

## SFMCA 2017 Energy Use Survey Report

### INTRODUCTION

The SFMCA commenced its energy surveys in in 2012 and this is the sixth annual report. The report is based on data from members that have voluntarily agreed to supply information relating to their energy use in the manufacture of stockfeed. The data generated from these surveys provides valuable comparative data for individual companies to benchmark their energy use against other manufacturers.

### OBJECTIVES

The SFMCA has undertaken this survey of members to generate information for two purposes:

1. Provision of collated data that members can use to benchmark their operations energy use and energy cost.
2. Calculation of greenhouse gas emissions and CO<sub>2</sub> production per tonne of feed manufactured, with the view of generating data trends over time.

### METHODOLOGY

All manufacturing members of the SFMCA were invited to voluntarily complete a survey of their energy use and cost for the 12 month period 1 July 2016 to 30 June 2017. Manufacturers were asked to exclude use within transport vehicles, both inward raw materials and outward feed delivery. In addition the quantity of solid organic waste removed from the site was requested, together with water use. The survey also required feed volumes being split between mash and pellets.

Mills were required to state their annual manufactured feed volume with this split between mash, pellets and liquid supplements. Pellets was defined as including feed manufactured through either pellet press or extruders.

*Explanatory Note: Information in this survey report is subject to the accuracy of data supplied from participating feed mills. Where data appeared to be in error, the respective mill was requested to verify the data supplied. SFMCA makes no representation as to the absolute accuracy of the data supplied by individual manufacturing companies.*

Confidentiality: Data from SFMCA members is presented in total figures, no individual company or site data is provided. All data supplied from SFMCA members is held as confidential and not for circulation to other parties.

# RESULTS

## 1. Survey Participation

In 2017 there was data submitted from 48 mills, this being a significant jump from the 29 sites supplying data in 2016. Increased survey participation may reflect the issue energy use and rising costs affecting manufacturing industries. The 2017 results includes data from mash only, mash and pellets and pellet only mills as shown in Table 1. There are also three sites manufacturing supplements and liquid feeds.

The average mill size from survey participants was 75,916 tonnes per annum, this being a reduction from the 111,440 tonne average for 2016. For 2017 there has been an increase in survey data submitted by medium and smaller size feed mills, as well as mash only mills. There were also two of the largest mills submitting data in 2016 that did not take part in providing 2017 data. This year has also seen the inclusion of data from three supplement plants manufacturing liquid feeds and dry supplements.

### Feed volume of sites taking part in the 2017 survey

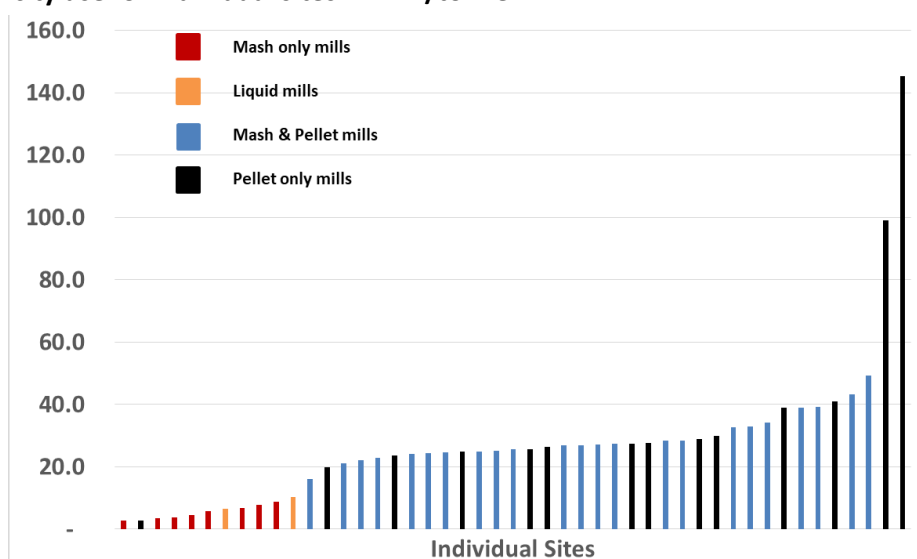
	Mash only	Mash & Pellets	Pellets only	Liquid & Supplement	Total
No. sites	8	24	13	3	48
Tonnes	364,682	1,512,563	1,710,160	56,571	3,643,976
Ave site volume - tonnes	45,585	63,023	131,551	18,857	75,916

