Why Field-Testing

Could Become a Relic of the Past

By Rodney Throckmorton, Manager, Applications Engineering, Corning Optical Communications

Factory-spliced, pre-connectorised fibre solutions have changed the way that we test fibre optic networks, cables and connections.

The business case for today's fibre-to-the-home (FTTH) deployments hinges on the ability to rapidly, cost-effectively and easily deploy optical fibre to the end-user. Depending upon the application being addressed, subscribers may live in Multi-Dwelling Units (MDUs) or Single-Family Units (SFUs). One technology that makes a strong case for FTTH, regardless of the deployment specifics, is pre-connectorisation.

Pre-connectorisation provides network builders with a rapid, simple and low-cost installation method from the distribution network through the customer drop. With the majority of FTTH network fibre jointing carried out in a quality-controlled factory environment, the builder can be assured that the pre-assembled components have been fully tested for high reliability. Pre-connectorisation also allows for a modular network build, meaning simplified deployments with easy swap-out of components for future network upgrades.

Now commonplace in FTTH deployments, pre-connectorised technologies are no longer the occasional novelty. With this maturity, there are signs that we may be entering an age where field-testing could become increasingly obsolete.

High-quality network infrastructure

As demand spurs more and more communities and cities to embrace Gigabit speeds, user expectations for seamless digital experiences have never been higher. The only thing that can harm that progress, and disrupt that experience for the user and the service provider, is the threat of unreliability.

Whether the technology is pre-connectorised or manually spliced on-site, field testing plays an important part in assuring service. However, the use of high-quality components is also just as essential in warding off the threat of service failure.

Creating these components demands precision manufacturing processes that can replicate a "perfect" product ad infinitum. To safeguard against complacency, it is crucial to diligently and methodically test products in their factory environment before use in the field.

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Why fibre splicing needs field testing

Pick the most pristine fibre imaginable, and select the most perfectly engineered connector to place at its end. Then thoroughly test these components in the factory to ensure their standard. If your deployment plan requires installers to manually cut the fibre and splice it to the connector, all of that upfront testing has to be repeated again in the field before you can call the job complete.

This is because a lot can go wrong during splicing…. Individual fibres can be damaged or become dirty, or technician error may lead to a bad splice that looks like a good splice to the human eye. These are the problems that Optical Time Domain Reflectometer (OTDR) testing processes are there to catch. Assuming these relatively expensive devices are used correctly by skilled technicians, they can locate each and every instance of fibre break or loss.

The major drawback to all of this effort is time. And time is money. Compared to pre-connectorised fibre solutions, manual splicing is significantly more labour-intensive and takes considerably longer, even before you start considering the delays necessary to allow extra testing. Pre-connectorised products can also increase capital deferment opportunities, as connection ports and splitters are only added on an as-needed basis.

As better regulation and more innovative business models have led a broader variety of organisations to become involved in FTTH – from major utility companies to regional/city municipalities and even rural community organisations – the demand for (and cost of) skilled installers has increased. In areas where skilled installers are in short supply, fully pre-connectorised systems can be deployed by local talent without traditional splicing skill sets, shortening time to revenue and minimising network disruption.

We have seen novice installers connect terminals in under a minute with a factory-spliced pre-connectorised solution, where it would normally take an experienced technician up to an hour using traditional field practices. We have also seen whole areas, that would normally be forecast to take 30 days to roll out, instead take as little as three days. But these speed advantages are already well known. The question to ask is; how are pre-connectorised solutions tested?

Testing pre-connectorised deployments

Factory-spliced, pre-connectorised fibre solutions have changed the way that we test fibre optic networks, cables and connections.

With these technologies, the key principle is to ensure that the maximum amount of complex, precision-testing processes occur within a controlled factory environment, instead of in the field. Factory testing means improved safety and less human error, getting the job done more quickly and to the highest possible quality.

While field testing must take place under time pressure in a range of inhospitable environments, factory testing can be undertaken more methodically and accurately at far greater economies of scale. The only possible limitation is how willing the manufacturer is to commit to the highest possible quality standards. Best practices for factory testing of outside plant, pre-connectorised optical broadband access products include:

- Testing each entire reel of cable before factory splicing to ensure that it is all within specification.
- Testing each factory splice (pre-seal) right up to its tether, including verification of polarity and other complex parameters not commonly available on handheld, field-based testing units.
- Testing each splice again after it has been sealed.
- Testing each individual fibre before spooling it back onto the reel.

