Novamont S.p.A.
Solutions for the Chemical Industry

Results

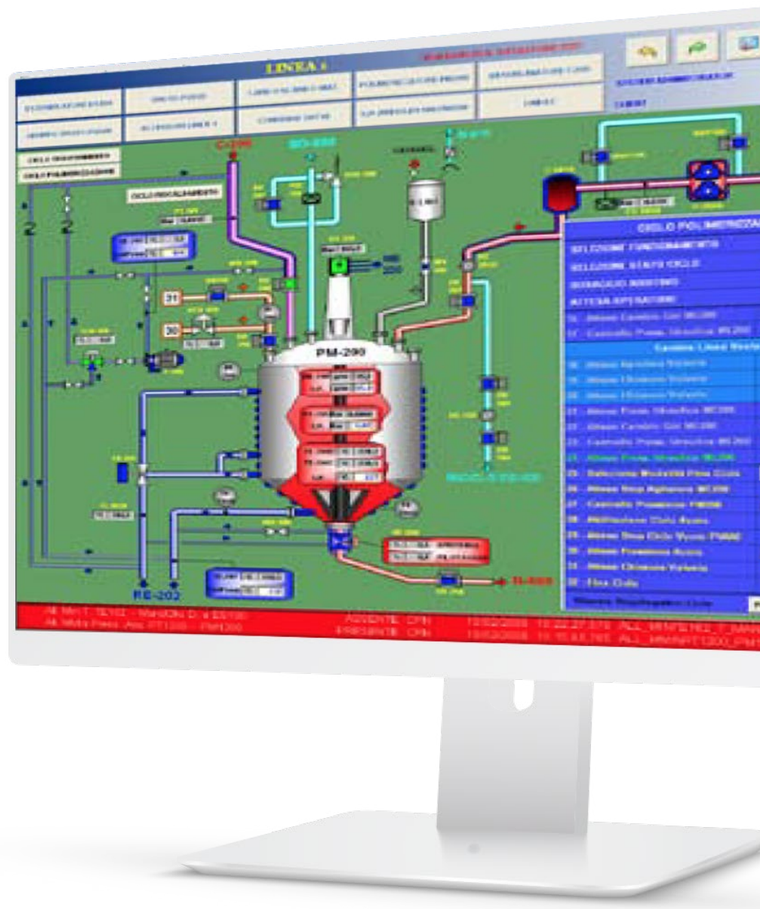
- Customized and flexible monitoring and control system
- Production of defect-free material through reliable monitoring of the production process
- High production uptime through powerful alarm functions, allowing immediate correction of irregularities to prevent production stops
- Easy upgrading without reprogramming
- Connection to existing infrastructure and third-party hardware
- Remote monitoring

Bioplastics manufacturer automates its plant with GE Digital's iFIX for eco-friendly production

Novamont, headquartered in Novara, Italy, seeks new ways to make plastic materials by turning raw vegetable materials—sources that are renewable year after year—into 'bioplastics' and intermediate renewable chemical products. These materials have all the properties of traditional products for low environmental impact applications.

A production growth target has led Novamont to develop an innovative system for making plastic materials from natural raw materials such as cereal starch (e.g., maize). These fully biodegradable, economically-sustainable materials require careful monitoring and high flexibility.

"Living chemistry for the quality of life". This has always been the dream and mission of Novamont, originally established as a research center, and today involved in the development of products generated from renewable agricultural raw materials. The company's objective is to significantly contribute to establishing a new industrial policy capable of combining development needs and sustainability, creating an integrated system which involves chemistry, agriculture, industry, and the environment for "truly sustainable development" with a low environmental impact.



A delicate process

The production of biopolymer granules is based on the reaction (complexing) of plastic starch with other biodegradable polymeric components. The typical plasticiser of starch is water. Put simply, the process consists of mixing starch and water with various components, which react together under controlled conditions of temperature and pressure.

As mentioned, plasticising occurs in the presence of water, the percentage of which is generally kept under 10% (traditional plastics have values lower than 0.1%), with a certain variability of temperature depending on the application of the finished materials.

Maintaining optimal process conditions is essential for good results on the finished product, and to ensure reproducibility of all the factors in different production runs. This uniformity is the key to ensure the correct mechanical properties of the product to be processed by machines designed for traditional polymers. A high deviation from correct values may irreversibly damage the delicate and costly organic material.