## 2. Energy Use Data

**2.1. Electricity** – Electricity use was found to average 27.9 kWhrs/tonne with this being higher than previous years. This year’s survey includes more mills with most of the extra mills being small to medium in size. This may have pushed up the average electricity use per tonne. It however is not due to a higher proportion of pelleted feeds, as this has reduced to only 81.8% due to more mash feed mills taking part in the 2017 survey. A note of caution is required when viewing results from year to year as the annual data includes different mills due the voluntary nature of the data submission.

The lowest electricity use was in the mash only and liquid feed mills and, as in previous surveys, identifies the considerably lower electricity use in the manufacture of mash feeds (Figure 1). The highest use was within mills manufacturing extruded feeds. There was little difference between mills dedicated to pelleted feeds and those that manufacture both pellets and mash.

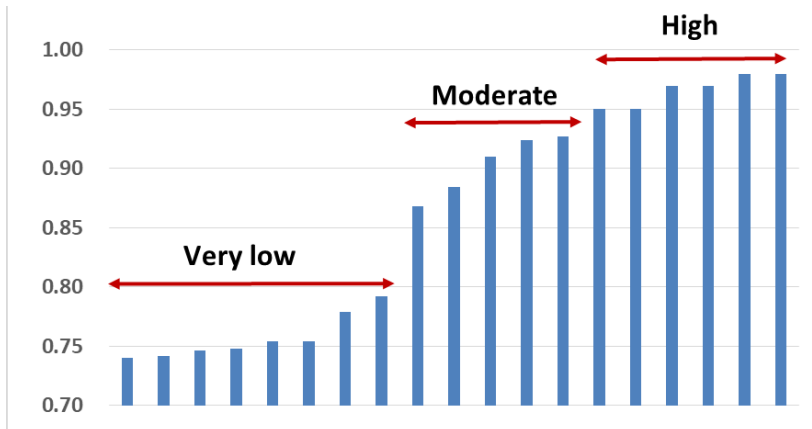
**Figure 1. Electricity use for individual sites in kWh/tonne**



There were 19 mills that provided power factor data with this ranging from 0.74 to 0.98. Figure 2 shows that a number of mills have a low power factor that identifies they are paying for electricity they are not using. Of further concern is the number of mills that do not identify their power factor and have little knowledge of this important measure in their electricity supply and use. A number of mills have reported their installation of power factor correction equipment to increase their electricity use efficiency. With rising electricity prices this expenditure is seen to provide investment benefits.

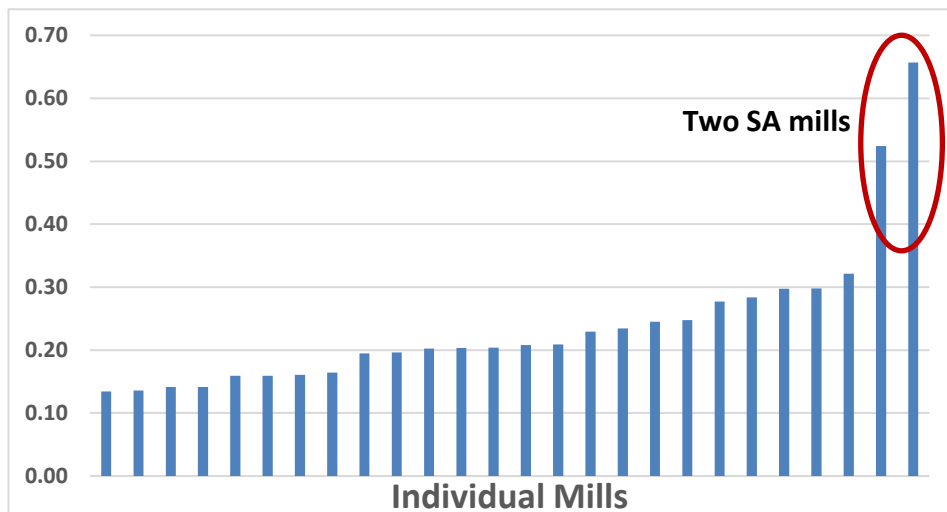
*Electricity supply includes real power that is used in equipment (motors, lighting, etc) and reactive power that is not directly used. Power factor is the relationship between the two. Mills that have low power factors are paying for electricity that is not being used. In effect a low power factor is in sites that are using only 70 to 90% of the electricity supplied and the best mills are utilising 90 to 99%.*

