SUGAR WASTE PROVIDES RICH SOURCE OF RENEWABLE ENERGY

As natural fossil fuel resources are rapidly depleting and energy costs ever increasing, it is critical for South Africa to address the use of biofuels to supplement the energy sources currently being utilised.

Many would-be diesel tree farmers have burned their fingers as Government outlawed the cultivation of non-indigenous species. Although Ethanol Africa, South Africa's first 'green fuels' company based in the country's maize-producing heartland around Bothaville in the Free State, is forging ahead with its plans to produce environmentally friendly biofuels, there is an untapped market in an alternative sector which has been extremely successful as a rich source of ethanol for many years in Brazil and the USA.

Jose Luiz Oliverio, vice-president of Brazilian sugar and ethanol equipment group, Dedini, said that South Africa should build an additional five sugar mills in order to stimulate ethanol production. This statement was made at a biofuels workshop as long ago as 2006, but little has been done to heed the advice of this proponent of ethanol from sugar.

He said that if the local sugar industry added five more plants to the current 14, it would increase the number of direct jobs from 85 000 to 123 000. There are about 47 000 registered sugar cane growers that annually produce, on average, 22 million tons of sugar cane. "South Africa should add sugar cane to its energy mix as the total energy content in sugar is more than that in oil."

It would be wise for South Africa to look to global countries with similar climates and resources in order to tap into viable solutions. Brazil is widely considered a pioneer in ethanol production and launched its ethanol programme in the mid-70s when its fuel consumption depended on foreign oil.

The southern section of Brazil and South Africa are on the same latitude and the former country has very successfully managed to turn waste from the sugar harvesting process (bagasse) into energy, while at the same time reducing pollution and creating job opportunities.

Bagasse is often used as a primary fuel source for sugar mills; when burned in quantity, it produces sufficient heat energy to supply all the needs of a typical sugar mill, with energy to spare. To this end, a secondary use for this waste product is in co-generation, the use of a fuel source to provide heat energy (used in the mill) and electricity, which is typically sold on to the national electricity grid.

The resulting CO_2 emissions are equal to the amount of CO_2 that the sugar cane plant absorbed from the atmosphere during its growing phase, which makes the process of co-generation greenhouse gas-neutral.

Currently the world's largest producer of sugar and ethanol products, Brazil, boasts over 420 fully installed plants, with the most recent of these established plants having an installed capacity to facilitate the processing of approximately 35 000 tons of sugar cane per day (32 million tons per annum between 2008 and 2009).

One of the reasons Brazil is in this leading position is the fact that the soil and temperatures allow for the production of sugar and alcohol in all geographic regions. Although it is possible for the environment to sustain sugar and alcohol farms throughout the country, these farms still only account for less than 3% of the total farming area in the country. This highlights the exceptional feat that the country has been able to achieve to date in this industry.

Brazil is the world's second largest producer of ethanol fuel (27 billion litres) and the world's largest exporter. Together, Brazil and the United States lead the industrial production of ethanol fuel, accounting together for 89% of the world's production. This represents 37.3% of the world's total ethanol used as fuel.

Today, light vehicles in Brazil do not run solely on pure petrol. Since 1976, the government made it mandatory to blend anhydrous ethanol with petrol, in quantities of between 10 and 22%.

A golden opportunity exists for South Africa to utilise the residual cane waste, to directly process heat and power. Currently, South African sugar cane farmers tend to slash and burn the crop waste after the harvesting process, which causes much consternation due to the increase in pollution that is generated as a result of the burning process.

By utilising the waste product to produce ethanol as a by-product of the sugar growing, harvesting and refining processing, the issues around pollution would be eliminated.

The cutting method with sugar cane burning is already considered obsolete in Brazil. Currently leaves and crop waste, which used to be considered useless, are now considered as valuable biomass, which can double the availability of energy to be sold and result in significant increases for businesses involved. This means that production and energy sale can be done even when the harvest is over or when the production of sugar and ethanol is completely finished.

In addition, if the sugar processors invested in ethanol plants at their current sugar milling plants, the issue of non-renewable resources could also be effectively addressed with ethanol resulting in a high energy balance (output energy/input energy), which varies from 8.3 for average conditions to 10.2 for best practice production.

