

Tech Tips – What You Need to Know About EtherNet/IP Compatible Instruments

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By now nearly every factory floor and office in the world makes use of Ethernet for its connectivity backbone. Worldwide it is also a given that IT Departments consider all things Ethernet a core capability of their expertise.

Leveraging ubiquitous investments in Ethernet technology and extending its reach throughout the factory floor is a logical next step for many manufacturers. This is especially the case if and when a manufacturer seeks to integrate test data with MES (Manufacturing Execution Systems) or ERP (Enterprise Resource Planning) systems.

EtherNet/IP is a standardized communication protocol that allows communication between different instruments and devices on the factory floor – provides a relatively easy method toward that end.

It is a standard for communication that allows normally incompatible platforms to proceed using a platform-independent common protocol.

EtherNet/IP compatible test instruments can seamlessly control test cycles and transmit test results to/from PLCs or to central servers. This communication standard, EtherNet/IP is well established. It has been in use since the mid-90's. Curiously, even though EtherNet/IP has been a viable and low-cost solution for nearly two decades, one still finds many leak testers and other test instruments being sold in the marketplace that are

not EtherNet/IP capable. Moreover, manufacturers of test instruments without EtherNet/IP capabilities typically do not have the engineering know-how to assist manufacturers in implementing EtherNet/IP solutions.

InterTech Development Company has been helping companies set up EtherNet/IP capabilities for quite some time. **Tech Tips – What You Need to Know About EtherNet/IP Compatible Instruments** is geared to give those who have not yet implemented EtherNet/IP protocols a working knowledge of the advantages and requirements when implementing EtherNet/IP. This white paper is also a good launch point for those who have been tasked to implement EtherNet/IP who need to get a deeper grasp on what is required to do so.

Tech Tips – What You Need to Know About EtherNet/IP Compatible Instruments does not replace the hands-on no-cost consultations with experienced Test Applications Engineers to do a first-time implementation of the EtherNet/IP protocols. Such no-cost consultations are provided as a matter of course to InterTech customers. Here, we simply set out to help your company determine if EtherNet/IP is the direction that will work best for your operation moving forward.

Advantages of EtherNet/IP for Leak Testing

Simply put, EtherNet/IP allows you to leverage the Ethernet backbone that you need to run your factory and business.

Leveraging a company-wide Ethernet with EtherNet/IP capable leak testers allows you to move data bi-directionally, quickly changing test parameters when desired while maintaining full traceability. One can extract an entire set of parameters from an existing

unit and download them to a new unit, or transfer data for uploading/downloading test system and unit parameters. Part setup configurations can be managed seamlessly. Leak testers with EtherNet/IP can upload the most recent test results.

Best-in-class EtherNet/IP capable leak testers can also be easily linked with corporate data networks for real time analysis of test results. Corrective action of a process can be taken without production downtime. In this way, EtherNet/IP capable leak testers facilitate Lean Manufacturing Process Performance and Cost Improvement initiatives.

Any EtherNet/IP capable test instrument, not just leak detectors, will provide comparable benefits such as: traceability, integration with quality assurance systems, and ease of data analysis. Because EtherNet/IP is a well-established standardized protocol it means that if you invest time and resources to set up EtherNet/IP communications from your leak tester you are learning the same set of steps you would need to go through to prepare any instrument for EtherNet/IP communications. This is what it means to say that EtherNet/IP is a standard.

EtherNet/IP employs a single wire protocol that eliminates unwieldy physical wiring issues. With older communication methods the various I/O switches and other machine control inputs each require separate wiring. In contrast, with EtherNet/IP you just plug in one cable with one connector. That means that the time previously required to design and configure connections is eliminated. Now, wiring is no more complicated than picking a standard Ethernet cable off the shelf. Eliminating these wiring issues is a cost-saver – both for the hardware (wiring) and the engineering time required to fuss with multi-wire systems.

Further, the complications of serial communications are eliminated. Although serial is supposed to be a “standard” it still requires unique setup and wiring for every connection. The difficulties of serial communications are compounded when one is using PLCs because they are especially inept at handling ASCII data. Serial connections might use a single cable but it is not a standard equivalent to the EtherNet/IP standard.

Because EtherNet/IP capable leak detectors are on an Ethernet backbone it removes the one-to-one relationship of serial configurations. In one-to-one setups each hardwire can only have one source and one endpoint. In contrast, InterTech’s EtherNet/IP capable leak detectors use one connector that allows six devices on the network to complete a logical or virtual connection. This basically means you can have six private channels through a common medium, i.e. one-to-many advantages. This allows the leak tester to interact with a PLC at the same time it is servicing metrics gathering tools for the factory as a whole, and PCs monitoring maintenance, etc. If you are using a non-Ethernet method you do not get these one-to-many advantages.

Consider also that factory-wide implementation of the EtherNet/IP standard is a means to future-proof your investments for later expansion. Instead of having legacy instruments with disparate communication methods, EtherNet/IP communications create one standard that allows for maximum flexibility to expand or change test instruments and other factory automation at any time.

