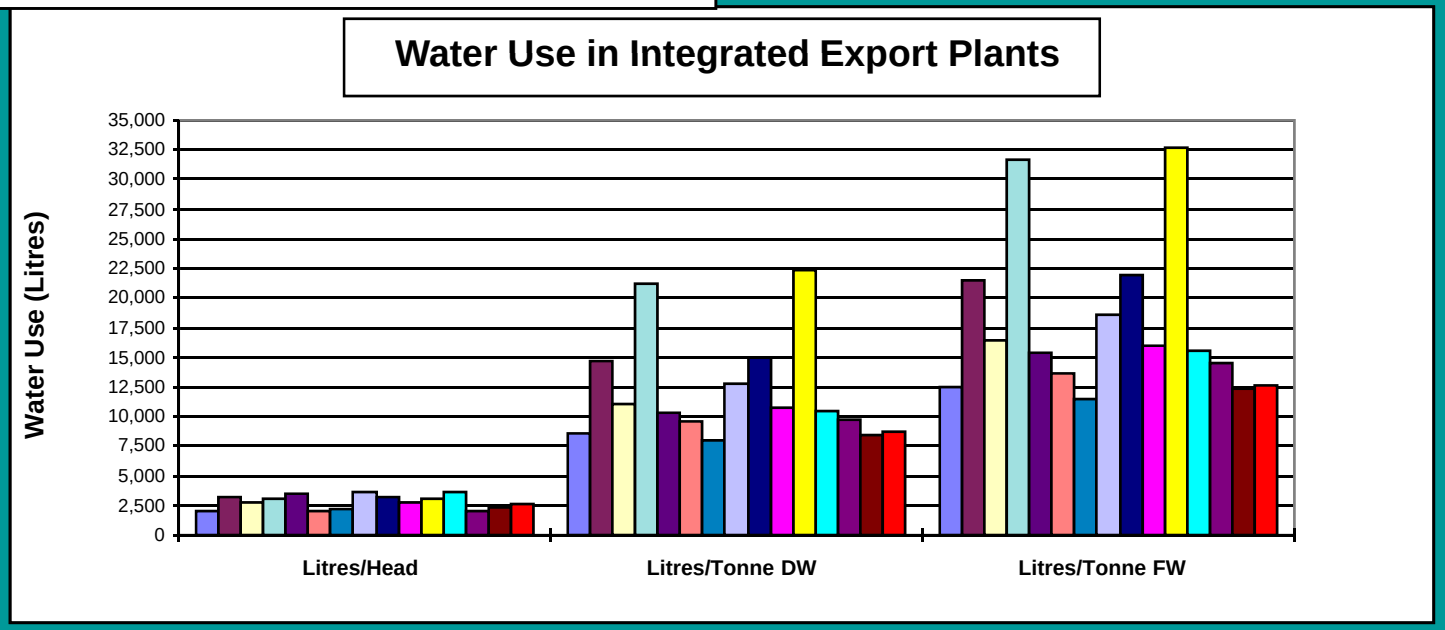


- Fabrication productivity can be significantly affected by carcase type, carcase mix and cutting specifications, as well as definitions of tasks.
- Only tasks to cartons exiting the boning room are included above.

Water Consumption



- Water consumption is highly variable depending on the compliance level of the plant and processes employed (eg white offal and intestines recovery).
- A number of plants now reuse and recycle water.



Reducing Demand for Water

- **Efficient spray nozzles**
- Nozzles can account for around 55% of total water use.
- Water-efficient spray nozzles can have a significant effect on total water usage.
- Correct selection and maintenance of nozzles. Appropriate spray tip required to achieve the desired result with minimal use of water.
- Durability and maintenance important.

	Abrasion resistence ratio	Flow increase from wear after 25 hours use	Flow increase from wear after 50 hours use
Aluminium	1	21%	26%
Brass	1	15%	17%
Stainless steel	4 - 6	4%	4%
Nylon	6 - 8	3%	3%
Hardened stainless steel	10 - 15	1%	1%

- **Centralised control of water supplies**
- Control water flow from a central point

Stock & Stockyard Washing

- ***Stock Washing***
  - Depends on the type and cleanliness of the stock.
  - Water use for stock washing increases significantly if stock are received in a dirty condition.
  - Feedlots are a source of dirty stock. Extra 80-100 litres/head can be used.

