

Building to Meet The Great Bandwidth Rush

Blown fiber can minimize deployment time and disruption when building urban fiber networks

By Tibor F. T. van Melsem Kocsis ■ *Emtelle*

The worldwide demand for high bandwidth and increasingly sophisticated service packages have established fiber both as the replacement for copper in existing access networks and as the logical alternative to copper in new installations. Countries such as the United States, Japan, South Korea and Denmark have been quickly shifting to fiber – and at a rate that's set to accelerate over the coming years.

But many municipal officials and utility managers have come to believe that laying fiber can only be achieved by ripping up busy streets – a time-consuming and rather disruptive process. Their belief is outdated. First of all, many urban areas already have quite a bit of fiber in the streets. Where that is not so, there are often under-street ducts in place that can be quickly used for fiber without disrupting surface traffic. And where there are not ducts, it may be easy to lay them, then insert fiber later by “blowing” it in.

In more rural areas, it may be economically advantageous – depending on local terrain and labor rates – to lay tough, empty, plastic ducts and blow the fiber later. There's no one-size-fits-all solution, but the need, internationally, is great and the technology is more flexible than ever before.

The International Overview

Let's look a little more closely at some of the big fiber hot spots:

The US is the world's fastest-growing market in Fiber-to-the-Home (FTTH) uptake. Between 2004 and 2008, FTTH access is expected to increase 15-fold. However, there's still a huge amount of untapped ground in the country – even in 2008, FTTH will be used by less than a sixth of all broadband subscribers. Those 2008 figures should therefore be seen not as the highpoint of FTTH penetration in the US, but as the basis for even more impressive growth.

In terms of raw numbers, Japan is the FTTH world champion. By 2008, it is projected that the country will have 14.5 million FTTH subscribers – up from 2 million in 2002 and more than 6 million now. This 2008 figure represents 40 percent of all broadband subscribers (in 2002, this figure was just 11.2 percent). A large reason for this upsurge is NTT's particularly aggressive FTTH implementation.

In 2008, FTTH subscribers in South Korea will represent more than half of total broadband subscribers, a reflection of the country's ambitious plans in this area (led by KT). Almost half the country's population lives in multiple dwelling unit buildings and 90 percent of households are within 2.5 miles of a telephone exchange – auspicious conditions for FTTH development.

In Europe, Denmark leads the way in terms of percentage FTTH penetration (in June 2005, more than 60 per-

cent of broadband subscribers). This dominance of FTTH over alternative technologies such as ADSL and cable has been driven by approved investments of €1.27 billion (about \$1.65 billion) by a number of power utilities. Their goal: To capture 40 percent of the country's broadband access market by 2015.

And Following Not Far Behind...

Does this mean there's a core group of countries running with FTTH, while the rest of the world stands on the sidelines? Not at all. Many other markets worldwide are eagerly eyeing FTTH as a means of providing customers and businesses with high-broadband services. Several examples:

In the European Community, the number of FTTH projects is growing 30 percent every year – most initiated by municipalities, power utilities, Internet Service Providers (ISPs) and non-incumbents. Granted, FTTH activity is most vibrant in specific countries and cities. Among the countries: Sweden, Italy, Denmark and the Netherlands. As to urban areas: Amsterdam, Paris and Vienna are cities with vigorous FTTH deployment. This leaves an immense market that will be open to FTTH as the benefits of fiber become more apparent. The upshot of all this: tremendous revenue-generation possibilities for those who

