

# Electricity Power generated with zero emissions by the largest biomass power station in Italy

*CPL has recently inaugurated the largest agricultural biomass biogas power plant in Italy. Nine hectares of ground area, Four 1 MWe power stations, for a total of 4 MWe generated electricity for 10,000 households a year at zero emissions.*

The largest agricultural biomass for biogas power production plant in Italy, engineered with the CPL Concordia know-how, was inaugurated last October at Bondeno (FE) by Paolo De Castro, the president of the European Parliament Agriculture and Rural Development Commission in Italy. This new power plant is built on a surface area covering nine hectares has four 1 MWe power stations, totaling an overall 4 MWe installed

power to generate electricity supplies for almost 10,000 households each year. CPL Concordia, who engineered this project, are a multi-utility cooperative group that go back as far as the 1890s when they went into operation and now have 1500 employees and 80 other establishments. Their main activities are oriented at technological power grids (gas, water,

remote heating systems); distribution and sale of gas, decompression and gas measuring and odorization systems, public illumination systems, energy production systems from renewable sources such as photovoltaic, cogeneration and trigeneration from biogas, as well as remote control and ICT systems, correlated with global service and facility management. CPL Concordia also operates abroad in 10 different European countries, Africa, South America and Asia.

“CPL Concordia were chosen for this project as unique solution providers for the four electric power station systems”, revealed Roberto Loschi, Manager of the CPL Cogeneration and renewable Energy sector. “Thanks to more than thirty years experience in the renewable sector, our company has been able to provide a product that can adapt to the different characteristics of the two chosen companies who supply the anaerobic digesters. CPL is also a solution provider for authorization and interconnection problems over the net for ongoing issues involving all renewable energy projects”.

A considerable amount have been invested (20 million euro) to provide clean energy and reinforce the economical and social value attached to this operation while boosting the economical situation for local agriculture as well. Every year about 72,000 tons of raw material is collected and utilized in the power plants from surrounding farms up to 20 km away covering 1,500 hectares of cultivated farmland.

### **The objectives**

This initiative has given life to the biggest national biomass biogas power plant: four electric power stations fed on biogas deriving from anaerobic digestion of agricultural biomass origin (fuel plants such as maize, sorghum, wheat).

The main objectives were to protect the environment and stimulate agricultural



*The four cogeneration motors are injected with the gas produced by the biomass to produce a total of 4 Mwe of electric power with zero CO2 emissions.*

production and to achieve this they first had to guarantee zero CO2 emissions into the atmosphere. This was achieved by developing a mechanism in which the four power stations work in harmony with the plant growth cycles based on the principle that carbon dioxide emitted by combustion engines is equivalent to that absorbed by cereal plants during their plant cycle whereby a zero balance effect is created between the two entities of CO2 emissions into the atmosphere. The second objective was to stimulate and guarantee agricultural production and this was done by convincing the local agriculture sector to cultivate the necessary raw material with a 15 year return guarantee on merchandize at a fixed rate in cereal market stock exchange in Bologna.

### **How Biogas is produced**

The “anaerobic digestion” consists of a biological fermentation process involving microorganisms (methanogenic bacteria) that, when deprived of oxygen, transform the carbohydrates, proteins and lipids (in the biomass fed into the power plant) into methane and carbon dioxide. The resulted biogas is 55% part methane and can sufficiently feed combined heating and electric production systems with internal

combustion engines housed within the Bondeno power stations. At this point it would be useful to emphasize that biogas energy use has a neutral CO2 effect on the atmosphere because the same amount of CO2 emitted by the biogas is equal to the same amount absorbed by plants (or consumed by animals indirectly when feeding on plant vegetation) therefore becomes part of the plant carbon cycle without worsening the greenhouse effect unlike fossil fuel combustion.

