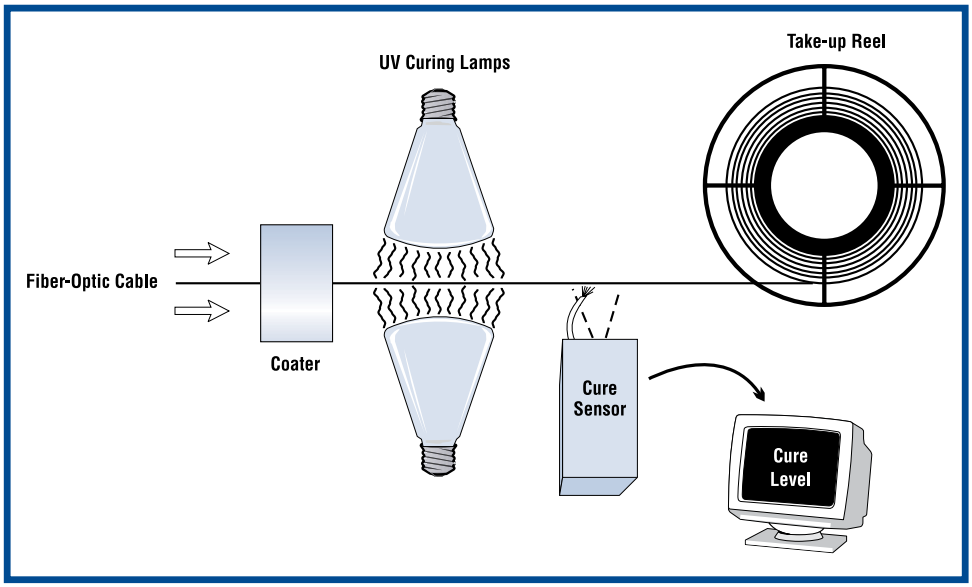
On-Line Sensor System for Monitoring the Cure of Coatings on Glass Optical Fibers and Assemblies

On-line Fiber Coating Inspection Would Safeguard the Dependability of the Nation's Communication Systems

During the manufacturing process, glass optical fibers and cable assemblies are coated with polymers that must be thoroughly cured to prevent damage and fiber degradation. Frequently, the curing of fiber-optic coatings is spot-checked after production, resulting in product losses of approximately 5% annually from under curing. Ames Laboratory and Corning Cable Systems formed a partnership to develop a continuous, on-line sensor to monitor coating cure at line speeds up to one kilometer per minute. One sensor tested is noncontact and uses infrared spectroscopy to inspect the polymer coating for cure level. A second sensor tested directly measures the tack of coatings. This sensor offers lower cost and is insensitive to changes in the type of coating. It is particularly applicable to production facilities.



In-plane stress within a glass sheet can be measured by creating a thermal grating within the glass and subsequently diffracting a probe beam from the grating.

Benefits for Our Industry and Our Nation

- Increased quality product and reduced waste
- Significant cost savings—as much as $70 million annually
- Large commercialization appeal due to minimal payback period. Outfitting all the United States' 130 draw towers would cost about $9 million ($70,000 per tower) and would save $70 million, yielding a recoup rate of less than two months per tower

Applications in Our Nation's Industry

This innovative technology would help the United States maintain its leadership in the glass fiber optical industry. In addition, this technology may be applied to other areas of the glass industry that involve applying and curing coatings (e.g., automotive glass, decorative glass, scratch-resistant eyewear).

Project Description

Goal: Develop a sensor for continuous on-line monitoring of coating cure at line speeds as fast as one kilometer per minute.

The proposed technology determines the correlation between ultraviolet exposure and the appropriate degree of coating cure for various systems. The sensor will acquire data continuously and feed it into a PC, where it will be correlated with degree of cure at 10-15 second intervals. The system can use that data to control the monitoring process by creating a visual display, sounding an alarm, or activating an automatic feedback loop.

Progress and Milestones

Both sensors were developed and tested at Corning Cable Systems. Results demonstrated the capability to sense cure variations on-line at line speeds typical of production operations.

Discussions were undertaken for continued work and implementation on these sensor technologies, but a slowdown in the optical glass fiber industry combined with changes in plant management and supplier-provided improvements in coating resins resulted in a substantial reduction in the perceived importance of the cure-level problem.

The infrared spectroscopy sensor technology was subsequently funded by another DOE program and successfully demonstrated on-line, real-time monitoring of three polymer processing applications.

The project concluded in 2000.

Project Partners

Ames Laboratory
Ames, IA

Corning Cable Systems
Hickory, NC

For additional information, please contact

Elliott Levine
Industrial Technologies Program
Phone: (202) 586-1476
E-mail: elliott.levine@ee.doe.gov

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