EFFICIENT ENERGY USE

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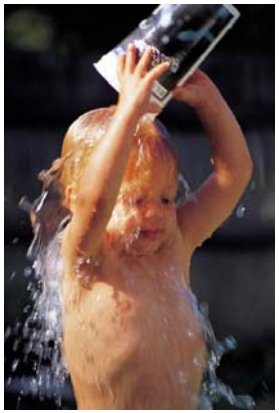
Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi

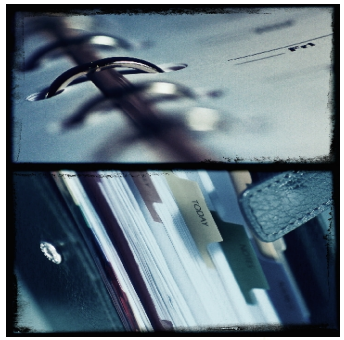
NOT ONLY BUT ALSO

This presentation “Efficient use of Energy” considers utilities in general



Agenda

1. The scope of previous AgResearch MIRINZ Utility Surveys
2. What was the outcome of the surveys?
3. Benefit to industry
4. What can be done on a day to day basis?
5. Planning for efficiency
6. Life cycle analysis
7. Potential for the future
8. Why bother with efficient utility use?



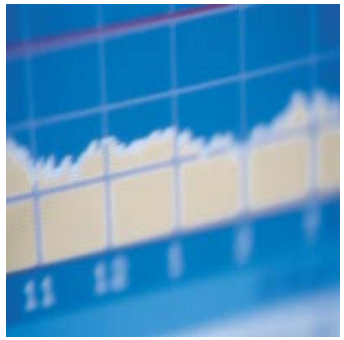
1. The scope of previous surveys

- Industry-wide surveys were carried out between 1974 and 1995
- Over that period we moved from using annual data to weekly data
- In 1993/94 Meat Plant Utilities Modeller was available to assist with data collection and analysis
- In 1993/94 water use was included for the first time
- By 1994/95:
  - data collected was a mix of monthly, fortnightly & weekly
  - Utilities Modeller or spreadsheets were being used by a number of plants

2. What was the outcome of the surveys?

The conclusions of the final survey (1994/95) included the following estimates:

- “the meat industry has the potential to save an additional 13.6% of its fuel consumption and 8% of its electricity consumption”
- “with capital investment, the industry has the potential to save about 22% of its fuel consumption and 12.7% of its electricity consumption”



3. Benefit to Industry: Improved Efficiency

	1979/80	1984/85	1989/90	1993/94	1994/95
SFC, GJ/t	6.2	5.84	4.14	4.08	3.59
SEC, GJ/t	1.76	2.01	1.89	1.74	1.53

3. Benefit to Industry: Confirmation of strategy

In-depth analysis of data from the 94/95 survey demonstrated that the range of energy use was well-explained by:

- The product mix
- The plant age

While it is not reasonable to expect a change in product mix, changing the plant age is being addressed by the re-building strategy being followed by a number of meat processing companies.

Benefit to Industry: What happened next?

- Funding for the surveys post 1990 came from MNZ and EECA, etc.
- In 1995/96 responsibility was handed to the meat industry
- MIRINZ offered to set up a continuous survey with annual reports to participating plants @ $1200 /plant/year
- There was little meat industry support for this move
- Surveys ceased

What else has MIRINZ done besides surveys?

AgResearch MIRINZ has developed a number of products that have the potential to provide better energy efficiency:

- COP Monitor
- NIFT-D
- Food Product Modeller
- Model Based Controllers
- Pulsed Electric Field water sterilisation

4. What can be done on a day to day basis?

- In order to reduce usage, you must understand what is being used and where.
- The surveys carried out considered the entire plant
- Data provided by the plants covered periods of between 1 week and 1 year (depending on survey year and plant)
- Monitoring and targeting requires a much more in-depth approach.

What uses energy?