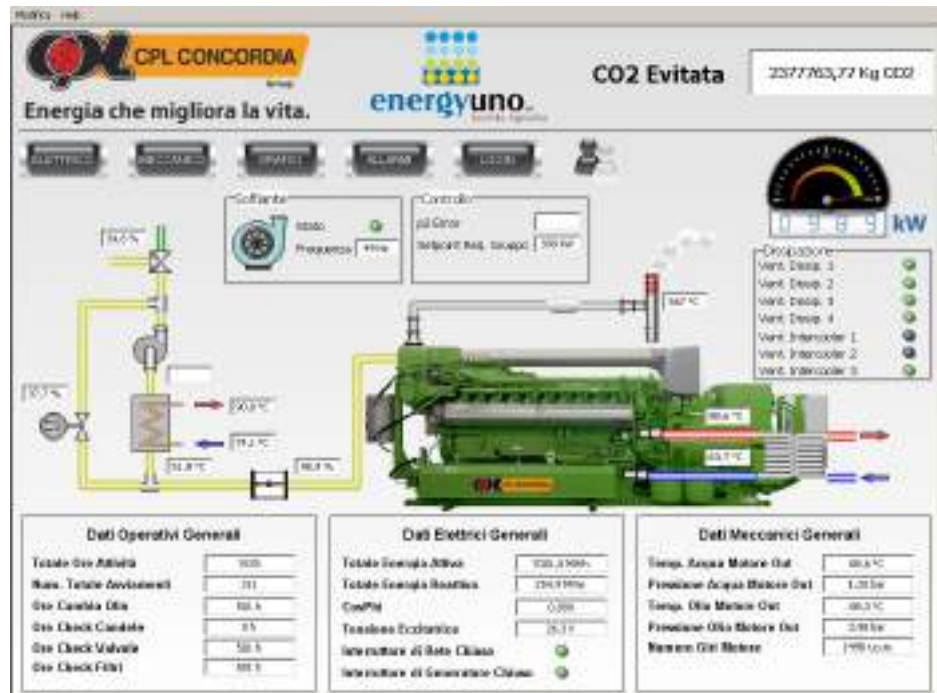
Another great ecological advantage of using biogas is that it prevents the spread of methane into the troposphere which is produced naturally during the decomposition of animal carcasses and plants: methane is in fact one of the most damaging greenhouse gases that produces a great amount of CO2 that degrades the water content in the atmosphere being unfavorable for combustion.

The cost effective cogeneration systems have been purposely implemented to immediate this problem which work in such a way that heat is dispersed while the motors are running as well as improving system performances by more than 90%.

“Biogas is previously purified in a cyro-treatment skid, while the produced electric energy is increased to a medium voltage rate and injected into the ENEL grid: both systems are designed by CPL” confirmed Omar Mazzuchelli, CPL service manager. “CPL’s contribution in creating medium voltage electric power grids (as an alternative to ENEL) put the system into action six months ahead of pre-estimated startup date.

### Production Plants

The plant systems are composed of 4 SINCRO 1000 cogeneration 999 kWe modules programmed to work at least 8,500 hours a



The plant supervision system is based on the Movicon 11 Scada/HMI platform consenting easy management and complete monitoring and control locally or via web.

year: estimated Energy generated is equal to more than 8 million kWh for each motor, for a total of 32 million kWh.

The plant system uses Jenbacher JGS 320 GS-BL motors version C25 that offer extremely high performances, low emissions and exceptional reliability. The motor components have a life span of 60,000 hours of working use before routine servicing is performed.

