



Application note



Wire, Cable & Pipe

Avoiding ink transfer on wound cable

The Challenge

If printed codes are not fully dried, cured and fixed to the surface of wire insulation or cable jacketing, ink can transfer onto adjacent areas when the product is wound onto spools. These 'ghost images' degrade the perceived quality of the product but are often entirely preventable.

Videojet Advantage

Videojet understands ink. With the broadest portfolio of CIJ inks and the industry's leading team of chemists, Videojet has spent years developing specialty formulations ideal for operating conditions just like this. Whether your challenge is cable spool ink transfer, harsh outdoor product storage, post-extrusion vulcanization or code contrast for product installation, Videojet likely has the answer.

What causes ink transfer?

Hot temperatures

Even after being cooled in a water bath, the temperature of cable and other extruded products wound onto spools is often 40°C (104°F) or more. This prolonged heat and pressure can cause many inks to transfer.

Plasticizers

Chemical additives called plasticizers are often used to enhance properties of the jacketing material including the flexibility and durability of the final product. Plasticizers can also be aggressive ink solvents and inhibit coding especially before excess plasticizers have had time to evaporate or be otherwise removed. Some manufacturers wind product onto large spools that are allowed to fully cool, then perform coding when the wire or cable is unwound and then rewound onto smaller spools for distribution to market. Even in this scenario, plasticizers may still be migrating to the surface and causing adhesion problems nearly as severe as if the coding had been done hot off the extrusion line.

Incomplete curing of inks

Although most coding inks dry to the touch very quickly, they may not cure completely in time to avoid ink transfer.

Pressure

None of these contributing factors would matter if not for the need to wind wires and cables under tension onto spools. The resulting pressure allows any ink that has not fully adhered to transfer onto adjacent surfaces within the spool.

What can you do to stop ink transfer?

There are three simple ways you can influence the coding process to promote optimum ink adhesion and eliminate transfer from one surface to another on spooled wire or cable.

1. Consider your ink

It is imperative that you select an ink that is specifically formulated for your application and operating conditions. Videojet offers inks that can address the root cause of code transfer.

- **V4201** is a very fast drying ink that will address code transfer caused by the ink not being fully dried when the cable is rewound.
- **V4202** is a grey ink that has lower contrast than black inks, but still can print legible codes on white cables. Any code transfer that occurs will be less noticeable with this grey ink.
- **V4235** has excellent adhesion to many wire substrates and a very hard resin that can resist certain types of plasticizers that can re-dissolve other ink resins.
- **V4237** is a good choice when printing immediately after the extruder. On a hot substrate, this ink can penetrate the surface where the substrate itself acts to protect the code from transfer.
- **V4225** (yellow) or **V4289** (black) are pigmented inks, whereas the other inks listed are dye based. Many plasticizers do not re-dissolve the ink but can extract the dye portion of the dried ink and have the same transfer affect. Pigments are resistant to plasticizer extraction and will not transfer in the presence of these types of plasticizers. V4225 has the additional advantage of having good contrast on both black and white cables.

2. Consider your material

Materials with formulas comprised of high amounts of volatile plasticizers tend to resist good ink adhesion for a long period of time. Transfer tends to be worse on PVC jacketing material like polyvinyl chloride due to the strong affinity for solvent based inks to adhere and transfer onto this plastic. When coding on these materials, performance must be checked and suitable precautions made. Selecting an ink with the chemistry appropriate to obtain good adhesion on your substrate is essential.

3. Consider your processes

It may be possible to alter your processes for better ink adhesion. For example, coding immediately after the wire or cable has exited the extruder, instead of waiting until it exits the cooling bath, can promote rigorous initial adhesion due to thermally induced interaction between the wire/cable surface and the ink.

It may be necessary to experiment with the coding location, particularly if plasticizers are initially present and subsequently removed in the process. Also, consider ways to reduce the temperature of the wire/cable surface as low as possible prior to the winding step so that the coded ink is well below its softening point temperature. A non-contact IR type thermometer is invaluable to check these process parameters.

Major process changes can be expensive and impractical, but you may be able to find more practical alternatives. For example, when dealing with cross-linked polyethylene, many manufacturers use a flame or corona treatment step to temporarily alter the surface structure of PEX/XLPE and promote ink bonding.



The Bottom Line

Videojet Technologies develops inks that are responsibly designed and manufactured to maximize contrast, adhesion, and uptime while meeting safety, environmental, and regulatory requirements. We offer a team of ink experts to assist and support manufactures with selection and implementation of inks that meet their packaging and regulatory needs.

Ask your local Videojet representative for guidance on ink transfer, a production line audit or for sample testing in Videojet specialized sample laboratories.

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