# Advantages of Automated Fiber-Optic Termination

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Fiber-optic cable manufacturing is primarily performed by hand today. These manual processes are highly susceptible to variation and prone to human error all of which affect the cable's quality. Where fiber-optic cables are being deployed in more and more applications, consistency and high quality need to be upheld in all manufacturing operations. Automated manufacturing techniques and equipment are currently being developed and deployed to address issues associated with manual processes. These systems can take fiber cable and terminations as inputs and automatically assemble and test completed cables with no reliance on operator technique or skill level.

Typically, fiber-optic cable manufacturing consists of the major steps shown in Figure 1. The cable is first removed from a large reel and cut to the desired length. Each end is then prepared by stripping a length of the outer coating/ jacket to expose the bare glass fiber. After it is stripped, the fiber is cleaned of any debris that may be resident from the stripping process. At this point, a termination is loaded with epoxy and the fiber is inserted. The assembly is then heat cured and then the termination end-face is polished to provide the desired optical characteristics. The polishing process consists of introducing the end face to successive stages of finer and finer polishing film until the surface is of optical quality. Inspection and test complete the manufacture, where the polished end face is inspected for surface defects and for defined geometry. An optical test is performed to ensure functionality of the cable to specified limits.

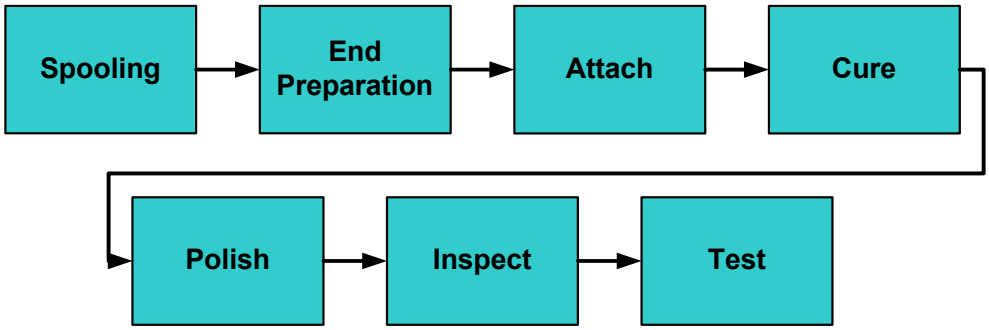


Figure 1: Fiber-optic cable manufacturing process flow

Equipment currently exists for segments of the manufacturing process. For example, Figures 2 and 3 show machinery for automatically attaching a termination to a fiber end and automated end face polishing. With these two systems, the bulk of the termination process can be automated. The termination assembly system automatically pays-out a coiled segment of fiber, strips/cleans/ cleaves the end, and attaches a termination. The system is configurable to accommodate a variety of different terminations with minimal set-up time. The polishing system accepts terminated cables in a work pallet, which is used to transport the end face through the sequence of polishing stages to finish the termination end faces.

Figure 2: Automated Termination Assembly System

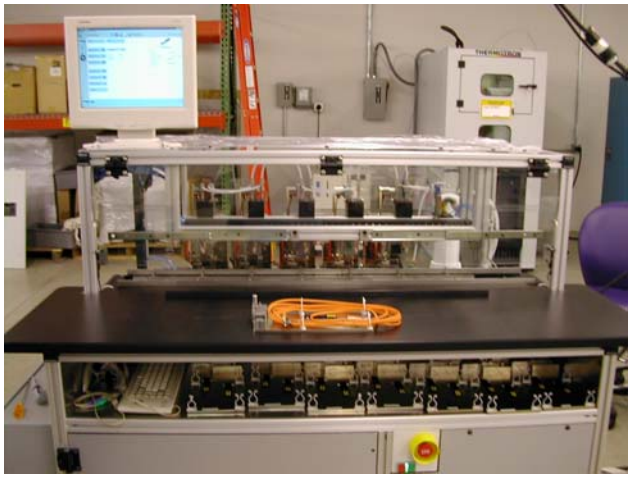

Figure 3: Automated End Face Polishing System

These systems can be configured into a work-cell for manufacturing fiber-optic cables as shown in Figure 4. This cell contains all of the elements for cable manufacture from raw material input through final test and takes advantage of the automation workstations that currently exist.

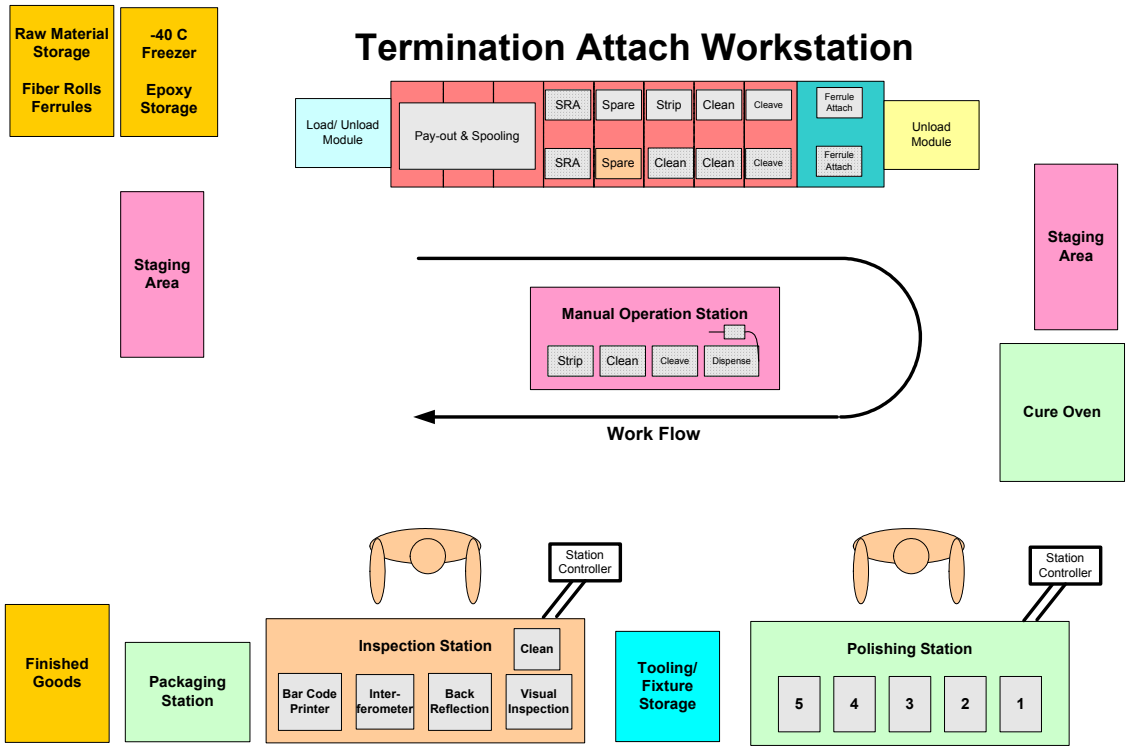


Figure 4: Fiber optic termination work cell

Raw materials enter at the termination workstation pass through each of the other stations and exit after final test. This work cell has the capacity to process over 300,000 terminations annually. Development work is being performed that can migrate this technology to a fully automated system that requires minimal operator intervention with the potential of even more capacity, higher quality levels and lower conversion costs.