



Clean Energy for the Bologna Freight Village

The Bologna freight village, one of the most important in Italy, has invested in renewable energy production using an enormous photovoltaic system. Aided with a supervision system, using real-time control and monitoring, energy reports, anomaly reports and productivity analysis has optimized investment returns.

The Bologna freight village is part of a larger Bologna area development scheme which was launched in the 70's involving joint effort and commitment between local political parties and public authorities and private companies. Various plans went into action to build a ring road, airport, the agricultural food center, the CenterGross wholesalers, trade fair and exhibition center, conference and business center located in the tower buildings designed by Kenzo Tange.

After 40 years in operation, this infrastructure network is still a great attraction for national and international players. This confirms the validity of Italian regional business and public service competitiveness (especially the transport services) according to which this area resulted one of the most competitive.

The Bologna Freight village has effectively contributed to promoting logistic innovation as a developer engine and kernel of local and regional economic systems. It also affirms its proposition that this intermodality would represent a responsible choice towards a growth model compliant to environmental sustainability issues. Forty years ago the intermodal transport idea was a challenge that has become a reality. Today it represents the way used by many to encourage market development and improve regional cohesion.

Logistics and Energy Infrastructure

The Bologna Freight village is continuously researching solutions to adopt within the freight village structure to produce energy from renewable sources with low *pollution emission* rate in line with the strategic aim to reduce external environmental costs. During 2006, the company evaluated the possibility of implementing a photovoltaic system estimating an investment of around five million euro.

The freight village structure includes around 400,000 Square meters of warehouses for which the company has implemented photovoltaic systems: so far the first big photovoltaic system has been activated with 4.2 MW consisting of seventeen support racks, seven power converters and 18,300 solar panels, spread out over nine freight village pavilions. Up to date this system has produced more than 4.52 GWh of electrical power, and is one of the biggest photovoltaic systems in Italy. An additional 8,000 square meters are currently being installed.

The control system

The photovoltaic control system was developed by Rebernig Supervisioni Srl, on commission by Overtech Srl, a Photovoltaic project engineering company who wanted the project engineered with the best technology available. Therefore they designed the project on a distributed supervision and control system, which gathers, displays and historically logs process data deriving from the field.

The Photovoltaic system is spread out among support racks which correspond to the pavilions accommodating the various divisions of the

freight village. Therefore many parameters are monitored:

- The electric current generated from over 900 photovoltaic panel strings
- Operating and functional status of the 200 Refusol inverters
- Fiscal meters which count the amount of energy produced by each pavilion
- Data from temperature and radiation sensors that are spread out throughout the field to calculate the system's yield



Main supervision screen showing all of the Bologna Freight Village's photovoltaic system based on the Movicon 11 Scada technology.

indices.

The distributed control system is deployed in various points along the warehouse roof tops, from which field stations gather and process data. The supervision and data logging system resides in a centralized server managed by the company for viewing the functional status of the system and for analyzing historical data locally or by Web access.

The 17 industrial routers installed in the field are connected to the main server through a 3G wireless connection. Communication with the photovoltaic system devices, the I/O slave and other control units is established through the Ethernet and serial bus.

Collected and processed information flow together in the supervisory system built with a server from the Movicon 11 Scada/HMI platform and the MySQL database. The industrial routers have been configured for gathering data relating to the different process parameters by implementing protocol conversions (i.e. proprietary protocols, such as those for solar inverters are converted to the TCP/IP Modbus standard protocols).

Another important field station function is to process collected production data in real-time and to confront it with environment sensors enabling predefined alarms to respond to current environmental situations. This permits the company to react accordingly to alarms in real-time in order to optimize system effectiveness.

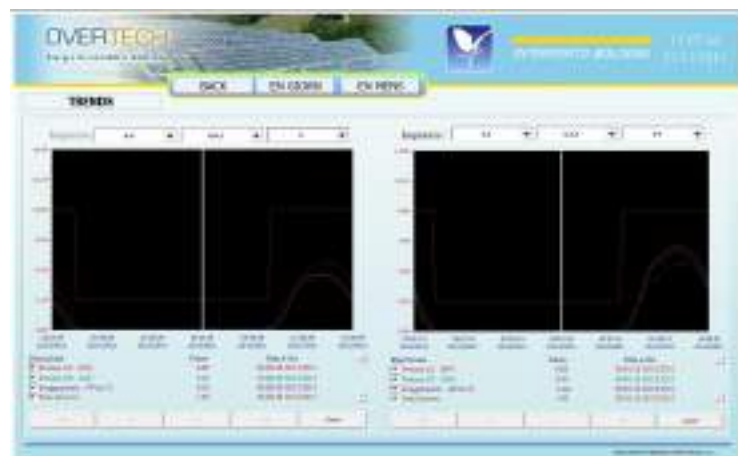
The software project based on Movicon supervises the diverse substations by presenting personnel with intuitive user interfaces which are user friendly and provide total system control and monitoring. Personnel can intervene using the user interface to optimize the working conditions of the various systems and/or promptly handle any eventual critical situations, such as inverter malfunctioning, damaged string box fuses or substation disconnections. The most important process data can be managed in real time using graphical displays screens. These screens are equipped with various smart graphics to display real-time information on status and values and for displaying data recorded on relational database to allow users to perform historical and statistical analysis. This type of architecture was made possible by using an all-in-one supervision system capable of synthesizing – without a margin of error – data deriving from heterogeneous systems. This supervision system also provided greater advantages by being more effective and efficient for personnel to use especially those who have specific roles and involvement in the functioning of the system:

- Design engineers
- Investors
- Maintenance

As explicitly requested by the company, access to the system is protected by Log In using password and username with assigned privileges based on job responsibility according to the security criteria.



The Movicon 11 user interface allows the user to get clear and intuitive vision and information of all the system's functionalities also accesible by web.



Energy production data analysis is essential for improving productivity and assessing investment returns.

Information availability via web

The enhancements implemented by Movicon in terms of HMI interface development have produced a straight forward and immediate graphical understanding of the whole system without neglecting the pure engineering aspects

involved. All operating data is displayable through web interfacing to enable those, who work the various photovoltaic system components, direct supervision using remote control. This also permits such personnel to perform analysis on historical log and Trend data which are easily performed using the Movicon software's great capacity to represent a high level of information in graphical charts and graphs. The Web Client technology offered by Movicon is extremely efficient and easy to use within a specially designed web architecture that does not need pre-configuring. Even though accessing the system through the Web still requires log in for user authentication, it does not require any additional installation and can be accessed from any remote system that use internet browsers or from mobile devices such as smartphones or tablets.

Rebernic Supervisioni Srl fully completed their project assignment within the agreed deadline to the great satisfaction of the client, who is now completely competent in managing and maintaining the whole system autonomously. Great satisfaction was also expressed by investors who now have the possibility to access operating data and view and control energy savings.

*Rebernic Supervisioni S.r.l.
Overtech S.r.l*



The Bologna Freight Village contains about 400,000 square meters of 4.2 MW photovoltaic with 17 support racks, 7 power converters and 18,300 solar panels spread out over 9 freight village pavilions. So far this system has produced over 4.52 GWh of electric power and is one of the biggest photovoltaic systems in Italy.