

The Long Road to Renewables

Slough Heat and Power is a well established company which has been generating energy from biomass for around a decade.

A power station and underground distribution network has supplied energy to Slough Trading Estate since the 1920s. Covering 500 acres, it is the largest trading estate in single ownership in Europe. With 400 buildings, uses range from warehousing and retail to high-tech industries and their peripheral services. Customers require a high degree of security and some require steam or pressurised hot water for processing. In order to maintain continuity of supply well into the future, a rather radical decision was taken in the early 1990s. The board voted to move away from fossil fuels and invest time, effort and money in 'renewables'.

For a business looking to secure a diversity of supply, 'renewables' provide plenty of options. Finding the right fuel inputs was just the start. Andrew Ellis, Deputy Managing Director of Slough Heat & Power (SHP) explains, "We looked at a number of different fuels, particularly waste derived fuel. We considered tyres, wood pellets, even sewage



To the right, the front of the fuel store. The building on the left houses the biomass boilers. Between them can be seen the conveyor that connects the infeed system to the boilers.

sludge."

The first 'renewable' investment was made in the mid 1990s. Packaging materials and non-recyclable paper from recycling facilities are delivered to SHP's revolutionary on-site processing facility and made into ready-to-burn briquettes called Fibre Fuel.

Dr Ellis continues, "We looked at what was happening in the energy markets – gas, oil, coal and electricity. Wood was a fuel opportunity with fewer fluctuations and more stability than other markets." With help from the Coal Research Establishment and a consultant from ADAS, SHP ordered a study into the viability of wood as a sustainable long-term resource. "The report concluded the whole of Southern England is largely forested. No question – there was enough wood! With waste-derived fuel and wood, we could offer a value-added utility service with green credentials. It seemed like a good combination, without suffering the sort of market variations you get with gas."

Examples of working 'renewable' power stations are few and far between in the UK. SHP opted to design their own, using in-house engineering skills where possible. Dr Ellis says, "It was decided early on that we would modify existing equipment. Over the last fifteen years our two main investments have been to build and adapt two new boilers, originally designed to burn coal, to run on wood." A new boiler dedicated to the burning of Fibre Fuel briquettes was also commissioned on the back of an export contract with the DTI, under the Fourth Non-Fossil Fuel Obligation Scheme.

The wood to be combusted includes forestry and tree surgery residues, sawmill off-cuts and wood waste. In 2000 the fuel unloading bay and coal bunker were transformed. In order to generate the equivalent power to one tonne of coal the fuel handling system needed to move between eight and ten times the volume of wood. One in-house engineer spent six months

working out how to solve this problem. The fuel now takes ten minutes to be conveyed up to the boiler on one of the largest bucket elevators in the country, moving 70 tonnes of wood per hour.

SHP began combusting wood in 2002. It took another two years to iron out the infeed system 'operation bugs'. The size of the lumped coal previously burnt was 50mm, a similar size to board-mill chips, and the chips should have fed through the boiler smoothly. Even with stringent quality controls in place, suppliers delivered unchipped planks or wood waste with nails attached. Even forestry thinnings with grit from the forest floor found their way into the infeed system, jamming it for hours at a time. Fines imposed on the suppliers, and the installation of a screening device, appear to have reduced the occurrences of foreign objects.

In 2004, the burning of wood-chip created major problems. Dr Ellis says, "We had corrosion. The hottest part of the boiler tubes dis-



(Left) Piles of biomass steam as the water evaporates away. This store holds 20,000 square foot of biomass, which Slough Heat and Power will burn in a day. At the back of the image, just by the left of the opening, the tops of two coal piles can be seen. (Right) A Volvo shovel loader with a 7 cubic metre scoop in the fuel store, loading a mix of biomass chips with waste wood into the moving floor so it can begin its journey towards the biomass boiler.

integrated within four months, having been there for ten years burning any number of other fuels. Residual sodium and potassium deposits on the surface reacted their way through the tubes. Thankfully we now think we know how to combat it. We could be burning 100% biomass, but we have to co-fire with an amount of coal to stop corrosion recurring."

Finally the coal and wood mix travels without incident up the conveyor. Once combusted in the boiler, it creates a steam that passes through a turbine. This generates electricity, which is exported out of the power station. Twenty tonnes of steam per hour are either extracted from the turbine and recycled through the district-heating network or used to power 'processes' on the estate. Biomass chips account for 30 to 40% of the heat input. Because it is wet and has a low calorific value, it accounts for half the weight.

