Case note

ABB drives for energy efficiency
Reducing energy consumption in the chemical industry

Energy consumption represents a major item in chemical industry production costs, and reducing it may contribute significantly to improving business results. Projects may concern different areas and require the expertise of several specialists. One of Bitolea’s partners is ABB.

The experience of a large factory
At its facility in Landriano, Pavia (Italy), Bitolea S.p.A. Chimica Ecologica has developed an advanced engineering facility for the synthesis of chemical and chemical-pharmaceutical intermediates, the production and purification of organic solvents, and the development and production of eco-friendly fuels and combustibles for the global markets. The group also includes the Cambiaghi Division located in Rho, Milan, which produces raw materials and formulas for the chemical industry; Eurochem, specializing in the marketing of the group’s products, and the logistics company IM.TRA.S. Two business units operate in Landriano. The Chemical-Pharmaceutical unit has a state-of-the-art multifunction plant equipped with independent Quality Control and Quality Assurance system, able to meet all customer needs. The Organic Chemistry Synthesis section consists of pilot plants for process up-scaling, the production plant, and the R&D, analysis and quality control laboratories. Measured in usable reaction volumes, the facility’s production capacity reaches 220,000 liters with reactors of different volumes, capable of operating at temperatures ranging from -197 to +180 °C.

The Solvent Purification unit includes fractionation columns operating continuously or in batches, high-rectification tray and/or structured packing columns, and thin layer evaporators. The range of process technologies is so wide that no solvents or mixtures are incompatible with Bitolea equipment. The whole facility is equipped with an ABB DCS control system, constantly upgraded since 1995, with over 8,000 monitoring and management stations.

Large consumption, effective response
The activities carried out in Landriano consume large amounts of thermal and electric energy. The production of heated steam (with pressures up to 55 bar and temperatures up to 430 °C) is somewhere around 40 t/h continuously, and power consumption – accounting for 30 percent of total energy costs – results in absorption levels that have progressively risen from 2 MW to over 4 MW, in parallel with production expansion. Half of the company’s load is on equipment operating 24 hours a day. A number of energy-saving solutions have been studied in the last few years: to address natural gas consumption, which had reached 2,700 cubic meters per hour, the furnaces were replaced and dual burners were installed so that oil or gas could be used depending on price levels. A 3.7 MW steam turbine was installed: this solution proved extremely cost-effective as it required a small initial investment and low maintenance costs, while meeting all production needs. Lastly, the plant has been equipped with inverters.
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Measurable benefits
The application resulted in savings that provided a return on investment over only eight months. Out of six pumps in the thermal plant, five operate continuously at a frequency close to 47Hz, with savings of more than 10 percent, equal to an actual 37.5 kW, which multiplied by 8,040 hours means 303,000 kWh per year. The water pumps operate at a frequency close to 42Hz, with savings around 38 percent, equal to an actual 355.8 kW, which multiplied by 8,040 hours gives 2,860,632 kWh per year. The total saving is therefore 3,163,632 kWh per year. This successful supply strengthens a long-lasting relationship. Despite repeated proposals from other manufacturers to migrate the DCS, over the years Bitolea has shown to prefer ABB technologies because of the excellent operation and ease of configuration of the system and the support they have always received for all their personnel development and training requirements. By express decision of the management, all medium and low voltage power and distribution equipment installed at the facility is also supplied by ABB.

Operation according to need
Designed in years when energy prices were lower, the plant’s pumps and motors are overdimensioned: the circuits being so extensive, suppliers tended to oversize the equipment to avoid risks of dispersion or load loss. Control was achieved through throttling valves, which caused a significant waste of energy. Three years ago it was decided to conduct the first test with inverters. Once the equipment was installed on a 75 kW pump and the measurements were performed modulating the frequency, the results showed that up to 40 percent energy savings could be achieved. Therefore, the management decided to proceed on the larger pumps, in operation for approximately 8,040 hours per year. In 2009 ABB supplied 17 inverters for a total power of 1,636 kW. The equipment installed included 6 inverters on 75 kW pumps to circulate diathermic oil in the thermal station; 7 inverters on 132 kW pumps to circulate tower water to the distillation units; 3 inverters on 75 kW pumps to convey tower water to the refrigerating units, 1 inverter on a 37 kW pump to convey tower water to other services. After evaluating other options on the market, Bitolea selected ABB because of its recognized brand quality, user-friendly equipment programming and maintenance, and dimensioning of the three sizes purchased, enabling to optimize installation.