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Reaching into the future

In a sugar processing plant there are hundreds of electric motors for fans, conveyors, compactors and pumps, all using electricity. But sugarcane processing produces a high percentage of fibre waste called bagasse which, in countries like Brazil, is widely used to generate the electricity used by these motors.

Bagasse fuel is renewable and the gases it produces (essentially CO₂) are more than used up by the new cane growing in the fields.

Using waste

As a supplier of a large percentage of drives to the sugarcane processing industry, Zest saw the Brazilian technology as an opportunity to offer the South African sugar industry a similar solution.

“SA Mechanical Engineer” speaks to Coenraad Vrey, managing director of Zest Energy to learn more. “Zest has traditionally supplied everything from electric motors through to variable speed drives, transformers, cabling and electrical installation work, but we did not have anything to offer on the power generation side,” he says. “We therefore established Zest Energy and entered into an agreement with a Brazilian company, TGM, to bring their technology of co-generation, specifically developed for the sugar industry in Brazil over the past ten years, to South Africa.

Total solution

“As a result, we can now supply everything from the drives through to the complete power generation plant to make a sugar processing plant self-sufficient and much more efficient from an environmental point of view,” adds Coenraad. “TGM manufactures a complete power generation system including the steam turbines and planetary gearboxes which they manufacture in-house. This means that we will be able to ‘customise’ every installation to the exact speed reduction and turbine pressures for each individual application, whether it is a sugar processing plant, a steel mill or a paper processing plant.

Coenraad elaborates, “One of Zest’s technology suppliers, WEG, has been supplying 90% of TGM’s requirements in terms of the alternator and electrical reticulation equipment to support the operation of the steam turbine unit that they manufacture. This now gives Zest Energy access to this technology and many years of expertise, thereby allowing us to bring proven technology to South Africa.”

Electric motors

The steam turbine units TGM manufacture can generate up to 150 MW and for more power, units can easily be combined to increase the output. “In Brazil, the sugar industry alone generates about 80% of the energy required by the industry,” says Coenraad, “which is why we are focussing on the African sugar industry as a start. In Brazil all the steam driven mills and centrifuges on the sugar processing plants have been converted to more effective electrical drives, while the steam generation plants have been upgraded to the higher pressure needed for turbine power generation.”

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Essentially, the process involves the burning of the bagasse to generate steam, which in turn generates electricity for all the plant equipment. Any excess power can then be sold back to the utility through a feed into the grid. Coenraad adds, “South Africa is currently in the same position that Brazil found itself about nine years ago. Brazil was negatively affected as the country was mainly dependant on hydropower, which was problematic in the face of a severe drought. The average sugar processing plant can easily generate between 25 to 50 MW. Since these plants only use about 40% of this power, it presents an ideal opportunity for them to participate in the generation and distribution of power, thereby combating power shortages throughout the country.”

Flexible

TGM’s steam power generation system is very flexible and can be adapted to operate with other fuels as well. “Many sugar processing plants also produce ethanol which can be used as a fuel,” says Coenraad. “Normally sugarcane estates only have accessible bagasse for about eight months of the year. To deliver constant power, we can now install dual boilers that can also run on coal for those short periods when no bagasse is available. In Brazil this translates to 97% power generation availability throughout the year, which is what we are now offering the local market.”

Other applications

Zest is not limited to providing equipment and solutions for the sugar industry only. They are also targeting industries that simply cannot scale down on the consumption of electricity. “You cannot simply adjust a furnace to use less energy. For these industries, it will become more difficult to afford electricity as the tariffs increase and high penalties start being introduced in the future,” says Coenraad. “In the case of a furnace, for example, we can take the gas from that furnace, clean it and then use it as a fuel in a co-generation configuration. The gas from a 20MW furnace could comfortably generate between 5 to 7 MW of electrical energy.”

Small steam power generation and co-generation technology is not new to South Africa, but it has not been readily available until now. “The advantage of dealing with Zest is that we now offer a total in-house solution, where we not only supply the motors, but all the mechanical and electrical equipment as well,” says Coenraad in conclusion. “All these systems are configurable to specific industries and their individual requirements and are backed up by the experience and expertise of our Brazilian counterparts.”

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