**Figure 2. Power Factor for individual sites**



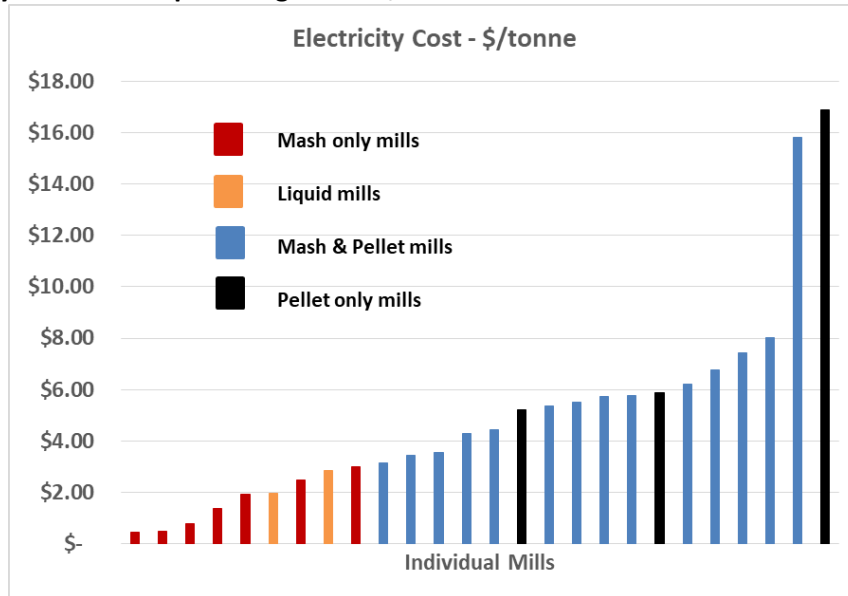
Electricity cost data was provided by 49% of the sites taking part in the survey. Mills were asked to provide their total annual electricity cost. This was excluding GST but including all associated network and any other charges. Together with electricity use and tonnes manufactured, the cost per kwh and per tonne of feed was calculated. Figure 3 shows two mills with electricity cost far higher than other sites. These are two different South Australian based companies that have experienced significant cost increases during the last 12 month period. Excluding the two SA sites with high prices, electricity costs are in the range 14 – 32c/kwh. What is not known is what point within supply contracts feed mills are positioned. A number of mills are known to have had longer term contracts, with the jump in costs more likely to be seen in the 2017/18 year.

**Figure 3. Electricity cost for individual sites - \$/kwh**



Based on electricity cost and volume data, Figure 4 shows the cost per tonne of feed manufactured for individual sites providing data. The shape of the figure is similar to Figure 1, with electricity use per tonne being a greater variable factor than electricity price per kwh. It is seen that mash and liquid feed mills have the lowest electricity cost at less than \$3/tonne while mills with pelleting capability range from \$3 to \$17/tonne with an average of \$6.70/tonne.

