

# Beard & Brau Farmhouse Brewery

## Sustainable Manufacturing in Action

- 33% material reduction per carton
- 30% reduction in cleaning chemical use
- 100% of processing water captured on site in rainwater tanks
- 40% reduction in water use
- 23% reduction in energy resulting in a reduction in energy costs from \$700 to \$480/kL beer
- Waste turb and spent grain used as feed supplement by local sheep grazier

Beard & Brau Farmhouse Brewery (B&B) is an independent brewery located on a farm in South East Queensland's Tamborine Mountain.

As a craft brewer, B&B's primary mission is to value-add to the brewing process to produce uniquely flavoured beers of the highest quality. Interestingly this involves retaining many traditional and natural processes whilst employing advance management methodologies, green technologies and research and development to help advance sustainable brewing practices.

B&B sell their craft beer locally, including through their own Tapas Restaurant & Beer Bar, the Malty Grain and though interstate

outlets and bars.

Producing a high value product for a small boutique market unwilling to compromise on quality means manufacturing cost margins are tight. To stay both economically and environmentally sustainable, Beard and Brau's directors, Chris Herring and Tanya Harlow have actively sought to identify and implement ecoefficiency opportunities across every aspect of their business.

***"If it's from the farm it goes back to the farm."***

**Chris Herring, Beard and Brau Farmhouse Brewery**

## Material Inputs and Product Design

### Ingredients

By employing a high level of process control and expertise B&B is able to craft beer that is unfiltered, naturally carbonated and free of additional preservatives or additives. Passionate about revitalising the community values of a village brewery and conscious of their carbon footprint, B&B use natural ingredients they can procure locally. The brewery's malt, grains, cocoa and vanilla are all sourced from Queensland & Australian producers, only their hops are sourced from Australia and overseas. Botanicals such as nettles and elderflower are grown on site while lemon myrtle and finger limes are supplied by nearby farms.





## Packaging

B&B actively seek to ensure its packaging is made from recycled content and suitable for either reuse or further recycling after its initial use. This includes using Australian made, amber glass bottles made from 80% recycled glass rather than clear glass bottles. The glass supplier is a signatory of the Australian Packaging Covenant and accepts all wrap (used for the delivery of glass bottles on pallets) returned by B&B for recycling. The bottles are recyclable and the brown glass provides natural UV protection so additives that prevents the beer from skunking and producing an offensive taste and smell are not required.



Amber glass bottle with PVC free seal

The business has also sought to light weight its packaging material by converting from 330ml bottles to 500ml bottles. Because 500ml bottle only contain 10% more glass than their 330ml counterparts the business can now bottle the same amount of beer per carton whilst reducing the number of bottles from 24 to 15. This initiative has reduced material resource consumption per carton by 33% and significant

reduced labour times in what was a previously a bottleneck in the production process.

B&B have also chosen to use polyvinyl chloride (PVC) free bottle cap seals which are recyclable. The seals are essential for reducing the transmission of oxygen into the bottle which can reduce the beer's shelf life.

Cardboard boxes used to package the final product are made from 100% recycled materials. Again, B&B support local businesses to meet their packaging, label design and printing needs.

## Chemicals

B&B treats its brewery's effluent on site. B&B is a dry brewery as all its drains are underground and flow to a single sump pit. This provides not only a safer and more pleasant work environment but also reduces cleaning requirements. Collected wastewater passes through multi staged digestion processes using naturally occurring bacteria and enzymes. The treated water is then irrigated onto the farm's pastures.

Cleaning chemicals traditionally used by breweries would harm the microorganisms treating the site's wastewater and pollute the receiving environment. B&B have worked closely with AIRD Chemistry to develop and test a range of biodegradable cleaning chemicals for the brewing and wine manufacturing and service sectors. The benefits have been multiple. In addition to enabling water to be treated on site the environmentally friendly chemicals have also significantly

reduced freight costs as B&B no longer have to pay for their chemicals to be delivered in a Dangerous Goods Truck.



B&B's Aquanova onsite wastewater treatment system

## Manufacturing

### Water

Many breweries pre-treat their incoming water with a reverse osmosis carbon filtration or other types of filtration system. B&B however capture all the water they require in rainwater tanks. Water is a vital ingredient in beer and consumes around 45% of all the water entering the brewery. The remaining water is used predominantly for cleaning. Water is treated with a 0.5-micron filter and then UV sterilised before salts are added to make the water more palatable for the yeast and to produce different styles of beer. Capturing rainwater not only saves money but ensures a consistent quality and flavour in the beer manufacturing process. It does however mean water efficiency is paramount, especially given the region has faced many extended dry spells in recent years.





