In the distant past, fiber optics had a reputation for being too fragile and expensive for the plant floor—a bleeding-edge technology that’s just not worth looking at for the day-to-day requirements of industrial facilities. But developments over the past 10 years have resulted in fiber optic systems tailored to the requirements of new—and existing—process plant and manufacturing environments, able to carry a wide variety of signals and data with capabilities wire can’t match, to provide a superior solution now and far into the future. There are many reasons to consider fiber optics for the factory. Here are 10 of the best:

1. Optical fiber offers higher data rates and wider bandwidths than copper, with a single optical fiber capable of carrying as much as 10Gbps in industrial applications.

2. Optical fiber can transmit a wide variety of digital and analog signals including contact closure information, 4-20 mA and 0-10 Vdc as a single input to output or multiplex bi-directionally, using inexpensive converters that translate electrical signals to and from optical datastreams. Additionally, copper/fiber media conversion of serial protocols such as RS232/485, Ethernet, Ethernet/IP, ControlNet, Profibus, DH+, Modbus Plus and Genius Bus are part of this mix.

3. Optical fiber is secure. Many refineries and other critical industries are using fiber optic instead of wired and wireless Ethernet due to security concerns, as fiber optic signals, unlike electronic signals traveling via copper, do not emit electromagnetic waves that are easily captured. Fiber optic signals also resist deciphering by hackers, and built-in diagnostics may be able to detect intruders.

4. Signal strength losses of optical fiber are significantly less than copper. In practice, transmission distances are so much greater over fiber than copper, distance becomes a non-issue in any industrial setting.

5. Being electrically non-conductive, optical fiber is immune to electromagnetic interference, allowing highly reliable networks in electromagnetically noisy environments and in crowded wireways.

6. Optical fiber doesn’t carry sparks, shocks or ground loops, protecting personnel as well as connected equipment from lightning strikes, surges and electrical faults.

7. Optical fiber is compact and lightweight, saving space in panels, wireways and ducts. It also resists corrosion and has a longer life expectancy than copper or coaxial cable.
8. Optical fiber systems can easily accommodate modifications, additions and upgrades. Installation and maintenance does not require exotic skills or tools: recent developments such as small form-factor pluggable (SFP) transceivers simplify connections, while simple equipment instructions and dip switches ease configuration.

9. Optical fiber provides high ROI and low lifecycle cost. In applications where distance, speed, security, reliability and safety are important, fiber optic often carries a lower installed cost than copper, as well as lower maintenance costs and longer life.

10. Optical fiber is industrial-strength. Industrial fiber optic networks are designed for the harshest environments, using fault-tolerant topologies such as self-healing rings. Industrial components exceed factory-floor requirements for ease of installation, maintenance and troubleshooting, as well as durability and cost.

Proven in the Toughest Applications
Industrial automation applications have unique requirements for communication networks that differ from those of commercial-grade networks. Industrial network components must withstand much harsher environmental conditions, which can include extreme temperatures, lightning strikes, electromagnetic interference and installation in hazardous area locations.

The use of fiber optic data transmission for industrial automation and process control has become increasingly popular over the past decade. A basic fiber optic system, using an optical transceiver circuit and fiber optic media, offers a wide array of benefits that are not available with traditional copper conductors.

Fiber optic cabling is commonly used in industrial automation applications to provide highly reliable networking appliances that don’t fail, thus maintaining revenue production and worker safety. Examples include:

- Mines requiring fault-tolerant networking topologies for hoisting people and equipment, building conveyor systems, drilling, reading environmental sensors, etc.
- Offshore rigs for drilling, fire, security, HVAC, etc.
- Oil & gas refineries and liquid terminal stations
- Military and defense
- Rail and transportation projects involving access gates and turnstiles
- Emission monitoring systems including smoke-stack monitoring for power utilities
- Supervisory and control systems communications for transportation, including rail, tunnels and waterways.

This Control white paper was made possible by Ultra Electronics, Nuclear Sensors & Process Instrumentation (NSPI). Ultra Electronics offers a full line of fiber optic converters, modems and multiplexers, as well as engineering advice and support for industrial users who are considering the benefits of fiber optics for industrial communications. For more information, visit www.ultra-nspi.com.