Industry News - Thought Leadership

Optimizing Inkjet Printing Adhesion for Wire & Cable Marking

Digital inkjet printing on wire and cable offers manufacturers productivity advantages, including variable data, fast changeovers, and indelible printing at top line speeds. However, achieving consistent, high-quality results presents challenges — such as material properties, contamination, and ink adhesion.

The Challenge

Fiber optic cables are essential components of modern telecommunications infrastructure. These cables consist of multiple fiber optic cores, fiber optic bundles, bundling material, rip cords and even electrical conductors. Advances in bundling technology allow for over 3400 individual optical fibers to be combined into a single fiber optic cable that carries an enormous amount of information over long

ink is jetted onto the cable assembly using an appropriately sized and compatible inkjet engine, then it is cured with intense UV light. To enhance ink adherence to the jacket material, corona or plasma treatment is applied to the cable jacket immediately upstream of the inkjet head. Also, when using UV-curable inks, there are lower concentrations of solvents and no need to discard ribbon backing material as with indent or hot press printing.

This technology is safe, easily implemented, and does not introduce stress into the cables and results in extremely durable and legible markings.

Inkjet Printing & Marking Technology

The application presented in this article describes a process for inkjet printing and marking technology for fiber optic and electrical cables using UV-curable inks and UV-LED curing systems. This technology is safe, easily implemented, does not introduce stress into the cables and results in extremely durable and legible markings.

Fiber optic cables must comply with a wide range of regulatory standards including standards for marking the cable jacket. Cable jackets are typically made of medium-density polyethylene and high-density polyethylene as well as polyurethane (PU) and polyamide (PA), all of which present challenges for ink adherence. The marked text on each cable must be legible and it must endure harsh physical and chemical environments. Since cable installation often involves dragging the cable through miles of conduit, exposing the cable to abrasive gravel and concrete environments, processes for cable marking must face particularly demanding requirements, and be durable to the wear and tear.

Traditional marking or printing technologies for fiber optic and electrical cables include emboss printing, indent printing, hot foil printing, hot stamp printing and sinter printing. Some of these technologies introduce unwanted stress into the fiber optic cables, while others are not entirely compatible or, in the case of indent printing, can introduce safety concerns in the workplace.

units.

OmniCure AC 8300

In this application, GEM Gravure's WTG 3360 ink was used. There are similar inks available from this manufacturer as well as from others. In this application, cable diameters ranged from 3 mm to greater than 100 mm. The printed text size was typically 3 to 5 mm in height, while the cable assembly vibration in X-Y directions results in a spatial text height of 10 to 15 mm. The large optical emitting window width of 30 mm of the OmniCure AC8300P-HD-395 allowed the system to compensate for cable vibration. The ideal working distance for the AC8300P-HD-395 was determined to be 15 mm between its emitting face and the cable.

An additional challenge arose from the occasional build-up of jacket material in the extruder. This buildup of jacket material caused knots to become attached to the jacket and increased the cable diameter tenfold. These knots had the potential to damage elements of the printing equipment including the corona generator, the inkjet and the AC8300P-HD-395 curing system. As a result, tools to monitor the cable diameter were designed and implemented to automatically increase the working distance between the printing equipment and the cable.

OmniCure AC8300P-HD-395 LED head, the cured print was tested by applying MEK (methyl ethyl ketone) with a cloth with average abrasiveness. The ink was swiped (rubbed) at least 25 times. And additional testing was accomplished by weighing down a dense water-saturated sponge with a 1 kg weight. The sponge was pulled back and forth across the cured ink for 1000 swipes. In these tests, any significant reduction in ink thickness or legibility is deemed a failure.

All testing with the OmniCure AC8300P-HD-395 head resulted in excellent durability. No failures or significant ink reduction were observed, even after curing at speeds of up to 200 mpm. The advantages of using the OmniCure AC8300P-HD-395 System are as follows:

- Enhanced speeds for printing and marking applications with UV-curable inks
- Reduction of workplace injuries due to removal of the unsafe indent wheel in indent printing process
- Reduced operational costs and resource consumption
- Improved customer satisfaction through enhanced marking durability

For more information on this application area, attend our latest webinar:

Optimizing Inkjet Printing Adhesion for Wire & Cable Marking. In this recorded webinar, industry experts from Gem Gravure, Excelitas, and Enercon shared proven solutions for achieving superior ink adhesion across various substrates.

👉 https://www.excelitas.com/event/optimizing-inkjet-printing-adhesion-wire-cable-marking-2025