**Figure 4. Electricity use for mills providing data - \$/tonne**

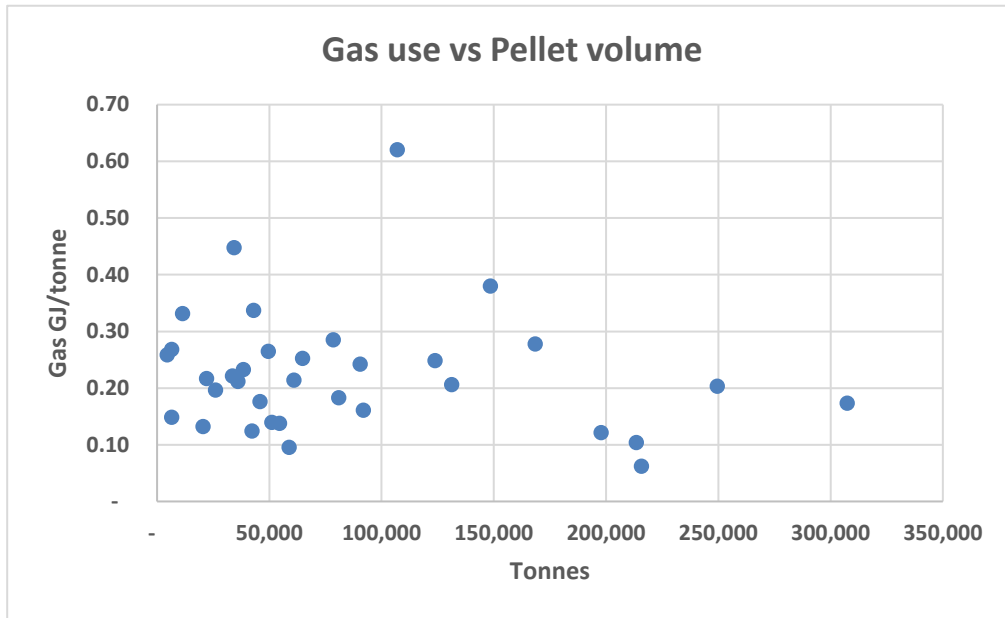


**2.2. Natural Gas and LPG** – gas is used primarily for boiler operation in feed mills with pelleting capability. Use of LPG for forklifts is minor relative to boiler use. The table below, from mills with pellet manufacture capability, shows that gas use when allocated against pellet manufacture ranges from 0.06 to 0.62 GJ/tonne. The significant range in energy use reflects different mill types, feeds they manufacture, boiler installation, pellet and/or extruder operation and product mix including length of production runs.

Gas Use	GJ/tonne pellets only
Lowest	0.06
Average	0.22
Highest	0.62

Figure 5 identifies no relationship between gas use per tonne of pellets manufactured and total pellet volume. Although the largest mills generally have lower gas use per tonne. There are a number of small mills that also operate with low gas use at 0.1 to 0.15 GJ/tonne. This would indicate that small boilers can be operated as efficiently as larger units for large mills.

Figure 5. Gas use (GJ/tonne) versus Pellet Volume manufactured (tonnes)



For mills pelleting feeds, 21 are utilising natural gas and 14 rely on the use of LPG for boiler operation. The price paid for natural gas and LPG reflects buying volume advantages for the largest milling companies. The following table provides the lowest, average and highest prices paid in 2017. The table excludes bottled LPG purchase for fork lift operation.

Gas Cost	Natural Gas \$/GJ	LPG \$/GJ
Lowest	\$ 7.29	\$ 18.52
Average	\$ 17.47	\$ 21.29
Highest	\$ 37.10	\$ 29.96

Gas cost (both natural gas and LPG combined) per tonne of feed, range from zero in some bulk mash feed mills to being a considerable manufacturing cost for mills with pelleting capacity.

Gas Cost	\$/tonne pellets only
Lowest	1.90
Average	3.93
Highest	7.33

**2.3 Diesel & Petrol** – the survey only includes diesel or petrol used within the feed milling operations. Excluded is diesel or petrol used in raw material or feed delivery vehicles. Of the 48 mills taking part, one mill uses diesel for power generation and two mills use diesel for boiler fuel. There was no significant petrol use in mills for feed manufacture purposes.