Because it uses an Ethernet backbone, EtherNet/IP also facilitates easy remote access to test instruments via the Internet. This streamlines a centralized capability for monitoring production and real-time analytics in globally distributed manufacturing facilities.

Understanding EtherNet/IP Requirements

PLCs require special programming to get them properly configured with EtherNet/IP as with any communication protocol. The PLC has to be configured such that it knows it has an Ethernet port and that it is using the EtherNet/IP protocol for communication. Including explicit messages is a necessary part of the PLC program.

For many experienced software engineers setting up these explicit messages to get status, to set up parts, and to retrieve results – i.e. the typical set of explicit messages required for an EtherNet/IP capable leak detector – will be a straightforward exercise of reading the Users Manual and applying the parameters as indicated. This is almost certainly the case for any engineer that has previously set up any EtherNet/IP capable instrument or other device. For those deploying EtherNet/IP for the first time you will need to decide if your in-house capabilities suffice or if you want to avail yourselves of no-cost guidance from InterTech's software engineering team.

Basically there are four pieces of information that must be included in the explicit message programming of your leak detector for EtherNet/IP communications – a service, an instance, a class and an attribute. As you can infer, this is NOT a time-intensive programming exercise and by the time you are tasked with programming a second EtherNet/IP capable instrument the time required for this task is barely significant. Expect that first-time deployments of an EtherNet/IP capable leak tester by those inexperienced with the protocol might take 1 day whereas programming a second EtherNet/IP capable instrument would typically only require minutes. This is a significant savings when comparing EtherNet/IP instruments' set up to the typical programming time required for serial communications.

A word of caution re: third party equipment that purports to adapt instruments such as leak detectors to EtherNet/IP capabilities. Third-party ASCII parsers are relatively costly – with typical price tags of US \$500 - \$800. And, every time you add any equipment or instruments that are not EtherNet/IP capable you will again need to incur these costs for separate adapters. EtherNet/IP adapters are typically more difficult to set up than EtherNet/IP capable leak testers or other instruments that have built-in EtherNet/IP capabilities. Bottom line – your manufacturing operation is better served by avoiding the complexities and costs of these third party EtherNet/IP converters.

Programming ladder logic needed for PLC operation has little to do with EtherNet/IP per se but is an inherent difficulty or complexity of PLCs. To communicate explicitly with equipment there needs to be a ladder logic message command. You will then need to know how to handle the information that is returned.

Applying the EtherNet/IP standard to best-in-class leak detectors requires programming of explicit messages during set up. PLC explicit message programming in EtherNet/IP communications is no more complex or time-consuming than that required for other communication platforms that require programming of messages. Once you are familiar with how to set up ladder logic for explicit message communications it becomes a very straightforward easy-to-do programming task for adding other EtherNet/IP capable instruments that have similar requirements for explicit messaging.

InterTech's User Manual provides sample ladder logic that can be used as a model but, like all other ladder logic programs, will not suffice as a copy-cut-paste line of code. PLCs are usually programmed differently, even within one plant.

The sample ladder logic will show how to program an explicit message for each separate operation from instrument setup through result retrieval. Through the years, InterTech's software engineers have walked many first-time users of EtherNet/IP capable leak testers through the exercise of how to adapt the sample ladder logic in the InterTech User Manual to their specific PLC programming. This is another example of why consideration of the bench of engineering talent supporting one or another test instrument is important to assess at the time of purchase. If you are moving your plant to EtherNet/IP communications you may be surprised to learn that several of the leak testers you find available for sale are not EtherNet/IP capable and that their manufacturers do not have in-house engineering expertise well-versed in EtherNet/IP protocols.

Another factor that needs to be considered when deploying EtherNet/IP leak testing is the potential increase in network traffic. Usually this is not significant because a one half or one second polling frequency for most leak testing applications is adequate. In the rare cases where polling is as frequent as every 50 milliseconds the use of a subnet is recommended. This allows the PLC and the leak tester to have fast traffic between them without affecting the Ethernet backbone for overall factory operations.

Summary

The well-established EtherNet/IP standard can be used with best-in-class leak detectors for several advantages. It allows users to leverage their investments in a business-wide Ethernet infrastructure. This is especially key for seamlessly incorporating leak test data into process improvement data analysis programs that are important to quality assurance and productivity programs.

By eliminating excessive cabling and the difficulties inherent in serial communications for PLCs, EtherNet/IP differentiates as an easy-to-deploy communication standard. This is especially the case when one enlists the expertise of test applications engineers who are familiar with EtherNet/IP communications to do first-time demonstrations of the ladder logic programming required with PLCs and EtherNet/IP capable leak testers.

InterTech Development Company (www.intertechdevelopment.com) has been assisting companies in implementing EtherNet/IP capable leak test instruments for many years. To schedule a no-cost consultation on best-match leak test technology for your application **call +847 679 3377 or write sales@intertechdevelopment.com.**