

# Linear powder coating reels in rewards for fastener maker

A manufacturer uses a reel-to-reel powder coating system to finish wire products for varied applications that exceed altitudes of 30,000 feet and speeds of 200 miles per hour.

**D**evice Technologies, Southborough, Mass., has centered itself by hanging on the edges for more than 2 decades. In 1984, Hector D. Petri, company founder, introduced the Spring-Fast line of high-performance grommet edging. A host of industries embraced and benefited from this product and its progeny, including aerospace, the US Department of Defense, banking and business machinery, data storage, gaming, HVAC, NASCAR, semiconductor manufacturing, and transportation.

Having buttoned up a large swath of varied businesses, Device Technologies created an Advanced Technology Division that performs fully automated, linear and selective electrostatic powder coating. Using a linear reel-to-reel system, the powder coating process can be used to finish cable, wire, flat wire, stampings, and profile-metal-formed products. The system applies both thermoset and thermoplastic powder coatings.

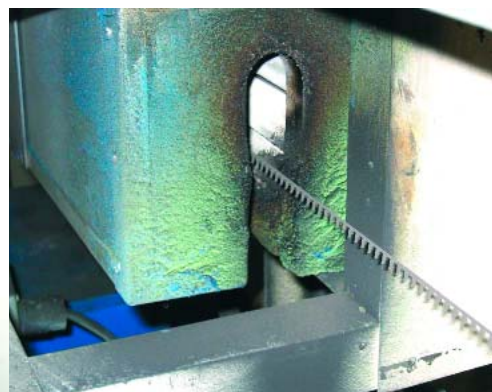
## Increasing business through powder coatings' properties

Initially, the company powder coated only its own line of grommet edging. This product can be used in various ways. For example, the aircraft industry uses the edging to prevent wire chafing. An airplane has wire

running through metal cutouts. After 20 to 30 years of operation, the sharp metal edges can cause wires to become chafed or cut, creating a failure. The coated grommet covers the metal edge and protects the wire from cut-through. The linear reel-to-reel coating system creates specific film thicknesses, which increase the grommet's abrasion resistance. This flexibility makes the grommet edging suitable for flanged holes in the aerospace industry. In addition, NASCAR uses the grommet edging because of its mechanical attachment capability. The edging can also withstand the high shock and vibra-

tion associated with racecars circling and careening across an oval track at speeds topping 200 miles per hour. Moreover, the powder coating used in the edging makes it flame retardant. It passes UL 94 V0—a typical requirement in the telecommunication industry via base stations, routers, servers, switching units, and patch panels. "From functional to decorative—it became a universal product needed in a host of industries," said Steve O'Loughlin, engineering manager.

Presently, Device Technologies offers its finishing services to other manu-

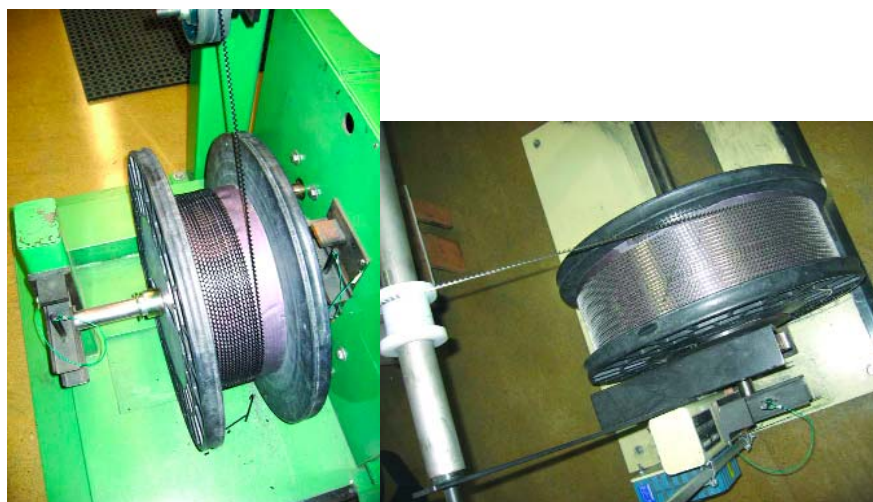


*The electrostatic fluidized box applies thermoplastic and thermoset powder coatings.*

facturers. Depending on performance requirements, powder imparts electrical insulation, corrosion resistance, and ultraviolet-light protection. A variety of colors can enhance a product's decorative facet. In addition to coating services, the company can fabricate, prestamp, and roll form. T-sections that hold up ceiling tiles highlight the range of services. The flat material can be stamped to a particular profile, formed, and finally powder coated. The system accommodates anything that has a small cross section and can be processed in a linear mode where a particular amount de-reels or pays up in a flat or round state, such as wire or strip, wire rope, and cables. Depending on customer requirements, Device Technologies can recommend the appropriate powder formulation and roll-forming methodology. The company collaborates with its customers to choose the suitable powder coating. "And that is where our experience with thermoplastics comes in handy," said Petri. "They are typically flexible even on a higher film build."