	Water flowrate (litres/min)		Typical time in use	Water use (litres/head)
	Range	Average		Average
Preliminary wash of heavily contaminated cattle				80
Manual pre-slaughter wash	50 - 240	100	0.5 min/head	50
Final spray wash		100	10 min/mob	50

- **Dry cleaning manure before washing**
  - Remove solid manure matter before washing. Can reduce water use by 20-30%. (Manure can be collected for sale).
- **Timer controls for stock washing**
  - Use timer controls to avoid waste

Slaughter-floor Demand

- **Viscera table wash sprays**
  - Viscera tables are a large user of water
- **Knife and equipment sterilisers**
  - Efficient continuous flow sterilisers
  - Double-skinned sterilisers
  - Water jacket sterilisers
  - Spray sterilisers
- **Steriliser Controls**
  - Set and fix a minimum flow-rate
  - Flow restrictors.
  - Temperature -controlled flow

Steriliser Water Use

	Water flow rate (L/min)		Activation time (seconds)	Water use (L/carcase)
	Range	Average		
	Continuous flow sterilisers			
Single-skin sterilisers	1 - 9	4.5		5.6
Single-skin sterilisers(with flow restriction)	0.6 - 4.5	1.7		2.1
Double-skinned sterilisers	1 - 8	4		4.9
Hot water jacket sterilisers	1.1 - 1.5	1.3		1.6
	Intermittent spray sterilisers			
Ring spray	6 - 18	15	10	2.5
Rose spray	-	3	10	0.5
Sparge pipe spray	-	4.6	10	0.8

Slaughter-floor Demand

- **Carcase washing**
  - Trim and spot cleaning with steam-vacuum systems
  - Use spray on bandsaw. Approx 8L of water per carcase.
  - Preferred technique dictate by food hygiene targets rather than water consumption considerations.
- **Manual versus automatic carcase washing**
  - Consider benefits of manual versus automatic washing.
- **Paunch dumping**
  - **Dry dump paunch contents**
    - Dry paunch dumping can reduce the loss of phosphorous to wastewater by around 40%.

	Water use (L/paunch)	
	Range	Average
Wet dump	145 - 310	220
Dry dump	7 - 20	15
2-step dry dump plus spray rinse		150

Red & White Offal Washing

- **Limit water use in washing & rinsing**
  - Don’t leave water running unnecessarily. Interlocking machine operation to a timer switch.
- **On/off control of flow**
  - Offal washing stations often run continuously. Use manually operated on/off controls to reduce water use.
- **Automatic spray washers**
  - Use tumblers with a perforated bowl to rinse offals.
- **Water efficient shower roses**
  - Use water efficient shower roses or spray nozzles for offal washing duties.

Plant Cleaning

- **High pressure water for cleaning**
  - High pressure water, supplied by a pressurised ring main. Higher pressure systems use less water and chemicals due to the mechanical cleaning action of the water jet.

	Water flow rate (L/min)	
	Range	Average
Low pressure cleaning hose	30 - 90	50
High pressure cleaning system	11 - 25	17

- **Improved dry cleaning**
  - Maximise Dry cleaning of plant and equipment prior to wash down.
  - Typically water use for cleaning can be reduced by 20—30% by using good dry cleaning practices. Dry cleaning also reduces product loss and pollutant load of the wastewater.
- **Automatic washers for tubs, cutting boards and trays**
  - Use mechanical washers for tubs, cutting boards and trays.
- **Floor cleaning machines for large areas**
  - Consider using floor cleaning machines.
- **Timers on water taps**
  - Install timers on significant water flow items

Amenities & Services

- **Amenities**
  - **Automatic controls for hand washing**
    - Use electrical sensors to control water supply. They overcome the problem of tap tampering.
    - Pneumatically operated valves can be operated by a foot pedal or ‘knee wand’, but switch off after a set period of time.

