# Making sustainability pay

photolibrary.com

**Following last year's launch of sustainability guidelines by the Engineering Council, Steed Webzell takes a look at today's key issues and responsibilities**

Energy conservation and recycling, paperless operations and zero waste to landfill. All three terms are in increasingly common use throughout industry. Some campaigns are self-driven by responsible plant operators; others are manufacturer-led or driven by the growing raft of standards and legislation. But, while no-one argues against the merits of sustainable industry, in the real world there is almost always a cost associated with such initiatives.

As Marcus Dodsworth, technical service division manager at family-owned engineering partnership Shenton Group, puts it: "Ultimately, available capital has to be spent in a manner that keeps the ship afloat. However much we subscribe to the green agenda, and however much we want to act responsibly on climate change, the blunt truth is we have to attend to our basic business profitability."

That said, the goods news for sustainability is that several carbon reduction technologies are capable not only of improving a plant's environmental standing, but also of paying for themselves – and sometimes remarkably quickly. Combined heat and power (CHP) systems that allow heat and electricity to be generated simultaneously from a single site-based packaged unit provide an excellent example.

Scorpion Power Systems' (part of Shenton Group) CHP offering is based on a natural gas engine-driven generator. Waste heat from the engine is absorbed via a water jacket and heat exchanger, and the heated water then connected to an existing plant heating system where it supplements boiler firing. Electricity generated can then be connected to the mains system to boost or replace power purchased from the grid.

"As a rule of thumb, producing 1kW of electricity creates 2kW of usable heat energy," asserts Dodsworth. "Our CHP systems capture most of the waste engine heat, making them over 84% efficient." So, if your annual electricity costs are in excess of £200,000 and the plant has a constant need for hot water, for example, a CHP system like this could save around £40,000 per year, according to Scorpion's calculations.

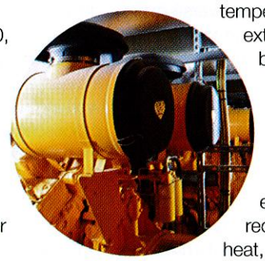
Meanwhile, Ener·G also champions CHP systems for sustainable heat and power, and cites a recent installation at BV Dairy in Dorset as an example of just what can be achieved, particularly when CHP is used in conjunction with pioneering liquid anaerobic digestion (AD) technology. Its high rate AD plant has been designed and built by Clearfleau, while Ener·G is supplying and operating the CHP technology (hired for a two-year period, prior to capital purchase) that will burn the biogas and convert it into renewable heat and energy.

BV Dairy in Dorset is using combined heat and power (CHP) with pioneering liquid anaerobic digestion plant

## Energy from effluent

Indeed, when this plant becomes fully operational later in August, BV expects it to generate more than 75% of the site's electricity. In fact, the 190kWe CHP system will be capable of generating 1,539MWh of electricity and 1,685MWh of heat per annum from effluent, so reducing the dairy's reliance on fossil fuels and pushing it well on its way to a targeted 65% reduction in its carbon footprint.

But CHP is not the only game in town when it comes to sustainability. The A-B InBev brewery at Magor in Wales engaged the services of Lorien Engineering Solutions to tackle its energy consumption, and went for a programme of no fewer than 40 projects affecting just about every aspect of its operation, including the utilities and packaging plants. The brewery now reports a combined payback of less than 18 months, with, for example, an energy efficiency improvement of 12.2% per hectolitre of beer produced between October 2008 and March 2010, and water usage per hectolitre reduced by 20.7% during this last year.



## Team effort

It didn't come easy, though: much of Magor's success was due to the hard work of the whole brewery team. Everything from leak detection and repair programmes to rewriting operating procedures to minimise water and energy losses was undertaken. One of the more novel projects also tackled the energy-intensive process of conveying spent grain by installing a low pressure compressor system, while another involved replacing low- and hi-bay lamps and fittings with new induction lighting. And Magor also installed carbon dioxide vaporisers that use waste heat from its secondary refrigerant plant, instead of steam.

Tackling wasted energy in the form of steam losses is another classic for the many plants that use it for space heating, process heating, hot water, humidification etc – and there are sustainable solutions here. "Typically, of the money a plant spends on producing steam each year, around 45% is lost, when up to 40% could be recovered by using reliable steam traps," says Grant Bailey, sales and marketing director at Thermal Energy International.

He also refers to equipment such as TEI's Flu-Ace, which can recover up to 90% of heat otherwise lost via a boiler's exhaust flue, while also reducing carbon emissions and energy bills by up to 20%, NOx and SO2 emissions by 20% and 90% respectively and particulates by 50%. TEI installs a condensing heat recovery system adjacent to the boiler stack, which drops the flue gas temperature below the dew point and extracts energy through a heat transfer bed.

Essentially, the unit taps into the existing flue and passes the flue gas through a short tower, equipped with a direct contact spray system. The shower passes over a heat exchanger at the base of the unit, recovering both sensible and latent heat, while flue gas flow is maintained via an automated variable speed, induced draft fan at the tower outlet. Hot water at up to 63°C accumulates in the tower's receiver, where it is treated before being used for boiler water make-up, CIP (cleaning in place) or any other hot water service. It can also be coupled with the economiser to preheat the boiler feedwater after the feed pump.

Bailey puts the average figure for consumed energy wasted out of boiler exhaust stack alone at 18%, which, along with other losses, means that for every pound spent only 55p of energy is used. This, he says, can be regained not only by installing Flu Ace, but also Gem steam traps, resulting in waste typically reduced to 17% – so providing an extra 28p of energy for every pound and delivering 50% more energy for your money.

Of course, sustainability is about far more than energy-saving and energy recovery, important though these both are. It's also about reducing

## Pointers

- However much plant managers subscribe to a green agenda, it has to pay
- Some carbon reducing technologies do pay for themselves very quickly
- Natural gas combined heat and power typically creates 2kW of heat for every 1kW of electricity
- Anaerobic digestion technology can add biogas for the fuel
- Plant engineers should consider everything from steam leak detection and repair programmes to low energy lighting and new conveyor technology
- Higher efficiency boiler equipment, such as reliable steam traps or condensate recovery systems, can make a massive difference