



# Renu Energy

Solutions for the Biomass Industry

## Results

- Productivity increased by more than 30%
- Staffing reduced by 35%
- Plant insurance costs significantly reduced
- Integrated control system for whole plant
- Quicker responses to visible and audible alarms
- System access via the Web
- Easy connectivity with third-party hardware
- Powerful interrogation capability of historical database

**“My experience with GE technology has been a good one. The company has certainly made my life and the lives of my staff a lot easier by simplifying a complex process.”**

*Brian Nel, Operations Director  
Renu Energy (Pty) Ltd*

GE Proficy\* Process Systems helps turn biomass into fuel more efficiently and therefore helps the environment

Renu Energy (Pty) Ltd. of South Africa focuses on the generation of electricity and the production of fuel from renewable and sustainable biomass. This fits perfectly with GE's ecomagination® initiatives to focus on products and services that provide significant and measurable environmental performance advantages to customers. Renu Energy runs a wood pelleting plant in Kwambonambi, Kwazulu Natal, which originally had two independent control systems that were difficult to maintain and had no built-in capability for expansion. During a major re-fit of the plant, Renu chose GE Intelligent Platforms Proficy Process Systems including PACSystems hardware and Proficy software to provide a unified, scalable alternative control solution. As a result, productivity has increased by more than 30% and the operational staff numbers have been reduced by a third.



With a head office in Houghton, Johannesburg, Renu Energy (Pty) Ltd. entered the renewable energy market with years of experience and the best international consultants at their disposal. The company's focus is on all forms of renewable, sustainable and environmentally responsible energy. This includes energy storage, transport and power generation. The company offers a wide range of services in conjunction with international specialists, from the erection of biofuel plants to the construction of biofuel power stations for commercial and residential purposes.

The total timber plantation in South Africa is 1.5 million hectares of large tracts of fast growing species, producing an annual harvest of 18 million m<sup>3</sup> of round wood. This allows for simplified but highly-effective management regimes and few countries in the world are able to match South Africa for cost competitiveness.

Sawn logs account for about 30% of the total round wood harvest and, on average, 60% is recovered as sawn timber, the remainder being waste. Sawdust and other wood waste have traditionally had no value and sawmills have been forced to either dump the waste at landfill sites or stockpile it on their premises. This causes various safety and environmental concerns in the form of fire risks, together with the release of methane and the leaching of tannins.

### Pelleting

In essence, producing pellets or briquettes involves the compression of wood waste into transportable and storable energy. Uses range from industrial power stations, where the pellets get used together with coal, through co-generation plants for energy and heat generation for small villages, to the residential market for heating and cooking.

The 'densification' of the pellet itself is only a part of an overall system that involves grinding, screening, cleaning and drying. Additional processes have to be completed to remove objects such as metal, glass, stones and silica.

The actual pelleting process occurs after the wood waste has been through all the other processes that ensure a consistent composition and moisture content.

The self-bonding of wood to form a pellet involves the thermoplastic flow of the polymeric material, lignin and hemicelluloses, which make up around 50% of the content. These materials serve as the 'glue' and become plastic and flow at specific temperatures and moisture content. Additionally, because of the springy nature of wood fibre, significant force has to be applied for the fibres to interlock. A pelleting mill applies this force. Combining the force with the plastic deformation of the polymers at a raised temperature causes a cemented fibre matrix when the pellets are cooled.

### The Kwambonambi plant

The Kwambonambi plant in KwaZulu Natal collects its biomass raw material, in the form of sawdust and off-cuts, from saw mills

around the region. Because of the high cost of transport, value has to be added in the form of pelletizing, briquetting or charcoaling in close proximity to the source. The plant turns this waste biomass into wood pellets suitable for large commercial burners.

The biomass is carefully fed from hoppers then broken down by passing through a chipping and crushing process before entering rotary driers. Renu, as part of its investment in the Kwambonambi plant, has developed a new hybrid design of high-efficiency rotary drum dryer for this process. Drying represents a critical point in the process as controlling the final moisture content within a narrow tolerance is vital to obtaining the highest calorific value when the pellets are eventually burned by the customer.

Once dried to the correct moisture level the raw material is heated then conveyed into one of three pellet drawing hammer mills. Using a grinding process, the material is pushed through screens of discrete dimensions. The thermoplastic flow process takes place and the size of the screen 'mesh' determines the final size of the extruded pellets. The product is then finally cooled so that it hardens, a fine screen filters out any residual dust, and the finished pellets are then bagged ready for export.

At Kwambonambi, the company now produces around 36,000 tons per annum of wood pellets for industrial use, most of which is exported for commercial use in Italy. This plant was, until recently, the only one in Africa producing that grade of wood pellet for export. The company is currently investigating other locations around sub-Saharan Africa for further development. Renu renewable biomass products are also exported to other parts of Europe, with interest also being shown in Asia.