	Water use (L/carcase)	
	Range	Average
Knee-operated units	0.03-2.97	0.7
Sensor-operated units	0.04-0.04	0.04

- ***Plant services***
  - **Maximising condensate recovery**
    - Additional boiler make-up water not required.
    - Reduced chemicals use
    - Energy saving
  - **Conductivity controlled blowdown on cooling towers**
    - Control blowdown using a conductivity

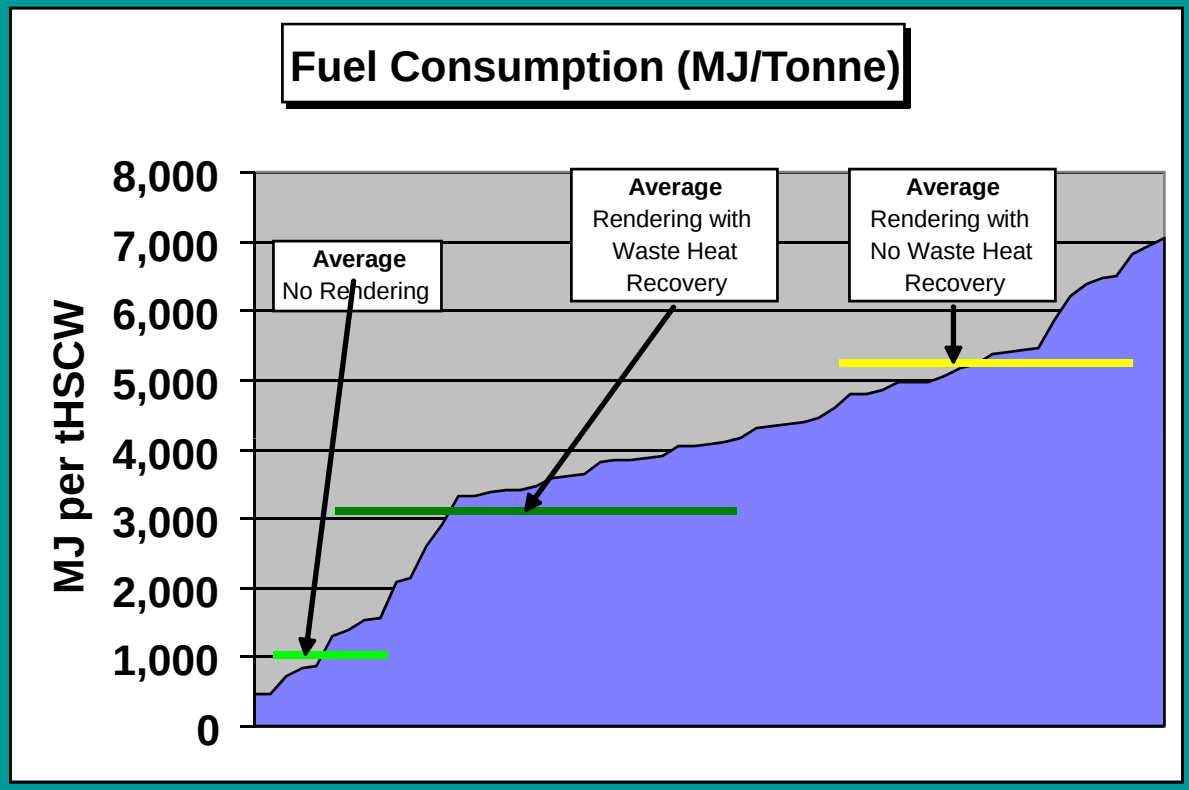
Reuse of Clean Wastewater Streams

- Some wastewater streams are relatively clean and may be used elsewhere in the plant for activities that do not require high quality water.
- The key to water reuse is the ability to segregate suitable wastewater streams from the main wastewater drainage system.
- Estimate the quantity and quality of water available for each reuse stream and match this with the quantities required for each potential application.
- Some form of treatment may be required.

Reuse of Clean Wastewater Streams

Potential sources of water for reuse	Potential area of reuse
Freezer defrost	Cooling tower makeup
Knife and equipment sterilisers	Stock washing (initial rinse)
	Stockyard washdown
	Pig scald tanks
Cooling water from pig singeing oven	Pig dehairing, scraping and brushing
Handwash basins	Rendering material chutes
	Sprays on trommel screens
Carcase wash	Rendering plant washdown
Viscera and bleed table final rinse water	Odour scrubbers
Edible offal wash water	Stockyard washing
	Truck washing
Head wash	Gut washing

Energy Consumption



- Waste heat recovery in rendering has a significant impact.
- Wet rendering has a lower energy demand than dry rendering.
- Good control of hot water consumption reduces energy demand.

