GET FAMILIAR WITH INSTRUMENTATION TRAY CABLE

AND REDUCE THE USE OF CONDUIT

Use Code Changes to Cut Cabling Costs

PHILIP BURGERT

SYSTEM AND MACHINE DESIGNERS, PARTICULARLY IN NORTH America, have long looked at conduit as the primary method for cabling control systems in hazardous environments within plants and factories. But changes in code standards that have taken place over the past few years are starting to shift new and upgraded systems to what many describe as more flexible and sometime less costly installations.

Instrumentation tray cable, or Type ITC, an innovation introduced in the 1996 cycle of the National Electrical Code, now allows devices that are not listed as power-limited and the movement of more cabling out of conduit. This saves money in installation and design costs for increasing numbers of industrial networks, according to its advocates. Type ITC was further amended with the addition of armored jacketing in 1999.

The cable can be used in control and instrumentation circuits operating at 150 V or less and at 5 A or less. Type ITC is defined as a factory assembly of two or more insulated conductors with or without grounding conductors enclosed in a non-metallic sheath. It can be used in cable trays, raceways, and under raised floor in information technology equipment rooms under certain conditions.

A particular advantage of instrumentation tray cable is it eliminates the need for special devices required with cable trays under previous NEC requirements allowing power-limited tray cable, or Type PLTC. Such devices often carry price tags of as much as $120,000 for listing of a terminal block and resistor, according to H. R. Stewart, a Houston-based cable industry consultant who worked for Okonite Co. during development of the Type ITC standards.

Recent cycles of the NEC have "included significant additions to the permitted uses of tray cables," says Bradley Larson, an engineer at Turck Inc. (www.turck.com) and the chairman of a committee addressing NEC changes for ISA. These changes enable what Larson calls "a revolutionary process wiring system for hazardous locations."

Turck and its InterlinkBT partnership with Banner Engineering Corp. are offering junction boxes and Lokfast guards, which are designed for quick-disconnect use in hazardous and non-hazardous locations. The products use a section of the new NEC code that allows ITC cable without metallic sheath or armor to be run as open wiring for 50 ft. between cable tray and equipment. This cable must be protected against physical damage using mechanical protection such as struts, angles, or channels.

"If you're doing transmitter and fieldbus wiring, this is much simpler and easier to use," Larson says. "You don't have to use fancy cable or stuff it in a fancy tube." He adds that the main challenge for marketing this kind of product is converting network designers, who are "married to bending conduit. We've had to educate them. This allows you to do some really neat things in low-hazard areas with low-level control circuits."

DO-IT-YOURSELF POWER LIMITING

David Wechsler, now a process safety technology leader at Dow Chemical Co. in Freeport, Texas, pushed the Type ITC addition into the NEC while working as a risk management consultant for Union Carbide Corp. "Users could not previously build their own power-limited circuits," Wechsler says. "The only way to get a power-limited source was through a third party."

Wechsler notes that power-limited tray cable has been widely used within the chemical and petroleum industries for instrumentation wiring schemes as those industries shifted first from pneumatic controls to electrical and then electronic controls. With the move to electronic controls, the amount of voltage involved in plant networks has been reduced, making 300 V insulation more than adequate.

CommScope Properties LLC (www.commscope.com), which claims to be the world's largest manufacturer of coaxial cable and also makes twisted-pair and fiberoptic products, completely recabled its 1 million-sq.ft. plant in Catawba, N.C., with tray cable and is in the process of recabling its other six plants in the U.S., Brazil, and Belgium.

"We like to eat what we sell," says Thomas Boucino, a CommScope product engineer at the company's headquarters in Hickory, N.C., who runs the research and development lab for the company's copper-based products. "Conduit has its place but it still has inflexibility when you install it."

Boucino suggests the move toward tray cable and Type ITC is being held back to some degree by the current economy, noting that some network designers are still on the fence with

doubts on the need to shift methodologies. "Little by little it is expanding throughout plants," he says.

But Boucino also believes the move toward increasing automation in factories will push tray cabling into greater use in the U.S. "I would say at least 50% of people installing industrial Ethernet are doing it in the tray cable mode instead of using conduit," he says. "In my view, this is the next big revolution after office networks. We're going to see more and more of it on the factory floor."

The next logical step for Type ITC and other tray cabling products, says Boucino, will be the development of systems constructed from modular components that can be easily installed in ladder trays and other configurations, making instrumentation and process control installation even easier.

Automotive industry customers are among those leading the shift to industrial Ethernet, as they require tier-two and tier-three suppliers to also incorporate today's real-time factory control systems. "They're looking at every possible way to cut costs," Boucino says. "A lot of people are still afraid to spend any money on infrastructure, however."

NOT JUST FOR SMOKESTACK INDUSTRIES

The introduction of instrumentation tray cable to the NEC continued a move toward tray cabling that was first introduced to the code in 1978 with an addition that provided for cable trays and power-limited tray cables. According to Richard Buschart, St. Louis-based technical director for the Cable Tray Institute, Type PLTC first was approved for flammable vapor and gas hazard Class I, Div. 2 locations and later was approved for combustible dust hazard Class II, Div. 2 locations.

A few years ago, the institute noted, cable tray was considered a "smokestack" product and was used primarily in heavy industrial facilities to support power cables. Since then, electrical and telecom industries have discovered cable tray's strength, speed of installation, and accessibility for future cabling requirements, leading to increasing use in institutional and commercial applications.

