Wired for Innovation

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Company's research and development results in "greener" high-quality, cadmium-free wire and cable.

"A solved puzzle is a simple puzzle," goes an old expression that acknowledges how a solution to a thorny problem may sometimes look obvious in hindsight. That bit of insight comes from **Joseph Saleh** who holds a PhD in metallurgy and is the Chief Metallurgist at **Fisk Alloy Wire Inc.**, one of the USA's leading manufacturers of specialty copper alloy wire.

Both Dr. Saleh and Fisk Alloy President **Eric Fisk** may share that smack-on-the-forehead "why didn't we think of it sooner" feeling about Percon® 24. The firm's most recent effort in pushing the copper alloy envelope, Percon 24 turned out to be the answer to a product puzzle that was finally solved by developing a stranded conductor that offered high performance in a more environmentally friendly cadmium-free alloy.

Percon 24 is the latest addition to the firm's Percon 11 and Percon 17 family of conductors. Percon 24 continues a tradition started by Eric and brother **Brian Fisk**'s father and company founder, **John Fisk**. The Fisk Alloy patriarch, a bit of an industry maverick, started the firm 30 years ago and instilled a company culture built on product quality and innovation. That spirit of experimentation and risk-taking has made increasingly desirable capabilities possible in copper alloy wire—and now stranded conductors—since the firm's inception.

Percon 24 is but the latest proof of that commitment to continuous process and product improvement. It represents the culmination of several years of research to develop "greener" stranded conductors. The products that resulted and the process responsible for them took time, but they didn't come a minute too soon for an industry that needs to find additional sources for high performance, environmentally benign stranded conductors that don't rely on heavy metals.

Company Synergies, Smarter Products

The only cadmium-free high-performance conductor on the market that meets or exceeds all industry and military specifications (e.g., **ASTM** *B-624*, etc.), Percon 24 is already earning its stripes so to speak with its recent approval by the USA military for aerospace applications that require high elongation, high tensile strength and superior conductivity.

While the process for producing Percon 24 and the product itself are both patented, there is no protecting other manufacturers from the reason why they haven't developed similar products sooner.

"Stranded conductor manufacturers haven't been proactive in making more environmentally responsible alloy conductors that don't sacrifice performance," noted Eric Fisk. "Our experience in producing copper alloy wire for electronic and electrical components, combined with our evolving manufacturing technology, is allowing us to make a synergistic leap into a new product class. We're using the same cadmium-free alloy know-how developed for electronic and electrical applications and are engineering them into stranded conductors. The results are next-generation products that have better performance characteristics and that are more sensitive to environmental considerations."

Fisk's facility in developing the Percon line and other products comes first and foremost from being one of the few companies of its kind—and size—willing to make the investment necessary in three important areas. The company has:

- Most importantly, made a financial commitment to process and product research and development, an activity led by a focused team of metallurgical experts.
- Fielded in-house engineering talent to design and build the required proprietary production equipment.
- Implemented a state-of-the-art information system that provides real-time processing, manufacturing and inventory control capabilities for higher quality products as well as higher levels of customer service and satisfaction.

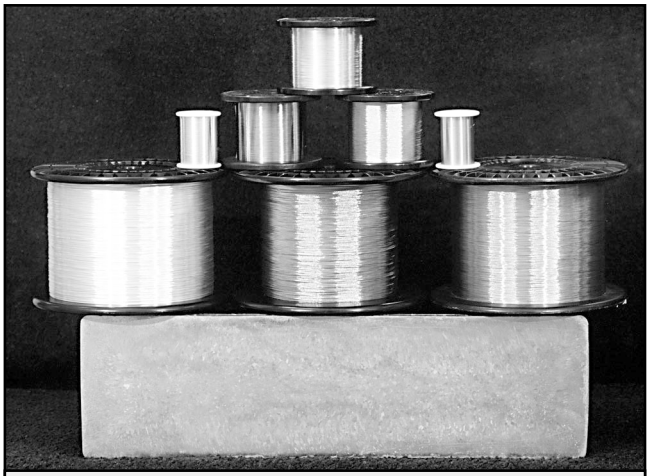
Great IT Leap Forward

Realizing that its business applications had to become as sophisticated as its growing markets and demanding customers, Fisk searched for an ERP/MES information technology (IT) system from the few vendors whose products looked like a possible fit. And Fisk finally found what it was looking for.

The new solution provided metals-specific applications that finally delivered the integrated production and sales data that was needed. It also provided all-important bar-coding capabilities that would allow the company to tag and track wire at the spool-ID level, with its associated heat, chemistry and quality attributes. That also helped the company to track product more accurately, assign it to particular trucks and customers and generate shipping documents or orders not to ship if batches didn't meet quality specifications.

With a roster of international customers, Fisk Alloy Wire was also compelled to subscribe to international quality standards to do business with them. That meant being able to compile and verify the extensive documentation needed for *ISO 9002* certification. Once again, the IT investment proved invaluable in guaranteeing that customers got what they asked for in product quality and making it possible for the company to achieve its desired certification in record time.

Because of the computer system's integrated, real-time



At Fisk Alloy Wire, 10 ton copper alloy bar castings (seen in lower part of photo above) see final conversion into redraw wire that is processed into cadmium-free alloy conductors.

