Fiber Optic Services And Products

EYE ON FIBER

Myths and Reality: Fiber Vs. Copper

Certainly, it is true that fiber and FTTD (fiber to the desk) has had difficulty in supplanting the incumbent UTP network technology. The reasons for this difficulty are many and differ, depending on the source. In this article, I will address five of the myths, which people present in an argument against fiber optics, and in particular, FTTD.

The five myths, for they are myths (or misconceptions), which influence decision makers against fiber and FTTD and their realities are:

Fiber is fragile

Fiber is hard to install

Fiber is hard to test

A fiber solution is more expensive than an UTP solution

Fear and uncertainty

As a brief summary, we present the realities.

1.Fiber is not fragile when packaged in a cable.

2. Fiber is not difficult to install, as long as the installer has the knowledge and training to perform the activities correctly.

3. Fiber is easy to test, as long as the tester knows how to set up the reference and perform the certification calculation.

4. A fiber solution can be less expensive than a UTP solution, depending on the configuration of the network and the cost of the telecommunication room.

5. Fiber optic communications has been around since the mid 1970s. Data communication applications began in the late 1970s and early 1980s. This fear and uncertainty is due to lack of knowledge.

Let us examine the reality behind the myths. The first myth, fiber is fragile, has three aspects: very early vs. current fiber, fiber in a cable structure and methods to avoid bending fiber with a primary coating or a with a tight buffer tube.

At one time, the coating did leave the fiber somewhat fragile. But, this was a reality twenty years ago, prior to 1981 or 1982.

Today, the reality is that fiber has a dual layer UV-cured acrylate coating that protects the surface of the glass extremely well. As an example of the toughness of this acrylate coated fiber, imaging wrapping the fiber around your fingers of both hands to attempt to break the fiber in tension. If you were to try this test of durability, you will probably cut your fingers before the fiber breaks. We have performed this test with nearly 5000 trainees in our FiberPro 1 training program with the same result: trainees agree that fiber is much more rugged than expected.

But this myth of fragility, though not a reality, ignores that simple fact that the fiber is never used alone. Instead it is used in a cable structure. The purpose of this structure is to protect the fiber during installation and use. Even if the fiber were fragile, which it has not been for twenty years, the cable structure would compensate for such incorrectly perceived fragility, so the cable would not be fragile!

This perceived fragility becomes a concern in two manipulations: pulling and bending. When you pull a fiber cable in, you must place a tensile stress on the cable. This stress results in a stretching of the fiber and the cable. All cables have a maximum installation load rating, which varies from approximately 100 pounds force to 600 pounds force. This myth ignores the fact that Cat. 5 cable cannot be pulled to more than 25 pounds force! The reality is that fiber cables are stronger than UTP cables! So much for the myth of fiber fragility in tension.

When you handle a cable or install a fiber cable into a connector or splice tray, you may bend the cable. Bending the cable puts a bending stress on the surface of the fiber. All cables have a minimum recommended unloaded bend radius. Most fiber jumper cables have a diameter of 3 mm, or 0.118inches. Fiber cables have a bend radius that is usually, but not always, ten times the cable diameter. With this rule of thumb, the minimum recommended bend radius for single fiber cables is 30 mm or 1.18inches. The fiber will never break at this radius, because this radius is limited by the plastics used, not by the fiber itself. When we run this test in our FiberProÅ 1 program, we find that the fiber breaks in bending at a radius of approximately 1/32 inches (0.031 inches). The cable structure prevents the cable from being bent to this small a radius. So much for the myth of fiber fragility in bending!

A third time of concern with fragility occurs when installers remove the cable materials to make splices or to install connectors. A simple technique avoids all breakage during these operations. Do not bend the fiber. If you do not bend the fiber, you place no bending stress on the fiber. If you do not stress the fiber during termination, you cannot break it. You can avoid bending the fiber by rotating it back and forth while installing it into a connector or a splice.

The second myth, fiber cable and connectors are hard to install, has not been true for at least 10 or 15 years. Let us examine cables and connectors separately.

Cables have been considered hard to install because they contain glass fibers. We all know glass is not the most robust of materials. (No one would consider a glass or ceramic baseball bat!) This concern ignores the purpose of the cable structure: to protect the fiber during installation and use. The installer automatically retains this protection when he complies with only two characteristics: the maximum recommended installation load and the minimum recommended bend radius. We presented these bend radii in our last article (The Novice 10 Minute Introduction to Fiber Optics).

If the installer complies with these two characteristics, he cannot damage the fiber. I have seen photographs of high school students installing their fiber network. If high school students can install fiber cable without damage, how difficult could it be for professional installers?

The key to success during cable installation is knowing and working within the two limits: maximum installation load and minimum bend radius.

Connectors have been considered hard to install because they contain glass fibers and require care during polishing. Installation of some of the early connector styles was, not so much difficult, but was, instead, time consuming. In the last ten years, new connector styles and new installation methods have greatly simplified the process for connector installation.

For example, the legacy connector styles, such as the SMA 905, the SMA 906 and the biconic styles, require polishing the ferrule to a specific length. The incumbent and future styles, such as the ST-compatibleÅ, the SC and the small form factor styles (FiberJack, LC, MU and LX.5) require polishing the fiber until it is flush with the ferrule. Polishing flush is much faster and simpler than polishing to a fixed length.

The difficulty in polishing epoxy connectors can be reduced by adding a bead of epoxy to the tip of the ferruleThe new installation methods have enabled additional simplification of the installation process and reductions in the installation time. The new installation methods include: the Hot MeltÅ products from 3M; the quick cure adhesives from Lucent, AMP, ADC and Suttle, which require no heating for curing; and the cleave and leave, or no adhesive, no polish products from Panduit, Corning Cable Systems and AMP.

The Hot MeltÅ installation method eliminated the need to mix and inject epoxies or adhesive. This change in method enabled an decrease in installation time from the epoxy methods 1/8 hour/connector to 1/14 hour/connector. The Hot MeltÅ connectors are more expensive than are the epoxy connectors and are more likely to be justified on the basis of total installed cost as the labor cost/hour increases.

The quick cure installation method eliminated the heat up cool down time and enables a decrease of installation time to 1/15 hour/ connector. In addition, the quick cure method allowed use of the lowest cost connectors, the epoxy connectors.

The cleave and leave installation method eliminates both the curing of adhesives (no adhesive required) and the polishing of the fiber (The connector contains a pre-polished fiber stub). This method is reported to enable a reduction in the installation time to 1/22 hour/connector. However, there is some concern with the yield, which we find to be lower than the yields of epoxy, Hot Melt and quick cure methods.

Mr. Eric R. Pearson is President of Pearson Technologies Incorporated, a Certified Professional Consultant, a Certified Fiber Optic Specialist, the Director of Certification for the Fiber Optic Association, an editorial advisor to Fiberoptic Product News, and a 24-year veteran of the fiber optic industry. Pearson Technologies Incorporated provides consulting on technical and marketing/sales issues, training to installers, designers and sales personnel, expert witness services in patent, installation and damage legal cases and network design services.