Bioplastics compete on the market directly with petroleum derivatives, such as polyethylene, which are easier to make and less prone to deterioration. Equivalent or better features are therefore paramount in order to succeed.

Many combinations of starch, water, and additives

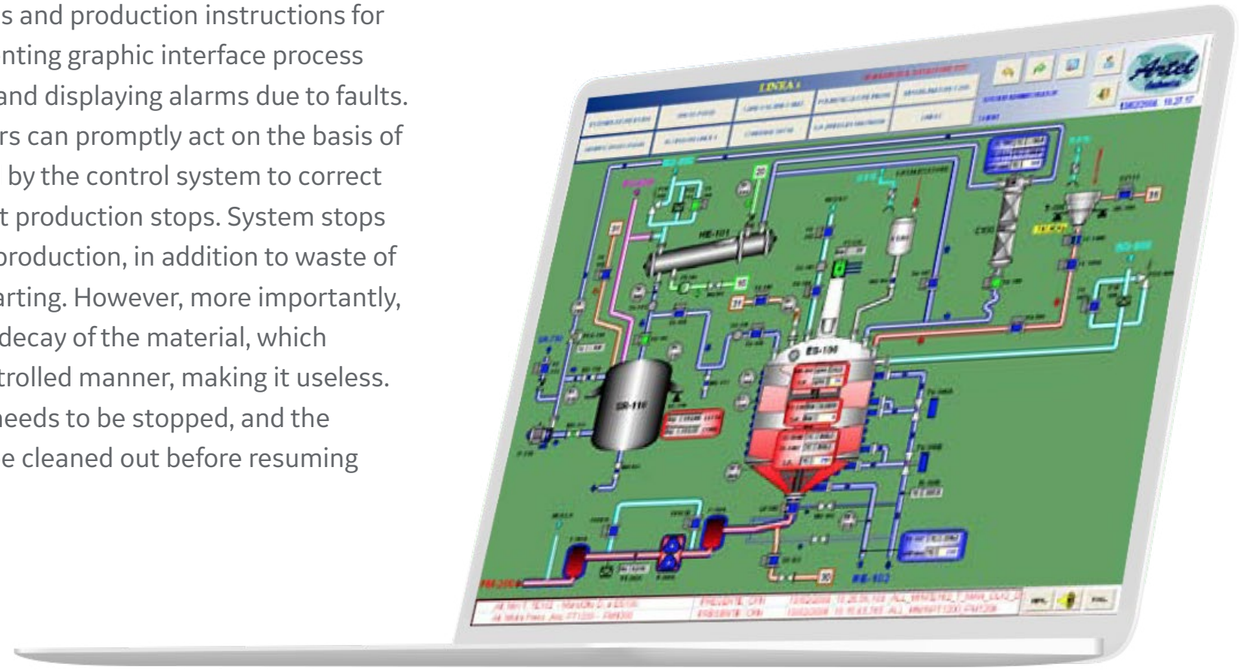
The percentages of starch, water, and additives are not the same in every Novamont product. Many recipes need to be created and fine-tuned in the course of time, and used with great care. Nearly 20 different products are made on the three production lines at the company's production plant in Terni. The properties of each are modified on the basis of market demands, a market which is growing steadily throughout Europe and North America.

The company's production management system must therefore be very flexible to allow a variety of production. Novamont's system is controlled by GE Digital's iFIX, which collects the recipes and production instructions for each product type, presenting graphic interface process overviews to operators, and displaying alarms due to faults. In case of faults, operators can promptly act on the basis of the information supplied by the control system to correct the situation and prevent production stops. System stops obviously cause missed production, in addition to waste of time and energy for restarting. However, more importantly, system faults can cause decay of the material, which polymerizes in an uncontrolled manner, making it useless. In this case, production needs to be stopped, and the entire system needs to be cleaned out before resuming the process.

The production cycle

The material stocked in silos is conveyed by means of a compressed air tube system to the hoppers, and from there to gravimetric dispensers, which in turn feed the right amount of material into the reactor. The molten product from the reactor is extruded, cut into granules, and finally carried by another conveyor system to the packaging line, where it is put into bags or boxes.

