Pad Printing - Not Just For Marking Anymore

At the dawn of commercial pad print history, 1950s Swiss watch manufacturers used a crude form of pad printing to mark their watch dials replacing laborious hand painting. But it wasn't until the early 1970's that the world got its first glimpse of pad printing at an international trade fair, and the technology picked up speed with automation through the 1990s.

In that span of time, pad printing has become a favorite for surfaces that challenge traditional flat printers: perfect for the irregular surfaces of golf balls, around syringes, water bottles and countless thousands of wood, plastic, metal or glass consumer, promotional, and industrial products. Now, well into the new millennium, the uses of pad printing are limited only by the imaginations of those who use these machines. One such area is as an alternative for non-decorating and non-identification related applications of fluids, including adhesives, lubricants and other chemicals.

Sticky situations
Applying adhesives is considered by many manufacturers to be a time-consuming and labor-intensive process. Small or translucent parts need precision application, which often drives up the bottom line. When factored in with waste and clean up, alternative methods of adhesive application are much sought after. Adhesive film is one method, but also results in waste materials.
Pad printing's transfer method of precise viscous liquid deposition is the ideal solution. A sealed inkcup keeps the glue from drying out, and the cliché (or plate) can be etched to the desired depth and exact line thickness (or thinness).

Once adjusted, the pad then deposits exactly the same amount of adhesive in exactly the same location every time. As part of an in-line automated process, the finished part - for example a beveled cell phone lens - can be fed into a custom machined shuttle fixture that holds the part in place while glue is applied to its edge. The lens is then conveyed to a pick-n-place robot arm that sets the cell phone body onto the glued area. Further automation can transfer the joined parts onto another conveyor that transports them through a drying tunnel or further down the assembly line. Ultraviolet or heat-cured adhesives are useable with this process, as are many solvent-based glues that aren't too aqueous or hydrophilic.

Smooth moving
Another exacting and hands-off use for the pad printing of fluids is in the realm of lubricants. Again, this is an area where precision can be challenging, and waste is costly and messy. Without re-inventing the manufacturing process by integrating new and different materials such as powdered or dry film lubricants (and their associated unknown problems, costs and technologies), pad printing provides a simple, proven mechanical solution.

Whether it's an oil, grease or other substance that reduces friction: if it can stick to a silicon pad and can be transferred to another substrate - it can be pad printed. Since pad printing is well suited for use on three-dimensional items - such as hinges, bearings, threaded parts and housings - any production line that manufactures similar components can integrate this technology into the process. Especially where misapplication can cause catastrophic failure of adjacent mechanisms, precise lubricant application can be achieved with pad printing & whether it be miniscule dots, fine lines and squiggles or exact angular confinement.

Better living
The increasing sophistication of pharmaceutical formulations, such as multiple-use base tablets with a variety of custom additives, also lends itself to pad printing. From applying micro-amounts of a specific chemical onto a supplement or analgesic pill, to creating made-to-order combinations of drugs - pad printing can open up new avenues of marketing and solve perennial problems of mass manufacturing.

The increasingly consumer-driven medication market challenges pharmaceutical companies to find new ways to refine and deliver their products. Integrating pad printing into the mix allows for greater production flexibility and responsiveness to the needs of medical professionals & while at the same time reducing costs passed on to consumers and businesses.

Automating such a deposition process involves existing technology, including feeder bins and chutes, custom machined fixtures that hold many pieces, robot arms and conveyors.
Speed can be less of a concern with pad printing, too, since some electro-mechanical machines can print up to 4000 strikes an hour. Multiply that by the number of spots for substrate in your fixture, and pad printing can be a viable part of an in-line solution.

Less filling
Pad printing on foodstuffs is another area that is only beginning to see its potential being explored.
More than just a high-tech way to decorate cookies, pad printing technology could be used to apply flavors or nutritional additives to receptive food surfaces. The pads used in pad printing are of variable hardnesses, so the end user can choose the "durometer" of their pad depending upon the strength of the substrate.
For example, a gumball would use a harder pad to wrap 180° around, while printing a flavor into the hollow of an antacid would need a softer pad, so as not to crush the tablet.

It's electrifying
Advances in conductive ink technology - including ethyl-cellulose polymers, carbon/graphite, silver or UV curable dielectric inks - allow for pad printing circuit boards, multi-layer membrane switches, and touch-key applications, among other uses.

Benefits include savings in process and materials cost, such as doing away with etched copper, gold plating or soldered wire. For example, replacing gold plating with a carbon ink has proven greater robustness over that extremely expensive metal, and a lower electrical resistance than copper.

A growing economic sector is using conductive inks for Radio Frequency Identification (RFID), which is rapidly streamlining inventory and shipping in the global marketplace. Other applications for conductive inks include medical sensors, transistors, antennas, and electrodes; shielding against electro-magnetic and radio-frequency interference plus dissipating or eliminating static.
Once again, pad printing's ability to print on uneven, curved or recessed surfaces gives the technology an advantage over standard flatbed methods of materials deposition. However, as with printing adhesives, conductive inks must be solvent based and neither too aqueous nor too hydrophilic to be effectively transferred with pad printing.

Beyond the horizon
With the fast pace of medical and technological design advances, finding a tool that bridges the past and future is critical, both on the manufacturing floor and in budget meetings. Pad printing is a tried and true technology that is flexible enough to adapt to a vast variety of substrates and substances. The need to customize materials deposition will only increase as market niches continue to increase and narrow.

Designers, manufacturers, engineers and managers would be well served to explore the ways pad printing can be used for non-decorating, non-identifying purposes. It's proven that the best tool is one with many uses and ideal for turning a problem into a solution: just add a full measure of creativity and a spark of imagination.

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