In the last two decades, Brazil has given major incentives to sugar and alcohol farmers to produce ethanol in line with a programme that promotes the consumption and production of dual-fuel.

Besides stimulating the manufacture of alcohol driven cars, a national legislation was created stating that it is mandatory to mix up to 25% ethanol into the total amount of gasoline used in the country. These efforts aim to contribute towards a decrease in the country's dependability on fossil fuels.

An additional government incentive for the development of the sector in Brazil was the creation of a programme that encouraged companies to invest in co-generation from sugar cane biomass. As a result of this incentive, Brazilian industries involved in the sector are prepared to deal with sugar, ethanol and renewable energy products.

A similar incentive, if introduced by the South African Government, could result in a multitude of financial benefits and would encourage compliance with global calls to utilise 'greener' farming practises.

Brazil has also made significant investments in research and development, aimed at maximising the production of sugar cane, including the techniques utilised for plantation and harvesting. These efforts are focussed on the development of new species of sugar cane suitable for improved production of saccharin and appropriated for different regions in the country. In essence, there is a constant search for innovation and flexibility in the industrial production of sugar and ethanol products.

The sugar and ethanol industries in Brazil are prepared to produce their products with flexibility, thereby allowing priority to be given to one or other product based on market price and market demand. It was seen that even with the possibility of maximising production efficiency, sugar and ethanol became secondary priority products as far as their production was concerned. Due to the Brazilian government incentives, the sale of energy became a priority product for the majority of the industries in this sector.

With emphasis on co-generation and energy sale, one of the main goals being considered when designing new plants or expansion/retrofitting of existing plants is the overall efficiency improvement of the whole production process. These considerations including selection of the sugar cane type to be cultivated, the harvest method and equipment to be utilised and the industrial processing machinery installed within the plant.

Examples of current plant efficiency improvements applied in Brazil include boilers, with an increase of operating pressure from 20 bar to 65 bar. There are also plants that have 120 bar boilers installed facilitating process efficiency maximisation as well as mills where high efficient planetary driven gearboxes coupled to variable speed motors have replaced steam driven turbines.

In the preparation process, high efficiency gearboxes coupled to electric motors have also replaced steam driven turbines, while in sugar and ethanol processing equipment systems, applications have been utilised to maximise various processes including heating, pumping, material handling and electric load driving.

Regarding generation and co-generation systems, use is made of steam turbines, turbo-generators and transformers as well as high efficiency and reliable auxiliary equipment. A relevant aspect considered within the process is the generation system configuration, which allows the generation and sale of energy independently of the sugar and alcohol production process.

Between 1990 and 2000, the turbo-generator capacity in Brazil ranged from 5 to 10 MW. From 2000 to 2004, the turbo-generator capacity had increased to between 15 and 30 MW, and after 2005 the capacity had reached 50 MW. The most recently installed plants have an average of 80 MW of total

generation capacity, with 80% of this value intended for co-generation and sale of energy.

Currently, the sugar and ethanol industry in Brazil is generating 1400 MW of energy. With new and current projects, this figure will increase to 3300 MW. Looking as far ahead as 2021, plans are underway for new plants to be installed and upgrades to be done to those plants currently using older technologies. This will enable the power generation capacity to reach 14 400 MW of renewable and clean energy. This capacity corresponds to the amount of energy generated by Itaipu power plant, the largest hydro-electric power plant in operation in the world today.

WEG and TGM are two world class manufacturers of equipment for this segment of the market. Both companies offer the latest technology and equipment and hold a leading position in Brazil as well as in Latin America.

As a traditional solutions provider for several industrial segments in South Africa and many other African countries Zest Group company, Zest Energy, is able to offer sugar and alcohol turnkey power generation systems and solutions to Africa.

Zest Energy’s solutions for this segment of the market will be complemented by both WEG and TGM products, expertise and well established reputation in

the industry. The unsurpassed performance and reliability, already tested and approved in Brazil, is now available in Africa.

By working together with Government, the SA Cane Growers' Association, the Sugar Association of SA (SASA) and all its members Zest Energy can help to alleviate the energy crisis and positively contribute towards the economy by providing a sustainable energy source for the future.