

Biomass instead of diesel

Entrade produces a multi-fuel mini power plant not just for the Third World / refrigeration is also possible





ENTRADE Opening at the LACi LA Kretz Innovation Campus in Downtown Los Angeles

With a little freshening up, many a clever idea from the past can prove highly suitable for the future. Older readers may remember that because of a lack of petrol, cars were sometimes fitted with wood-burning carburettors in the immediate post-war years. With a little luck the vehicle would, with a lot of spluttering, begin to move as the heating of the wood generated gases which fuelled the combustion process in the car's engine.

This is a principle which works in exactly the same way in the modern world, except for the fact that the method no longer consists of ingenious improvisation but is the result of scientific development. The Düsseldorf firm of Entrade Energiesysteme AG has now presented the first generation of its E3 power plant to be ready for series production. It operates on solid biomass as fuel and can provide electricity, heating or cooling in any location where at present diesel motors are still chugging away. The combustion process is so clean that this compact cogeneration plant can be operated not just in developing countries, but also in this country – for example to supply apartment blocks, hotels or agricultural operations. Even the stringent exhaust gas standards applied in the United States are complied with, states Entrade CEO Julien Uhlig.

He explains that the power plant originated in a project initiated by Germany's Economics Ministry and 'Umsicht', the Fraunhofer Institute for the Environment, Safety and Energy Technology. The aim was to develop a small power plant which would offer base-load capability as a stand-alone solution. This would then be used instead of the diesel generators which are normally applied in developing countries, with fuel provided by locally available materials. At present this above all means wood, which is fed into the carburettor in pellet form, but bamboo, nutshells, cherry pips and charcoal are also feasible options. "In Italy we use vine cuttings," says Uhlig, adding that one of the unique features of the E3 is the possibility of using a wide range of fuels. A further option is to add a certain proportion of synthetic materials such as shredded old car tyres, and even animal fats. So far 132 types of possible combustible materials have been tested by the research team at the University of Graz, and new substances are being added all the time. For optimum combustion the installation is adapted to a specific type of fuel, but for the future it will be a viable option for the plant to be switched to a different type of fuel at the press of a button – in Uhlig's words: "We'll have to look at what's available, and then make use of it."

On a base area of 190 x 160 cm a high-temperature reformer and a gas motor are installed on two

separate steel plates. Both together can be transported on a pickup truck and can if necessary be handled by a couple of strong men. The E3 is the world's smallest biomass power plant and two of them will fit into a 20-foot standard container, together with the cooling module, pellet feed and control unit. The reformer converts the solid biomass into synthesis gas, which is combusted in the engine which then drives the generator. The E3 has an electrical output of 25 kW and heating capacity of 60 kW, with an indicated energy conversion efficiency level of 85%. If increased output is required, a number of units can be combined. However, because in many applications such as hospitals or food stores there is often greater demand for cooling, above all in warm countries, an adsorption refrigerating machine from SorTech can be fitted. This converts the heating output into 30 kW of cooling.

In the reformer the fuel materials are converted into a synthesis gas at temperatures between 1000 and 1200°C. This high-temperature is the precondition for clean combustion operations. If the temperature drops too strongly, for example because the fuel isn't dry enough, tar is generated. This tough black sludge is deposited in the motor and reduces its useful life. To combat this, according to the manufacturer's information the E3 power plant is designed in such a way that the level of tar residues amounts to less than 0.1 g per cubic meter. This is so low that the residue particles in the motor can be combusted without difficulty. The secret of the power plant's clean energy generation lies in the fixed-bed DC carburettor, for which an entirely new airflow system has been developed on the computer. The chamber in which pyrolysis, reduction and oxidation take place has a cylindrical form, and there is no longer any movement within the reactor, where the pressure is always at a constant level. The entire design is protected by a number of patents.

Wherever possible components which are commercially available as standard are used in the entire installation. The V-6 motor, a unit which is normally used for small trucks, is produced by General Motors, and the paper filter is also a standard product. As a result the maintenance work involved is low, and spare parts are easy to obtain.

A biomass dryer and an automatic pelleting unit can be integrated into the system. The power plant is designed for continuous operations, with an availability level which, according to Uhlig, is 98%. Because the same amount of electricity and heating is not always required at all times, it makes sense to combine the unit with storage batteries. After installation little input is required from the operator, other than to supply the unit with fuel, change the filter occasionally and empty the ash collector. For maintenance work it is only necessary to switch off the motor. The operation of the plant is monitored and remotely controlled from the control centre in Graz. Entrade does not regard itself as a plant manufacturer, but as a supplier of turnkey solutions for energy generation.

In ideal conditions the materials which fuel the plant cost nothing, apart from the transport, and the entire installation can be purchased for under €200,000. Julien Uhlig explains that the aim is to operate the plant at a cost of one to two euros a day. Depending on the price of the fuel, the E3 can also be competitive in Europe compared to conventional cogeneration plants.

Hestates that 16 units are already supplying the grid in six countries, with the initial unit going on stream one year ago. The projects are in part financed by the World Bank and implemented by Entrade itself. Entrade recently became the first German company to be listed on the NASDAQ Private Market. Founded in 2006, the company has been recognised as one of the fastest-growing German operations in the renewable energies field. From January there are plans for series production of an initial 20 units a month, with capacity available for up to 45 units monthly.

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BY Dr. LUKAS WEBER

“Even the stringent exhaust gas standards applied in the United States are complied with, states Entrade CEO Julien Uhlig.”

— Julien Uhlig, CEO ENTRADE

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