Energy Use & Production

Example breakdown of energy use at a typical meat plant

Hot water

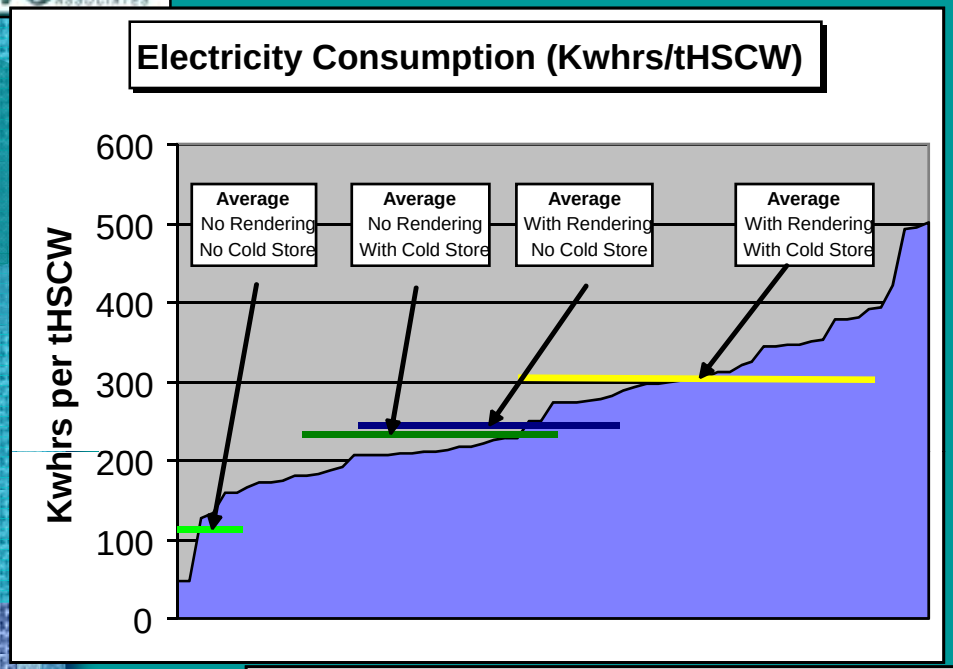
Areas of hot water use	MJ/day
Knife and equipment sterilisers	30,000
Hand wash stations	5,000
Slaughter and evisceration	15,000
Plant cleaning	25,000
Amenities	5,000
Tripe / bible washing	2,000
Hook wash tanks	1,000
Heat loss from hot water pipes	5,000
Total	**88,000**

Hot water production		
Hot water demand	88,000	MJ/day
Recovered heat	60,000	MJ/day
Supplementary steam heating	28,000	MJ/day