DEPLOYMENT TECHNOLOGY

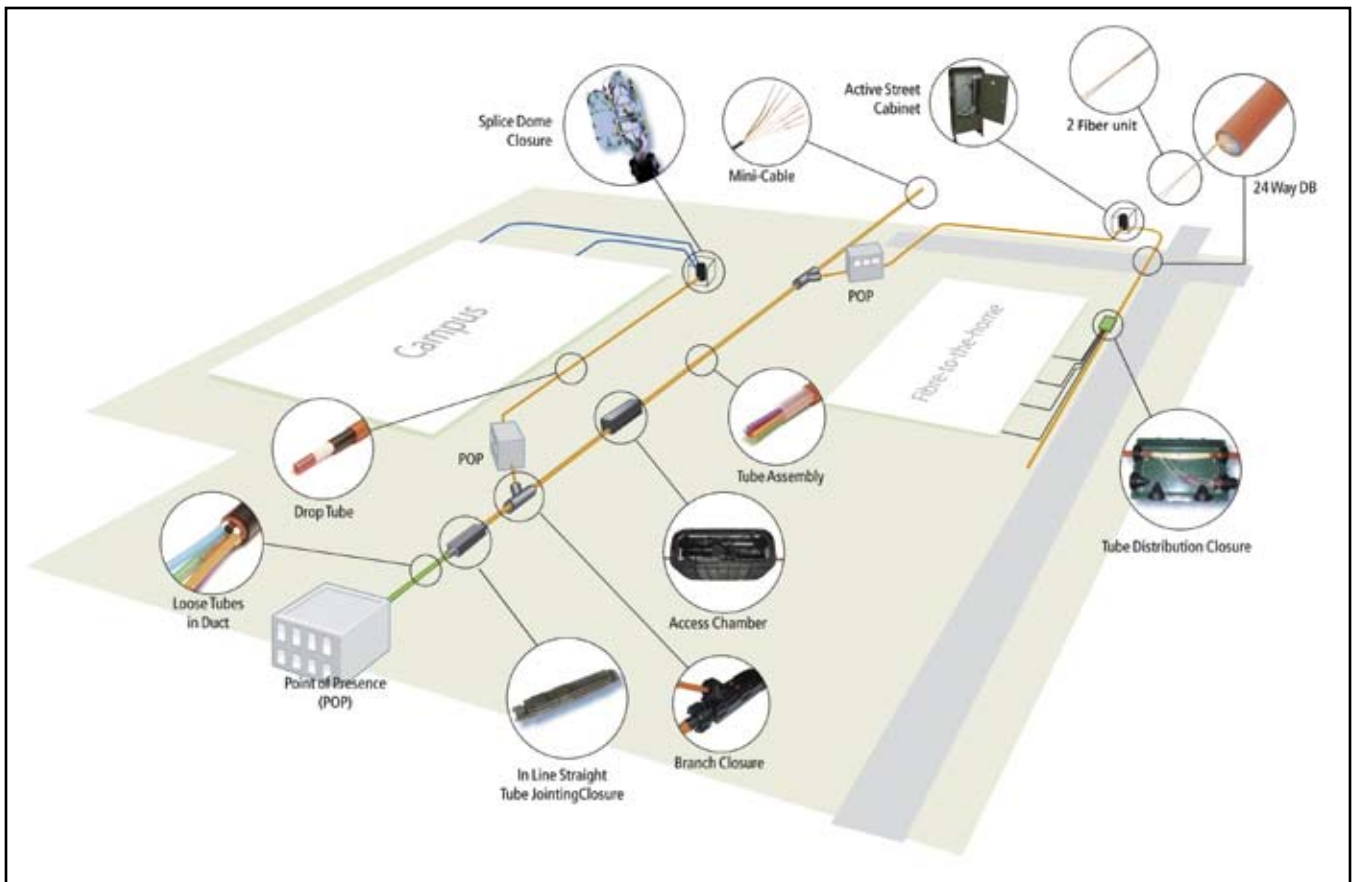


Figure 1. A wide array of underground ductwork, access chambers and distribution boxes has evolved with blown fiber technology.

design, install, operate and own fiber-based networks and deliver the related services.

China is another area of obviously huge potential. Most of its FTTH deployments are in early stages, but given the size of its population – along with its many high-density urban areas – China is a market that offers dizzying potential to those in the FTTH industry. Material examples of auspicious activity are the FTTH trials conducted by China Telecom and China Netcom (with connections running into the millions) and the fact that Hong Kong Broadband has passed through almost one-third of the total homes in the city with fiber.

And that's just two markets. From the Middle East to South East Asia, India to Australia and New Zealand, fiber is winding its way all around the globe, bringing broadband and its myriad services to homes, communities, businesses and any other organization you can think of.



Figure 2. Closeup of microduct, this one for multiple fiber cables.



Figure 3. Unspooling microduct for a roadside installation. Here, underground ducts were necessary because there was no existing aerial telephone or power line over which to string fiber. The fiber cable itself is considerably less bulky.