The biomass supply chain could not have come at a better time for many suppliers. John Watson, Fuel Manager at SHP says, "Two or three years ago, companies chipping for the board industries were told they were no longer required – competition from recycled wood waste. This happened to one of our major suppliers, RF Giddings & Co Ltd. When we came along, they said 'Fine, that's a good alternative.' Without their material being purchased, the woodland around Giddings would have been left to go its own way. In this case, we have created opportunities to maintain a market for one of their products."

Aggregators Shredco and Thames Valley Energy smooth out the day-to-day supply of wood-chip from small and medium-sized producers, giving small suppliers access that they would not have had. Mr Watson explains, "One farmer in Lasham, Hampshire, had a large amount of woodland to clear. Without a market, the timber would have been mulched, generating methane. Instead, via Shredco, they cleared and processed the timber in a specific way and the economics of the clearance became far better because they had market for their wood."

The Slough Trading Estate is seen as the largest employer in the area. Some argue that as the energy provider, SHP profits from the estate and has a duty to put something back into the local community. Through Thames Valley Energy (a local authority initiative involving local businesses, waste companies, sawmills and farmers), they



(Left) The biomass gets loaded onto the walking floor infeed system, it comes through the wall and is mixed before dropping through onto a vibratory feeder to convey its way up to the boilers. (Right) Piles of biomass steam away before they are scooped onto the vibratory feeder (at base of yellow wall in middle of image) to begin their ten-minute journey starting at the base of this conveyor belt.

are doing just this. When Thames Valley Energy applied for funding to develop a project supplying biofuel to run boilers in local schools, it was SHP who provided the letters of support. They guarantee an additional market for the biomass over a five to ten year time horizon while the school heating projects get up and running. Other beneficiaries include a newly formed cooperative of sawmills and Surrey Wildlife Trust, who have put supplier quality measures in place in their sawmills, now producing chips on a number of small sites across the North Downs.

Not all of the locals will necessarily be satisfied. Dr Ellis says, "It's the same all over the UK: if there is a problem people tend to look to the tallest chimneys in an area. Little do they know that apart from all the continuous monitoring and spot checks we do throughout the year, all processes are heavily regulated by the Environment Agency under EU legislation."

"At the moment we use 30,000 tonnes of solid fuel per month," says Mr Watson. "We get the same weight in wood from wood waste sources as we do from biomass – about 25,000 tonnes in total. The remainder of the 30,000 tonnes is Fibre Fuel and coal."

SHP now deals with around 50 suppliers of biomass, with large suppliers directly and with smaller suppliers through aggregators. They have enough supplies to keep them going at the present, but are always looking to improve the quality. On the forestry side, they would prefer the wood to be dryer, and have one or two suppliers who are looking at ways of drying the chip to get it 30% rather than 50% wet.

John Watson has spent the last 6

months visiting suppliers from both sides of the wood business. He admires the professionalism of those in the forestry industries. "As a nation, instead of burying everything in the ground, we are asking people to segregate materials and find a use for those materials, a market. Sawmills have been doing this for years. They see it as part of their core business. If something goes wrong, it is fixed immediately. They realise that the supply chain is something that is going to be there for years to come. The waste industry has not had such a focus over the years. Wood recyclers have an awful lot to learn."

As in any industry, suppliers come and go. In order to maintain diversity SHP would like to increase supplies within a fifty-mile radius. SHP estimate that around 2% of the energy that they currently burn is used in hauling wood to the power station. As part of the global energy market that SHP trade in, the New Forest and even Cumbria are fairly

local, especially when you consider that the gas boiler – used when the solid fuel boilers are serviced annually – can get its supply from Siberia.

Converting a fossil fuel power station to run on renewables is never an easy task. No matter how large or small the operation, there is always a price. After losing £4million in 2004, Slough Heat and Power announced first half profits of £0.8million in 2005. It has been a steep learning curve, but they are finally there. As far as they know, they are the largest power station in the UK fuelled by 90% 'renewables'. Dr Ellis says, "The culmination of generation and diversity of fuel supply means that we always have fuel available if gas or coal is unavailable. It is a unique combination."

Slough Heat and Power's trading estate customers and suppliers alike, may be grateful for just such a combination.

Carolyn Locher



AW Jenkins Forest Products, one of Slough Heat and Power's suppliers, unloading in the fuel store. The plant burns four lorry loads of biomass per hour.