Fuel usage in a typical rendering plant:

• Rendering process heat	75%
• Hot water	35%*
• Other uses (space heating, etc.)	25%

Electricity usage in a typical rendering plant:

• Refrigeration plant room	40%
• Freezers and stores	18%
• Services (air, hot water, etc.)	12%
• Air conditioning process areas	12%
• Meat Chillers	8%
• Rendering	8%
• Other	2%

*gained via heat recovery from rendering vapour and/or steam condensate

KISS - Keeping It Simple, Stupid

Look for the obvious first:

- Leaking air hoses / steam pipes / water pipes
- Check lagging/insulation on hot water / steam / refrigeration pipes
- Protect doors / ensure good door discipline to chillers and freezers
- Don’t run screw compressors part loaded for long periods
- Carry out chilling/freezing in the chiller/freezer, not in the cool/cold store
- Turn off unnecessary equipment
- Talk to the experts

The nuts and bolts

Spend a few $$'s

- Modulate fan speeds in chillers/freezers based on chilling/freezing requirements
- Monitor product temperatures so that refrigeration in chillers/freezers can be turned down once required temperatures are met
- 'Tune' chillers/freezers to reduce over cooling of product
- Recover waste heat and use to pre-heat for other processes/water heating
- Is steam really necessary?
- Use gas engine driven compressors in conjunction with co-generation, and recover cooling water waste heat

What happened to “Utilities”?

- Fuel and electricity are utilities, the other key utility used on-plant is water – as steam, hot, warm or cold.
- Water:
  - Is a finite resource
  - Costs to get into the plant (pumping & treatment)
  - Costs to distribute, heat and use on site
  - Costs to get out of the plant (pumping & treatment)
- On that basis, water deserves the same attention as fuel & electricity.
  - Monitor its use
  - Target improvements
  - Maintain and repair equipment used to provide, treat and circulate it

Water IS a Finite Resource

A recent MeatNews.com article contained the following:

- “Over-pumping of aquifers and surface water reservoirs has largely depleted the shallow aquifer under the North China Plain, forcing farmers, meat processors, and other industries to turn to the region’s deep fossil aquifer, which is not replenishable.”
- “Because over-pumping to satisfy growing food demand virtually guarantees a future drop in food production when aquifers are depleted, many countries are in essence creating a ‘food-bubble economy’ – one in which food production is artificially inflated by the unsustainable mining of groundwater.”

Lester Brown, head of the Earth Policy Institute, Washington, D.C.

6. Life Cycle Analysis

The concept of Life Cycle Analysis is gaining momentum

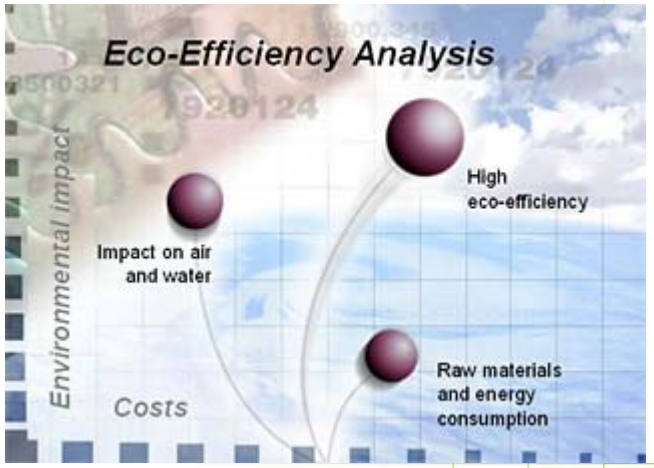
- It is becoming more important to consider the full “cradle to grave” impact of a product
- Individual countries will always try to protect their indigenous industry
- Some arguments presented will be more “perceived” than “real”

A recent example held up against NZ produce:

- Food Miles and dairy products in the UK

Even refrigerants come in for consideration:

- Carbon Dioxide as a refrigerant?
- On a LCA basis, is it really more efficient



7. Potential for the future: A Case Study for the future - now

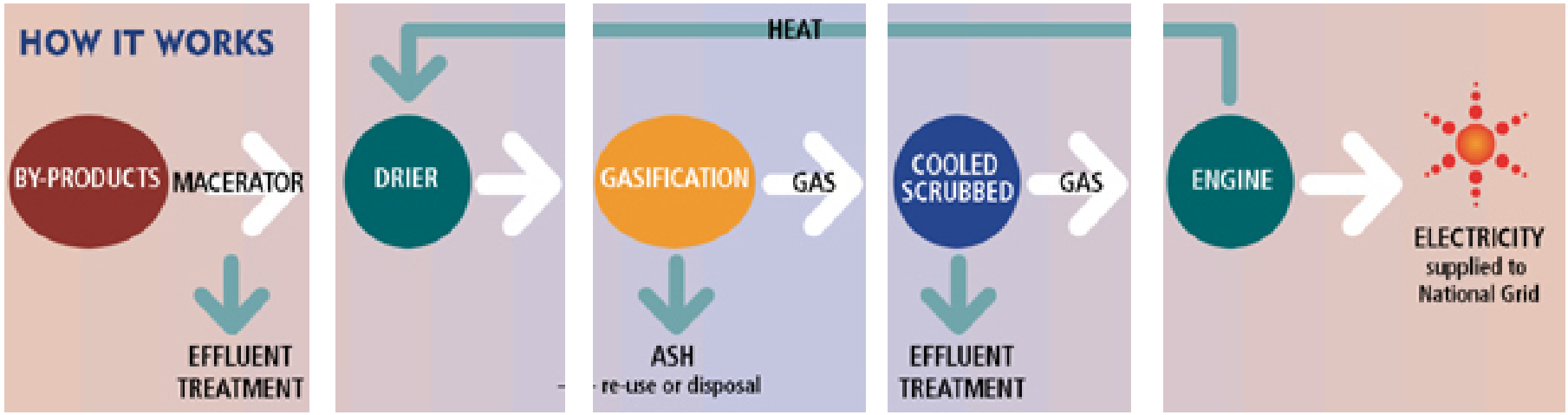
What can you do with processed animal waste?

- Prior to BSE
- Today?
- And the costs?
- The challenge faced

One such process involves heating by-products under contained conditions to release a gas which is then used to generate electricity.

The process, known as pyrolysis and gasification, is well established as a safe and extremely efficient means of energy generation in other parts of the world.

Banham Power – Renewable Energy



Stage 1 – Intake

Chicken by-products (e.g. feathers, head viscera) enter the plant at a rate of 8 tonnes/hour to be shredded into 6 mm particles in a macerator. At this stage, the material has a moisture content of 60% and a calorific value (CV) of around 24 MJ.kg.

Stage 2 – Drier

The shredded material is dried at temperatures of up to 500°C until moisture content has been reduced to below 8%. After drying, the material resembles Rockwool fibres

Stage 3 – Gas Converter

Thermal treatment takes place under contained, oxygen free conditions in a double-walled converter whose outer wall is heated to temperatures in excess of 800°C. This results in the production of a fuel-gas, known as syngas, and ash for re-use or disposal. At this stage, the ash represents just 7% of the original volume of material processed.

Stage 4 –Cooler

The gas is water-cooled and scrubbed to remove impurities. 12% of the gas produced is recycled to fuel the gas conversion process, a further 6% is used to run a thermal oxidising unit which de-odorises emissions to air. The remainder is used to generate renewable electricity.

Stage – Engine

The gas produced powers three 20 cylinder engines, each capable of generating in excess of 1.8 MW of electricity ready to be supplied to the National Grid. Heat from the engine exhaust is recycled to power the drier.