Figure 4. The fiber itself can be moved around the job site on a compact reel, often mounted on a hand truck. The equipment to “blow” it into the ducts is also compact and readily carried on the bed of a small pickup truck. Fiber can be blown even when it has a factory-installed connector on the end.

More Fiber Means More Competition

Simply in terms of its broadband capacity, fiber is the preferred medium for bandwidth-intensive services. These services are numerous and diverse, and are constantly growing more so. They include video-on-demand, high-definition TV, additional interactive services, business services such as ASP (application service providers), IT outsourcing, virtual business networks, personal services, working

It’s clear from the profusion of services that the real issue is whether a network can sustain not single, but multiple-application bandwidth. At any one time, occupants of a home or office could be using assorted applications. This puts a tremendous strain on the network, a strain that only fiber can withstand.

and learning applications, peer-to-peer applications, customer-generated content (MySpace, YouTube, flickr, Craigslist, local church services and the like) and advanced gaming. Five years ago, some of these applications didn’t exist. You can be sure that five years from now, applications that currently aren’t even a whisper will be the talk of the town.

It’s clear from this profusion of services that the real issue is whether a network can sustain not single, but *multiple*-application bandwidth. After all, at any one time, the occupants of a home or office could be using assorted applications. This puts tremendous strain on the network, a strain that only fiber can withstand. It can bear the load now and – more importantly – in the future. Let’s

be clear – a broadband network isn’t free, and those who put their hard-earned money into one want to be sure it will still be earning money for them many years down the road.

This demand for high bandwidth has naturally created intense competition in the industry. In such an environment, profit margins are best secured through smooth network build-out, rapid response times, reduced operating and capital expenses, and sheer durability. Now, while fiber is generally accepted as the best medium for current and future broadband demand, not all fiber technologies are equal. Those intending to deploy fiber therefore owe it to themselves to ascertain which technology is the most flexible and cost-effective for their situation, while of course maintaining the highest levels of reliability and efficiency.

There’s Fiber...And Then There’s Blown Fiber

With preconnectorized “Fibreflow” fiber cable from Emtelle, and many other vendors’ fiber products, for instance, fiber can be blown through under-the-street ducts. There are many advantages. First, it greatly simplifies network development, requiring less expertise on the part of installers and maintenance technicians.

It’s a lot faster than other methods, too. Blown fiber can cover hundred of yards in a matter of minutes. And instead of having numerous installation crew members standing around while equipment is set up – as is the case with conventional installation – only one person at each end of a run is necessary with Emtelle’s Fibre-flow process. It has been estimated that



Figure 5. Buried microduct in Nuenen, in the Netherlands. Microduct containing the main fiber is at top; smaller cables for homes fan out from junction box below.

network upgrades with additional fiber could potentially be 12 times faster and (given the high rate of hourly labor costs) cost a tenth of conventional methods, provided the ductwork already exists.

The use of products like Fibreflow also minimizes the number of splice locations because cable runs can be much longer than with manually placed fiber. This improves overall network performance (reducing dB loss), requires no additional electronics to compensate for signal loss and facilitates network modification, allowing upgrades without disruption to normal operation.

In addition, blown fiber products like Emtelle's eliminate the need for redundant fiber, allowing network owners to defer the cost of additional fibers until they are actually needed (pay-as-you-grow), and freeing them of the need to overdesign and make risky speculations about future needs.

Blown Fiber Technology Is Constantly Evolving

Emtelle and many other vendors are heavily involved in blown fiber research, not least in the burgeoning area of FTTH. Extensive testing programs have created constant improvements in blowing performance and a corresponding reduction in installation, repair and maintenance times. There has also been steady development of smaller cables and fiber units, accompanied by cost reductions and performance improvements both in optical infrastructure and in passive and active equipment.

Emtelle alone has made numerous improvements in design, flexibility and cost per home. Think of a plug-and-play fiber unit that substantially reduces installation time, eliminates field splicing at the residence or point of presence, and transfers splicing costs to the factory en-

vironment. Six Emtelle fiber strands can now be blown together, cutting installation costs per meter by 83 percent.