B&B has reduced its overall water consumption by 40% and is now at world's best practice, using 1.8-2L of water for every litre of beer they produce. Initiatives have included:

- Changing the breweries cleaning regime. The biodegradable chemicals developed and tested by B&B and AIRD Chemistry have reduced the breweries water consumption by 24%. See Table 1.
- A new automatic keg washer that reduces LPG gas usage and water use from 200L/hr down to 130L/hr whilst also reducing the risk of Repetitive Strain Injuries.



Rainwater tanks for water supply

## Energy

The biggest challenge for B&B is reducing its electricity consumption. In addition to installing a 2.6 kW solar photovoltaic (PV) system on the brewery's roof the business has implemented a number of measures to reduce electricity and Liquid Petroleum Gas (LPG) use, reduce greenhouse gas emissions and to manage the heat mass within the brewery. Initiatives have reduced energy consumption by 23% resulting in a reduction in energy costs from \$700 to \$480 per kilolitre of beer.

**Table 1: Traditional vs biodegradable cleaning**

Traditional cleaning and sanitising chemicals for washing brewing tanks			Biodegradable cleaning and sanitising chemicals brewing tanks		
Product	Temp of water (°C)	Amount (L)	Product	Temp of water (°C)	Amount (L)
Caustic wash	80	100	Beerox or Cleanskin	40	40
Rinse		30	Rinse		10
Phosphoric wash	60	100			
Rinse		30			
Peroxide wash	Ambient	100	Vinisan	40	40
Rinse		60	Rinse		10
<b>Total</b>		<b>420</b>	<b>Total</b>		<b>100</b>

Initiatives have included:

- Two phase heat exchangers (water and then glycol) are used to recover heat during beer cooling to heat cleaning water and to preheat vessels for the next batch. Beer is cooled at a rate of 12L/min from 98°C to 8°C.
- Biodegradable chemicals are used to reduce hot water requirements. The previous cleaning regime required hot water to be over 80°C for the caustic wash. Water heating can now be reduced to 40°C resulting in considerable LPG savings.



Foilboard Green® panels on the brewery's roof

- Along with strategically placed vents and fans to expel unwanted heat B&B use Foilboard Green® panels (R2.5) to insulate the brewery. Maintaining a constant temperature is very important in the brewing process. The panels have a core of fire retardant expanded recycled polystyrene laminated by aluminium. No volatile organic compounds are used in their manufacture and they are 100% recyclable.

## Waste

When it comes to waste management, B&B's philosophy is that *"if it's from the farm it goes back to the farm"*. This means that with the exception of pallet wrap all waste is beneficially reused:

- Trub and spent grain constitutes a large percentage of the brewery's total solid waste. The nutritious by-product is used as a feed supplement for a local sheep grazer who supplies meat to the B&B



restaurant. This is beneficial to the grazier during drought periods.

- Plastic supports and CHEP crates are returned to the supplier for reuse.
- Stain steel kegs are returned to B&B for cleaning and reuse.



Grazing pastures are irrigated with treated wastewater and yeast by-product

## Business Processes

B&B brews over 28 different types of beers annually. The ability to maintain consistency and to track each batch for quality purposes is critical. B&B applies a 6 Sigma approach to each batch to identify and quickly resolve any defects in the process. 6 Sigma is a data driven methodology that involves undertaking frequent measurements during the process and then statistically analysing the results to ensure



A work station with necessary items in close proximity

they are within six standard deviations between the mean and the nearest specification limit. Data is then stored as part of B&B's document quality control system and linked to a batch code that is labelled on every bottle or keg leaving the brewery.

B&B have also applied the workplace organisation method 5S which translated from the Japanese language are to "sort", "set in order", "shine", "standardise", and "sustain". This approach makes work easier and has been applied by B&B to eliminate obstacles and unnecessary disturbances, to prevent the loss of time and to create smooth and easy workflows. The approach maintains safety and high levels of hygiene necessary in food processing and sets and maintains high process standards.

## Social Responsibility

As demonstrated in their procurement processes B&B "*like everybody to succeed*" - Chris Herring.

When first starting out in the craft brewing business a decade ago the business's directors had to take a leap of faith and risk a significant upfront investment. B&B is conscious of the industry's tight margins and now mentor interested start up craft brewers.

## The Future

B&B seek to continuously improve their environmental and economic performance. They are exploring the possibility of capturing heat off their refrigeration's compressor for heat and steam generation plants

to further reduce their hot water usage. For example, cleaning kegs with steam could reduce their water consumption from 30L to just 10L per keg. They are also keen to reduce their reliance on grid electricity and are investigating options that will allow them greater solar capture and battery storage.



B&B sponsor and produce specialty beer flavours for local festivals and shows

This case study has been prepared by The Ecoefficiency Group Pty Ltd for the Queensland Department of State Development in 2017.