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tracking of process routings and bar-coded part numbers, Fisk can track all the critical quality parameters for customers on each of the products they order that go through the company's various manufacturing and testing procedures. More importantly, Fisk employees can repeat it precisely.

"During the drawing operation for example, the company verifies and tests that wire is the correct thickness, length, surface condition and heat treatment response," says Fisk. "Different wire products require different tensile strengths, so the new system also keeps track of the results of the annealing process so that we know the heat treating history of each individual spool. Regardless of the wire size or the weight of each spool, the processing data is traceable through all manufacturing steps back to its parent casting. This is a critical ability when developing alloys and optimizing processes."

But even the smartest computer systems can only do so much for a company in Fisk's market niche. The key to Fisk's foray into new conductor alloys was the industry experience of **Dr. Joseph Winter**, the company's Director of Technology.

Strip Search

"In the realm of copper alloys, strip and wire, companies represent two different terms of scale." observes Dr. Winter. "As a net shape material, the wire world's volumes are much smaller than the strip industry's, so the economies aren't there for most of those wire companies to make large investments in alloy research and development. That is in contrast to the copper alloy strip producers who have the larger production volumes necessary to fund development of new alloys and manufacturing techniques. In essence, what we do is take their alloy research and development efforts and apply them to the fabrication of wire products."

"Fisk's work over the years has allowed the company to create and commercialize the unique properties of wire made from alloys originally designed for strip applications," explains Dr. Winter. "The properties of wire when it is processed in certain way are superior in strength and other characteristics to what is found in strip."

"That is because strip is rolled in one dimension," points our Dr. Saleh. "But wire is made by drawing it, which changes the shape of wire circumferentially and results in producing different textures that can achieve better performance. As a result, we are able to achieve properties that are often well in excess of the strip alloy's native performance characteristics."

Optimizing the process and the alloy properties to meet existing conductor industry specifications, and without using cadmium or beryllium, was a challenge that took several years. Cadmium is a reliable engineering material, but it is an anticipated carcinogen and few companies want to cast it anymore. "Just as important is finding the right foundries to cast the cadmium-free alloys," Dr. Saleh is quick to add. "These are facilities that must maintain an ultra-clean practice and meet other conditions to achieve a final product that adheres to exacting performance standards for military, aerospace, automotive, computer and other applications."

"In drawing wire, particularly to fine gauge sizes, alloy cleanliness and microstructure uniformity are critical to the production process," emphasizes Dr. Saleh.

An Industry Win-Win

All that effort, however, has resulted in a win-win situation for both Fisk and the wire industry at large. Bringing Percon 24 to market has given the industry a much needed second source of high-performance conductors, which had been the exclusive domain of alloys PD 135 and Cad Copper 162, both of which contain cadmium. "A second source for high-performance conductors can only improve the competitive environment," believes Fisk. "But the Percon line is also allowing USA wire manufacturers to compete more effectively at home and abroad, both economically and environmentally."

"Percon's superior performance, for example, doesn't come at a higher price. It remains cost competitive with current copper-cadmium high-performance alloy products," notes Fisk.

Just as significant, Percon's cadmium-free composition allows USA manufacturers to meet more stringent environmental standards for such products in Europe and Asia. Several European countries have banned or are in the process of prohibiting the use of cadmium-bearing products. The same is true in a growing number of Asian countries. The USA, it is reasonable to speculate, is not far behind.

Brian Fisk (l) & Eric Fisk (r).

How large a market is there for these cadmium-free conductors? "That's still a mystery. We don't yet know what the ultimate size of this market might be," observes Fisk. "But we do know it is growing. Such products' strength and conductivity performance, combined with an increasing awareness of processing, product and disposal waste stream responsibilities, means there will be more and more demand for environmentally benign alloy conductors wherever they are used."

And Fisk's interest doesn't stop at stranded conductors. It has also recently introduced MicroShield, a very high-strength copper alloy shielding wire that solders when bare and can be plated with nickel, silver or tin if desired. This an alternative to a more expensive and far less accommodating stainless steel shielding wire.

Dr. Joseph Winter (l) & Dr. Joseph Saleh (r).

"I'm always interested in new alloys," says Dr. Saleh. "Given our core technology competencies in copper alloy wire, combined with our other advanced capabilities and focus on the market , we at Fisk Alloy Wire are continually exploring a wide range of metallurgical options that address customers' requirements."

To learn more about Percon 24 stranded conductors that offer high performance in a more environmentally friendly cadmium-free alloy, contact the author. **WCTI**

Company Profiles...Fisk Alloy Conductors, Inc., *was established to make next-generation, high-strength, high-conductivity bare and plated conductors. It is a unit of copper alloy engineering company* ***Fisk Alloy Wire Inc.****, also in Hawthorne, NJ, USA. Fisk Alloy Conductors employs technologies for fine wire drawing, stranding and heat treating of copper alloys and bimetallic composites to make specialty stranded conductors and bobbins. Fisk Alloy Wire Inc., makes copper alloy wire to meet specific alloy, shape and quality requirements. Offered are flat, round, square and shaped wire to customer specifications.*