### The control system

In the original legacy system, one PLC controlled the crushing and drying systems, and a second PLC controlled all the peripherals. There was no communication between the PLCs, no network access, not enough I/O and no facility for expansion.

Renu Energy is now using GE Intelligent Platforms' Proficy Process Systems, a fully integrated process control system that offers improved quality and reliability, increased throughput, performance and efficiency, and reduced total cost of ownership. The foundation of Proficy Process Systems is a contemporary hardware and software infrastructure that offers the benefits of both traditional DCS and PLC/HMI systems without many of the historic limitations of those approaches.

GE PACSystems controllers handle process, discrete, and motion control applications, giving users unparalleled flexibility in their control system. Powerful Proficy software technologies empower users with unprecedented visibility, analytics, and connectivity throughout their enterprise. At Kwambonambi, Proficy HMI/SCADA - CIMPLICITY coupled with Batch Execution and Historian technologies provide automation and information, and an open fieldbus approach supports all the major fieldbusses.

## Solutions for the Biomass Industry

The Kwambonambi plant is now essentially controlled by one operator. The Control Room houses two large-screen Operator Consoles together with CCTV (Closed Circuit Television) monitoring of various key parts of the plant. Other nodes provide engineering maintenance, enabling upgrades to the system while it is running live and providing Change Management information. The plant management team also has access, via the web, for monitoring, control and reporting purposes from a remote location. Reports can be broadcast via the web to other senior management within Renu Energy. All access is under password control, with each password gaining a different level of access depending on the person's role within the organization.

The system was developed under the guidance of Brian Nel, Operations Director for Renu Energy, by the Systems Integrator Protemp Automation based in Durban. Nel commented: "Protemp

Automation has been truly excellent. Once familiarized with the needs of the system, development was rapid and the installation went very smoothly. I cannot praise the company's professionalism enough. GE was always on hand also, to provide assistance and advice if necessary."

The plant went through a significant rebuild including the installation of the newly designed driers. Over this 8-month period the new monitoring and control system, containing around 700 I/O points (e.g. temperature, pressure, speed, level, on/off, moisture, position), was developed and installed.

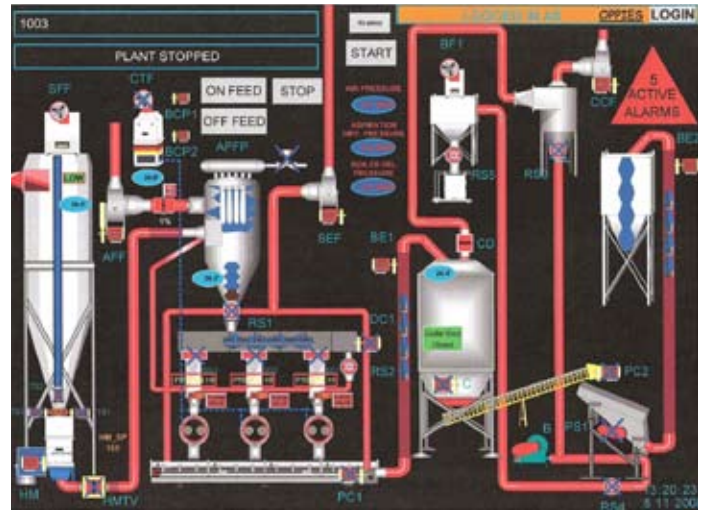
"Now a single GE PACSystems RX3i controls the whole plant. It is also easily expandable", continued Nel. "The system is very easy to troubleshoot using pop-ups accessible to the operators and further aids accessible to qualified personnel."



## Benefits

As a result of the new control system, stability has improved greatly so that uptime has increased by at least 30%, with a consequent increase in productivity of the plant. Staffing has not only been reduced by around 35% but the operators now get a very clear view of the whole plant from their control screens. They are able to drill down easily to see what is happening throughout the plant. Clear alarms (based on temperature/flow/speed/moisture levels/pressure) alert them to any pending problem well in time for corrective action. Thus, rather than continuously 'fire-fighting' as they did on the old system, they are able to spend most of their time carrying out more productive work.

One spin-off benefit is a reduction in plant insurance costs. This is because the plant is now so well monitored and controlled by the system. The audible and visible alarms inform the operators and plant management well in time of any developing faults so they can be contained. Should the plant need to be shut down or purged with steam this can be done in an orderly and safe manner. This built in safety has been recognized by the insurers of the infrastructure.



Nel added: "My experience with GE technology has been a good one. The company has certainly made my life and the lives of my staff a lot easier by simplifying a complex process."

### GE Intelligent Platforms Contact Information

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Global regional phone numbers are listed by location on our web site at [www.ge-ip.com/contact](http://www.ge-ip.com/contact)

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