The Benefits

The benefits now

Additional employment opportunities created

A lifeline to other local processors

Reduced transportation of waste materials

Cleanest and most efficient way to handle by-products

Positive development

.....and for the future

A sustainable solution to post-BSE disposal of animal by-products

Transforming waste into clean, renewable energy

Local electricity supplies guaranteed

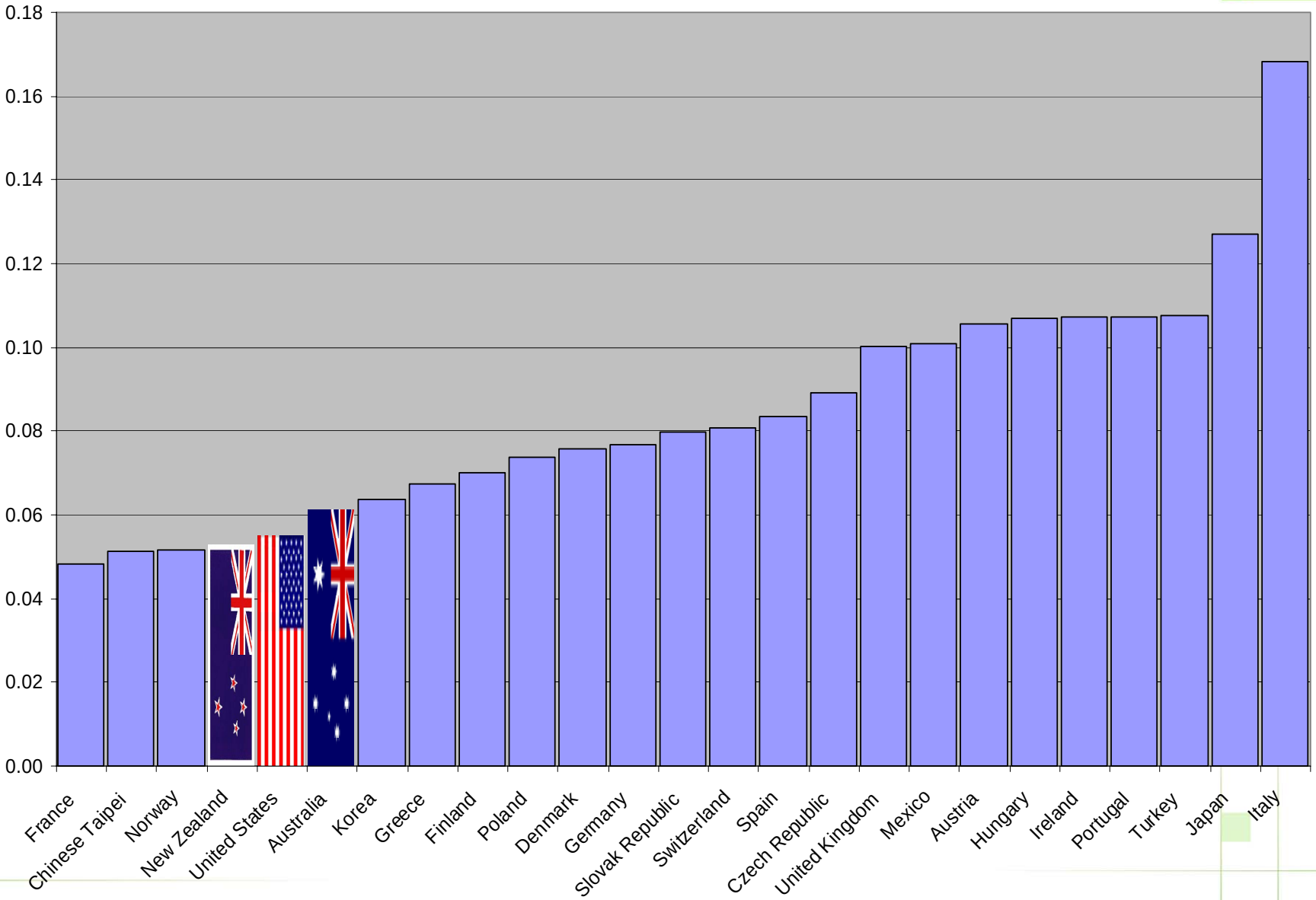
Helping achieve NZ targets for renewable energy

Establishing NZ as a leader in renewable energy resources

8. Why bother with efficient utility use?

- The risk of power failure is increasingly real.
- Power cuts and escalating electricity bills will result if urgent action is not taken
- Our efficient hydro systems are stretched to capacity
- Fuel for the non-hydro stations is escalating in cost
- NZ will struggle in the future to retain its low cost electricity

Electricity for Industry (2005 data)
USD/kWh



Electricity for Households (2005 data)
USD/kWh