CleanCut Technologies, LLC.

Surface Pre-Treatment Options

For Optimal Pad Printing Results

Pad printing is a process used to transfer graphics like graduation marks, biohazard labels, part identification numbers or corporate logos on to medical devices and device packaging. The technology allows for the required high level of adhesion and image quality on almost all materials substrates and odd-shaped parts.

Since pad printing equipment and supplies are cleanroom compatible and can be USP Class VI certified, they can mark devices such as catheters, syringes, cannula, handles, ports and luers within the vascular, orthopedic and neurological device markets.

Pad printing for medical devices offers a labeling method that is safe, effective and inexpensive with consistent, repeatable results. On many types of plastics, pad print markings are more visible and the process allows for easy flexibility when the image design needs to change. Plates that hold the image can be made in a matter of hours and are relatively inexpensive.

Pad printing is ideal for printing on surfaces that are curved or recessed. There is an almost endless possibility to the shape and durometer of printing pads that will allow the image to be wrapped around a device or into a recessed area of a complex medical device.

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Surface Tensions & Pre-Treatment Techniques For Optimal Adhesion

All plastics have a natural dyne level or surface tension that will determine how easy or how difficult it will be to achieve good adhesion. In order for the ink to adhere well, the surface tension of the substrate needs to be higher than that of the ink. Some plastics such as polycarbonate, ABS and Styrene have natural surface tensions higher than the dyne level of the ink. Others such as polypropylene and polyethylene will have surface tensions lower than the ink. The best way to imagine the effect of a dyne level in reference to ink adhesion is to think of a waxed car sitting out in the rain. The rain will bead up enough to not wet the surface. Similarly, when printing on a surface that is too smooth, or a low dyne level surface, the ink will bead up and not wet the surface as needed for adhesion. Prior to printing on some materials, the surface must be pre-treated to raise the dyne level to the point where the ink will not bead up, but rather wet the surface, allowing the ink to adhere properly. Ink adhesion requirements will vary greatly depending upon the end use or application of the device. In almost all cases, with the correct pre-treatment method and ink/thinner combinations, the adhesion will meet the end-use requirement, USP Class VI requirements and sterilization techniques such as ethylene oxide sterilization, gamma radiation or autoclaving.

Prior to pad printing any part, it is a good idea to wipe the surface with isopropyl alcohol. This will help remove any oils or residue on the surface. When surface pre-treatment is required, there are a few different methods to raise the dyne level and ensure optimal adhesion such as flamers, plasma, corona and chemical pre-wipes. Flamers use a low flame to pass over the printing surface, while corona and plasma treatment devices use an electric discharge to pass over the surface. In all methods, the idea is to oxidize the surface to allow for better ink adhesion. Done properly, the surface is not overly heated and the integrity of the printed part is not compromised. Chemical pre-wipes are most commonly used for polypropylene parts, but are not USP Class VI compliant and can potentially mar the surface of the material. The method best for an application is dependent upon surface materials, end-use, and the design of the part.

Conclusion

With proper surface pre-treatment, preparation and accurate ink to additive ratios, it is possible to achieve very good adhesion on almost any substrate. While adhesion requirements are very subjective and dependent upon the end use of the device, even the most difficult surfaces and applications can be marked by pad printing.
As a reminder, parts should always be wiped with isopropyl alcohol prior to printing to remove any surface residue. The dyne level needs to be determined and the substrate needs to be pre-treated to ensure the surface tension level is high enough for the ink to wet the surface; the ink thinner/hardener mixture needs to be monitored to ensure the correct ratios and components are being used. Some of the most common culprits for poor ink adhesion are simply an ink that is too dry, flashing (evaporating) too fast, or the wrong ratio of hardeners to ink is used during the printing process. These pitfalls can be mitigated with patience, experience and thorough testing.

About CleanCut Technologies, LLC

CleanCut Technologies is an FDA QSR compliant and ISO 13485 certified medical device packaging company located in Anaheim, California. Its products are manufactured in Class 7 (10,000) & Class 8 (100,000) certified environments with full traceability. CCT offers the following services and products: zero cost design and prototyping, 3D printing, HDPE die-cut cards, patented "clipless dispensers (hoops) for guidewires and catheters, pouches, labels, SBS shelf cartons, corrugated shipping boxes, pad printing, tube flaring, ultrasonic welding, tube drilling/coring, tooling and contract manufacturing.

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