



Magnetic Substrates Are Nothing to Fear

A White Paper
by Richard Romano,
Industry Analyst
Sponsored by



Abstract

Printed magnets have been popular printed items for decades, but new magnetic substrates and the enhanced capabilities of printing systems are making magnetic printing more versatile than ever. Still, there are many who continue to think that printing on magnetic materials isn't possible, or is incompatible with their printing press or printing technology, or causes nothing but problems. As it turns out, imaging magnetic materials is within the reach of virtually any commercial print shop, and there are myriad solutions to fit all press technologies—and budgets.

Introduction

In Stephen King's 1998 thriller *Bag of Bones*, writer Mike Noonan spends a summer in lakeside cabin. On the refrigerator in his kitchen is a set of magnetic letters. One day, Noonan walks into the kitchen, and the letters have mysteriously rearranged themselves to spell out a message. It turns out that ghosts haunting the house are using the magnetic letters to communicate from the Great Beyond. It's pretty creepy (it's Stephen King, after all), and reading it at night is not to be recommended.

In the general course of our lives, though, most of us don't find magnets to be especially scary. But for many who consider the idea of printing on magnetic substrates, there is no small amount of trepidation.

A look at your own refrigerator will probably be no small indication that printed magnets are very popular promotional items. Magnetic signs have proven ideal for buildings, vehicles, and other indoor and outdoor applications for decades, and magnetic materials are increasingly being used for elaborate wall décor and point-of-purchase (POP) displays. Even your average office superstore like Staples sells magnetic sheets that can be run through a desktop inkjet or laser printer.

On a larger scale, printing on magnets is not a completely trouble-free process—but then what is? Historically printed using the screen process or some kind of transfer medium, magnetic substrates pose unique challenges to the perennial issues of image quality and color management, not to mention that you're trying to run a big magnet through a largely metallic printing press. Plus, magnetic materials are thicker than other types of media you may be running, although they're thinner than a lot of rigid materials like boards. Magnetic substrates are considered semi-rigid, and as such there is the potential for feeding problems. Then there is the potential for damage to the magnetic material. Toner-based laser imaging systems expose a substrate to high temperatures as part of the fixing process, and not all magnetic materials can withstand exposure to this heat. They can soften, deform, and even melt. So choosing a magnetic substrate that is optimized or even certified for a particular printing system is crucial.

That all said, printing magnets is not as challenging as you might think, and new developments are taking some of the—shall we say—sticking points out of the process as well as opening up magnetic media to entirely new applications for small- and wide-format printers and installers. One major solution is to magnetize the substrate after printing, which eliminates all the problems of running magnets through a press.

Options for Magnetic Printing

Printers wanting to put an image on a magnetic substrate, either small- or wide-format, have a few options, each of which has its pros and cons.

Direct Printing on Magnetized Substrates

The first option is to print directly on a magnetic material. What could be simpler than running a sheet or roll of magnetic material through a press or printer?

Pros: It's a simple process not requiring additional steps, materials, equipment, and, thus, costs.

Cons: Some types of printing equipment have metallic parts that can be themselves be magnetized by running magnets over them at high speed. Running the wrong kind of magnet or using the wrong settings may run the risk of printer and printhead damage, which may invalidate the warranty and/or service plan. Damage to the magnetic material is also a possibility.

Printing Via Transfer Sheets

The traditional way of getting images onto magnetic substrates has been to use an intermediary material. Using the press of your choice, an image is printed onto a label, transfer sheet, or other material and then applied to the magnet, typically using a pressure-sensitive adhesive or dye-sublimation.

Pros: This process avoids the mechanical issues that can arise when a magnetic substrate is run through a press.

Cons: It requires extra steps (the transfer process), materials (transfer sheets), and equipment, which impose extra costs and reduce productivity.

Print-and-Magnetize Solutions

A third option is to use a material that is magnetized after printing. This is referred to as post-print magnetization. You print on un-magnetized media just like any thick plastic or vinyl substrate, then as part of a finishing process you run it through a magnetizing machine.

Pros: This process eliminates the need for transfer sheets and associated equipment, avoids the problems associate with running magnetized material through a press, especially the tendency for stacks of magnetic sheets to stick together and jam during feeding.

Cons: It requires magnetizing equipment, either added to your production line or as an extra step after printing.

As you can see, each of these three approaches has its advantages and disadvantages. However, in this report, we're going to highlight the third option—print-and-magnetize solutions—as proving perhaps the best tradeoff in ease of handling and post-press processing.