The 1996 NEC provided for the addition of Type ITC in both Class I, Div. 2 locations and Class II, Div. 2 locations while specifying that no spacing was required between cables or single-layer installations, Buschart notes. The 1999 code allowed for Type ITC cable with an armor jacket for use in Class I, Div. 1 locations in industrial establishments. This cable requires a gas and vapor-tight continuous corrugated sheath.

Contributing to the move to ITC has been a series of other changes in the NEC and Canadian Electrical Code, which have been intended to bring North American standards in line with those of the International Electrotechnical Commission.

Before these changes began, an estimated 90% of North American cabling was installed in conduit, while cabling in Europe and other parts of the world has long been dominated by cable trays, says Paul Babiarz, manager of business development for Cooper Crouse-Hinds (www.crouse-hinds.com).

Belden Targets Cable Connectivity Interoperability

Proving the performance of cable in combination with passive connectivity hardware from other vendors is the target of a new Networking Interoperability Laboratory opened in mid-2002 by Belden Electronics at its Richmond, Ind., headquarters.

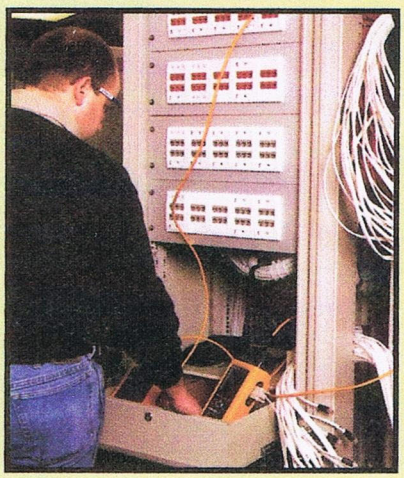
The laboratory initially worked with customers and other vendors primarily in the commercial, entertainment, and home automation markets, but the company is planning a "strong implementation" program for lab utilization by the industrial sector during 2003, according to Belden managers.

The launch of industrial testing in the lab will coincide with the rollout of a new line of twisted-pair copper and fiberoptic industrial Ethernet cables announced by the company in December. The cables are designed to withstand exposure to oil and sunlight, temperature variations, abrasion, crushing, and the presence of electromagnetic or radio frequency interference.

"We think this [lab] will be very good at demonstrating the technical capability of the products that we design," says one Belden manager. "We're looking at the core competencies of the products we deal with."

Belden managers so far have declined to name any hardware vendors working with the lab on joint research projects and say the lab does not test cable products of competitors, although one customer suggests some cable-to-cable comparisons are being made.

"The lab sold me on their bonded-pair technology," says Steve Harris, project manager for Braggs Electric Construction, a division of CDI Contractors LLC, Little Rock, Ark. He said the lab used a Hewlett-Packard network analyzer to demonstrate the failure of non-bonded pair cables from Belden and other vendors in maintenance of Category 5e structured network cabling system performance standards.



Last year, Belden opened its Networking Operability Lab for customer-driven or joint research and testing projects with other networking industry leaders.

The testing uses the 568b-type standards applied for the testing standards of Category 5e and 6. The lab started with 3,000 testable channel configurations, but is expected to have more than 5,000 testable configurations by March of this year.

Babiarz is in the midst of updating a survey, first conducted in 1997, that tallies those differences. He expects the new survey to show North American cabling is shifting toward cable trays.

"Though conduit wiring use remains steady, there is a growing trend toward cable," he says. "In hazardous areas, this normally means some type of armored cable or a power-limited tray cable for instrumentation or low-power circuits."

Canada a decade ago embraced a type of armored, PVC-jacketed cable that favored conduit. But now, he notes, there are initiatives in western Canada to abandon this type of cable and switch to a less expensive non-armored cable for Zone 2 locations. This would reduce installation costs significantly, he says.

A little less convinced is Frank Koditek, industrial market manager for Belden Electronics (www.belden.com). "It's tough to differentiate how many of the users are saying that ITC is important," Koditek says, acknowledging that most of his company's sales and contacts with end users are through distributors. He notes that most of Belden's products for the tray cable market are sold with both PLTC and ITC approvals.

PLTC AND ITC CABLE SPECS

Available in single or multiple-pair cables, shielded.

300-volt insulation rating and are available in sizes down to #18 and lower.

PLTC cable covered in NEC sections 725-61 and 725-71 (e) and listed per U.L. standard 13. Application of PLTC requires the power supply listing requirements of Article 725.

To avoid the requirements of Article 725, industrial users added type ITC, Instrumental Tray Cable, described in article 727. Type ITC is listed per U.L. standard 2250.

NEC does not generally require PLTC and ITC be separated for power wiring if the PLTC and ITC cable is supplied with NEC Article 770 metal armor. However, separation is still desirable to avoid cross talk noise problems.

Belden recently announced the introduction of several new 300 V, Class 2-rated cables for DeviceNet applications along with a round cable version of 600 V, Class 1 tray cable for DeviceNet. Belden claims the cable allows end users to put more power on a network, gives more installation flexibility, and reduces cable and installation costs.

"We intuitively know this product is growing," Koditek says, noting that generic industrial users, transportation markets, and petrochemical industry applications appear to show the greatest growth. "For us, this is important to have on hand because we know there are people who require it." ●

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