

METAL PARTS COMPETE

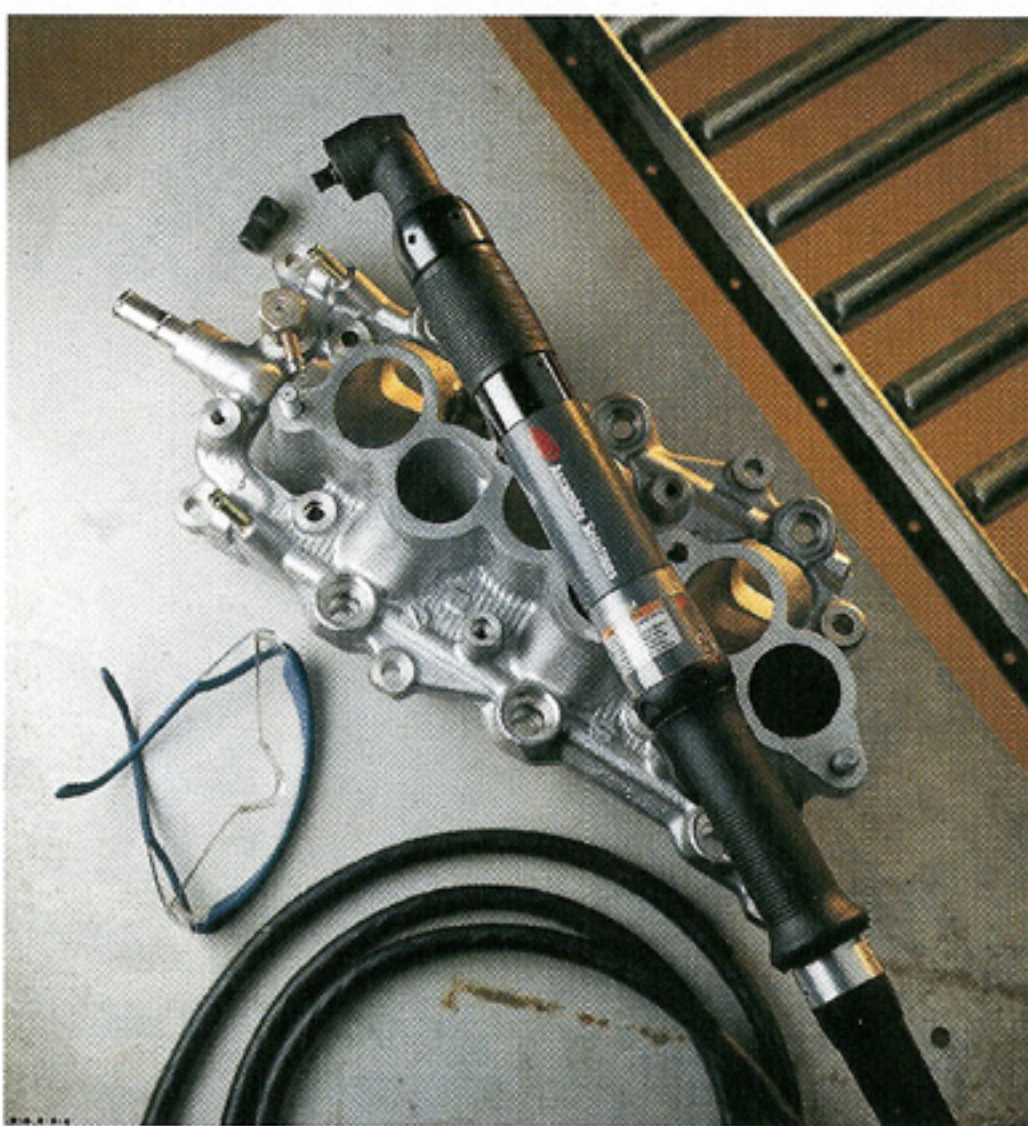
The Metal Powder Industries Federation has begun accepting entries for the 2004 International P/M Design Competition. Open to MPIF members, the competition recognizes achievement in seven categories—ferrous, nonferrous, stainless steel, injection molded, advanced particulate materials, innovative functional assembly, and overseas. Winners will be announced at the International Conference on Powder Metallurgy & Particulate Materials, June 13-17 in Chicago. For more information, click on www.mpif.org.

PLASTIC FIRE FIGHTER

Ticona has introduced a line of flame-retardant polybutylene terephthalate (PBT) materials with improved performance and processing characteristics. Called Celanex 14 Series, this line includes two unfilled and three glass-fiber-reinforced grades. The materials target a variety of electrical applications but especially thin-walled components. The 30% glass-filled grade, for instance, meets the UL-94-V0 specification at wall thicknesses down to just 0.39 mm. Check out www.ticona-us.com.

URETHANES SOFTEN

Rogers Corporation has added six new, extra-soft materials to its 4790-92 PORON Urethanes family. Available in 12- and 15-lb densities, these new products are up to 90% softer than the previous extra-soft, slow-rebound materials. With their longer recovery times and compression set less than 2%, the materials can serve in gasketing and cushioning applications requiring low closure forces, including handheld electronics. These products are cast directly onto a 0.002-inch polyester film. The materials will retain their properties at constant temperatures of up to 158F and can survive intermittent temperatures of up to 250F (121C). Visit www.rogerscorporation.com for more information.



WRENCHING CHANGES: The latest nut runners from Ingersoll-Rand feature design enhancements that make the tool more powerful, robust, and easier to use.

ASSEMBLY

Cabling Matters

A custom hybrid cable helps keep Ingersoll-Rand's new nut runner up and running in automotive and appliance manufacturing

Annandale, NJ—Power and data cabling may not be the first thing engineers think of when they design a new power tool. But it shouldn't be the last thing either. A new line of nut runners from Ingersoll-Rand shows just how much of a difference the right cabling can make.