**2.4 Total Energy Use** – the survey data has been used to convert total energy used from electricity, natural gas, LPG, diesel and petrol into GJ energy units. The average energy use for all 48 mills taking part in the 2017 survey is 0.27GJ/tonne. It is seen that there is a very wide range in energy use, from very low use in mash feed mills through to almost 1GJ/tonne by the highest use mill.

Total Energy Use	GJ/tonne
Lowest	0.014
Average	0.274
Highest	0.98

The total energy cost including electricity, natural gas, LPG, diesel and petrol for all mills supplying data is shown below. The cost advantage of mash feeds compared to pelleted feeds is on average \$7.34/tonne.

Total Energy cost - \$/tonne feed manufactured	Mash only & Liquid Feed Mills	Mash & Pellets Mills Pellet only Mills
Lowest energy cost	\$0.43	\$4.59
Average energy cost	\$1.42	\$8.76
Highest energy cost	\$4.97	\$40.28

Based on the mills providing cost data, there has been a large increase in the cost of electricity, natural gas and LPG over the 12 months 2015/16 to 2016/17. The energy cost data needs to be treated cautiously. The average data is affected by different mills taking part in the two survey year periods. When viewing data from individual mills from 2016 to 2017, there are large differences in the cost changes. The high 356% increase in electricity is for a South Australia site coming off long term contracted prices at a time when the SA electricity market was impacted by supply interruptions. There are also companies that are yet to see significant cost increases as they are yet to complete their current contract supply periods.

**Energy Cost Increase 2016 to 2017 – average for mills providing data in each year.**

Energy Source	Average Cost Increase 2016 to 2017	Individual Mill Cost Change Range
Electricity	27.6%	- 9.8 to + 356%
Natural Gas	59.3%	+ 1.8 to + 108%
LPG – bulk supply	28.3%	- 6.8 to + 15.8%

**3. Carbon Emissions Calculation**

Carbon emissions calculations were completed in accordance with the National Greenhouse Accounts Factors published by the Australian Government Department of Climate Change and Energy Efficiency in July 2013. The Factors in use are the same as those used in previous energy survey reports to provide reporting consistency.

For solid organic waste, a conversion of 1.2X is applied i.e. every tonne of organic green waste equates to 1.2 tonnes of CO2 emissions. This conversion factor is based on green waste. This conversion factor may not be directly applicable to the solid waste produced by the stockfeed manufacturing industry but at this stage is the best available.

**Solid Organic Waste** for 2017 the average waste removed from sites was 1.5kg/tonne of finished feed and

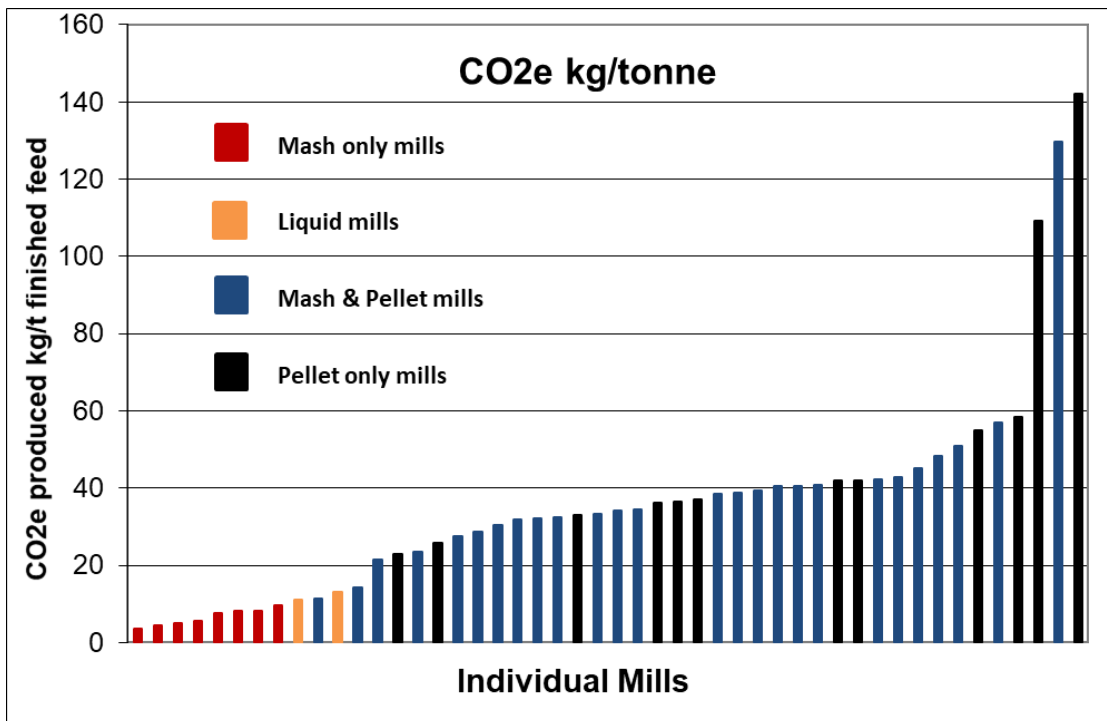
similar to the 1.4kg/tonne reported in the 2016 survey.