In addition to the reactor, the control system also governs the conveying areas that must be kept cool (a refrigerated air heat exchanger is located there). This prevents the material from softening and clotting along the conveying tubes, which would hinder the upstream dispensing operation and downstream packaging operations. In the reactor, the control system governs the pressure and the amount of water, evacuating the excess water by degasification.



The iFIX controller

A new production line was first opened at the Terni plant, and used to perfect the process and define the definitive recipe set used today. Since the product is innovative, the process was defined by experimentation, and by gradually fine-tuning the system parameters. To support these changes and settings, the development team of Artel, a Terni-based company specializing in chemical plant process control, installed iFIX on the centralized servers, which manages the entire system, and installed single lines on the clients. The SCADA system monitors and displays what happens in the plant, following the whole line, and allowing operators to work on the processes.

Users can interact with the Terni server by logging on as an operator, an administrator, or as maintenance personnel. Each user type displays and works on graphic pages with different content.

A remote supervisory station at the Novamont headquarters displays the system state via an interface with the server at Terni.

The installation includes GE's PACsystems RX7i and RX3i, and two types of Siemens PLCs, with which iFIX interfaces via corresponding OPC drivers, demonstrating the product's versatility.

Redundancy

The critical nature of the system to Novamont's business, and the potential damage which may occur in the event of faults and/or stops, have led to the introduction of redundancy in control hardware—PACSystems RX7i pairs in Hot Backup Redundancy—as well as in the communication networks and in the supervisory stations. Even the PC connection hubs are redundant and connected through optical fiber.

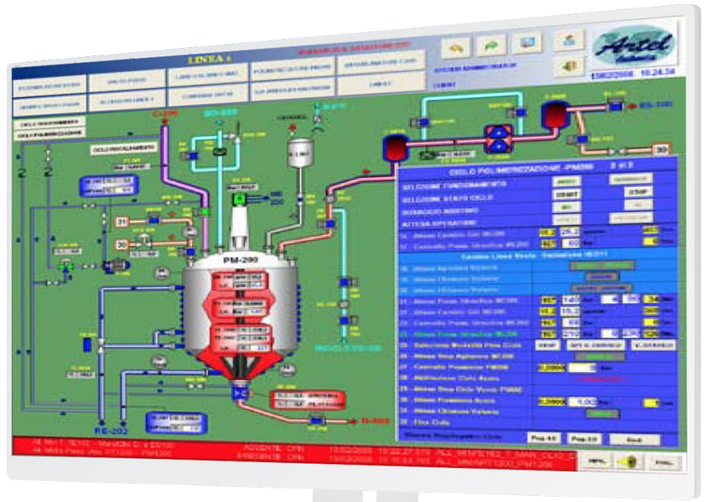
The client, located in Novara, can display what is happening on the server at Terni; it cannot control the system directly, but allows further monitoring of the Terni plant. There are four supervisory PCs, one for each line. They work in pairs, each gathering data from two lines, so that one back-up station is always ready in case the other computer fails.

The communication infrastructure

The system has several hundreds of tags, and a fast scanning speed is needed because of the critical chemical and thermal processes. For this reason, the communication infrastructure must support the data exchange speed between PC and PLC. Therefore, the communication infrastructure is split into three local area networks.

The first LAN connects the computers in the system together, and to the rest of the company, including supervisory and process data collection servers. The second LAN connects all the PLCs and the equipment dedicated to process management with the supervisory PCs by means of communication drivers. Due to its importance, devices are redundant in this network branch to ensure communication at all times. Finally, the third part of the network infrastructure, the Support PLC LAN, connects the supervisory PCs to the controllers (or process support controllers). This system manages all of the PLCs and the devices that manage system parts and services.

This architecture ensures better network load distribution management, increases system performance, and guarantees the necessary bandwidth for the most critical functions (interfacing between Primary PLCs and Supervisory PCs). All LAN branches use coaxial cable connected to the hubs (which are also redundant), to the PLCs, and to the supervisory PCs. The system includes a gateway for converting part of the communications from Modbus Ethernet to Modbus RTU, using RS-485 for managing a number of scales used for batching raw materials. Other RS-485 serial communications are used for connecting the Service PLC to other devices, such as refrigerators, etc.