### Winding through the powder line

Device Technologies designed the components of the powder coating system and specified the entire process by using a proprietary non-contact measurement system. The linear coating system (Figure 1) can process products up to 2 inches wide.



The linear, reel-to-reel coating system continuously powder coats reels containing 7,000 to 60,000 feet of material.

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Product strips pass through sheaves as they're being fed. Workers make minor modifications to the sheaves to accommodate the stock width. Depending on profile size and substrate type (aluminum, stainless steel, or other metal alloy), an operator employs tensioning techniques to keep a product parallel to the floor and to feed it smoothly through the continuous process. Trained operators control and monitor the coating system, interface with the engineering department, inspect to the quality system, and test to the ISO (International Standards Organization) inspection criteria prescribed by ASTM (American Society for Testing and Materials) standards, including crosshatch adhesion, and mandrel-bend and adhesion testing. "It's a specialized area," O'Loughlin said. "You don't just hire someone and put them on the [production] line."

Depending on the end-product specifications, workers clean the raw material as it comes in. Afterwards, the material can go through all or some of

the following processes: stamping, roll forming, powder coating, and re-reeling. If the customer just needs powder coating services, the company will receive the reeled product, inspect it, and pretreat it before powder coating. The proprietary pretreatment process cleans copper, aluminum, stainless steel, and steel alloy. "We can process all of them," O'Loughlin said. "It's just taking the right measures to clean and process with the appropriate technique."

Following pretreatment, a worker installs the reel, ranging from 7,000 to 60,000 feet per reel, onto the pay-off system. It then unwinds and feeds through the powder application section, known as the electrostatic fluidized box. The box can apply thermoplastic or thermoset powders. Device Technologies collaborates with its customer to select the appropriate powder formulation, from epoxies and polyester triglycidyl isocyanurate (TGIC) thermosets to thermoplastics, including nylon 11, polyolefin, and polyamide.

For example, a customer will initially specify a product to address corrosion resistance or abrasion. If cost or performance becomes a concern, Device Technologies will recommend a cost-effective and performance-enhancing alternative based on testing. Said O'Loughlin: "They give us [specifications and create a] first-article procedure for the manufacturing process, and we [may] come back and say 'these specifications cannot be met. We need to change something.'"

In addition to applying a variety of powder formulations, the system also allows the company to selectively coat specific part areas by us-

ing a combination of motors, pneumatic controls, air controls and masking, scribing, and vacuum techniques. Selectively powder coating in areas or sections benefits the electronics industry. "Picture a flat wire or flat stamping approximately 1/2-inch [0.500] wide by 10,000ths of an inch [0.010] thick," O'Loughlin said. "We can coat the bottom section and the sides while keeping the top section uncoated. On the bottom, you would have an insulator, and on the top, you would have a contact point to create a ground—typical in lead frames or switch components for the electronics industry."

To facilitate powder changeover without stopping the line, the company has multiple pieces of equipment, allowing the system operators to change powders while the line continuously coats product. "Changeover for color or material is minimal," O'Loughlin said. "We're able to set up and changeover in anticipation of the next job while the current process is running."

After emerging from the electrostatic fluidized box,

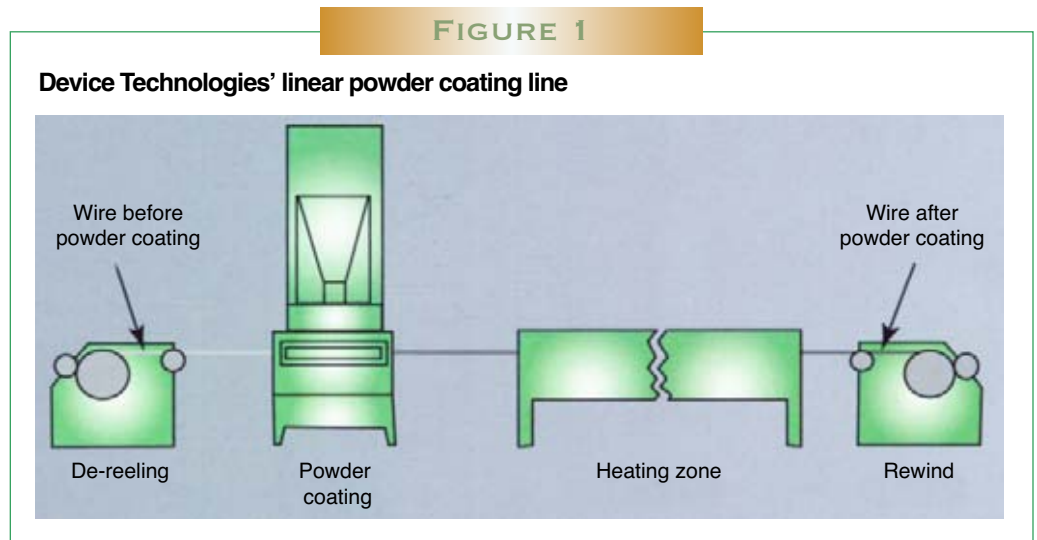
the coated reel section goes through the oven for the melting and subsequent cooling process for thermoplastic powders or the curing process for thermosets. Then, it's re-spooled onto the take-up reel. The coated product can next be roll-formed and shipped to the customer or shipped directly after inspection.