Reducing Energy Consumption

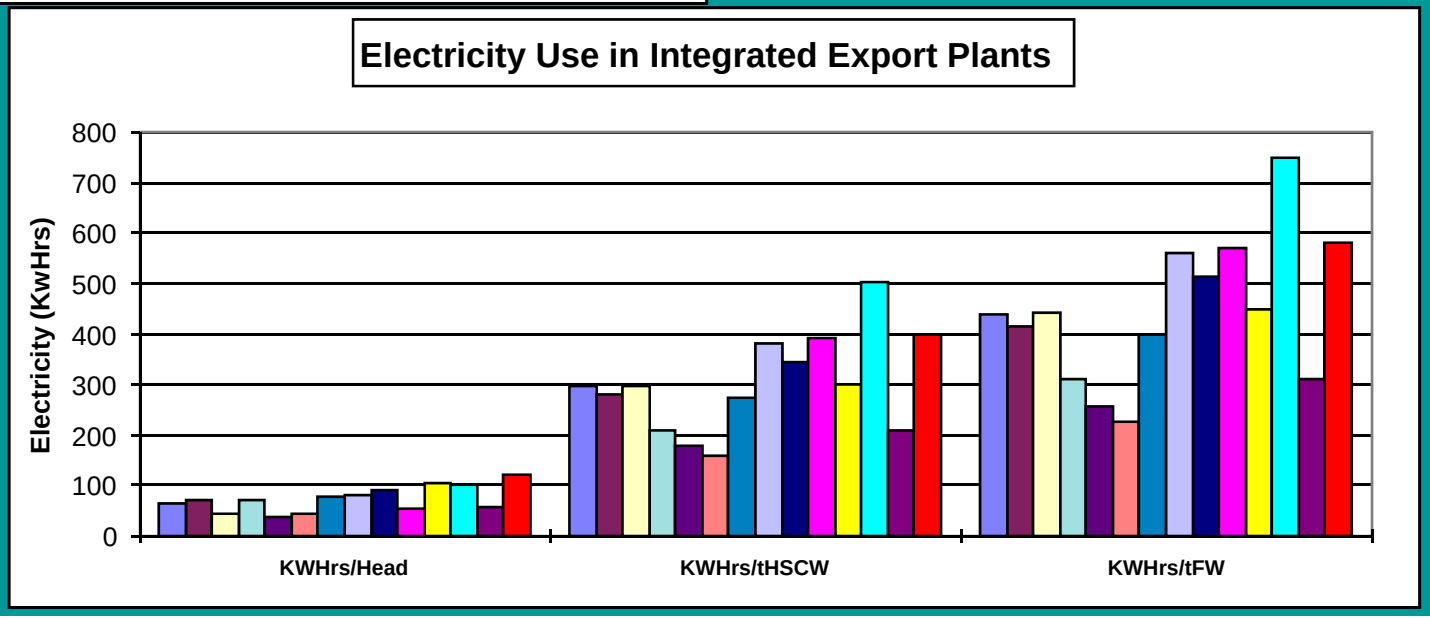
- Processing Departments
  - Reduce hot and warm water use
- Rendering
  - Reduce water entrainment in rendering materials
  - Control bleed area to avoid dilution of blood
  - Optimise heat recovery from rendering
- Services
  - Insulate steam lines
  - Rectify of steam leaks
  - Fine tune boiler firing operation
  - Mzximise condensate return
  - Rationalise steam lines
  - Recover heat from sources other than rendering
- Other
  - Consider using tallow as a boiler fuel
  - Consider biogas as a supplementary heating fuel

Electricity Consumption



Electricity consumption is dependent on in-house processes.

The use of plate freezers reduces electricity consumption relative to blast freezers.



Electricity Consumption

- Refrigeration utilises 60-70% of electricity consumption

Electricity		
Areas of electricity use	kWh/day	MJ/day
Refrigeration	22,222	80,000
Motors (pumps, fans, conveyors etc.)	15,000	25,000
Lighting	833	3,000
Air compression	2,778	10,000
Total	**40,833**	**118,000**

Reducing Electricity Consumption

- Refrigeration
  - Reduce heat ingress to refrigerated areas
  - Improve efficiency of refrigeration compressors
  - Optimise refrigeration cycles (consider VSD fans in chillers)
  - Plate freezing
- Services
  - Improve efficiency of air compression
  - Avoid over–capacity motors
  - Install variable speed drives where appropriate
  - Optimise piping layout to reduce pumping load
  - Install energy efficient lighting
- Other
  - Where there is no rendering investigate co-generation of heat & electricity

Meat Processing Resource Use

Resources use	Per unit of production
Water	10 kL/tCW
Energy Coal	150 kg/tCW
LPG	0.8 m^3/tCW
Electricity	300 kWh/tCW
Chemicals Cleaning chemicals	1.3 L/tCW
Wastewater treatment chemicals	0.2 kg/tCW
Oils and lubricants	0.2 L/tCW
Packaging Cardboard	31 kg/tCW
Plastic	1 kg/tCW
Strapping tape	0.7 kg/tCW
Waste generation	**Per unit of production**
Wastewater Volume	9 kL/tCW
Organic matter (COD)	38 kg/tCW
Suspended solids	33 kg/tCW
Nitrogen	1.7 kg/tCW
Phosphorous	0.6 kg/tCW
Solid waste Paunch and yard manure	47 kg/tCW
Sludges and floats	40 kg/tCW
Boiler ash	43 kg/tCW
Cardboard	0.6 kg/tCW
Plastic	0.07 kg/tCW
Strapping tape	0.01 kg/tCW

Finally

- Benchmarking can assist meat processors to understand where improvement opportunities lie.
- Metrics should be seen as guides not as facts.
- There are often reasons for variation from standard indicators.
- Good assessment of improvement opportunities requires a good understanding of processing variations and their impact.

It’s all Over