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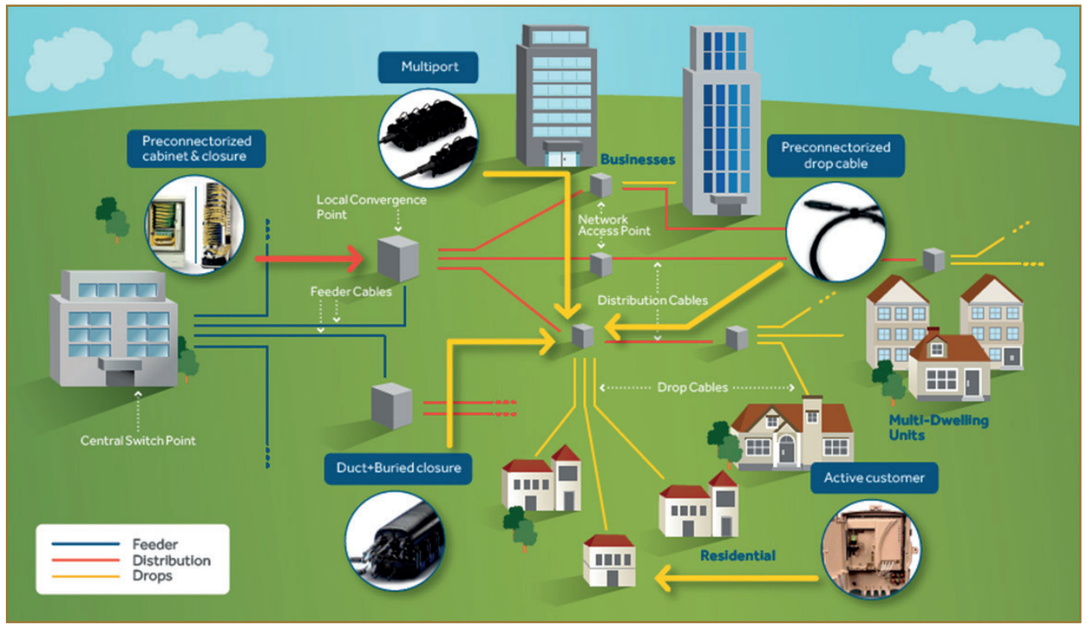

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- Testing every fibre a final time, after it has been spooled, ready for shipment.

Even with these exhaustive factory testing practices, field testing still happens in pre-connectorised deployments such as FTTH rollouts but at far lower (and less disruptive) levels than with traditional splicing.

A common approach to verifying the quality of pre-connectorised deployments is sample testing. In sample testing, 10 per cent of fibres – typically the longest – are selected to represent the overall system. Completing sample tests in this manner is faster than testing every fibre and still gives the installer the metrics needed to assure quality, without introducing significant risk.

When testing risks becoming counterproductive

In some instances, it has become safer and faster to trust the quality standard achieved in the factory rather than incur the risk and delay of repeating the testing process in the field. Why? Because factory testing is now so efficient that some field testing has not only already become unnecessary, but also counterproductive.

Corning's pre-connectorised outside plant connectors (OptiTip® multifibre connector and OptiTap® single-fibre connector) are examples of this shift away from field testing. Each is cleaned and sealed in the factory before shipping.

In a typical pre-connectorised solution, the practice of plugging a cap or cover over a connector fails to ensure that small quantities of dirt or moisture won't seep in and affect the performance of the component. Even a good, tight cover or cap is susceptible to loosening when subjected to changes in atmospheric pressure, such as during air-freighting. The standard practice for any installer, in preparation for mating an outside plant connector, is therefore to clean it first, and then test that it is clean. This step adds time to the network deployment process, and requires each installer to not only carry cleaning products to site but also to keep the cleaning products free of contamination, regardless of ground and weather conditions.

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Instead, by applying a tight, factory-tested seal to each OptiTip and OptiTap connector, there is no longer any need for cleaning or testing. Any cleaning that the installer might proactively execute will only serve to contaminate the connector. In these situations, we recommend that the product is not tested or cleaned in the field, as both actions would undermine the quality-testing safeguards carried out in the factory environment.

Sealed connectors could be just the tip of the iceberg. The ultimate long-term goal for pre-connectorised innovation has got to be a true plug-and-play, tip-to-tip solution with zero field testing.

Building strong, flexible foundations

Broadband has never been such a life-changing catalyst and compelling business enabler as it is today. Innovations in pre-connectorised technology show that assuring reliability without compromising deployment speed is a challenge made easier when you're able to rely less upon field testing each and every part of the network.

Quality control in a factory is easier, faster and more reliable than in the field. A factory-installed, factory-tested solution can greatly reduce the number of field re-works required as a result of broken fibres and/or bad splices during the cable access and terminal installation process. In addition, increased network deployment speeds provide the operator with the ability to leverage its workforce more efficiently. Skilled workers can be deployed to areas of the network where their skills are better utilised and more valuable.

However, foundations cannot just be rigid - they must be flexible. High quality doesn't just make the difference during the installation process, but also throughout the service lifecycle. This requirement extends to design innovation throughout the fibre infrastructure, such as Building Access Terminals (BATs) that combine outside fibre termination and in-building distribution points within a single unit; modular street cabinets that facilitate faster, more cost efficient and orderly growth on demand and high-density headend equipment where simple routing paths and jumper management systems allow continuous reconfigurations as well as future capacity upgrades without disturbing adjacent in-use fibres.

Finally, let's not forget the fibres themselves. Whether it's in the form of micro cables that allow non-disruptive, modular increments of fibre capacity within confined ducts to reduce civil costs and speed up deployment times, or more traditional cabling profiles that extend reach by combining the benefits of attenuation and improved macrobend performance in one fibre, one thing is clear; an investment in the highest quality really is tried and tested.

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