Case Study: Lumenyte

Optical Fiber Production Processes Controlled and Monitored by Opto 22 SNAP PAC System

Optical fiber, made of either glass or plastic, is designed to guide or provide light in settings where illumination is neither naturally nor easily available. For instance, optical fiber is used to transmit natural light into dark or recessed areas of buildings. Optical fiber illumination is also used in architectural, medical, inspection, and many other types of applications.

Examples of Lumenyte's optical fiber

Southern California-based Lumenyte International Corporation specializes in fiber-optic lighting solutions for original equipment manufacturers and a number of industrial, architectural, and transportation-related industries. Beginning with water-related applications, such as providing underwater lighting for pools, spas, and the like, Lumenyte has established a 26-year history of innovation in providing sophisticated and energy-efficient plastic fiber-optic lighting systems to a worldwide customer base. The company has also been largely responsible for the use of fiber-optic lighting beyond simple decorative and aesthetic uses, to more utilitarian functions. The company even holds several patents for technologies such as linear emitting fiber-optics (LEF), the only functional sidelight fiber-optic currently available.

Today, Lumenyte boasts an impressive roster of clients, many of whom chose Lumenyte systems for their design flexibility, ease of maintenance, and particularly, their energy conservation qualities. According to Lumenyte Facilities and Production Operations Manager Scott Dill, many of the companies that are now sourcing fiber-optic solutions do so as part of their concerted, company-wide energy conservation (or "green") efforts and because they recognize fiber-optics (coupled with energy efficient light sources) as a viable low-energy lighting option. This new application of technology has the potential to save considerable amounts of energy throughout the world.

Lumenyte has further branched into an even more broad and diverse assortment of application areas (such as customized architecture) and has also found great success in developing solutions in the military and homeland security sectors. Examples include the development of a variety of self-illuminating telescoping search and inspection mirrors, LEF lighting for US Navy ships and aircraft carriers, and the Security Illumination Mat System™ (SIMS), which uses fiber-optic technology to provide a portable under-vehicle inspection system to detect the presence of explosive devices. The SIMS system has been deployed at several government and military installations (such as embassies and border checkpoints) in Iraq and has provided a greater level of security for military personnel and undoubtedly saved many lives.

Lumenyte International Corporation headquarters

Lumenyte is currently using Opto 22's SNAP PAC System and other hardware to control and monitor a host of equipment used in the manufacturing of its plastic optical fibers. This equipment includes a large stainless steel casting chamber, 56 feet long and 16 inches in diameter.

"This chamber has what we refer to as a 'hot side' and a 'cool side', and it is one of the key pieces of manufacturing equipment used to produce our optical fiber," says Dill. "We use the Opto 22 systems in many phases of a very complicated process that relies

on repeated heating and cooling and the application and accurate measurement of very precise temperatures, flows, and pressure."

For example, Opto 22 SNAP analog input and output modules and Opto 22 SNAP PAC programmable automation controllers monitor the levels, flows, temperatures, and pressures in a process utilizing over 35 various sensor inputs. The controller regulates over 50 ball valves that open and close in various sequences and percentages so the various flows, temperatures, and pressures are accurately maintained at the specified parameters. Also monitored are flow meters, which send data to the controller to ensure that the flow rates calculated and set in the Opto 22 control program are maintained.

Lumenyte's fiber optic casting chamber

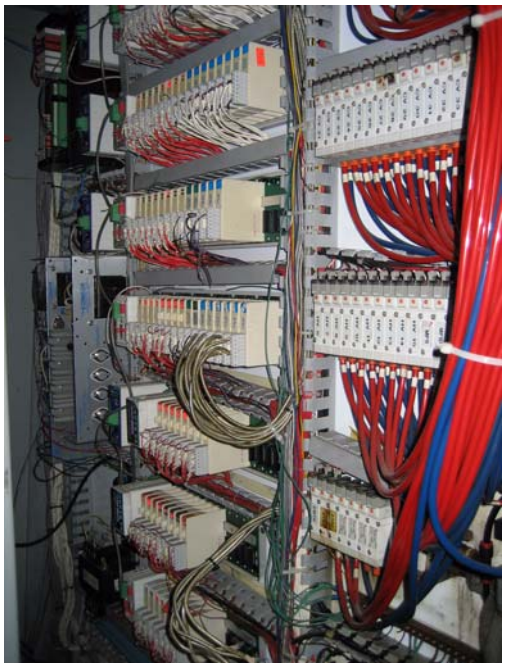
Lumenyte also uses the controller to regulate nitrogen delivery equipment, to control the flow of liquid from a 3000-gallon nitrogen holding tank to a liquid nitrogen cooling system. The system plays a critical role as a cooling medium during the fiber-optics production processes. Inlet pipes and valves are regulated to divert liquid nitrogen through different parts of the cooling apparatus to provide the necessary flows and cooling effect.

Multiple Opto 22-controlled valve actuators regulate delivery of hot water and liquid nitrogen needed for casting of the fiber optics

"The casting chamber's heating elements are also controlled by Opto 22 systems, so as the water is added, we initiate a progressive heating process to get the water temperature properly elevated and then maintained," says Dill. "Changing this cool environment to a very warm one is a critical part of our process."

To execute this process, the controller interfaces to analog and digital modules. In turn, the modules connect to the various valves, flow meters, and circulation and metering pumps' drives and motors. The Opto 22 control strategy executes all of the logic and controls all of the equipment for the cooling process, such as drawing water out of large tanks and delivering it to the chamber. As the strategy executes and specified amounts of water are introduced to the process, optimal temperatures are reached and additional processes and changes are initiated, including a heating process.

Lumenyte's mix of flow and pressure sensors, type T and J thermocouples, and resistance temperature detectors are all wired back to the controller via SNAP analog I/O modules and the data they deliver then becomes part of the executing control strategy. Using the OptoDisplay runtime human machine interface, all aspects of the process are closely monitored to ensure that they meet strict parameters defined in the strategy by the Lumenyte operators. The flexible OptoDisplay HMI makes it easy for operators to preset different parameters for many different production requirements. Upon completion of the process, the controller initiates a complete shutdown, returning everything to its original state so the product can be removed for further processing.



Lumenyte's Opto 22 control system features a PAC-based architecture

Significantly, when Lumenyte replaced its older Opto 22 serial-based M4RTU controllers with its current SNAP PAC controllers, Dill and his colleagues had to migrate all of their control strategies—a task they found to be much easier than expected. The SNAP-PAC-S1 has an RS-485 serial port that Lumenyte used to connect to all of their external I/O—thereby saving the time and expense of deploying new I/O and also having to rewire much of the control architecture. At the same time, PAC Control Professional (the programming environment for the SNAP PAC System) because it supports the *mistic* I/O serial communications protocol and command set, allowed Lumenyte to migrate to the newer software and import existing control strategies with very few issues.

"Readdressing these strategies is something that we were going to do anyway," says Dill. "But PAC Control has made importing fairly painless. PAC Control gives you a highly intuitive interface that reflects your understanding of what's happening with your process, and the software goes well with the solid Opto control system. Plus, it's easy to learn, just as flexible, and more straightforward than ladder logic. The easier learning curve has allowed us to utilize Opto 22 as an effective control system and the Opto 22 customer support has been the best I've ever encountered."

As Lumenyte maintains its leadership in developing fiber-optic solutions, the company will continue to rely on its partnership with Opto 22 and the superior control, monitoring and data acquisition interfaces the company is able to provide for Lumenyte's many complex manufacturing processes.