

Fiber Optic Cleaning Overview

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Overview

- This presentation provides an overview as to cleaning techniques that are currently available to the industry.
- Spans manual and “automated” cleaning solutions.
- Listed in order of cost/complexity.
- Commentary is subjective, but data is available to support most of the claims.

Compressed Gas



- Most commonly “canned air” is used to blow dust from endface.
- Effective for large dry particles, but has little or no effect on particles below 3 microns in diameter.
- Ineffective if contamination includes oil, fingerprints, dried solvent residue, etc.
- Non abrasive

Wipes and Solvents



- Oldest approach is to use some sort of lens paper, cloth, and sometimes solvent to clean endface.
- Typically laid flat on table top.
- Unreliable, but does work.
- Inherently abrasive and proven to induce scratches
- Most common solvent, IPA, tends to leave a residue as it dries slowly and dissolved/suspended solid are left behind.
- New solvents are becoming increasingly popular that use rapid evaporation to minimize residue. Noyes-AFL and Westover are both promoting such solvents.

Reel Based Cleaners

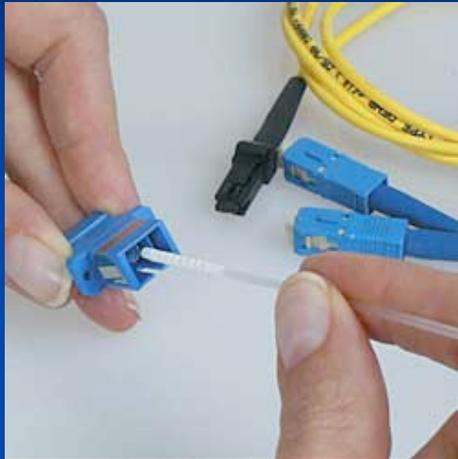


- 2 Primary brands: Cleetop (NTT-MT), Optipop (NTT-AT)
- Other systems are available but unpopular to date.
- Purpose built with ratcheting mechanism, sliding dust cover, resilient pad, and replacement reels
- Abrasive, but pad mitigates this significantly.
- Newer versions now available that are compatible with male ribbon connectors.

Cleaning Inside an Alignment Sleeve

- This has been the “story” of the last few years.
- As OC48 and OC192 hit, everything had to be clean.
- The industry was initially only equipped with connector cleaners (ie Cletop), but quickly learned that the connector “inside the box” had to be cleaned as well.
- Inspection probes and in-situ cleaners have been developed and introduced over the last 3-5 years and continue to be refined today.

Cleaning Swabs



- Two main categories of swabs: basic and purpose built
- Basic swabs are inexpensive, but very unreliable.
- Purpose built swabs are better, but still a highly iterative approach
- Both are abrasive, but most brands now feature a resilient head that mitigates this.
- Purpose built swabs are fairly expensive (ie: \$0.60 each and about 3 swabs per port)

Semi-Automated In-Situ Cleaning



- In recent months/years, several vendors have released in-situ cleaning devices that seeks to automate the process.
- Aerotech® created a device that feeds a cleaning media across a head while that head turns. The media is automatically advanced to ensure that it is clean
- Seiko Geiken announced a different device with a similar approach at OFC this year. It features a different sort of media that is more like a traditional cloth narrowly cut.
- The Fibers is a Korean company that recently released its “Hux Pend Cleaner”. I haven’t tested one yet, but would appear to be a similar approach to that of Seiko Geiken.
- It is unclear if these devices are suitable for APC
- It is unclear if these devices will handle 1.25mm as well as 2.5mm
- I have demonstrated the Aerotech and Seiko Gienken Products and find that they perform rather like the purpose built swabs, but are less technique intense.

Automated In-Situ Cleaning



- Two major brands on the market: Lightel Technologies and Westover Scientific
- Lightel system uses ultrasonic cleaning approach
 - Media is conductive and lacks suitability with powered components/systems
- Westover system uses a pressurized solvent jet with drying and vacuum circuit
- Both still new to market.
- Both have high unit cost and low cost per clean
- Both non-abrasive
- Neither will clean everything without the occasional need for a swab to break tough debris loose.

Miscellaneous Comments

- Several companies have demonstrated automated cleans that utilize robotically driven cloth or tape media, but to date none are commercially available.
- Non-abrasive versus abrasive is a huge topic for this industry to tackle. Abrasive techniques can be used, but procedures must be outlined that prevent/minimize scratching of the endface.
- NEMI has done some very interesting work related to static charge and cleaning techniques. Essentially, cleaning techniques that build a static charge on the endface make that endface more likely to attract dust down the line. This isn't particularly relevant for cleaning just prior to mating, but matters for cleaning prior to packaging, storage, or shipment.