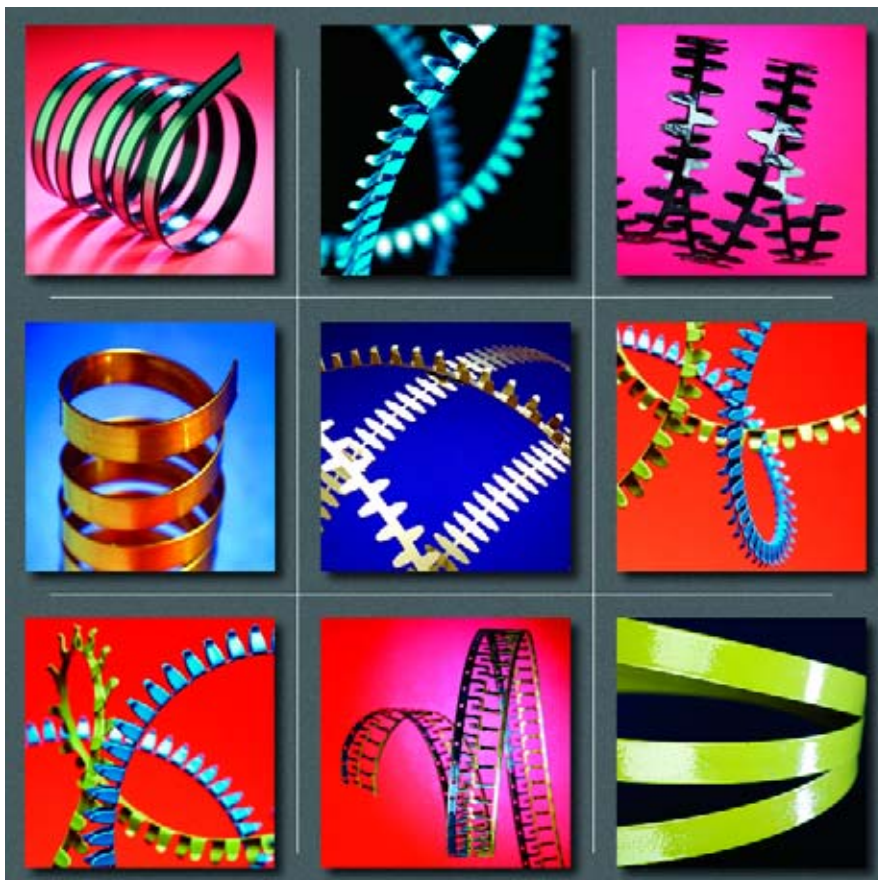
**Looking for constant improvement on a continuous system**

Device Technologies has taken a basic material used in countless ways, developed a way to coat it, and made a product that can be both

functional and decorative. The company designed a powder coating system to achieve abrasion resistance in its own specialty fasteners. By applying continuous improvement to its system, such as different heating techniques, tensioning, in-line thickness measurement, and vision systems to detect imperfections throughout the line, the company can provide reel-to-reel powder coating services for an increasing customer base.

By opening its doors and offering its reel-to-reel coating prowess to oth-





The powder coating process can selectively apply powder coatings to sections of coated stampings.

ers, the company that once used powder to transform its own products is constantly raising the expectations of its customers. "In many cases, the coating is decorative,"

O'Loughlin said. "There's a new building going up, and [the customer] wants to coat hangers for lighting going up—yellow, pink, or purple—the particular color is the

actual application. But product formability and flexibility [are] also important. [Our process allows our customer] to take a flat piece of wire and bend it 180° without any cracking or fracture at the bend for instance—aesthetics remain constant as the product is flexed." PC

#### Editor's note

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