There are many "blowable" fiber cable designs for special circumstances. For instance, there are tube bundles whose outer layer is filled with a low-density polymer, ensuring tube concentricity, better compression strength and full water-blocking capability, while allowing the use of cost-effective closures that offer simple clamping. Microducts are typically made from HDPE, which is inherently fire-resistant. But local codes may specify other materials or installation designs (such as running microducts through special raceways) in buildings.

There are lighter-weight, reduced-diameter mini-cables that allow higher fiber counts in smaller tubes. Newer, longer installation lengths mean less labor, less material and greater savings. Tube bundles are available as single or multiple tubes in different sizes for maximum flexibility. Tube bundles can be fully assembled in the factory, providing significant cost benefits compared to blowing loose tubes into an existing duct or into pre-installed loose tubes in a duct.

Emtelle supplies complete end-to-end air blown fiber solutions from 2 to 96 fiber counts. It also provides dedicated design, installation and advisory services, including detailed design and engineering and detailed installation and maintenance training programs. Emtelle offers two training programs designed to provide installers and technicians with the expertise they need to implement, develop and maintain air blown fiber networks. In February 2007 these courses were awarded RCDD accreditation by BICSI (Building Industry Consulting Service International), a global not-for-profit association based in Tampa, Florida. BICSI (www.bicsi.org) supports designers and installers of Information Transport Systems (ITS) for residential, commercial and government applications.

Experience

Emtelle's recent FTTH deployments include a wide range of projects:

- **Leonie Hill condominium** – Singapore's first PON-based FTTH instal-



Figure 6. Splicing two lengths of multiple-tube microduct together in the field.



While fiber is generally accepted as the best medium for current and future broadband demand, not all fiber technologies are equal.

Figure 7. Blowing fiber into buried microduct to serve new customer.

Major Microduct, Blown Fiber and Cable Vendors

Vendor	Brands	Web Address
AFL Telecommunications	Microcore	www.afttele.com/products/fiber_optic_cable/microcore_cable/index.html
Draka Comteq	JETnet	www.jetnet.nl/index_e.htm
Dura-Line	MicroDuct	www.duraline.com/en/html/usproducts/microduct.html
Emtelle	Fibreflow	www.emtelle.com
Ericsson	Ribbonet	www.ericsson.com/products/hp/Fiber_Units_pos.shtml
NextGen Fiber Optics	BloLite, MicroBlo	www.mynextgen.com/mygcc/nextgen/catalog.jsp
OFS	AccuBreeze, Accuribbon, MiDia	www.ofsoptics.com/cable/category.php?txtCategoryID=18
Prysmian	Unitube, CampusLink, Sirocco	www.prysmian.com
Sumitomo Electric Lightwave	FutureFLEX	www.futureflex.com

Vendors of Blowing Equipment

Vendor	Brands	Web Address
CBS Products (UK)	Tornado Plus, Breeze	www.cbsproducts.com
Condux International	Fiber Optic Cable Blower	www.condux.com/products/undrgrnd/m3blowng.htm
Emtelle	Breeze, Fibreflow	www.emtelle.com
Sherman and Reilly	Cablejet	www.sherman-reilly.com

lation in a condominium building.

- **Nuenen** – High-speed broadband network serving almost 8,000 people in Nuenen, the Netherlands. Some 96 percent of households in the town expressed interest in the service.
- **Changi Airport, Singapore** – Fiber-optic infrastructure for the airport's new Terminal 3, including communications systems that enable easy upgrades and seamless service.
- **University of Manchester** – Large project that involved installing fiber in new ducts and routing them around a demolition site to all areas where old fiber had been connected.
- **Lenowisco** – Installation in Virginia whose aim is to get high-capacity broadband to every home and business in the area in 10 years. Used Emtelle microducts alongside existing water lines.
- **Dubai** – Installation of a fiber-based closed circuit television network to be used for security purposes at the Dubai International Financial Centre.

The Great Bandwidth Rush is just beginning. In this new rush, however, the thing that glitters is not copper, but fiber. In terms of establishing a network that's reliable and flexible enough to handle the demands of the future, it stands alone. **BBP**

About the Author

Tibor F. T. van Melsem Kocsis is Global Commercial Director for Emtelle. Since April 2006 he has been a board member of the European FTTH Council. He can be contacted at +44 1450 364 000 or at TiborM@emtelle.com. The company's Web site is www.emtelle.com.

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