Working with Un-Magnetized Material

First of all, whether you're running magnetized or un-magnetized media from Magnum Magnetics or from other vendors, it's imperative that you ensure that the substrate you choose is compatible with your particular press and printing process—offset, toner-based digital, inkjet, and so on. Be sure to inquire as to whether it has been certified, or at least tested, for use on a given press. This is not a problem unique to magnetic substrates; running incompatible media can result in at best poor image quality and color reproduction or at worst an inability to get the material to perform on-press—or even damage to the press and/or substrate.¹

That basic caveat out of the way, one conspicuous aspect of the print-and-magnetize solution is the need to acquire an extra piece of equipment: a magnetizer, which is a device that induces the magnetic field in the printed substrate. There are different types of magnetizers available. If you have been to an Ace Hardware or Home Depot, you may have seen small tool magnetizers/demagnetizers that let you induce a magnetic field in screwdrivers, to better hold screws in place. Magnetizers for magnetizing substrates are along the same lines, but are built for large sheets or rolls of material rather than small pointy things.

Magnetizers can range from small, handheld devices to large, industrial machines, and anything in between, and the best choice will be a function of the volume of magnetic print work a shop does. If it's just the occasional sign or refrigerator magnet, a small portable or handheld unit will suffice, but if it's a substantial volume of magnetic work, it is faster and more efficient to invest in an industrial-scale magnetizer, or even an inline solution.

When shopping for a magnetizer, there are a couple of technical terms that are helpful to know.

High-energy/standard-energy—“High-energy” magnetic material is formulated to have stronger magnetic properties and thus a stronger “grip” than standard-energy material. High-energy magnetic material is suitable for applications like vehicle graphics, where there is the danger of the magnetic material sliding around or falling off. High-energy magnetic material requires less thickness to achieve the same strength as standard-energy sheets. Magnum Magnetics’ MuscleMag® high-energy sheeting, in as thin as 15 mil (.38 mm) is about as strong as the 30 mil standard-energy magnet normally recommended for car signs.

Poles per inch (PPI)—As you may recall from high school physics, magnets have a north and south pole, and it's the attraction between opposite poles that makes a magnet magnetic. Poles per inch refers to the number of north-south poles per linear inch. A higher PPI—and thus more poles—means a stronger magnetic grip. However, the tradeoff is a lower reach. A high-PPI magnet will have a higher holding strength than a low-PPI magnet, but will attract at a shorter distance. To illustrate: if you have an array of refrigerator magnets, you know that some can hold a thick postcard without sliding, while others can barely hold your son's report card; likewise, some “grab” the surface from an inch away, while others need to be brought right up close before they stick. These differences are essentially due to differences in PPI (as well as a function of the magnet's thickness).

Magnum Magnetics manufactures its own magnetizers that are optimized for its magnetic substrates. There are several sizes and scales, depending on the end user's needs. These include:



Handheld Magnetizer—This is a lightweight magnetizer for low-volume and other occasional jobs. It resembles a semi-circular rolling pin and is battery operated. To use it, drag the magnetizer down the magnetic side of the media. It magnetizes a six-inch-wide swath per pass.



Portable Desktop Magnetizer—If your magnetic media volume is still fairly low, but large enough that a handheld unit would be inefficient, a portable desktop magnetizer is a small, motorized option that magnetizes whole sheets at a time. Just plug the unit in and slide the material through the device. It's available in high-energy and standard-energy models, which can magnetize at speeds of up to 60 and 50 feet per minute (fpm), respectively. It's portable, and can be stored in a carrying case out of the way when it's not required.



Motorized Magnetizer—If you produce a substantial volume of magnetic materials, Magnum offers a motorized friction-fed magnetizer that can process sheets of magnetic material up to 26 inches wide at speeds up to 70 fpm.

In-Line Magnetization—Finally, if you do a high volume of magnetic work, find manual magnetizing to be too slow and inefficient, and need an automated magnetizer that can match the speed of your press, an in-line solution may be the best option. Magnum Magnetics can custom design and build an in-line magnetizer for your specific print production workflow.

Caution: It bears mentioning that magnetizers contain strong permanent magnets. Therefore, people with electric or electronic life-support equipment such as pacemakers should not operate them and, in fact, should keep a discreet distance (at least 12 inches away) from a magnetizing unit.

The point is, by using post-magnetized material, you overcome any limitations your press may have when it comes to printing on magnetic materials.

Conclusion

Today's market for printed materials tends heavily toward high-value print products and applications, and "high-value" can be synonymous with "high-margin." Magnetic products fall into that category. Successfully printing on magnetic substrates is not the challenge it used to be—and is certainly nothing to fear. With a few simple investments and a little bit of education and practice, those high-value applications are within easy reach of any print provider regardless of press.

¹ Magnum Magnetics offers a full range of magnetic materials that are compatible with different printing technologies—offset and digital—and, on the digital side, different press manufacturers—HP Indigo, Kodak Nexpress, Xerox iGen, etc.