Solid Organic Waste	kg/tonne finished feed
Lowest	0.1
Average	1.5
Highest	6.7

#### 4. Carbon Emissions

The lowest CO2 emissions come from the manufacture of mash feeds. There is a large range in CO2 emissions for mills having pelleting capability, with mill volume and manufacturing efficiency being a major contributing factor. The highest CO2 emissions are from mills with pelleting capacity and a high use per tonne of electricity.

Carbon Emissions	Average kg/tonne	Range
Mash only, Liquid & Supplement mills	8.3	3.6 to 13.1
Mash/Pellet and Pellet only mills	37.2	14.1 to 142.1
Average all mills in survey	33.7	



5. **Water Use** is greatest for boilers and pelleted feed manufacture. The following water use is for mills with pelleting capability.

Water Use	Litres/tonne finished feed
Lowest	62.5
Average	86.5
Highest	121.0

## DISCUSSION

This is the sixth year of energy use data collection for Australian feed mills. The following comparison table provides the average mill data for 2012 to 2017. This data is for all mills taking part in each survey year and does not distinguish between mash and pellet feed mills.

	Average mill taking part in survey					
	2012	2013	2014	2015	2016	2017
<b>Feed volume - tpa</b>	58,411	93,974	83,229	93,336	111,440	75,916
<b>Electricity use - kwhrs/tonne</b>	25.2	25.4	23.6	27.0	27.2	27.9
<b>Gas use - GJ/tonne</b>	0.180	0.184	0.179	0.192	0.190	0.190
<b>Total energy use - GJ/tonne</b>	0.260	0.257	0.265	0.280	0.300	0.274
<b>Water use - litres/tonne</b>	87.7	77.1	88.6	88.7	99.9	86.5
<b>CO2 emissions - kg/tonne</b>	35.1	32.0	32.2	36.8	36.5	33.7
<b>TOTAL FEED IN SURVEY</b>	2,548,326	3,791,273	3,578,868	3,486,068	3,425,420	3,643,976

The 2017 survey had seen a reduction in average mill size as two larger mills did not participate and several small to medium size mills have submitted data for the first time. The higher 2017 electricity use is felt to be due to the shift in mills taking part in the survey. Gas use that is largely going into pellet feed manufacture is relatively stable from year to year.

Total CO2 emissions has dropped in 2017, this being a function of proportionately more mash feed being included within the survey total tonnes. This year's data through the inclusion of more mash feed mills is felt to be more representative of the Australian feed manufacturing industry than the previous year.

**Acknowledgements:** The SFMCA thanks all the feed companies that participated in submission of data for the survey.

**Further Information:** Enquiries relating to this report should be directed to John Spragg, Executive Officer SFMCA, phone 03 5659 9256 or email [jspragg@sfmca.com.au](mailto:jspragg@sfmca.com.au).

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