PUBLICATION

Crunching “sustainable” cookies

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The bakery industry is a large supplier of jobs and revenue, but on the other side of the coin it is hungry for energy.

In the UK, the government's leading low carbon agency Carbon Trust (CT) has issued a report stating "energy savings available within bakeries can be significant due to the high energy consumption of baking itself, which costs an average bakery £335,000 per year", over €380,000. "Ovens are responsible for 35-45% of total site carbon emissions", and in a typical direct-fired gas oven "hot air exiting the flues is responsible for around 20% of gas use. This makes no contribution to heating bread dough and is a direct loss".

CT experts measured gas volumes produced during baking in some pilot plants, and then analysed the effects of improving the oven balance (reducing the amount of exhaust air to match the burner air) using sensors, a ratio controller and a variable speed fan. The production modelling trial allowed savings of 4.7%.

Further measures recommended for cutting energy loss include reducing the thermal mass of tins (a 30% cut in tin weight would produce a 3.5% saving in overall oven thermal energy use) and recovering heat from flue gases, especially in indirectly fired ovens. "Up to 50% could be recovered. While some of this is already being done, more could be done through the use of condensing heat technologies," says Al?Karim Govindji, senior manager at Carbon Trust.

But it is also true that the benefit of deploying these measures depends on the type of ovens used. [All the innovations] need to be tested under real life conditions to see if the energy savings justify the technology deployment cost," Govindji points out. "Older ovens require more technology at a greater cost and so would be unlikely to see a good return on investment (ROI)".

A recent example of modernisation is given by Gullón, a Spanish bakery manufacturer that has produced biscuits and cereal products since 1982 and has the largest facilities in Europe. They started on a small scale from a pilot plant, a first step for a centralised and automated system of production and energy management.

The tests have been carried out under the European project Reemain. The aim is to cut electricity bills, and also CO2 emissions by 360 tons, explains project manager Carlos Zaballos. Firstly, the company wants to reduce the consumption of natural gas, the main source of energy used, and install heat recovery systems in the oven.

Secondly it is important to maintain efficient cooling control. Their factories are located 900 metres above sea level. Therefore, they decided to use the outside cold to reduce the work of the cold water generators, thus saving electricity, adds Zaballos. Another feature is the improved refrigeration management and control which use a series of innovative sensors.

In addition, the hot water systems are combined to make the plant work to maximum performance. And finally there is a monitoring and data acquisition system to check production against energy consumption in a production line.

There are certain lessons the bakery sector can draw from other experiences. The British Clearfleau company built an on-site industrial anaerobic digestion (AD) plant at Nestlé's Fawdon confectionery factory, near Newcastle, UK.

AD is a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen, converting it into biogas that can be used directly as fuel. It should produce enough heat and power to meet about 10% of the site's overall energy needs. Greenhouse gas emissions are expected to be reduced by about 10%.

This system converts food waste from the site's manufacturing processes into renewable energy and clean water. "We have a digestion system that is very different from most anaerobic plants across Europe including farms, retail or households. It is designed to treat liquid residues from food factories," says the marketing director of the company, Richard Gueterbock. "So it is a small plant, it fits on the factory site and it is able to deliver energy back into the factory," he concludes.

By Joan-Carles Ambrojo