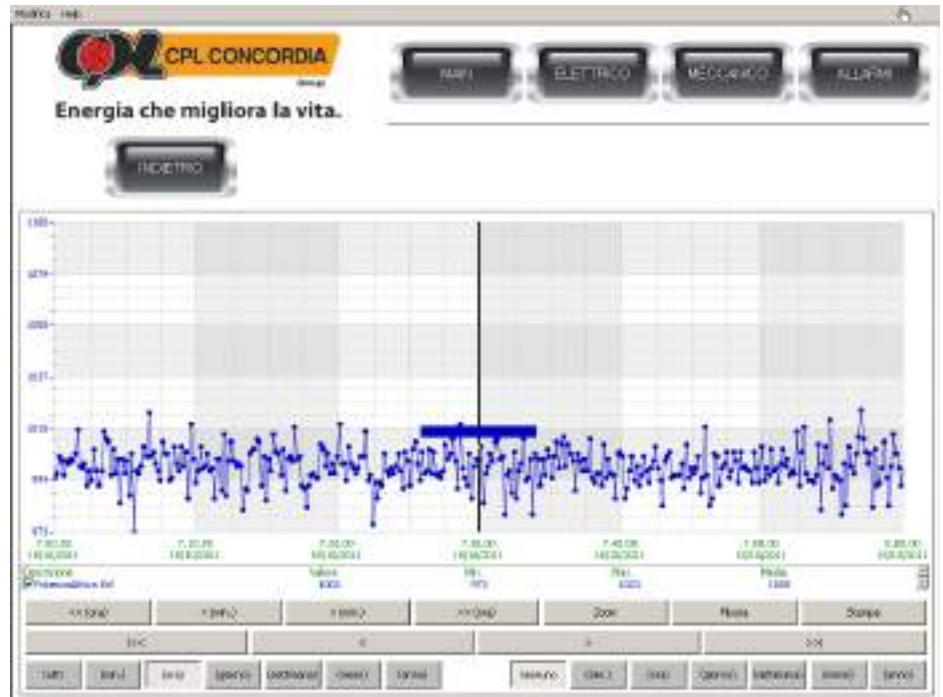
### Automation and Supervision

Particularly important is the plant’s automation system essential for monitoring, efficient management and maintenance, as well as analyzing historical system performance data. Each motor is equipped with a local control panel to monitor and control the running of motors using a PLC. CPL Concordia has applied each motor with a local supervision workstation which responds to the main centralized supervisory system housed in the onsite technical building which serves as the control centre for running the entire plant complex.

Engineer Alessio Vaccari, head of the CPL Congeneration software department carried out a technical survey to evaluate the most suitable software platform to use. He chose the Movicon 11 Scada/HMI technology judged as being ideal for achieving the company's set objectives. The four local workstations with touch screen PCs communicate with the motors' PLCs to collect all operating statuses, alarms and alerts, together with all electric power, heating and process measures including data on the amount of gas produced by the anaerobic digestors.

All the data is stored in a SQL Server database locally for analyzing electricity yield performance trends (power, voltage, current) and the motor working parameters (alternator and cylinder temperatures, water and oil temperatures and pressures). Thanks to the Movicon Data Analysis tools, the recorded measures can be instantly extracted from the DB archives and effectively represented by applying filters, zooms and using curve overlapping tools along with a variety of other analysis functions. Purposely designed reports have been provided within the Movicon Report Designer to represent data summaries by exploiting a great selection of charts and tables that can then be previewed and printed as pleased. Another particularly useful tool is the Movicon Web Browser that can be used in screen pages to connect and display dynamic HTML pages provided by the motor builders to display different parameters showing

essential functional motor details for maintenance staff to analyze. System access is protected and regulated by a Login procedure based on pre-assigned



*To compliment efficient management and maintenance, the inbuilt Movicon data analysis tools are extremely efficient in visualizing historical DB data according to client needs.*

security level and password. Since CPL Concordia have been entrusted with the maintenance of the whole system, a lot of care has been dedicated by Engineer Vaccari to establish a reliable on-call staff service to all maintenance workers according to work rotas. In addition to the statistical information, there is also an alarm management which has been designed for easy use and consultation with options to send notifications automatically via SMS using GSM modems enabled for each motor together with the Movicon Alarm Dispatcher.

The Main Movicon Supervisor, housed in the technical control center, simply offers centralization of data deriving from each local workstation. Control center engineers can view all information on individual motor separately or altogether in one display with overall parameter aggregations. Data is also stored in the control centre on a relational DB based on SQL Server in the main supervisory workstation. As the power plant site covers quite a large area of ground (1.2 square Kms) each motor is connected to a public ADSL network using a Static IP address. This allows access to the supervision system via internet possible by using the built-in Movicon Web Client.

Web access to the system not only consents CPL Concordia, but staff or clients as well, wherever and whenever, to connect to the power plant system to check data and working statuses. In addition to all this, the CPL Concordia technicians have been exclusive permission to remote access the PC for maintenance purposes and interventions by using the Team Viewer tool.

### **Conclusion**

CPL Concordia – has dedicated a team of 30 personnel, which include technicians, design engineers and maintenance staff, under the co-ordination of Project Manager Gianni Pezzetti – the clients have also entrusted CPL with the management and full service maintenance of the power stations for the next 15 years. This acknowledgment is linked to the 96% guarantee offered by CPL for the running of these power stations as well as the company's 30 years experience in the cogeneration sector (over 400 plant systems have been installed in Italy alone) which comes with the Post Sales Services offered to clients by CPL Concordia.

*Ing. Alessio Vaccari  
CPL Concordia*



*One of the 4 Jenbacher motors, situated in a container purposely designed to house all the process components needed for efficient system management.*