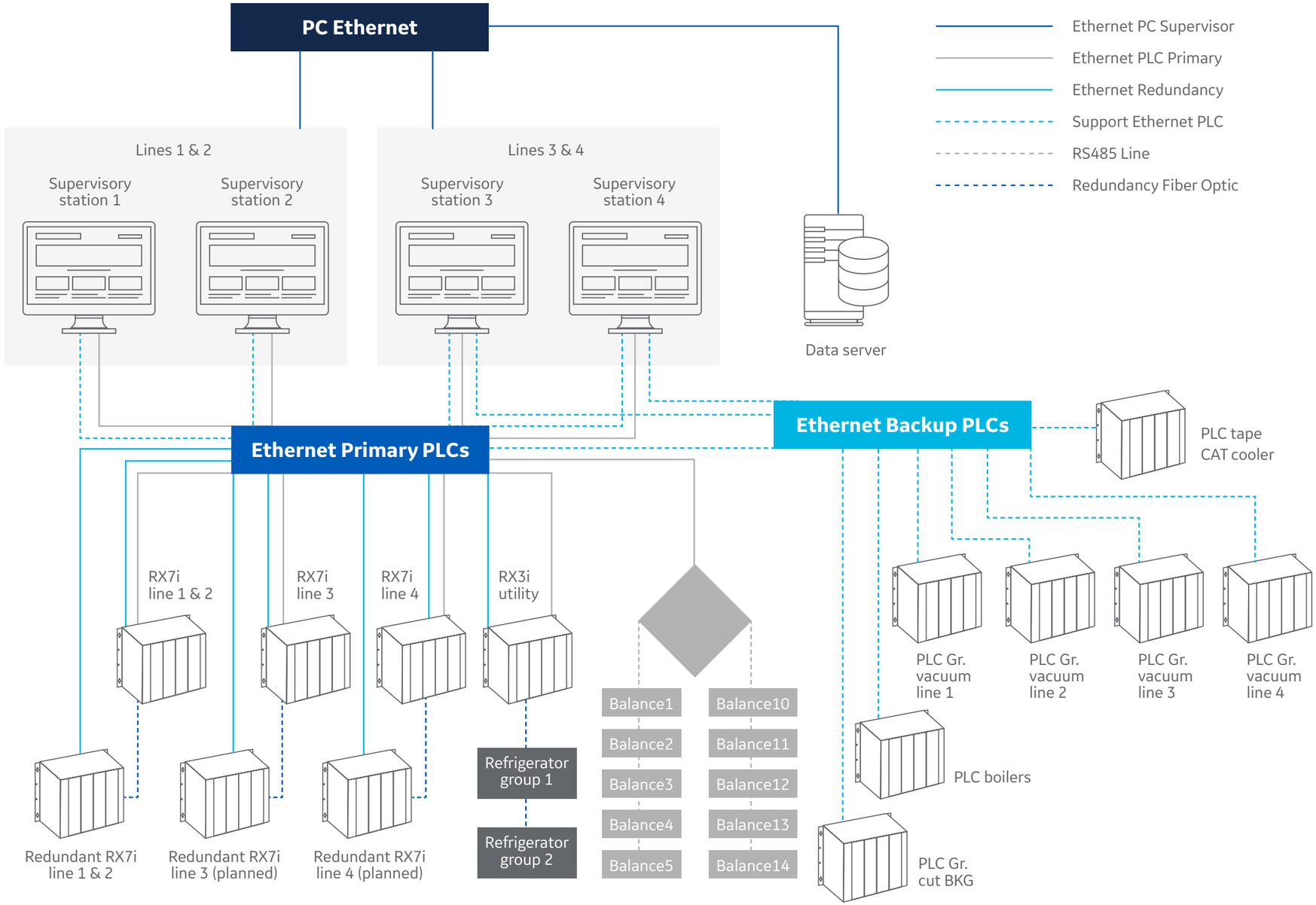


The results

Artel's work with iFIX provided Novamont with a tailor-made supervisory system that grew and changed over time, meeting the company's developing process needs.

The flexibility of iFIX was paramount. Above all, it can work with controllers of different brands, allowing easy gathering of major changes in parameters and control logic during all of the adjustment phases of the production process.

The graphic control tools allow the easy addition of new recipes, leading the way to new eco-friendly products. The control system has grown, and continues to be integrated with new functions without needing reprogramming, and without affecting the existing application.



About GE

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