These QE Series nut runners serve on a variety of automotive and appliance assembly lines, where they provide tight torque control and monitoring for safety-critical fasteners. Ingersoll-Rand will soon introduce its second generation of these dc-motor-driven wrenches. They feature a host of enhancements, and a custom cable helped make some of them possible. "Lighter, smaller, faster" is our mantra," says Senior Project Engineer Warren Seith. "And the cable ties into all of that."

Why go custom? Senior Electrical Engineer Bill Ball simply couldn't find a standard product to meet

his stringent requirements. "We wanted to do everything with one cable," he says. So Ball worked with Leoni Tailor-Made Cable Inc. (www.leoni-tailormadecable.com) to design his own 12.9-mm-diameter hybrid cable that carries both power and data. These cables supported three important design goals:

More power

The QE Series nut runners feature a significant

boost in power density compared to the previous generation, thanks to a newly designed motor and a voltage increase from 160 to 320V dc. Some of the power density increase has been applied to weight reduction for the tool. But mostly it has created a huge speed increase at the same torque levels: The old wrenches ran at a maximum of 16,000 rpm, while the new ones go to 32,000 rpm. While it's true that standard cables could handle the extra voltage, Ball notes that Leoni played a role when it came time to select the wire gauges for the more powerful wrench. "We thought 16-gauge, which we had used in the past, would do the trick because we didn't increase the current," he says. "But we initially questioned whether 14-gauge might be better." Leoni helped settle the question by shipping Ball a few feet of its off-the-shelf 14-gauge for comparative testing. Sixteen-gauge won out.

More robust

With the wrenches attached to their controller cabinet via a single cable, it's not hard to see a potential for problems. Imagine operators twisting and bending the cables as they work. Imagine them swinging their wrenches from the cables when they're not doing their jobs. "Cable problems were the most common cause of failure," notes Ball. The custom cable helped on this score by allowing Ball to pick materials systems that met all his design criteria—including flexibility, resistance to >>



LOUD AND CLEAR: Digital communications allow the nut runner to operate 2,000 ft or more from its controller without noticeable signal loss.

ASSEMBLY, Continued

automotive fluids and other manufacturing chemicals. For these reasons, he opted for chemical-resistant polyurethane jacketing rather than the more standard PVC. In continuous flexing applications, like the nut runner, the new cables have a tight bending radius of five times their diameter.

And how well do they withstand flexing? In a test that involved swinging a 3-lb weight from the cable, the old cable could withstand only about 170,000 cycles. The new one exceeded the design specification of 250,000 cycles, Ball reports. Ingersoll-Rand engineers bumped up the flex performance even higher with the addition of a patent-pending strain relief system. It provides a simple threaded connection between the end of the cable and the wrench housing. With the strain relief in place, the cable made it to two million cycles in the flex tests before Ball pulled the plug. "We could have

"LIGHTER, SMALLER, FASTER IS OUR MANTRA," SAYS SENIOR PROJECT ENGINEER WARREN SEITH. "AND THE CABLE TIES INTO ALL OF THAT."

kept going if we wanted to," he says.

What's more, the improved connection promises to make repairs a snap should the cables ever fail. In that case, users would then be able to screw in a new cable in the field. In the old design, by contrast, the cable attachment was inside the tool's housing. "When cables did fail, the whole tool had to be disassembled," he says.

More digital

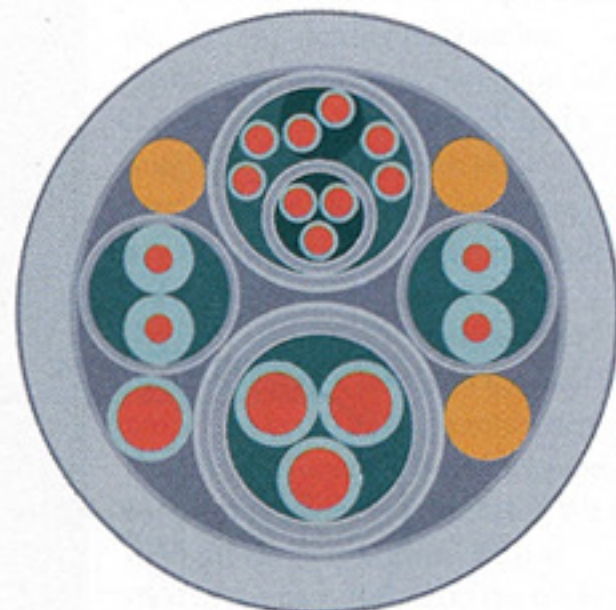
The custom cable also allowed Ingersoll-Rand to improve the wrench's torque control functionality by going digital. In past products, raw, low-voltage analog signals related to torque control would travel from the wrench back

to the controller. At long distances—sometimes as much as 100 ft—the resulting noise threatened to degrade the torque-control performance, according to Ball. "We were right on the edge of unacceptable," he says, noting that most customers want to control torque to within 5%. On the new QE nut runners, all but one of the control signals now travels over a digital (RS-45) connection, allowing the wrench to operate 200-ft or more from its control cabinet with no noticeable loss of signal.

Moving to digital communications also had important size implications for the cable. "We wanted to keep the cable diameter small," Ball says, explaining that the small cables weigh less and are easier for assembly workers to manage. And he says the

move to digital dropped the number of wires from 23 in previous wrenches down to 17—and three of these are spares to support future improvements.

—Joseph Ogando



GOING DIGITAL: The custom hybrid cable on the new nut runners supported a move to digital data communications, which in turn reduced the number of wires running between the wrench and the controller from 23 in previous tools to 17. And three of these are extras to support future upgrades.