

The Efficient Drive System

Coupling Manufacturers Discuss Trends, Challenges and Future Outlook

Matthew Jaster, Senior Editor

It's a fact that drive systems wouldn't function properly or efficiently without couplings.

They quietly go about their business of transferring motion from one drive element to the next. In the PT market today, couplings have the unique challenge of satisfying a variety of customer needs including tighter tolerances, higher speeds and a more versatile selection process.

"Many of the advancements have been in manufacturing technology leading to a more reliable and consistent product," says William Hewitson, vice president of operations, Ruland Manufacturing Co. Inc. "As the manufacturing equipment has gotten better, we have been able to make changes, such as maintaining tighter tolerances, more precise geometry of features, improved balancing for higher speeds, and better finishes for longer life of wear components. Maintaining tight tolerances is important, as most industries are moving towards higher precision servo-driven systems with less misalignment and higher speeds. Fit is critical for couplings, as it helps prevent slippage and failure during operation. Balanced designs for our flexible couplings as a standard plays a key role in system performance, as balancing reduces vibration and allows for higher RPM capabilities."

"Our customers are placing a greater reliance on Lovejoy to provide expertise in the selection of the proper type of coupling for the application," says Paul Petruska, executive director of strategy and business development at Lovejoy. "In some instances we have become an extension of the customer's engineering department and are routinely consulted during the design phase. This gives the ability to not only ensure that the coupling—but the entire system—will perform at optimal



levels while identifying and eliminating any major issues before the unit is manufactured."

"One of the key advancements in coupling technology in which R+W played a role was the development of extremely compact, lightweight, ball-detent safety couplings in 2010," says Andy Lechner, sales and marketing manager at R+W. "On average the couplings have a 50 percent higher torque capacity and 50 percent lower mass and moment of inertia for a given size than previous designs. This becomes important as some designers move away from using mechanical torque limiters, opting instead to rely on electronic current limitation in the drive for overload protection. In situations where this is ultimately determined to have been a mistake, there is often very limited space for the integration of mechanical overload protection. So the small size is sometimes critical.

The light weight and low inertia are also advantageous to people developing smaller, faster, and more energy-ef-

ficient devices from the manufacturing world and beyond, into flight systems, military robotics, and many other high tech devices," Lechner adds.

"In the last three to five years, some of the biggest industry improvements have come as the result of the consolidation in the industry. Today more customers have easier access to service and support of a broader range of products locally than they did five or 10 years ago," says Mark O'Neil, director of engineering at Altra Couplings.

Challenges Ahead

With technology rapidly changing and price always a factor, many coupling manufacturers have to aggressively seek out new industries and raise the bar on the quality of their own products. Additional challenges include redesign, higher speeds and changing the perception of couplings in the PT market.

"There are several advancements in electrical generator technology that are being developed that will require very

high-speed reliable couplings. These new applications are still many years away from large-scale production, but they offer some of the most challenging opportunities for coupling design," O'Neil says. "On the other end of the spectrum is the constant cost pressure of a global market. Engineering and production are continuously challenged to provide quality products that meet the customers' requirements at a competitive price. We are continuously working on new materials to provide our customers with longer life, higher torque ratings and increased misalignment capabilities to allow us to differentiate ourselves in the market."

"In many industries the need for higher speeds is increasing, with demands placed on coupling manufacturers for a wider variety of precision flexible couplings capable of running smoothly at higher rotational velocities. Coupling engineers are challenged with evaluating and redesigning existing products for the types of loads that develop at speeds into the tens of thousands or revolutions per minute," Lechner says.

"One of the biggest challenges is overcoming the perception of the cou-

pling as a low-cost component by both engineering and purchasing," Hewitson says. "Couplings are often the last component to be designed into a system, as they have a low relative cost when compared with other components. Customers expect that there is a standard coupling that will fit their design when this is often not the case. For example, couplings with minor dimensional differences in length or outside diameter can have a significantly higher cost than a standard part. As a manufacturer, we work with customers during the design process as much as possible to ensure they are using a standard part that will function as required and keep cost to a minimum. There is also a significant amount of variation in sizes, styles, and materials of couplings that are offered. Customers expect that they can get our products quickly no matter where they are in the world."

"Our greatest challenge is educating the user groups on the technical features and maintenance of different types of couplings. To increase user knowledge, Lovejoy has teamed up with VibrAlign, a leading supplier of laser alignment systems, to provide a coupling alignment and maintenance practices seminar, free to the user.

This allows the user to learn the latest tips and tricks while having the alignment and coupling experts answer any questions they have," Petruska says.

Stock vs. Custom

Like other power transmission components, coupling manufacturers need to provide a balance of stock and

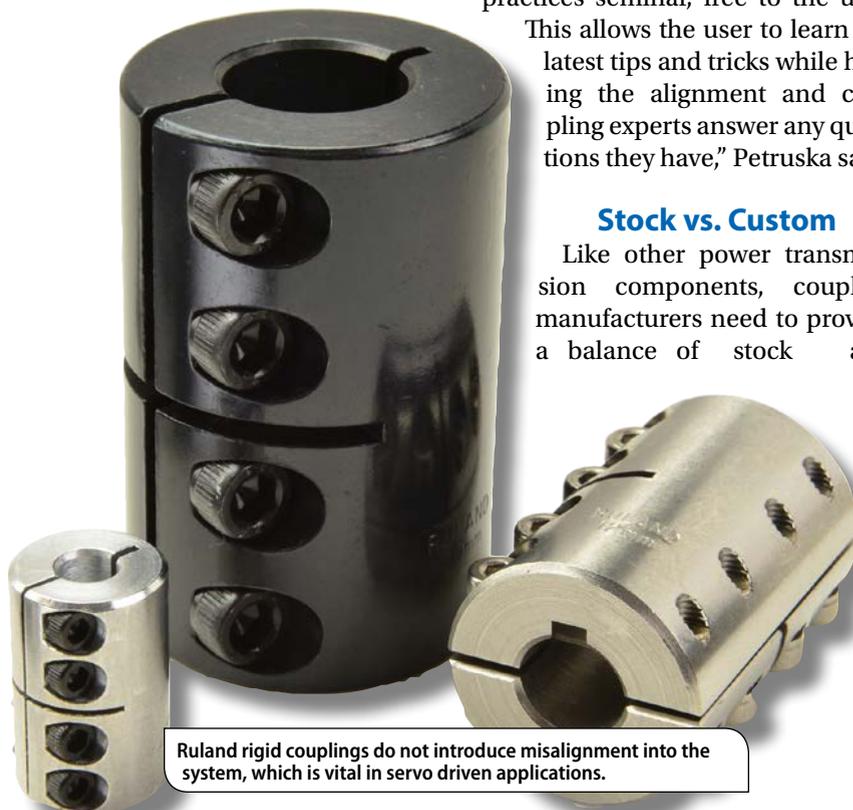
custom products. Custom couplings provide better results for high performance applications, but a shelf full of stock products is equally important.

"Approximately 40 percent of the products delivered by R+W are custom made in some way. This obviously benefits engineers who are looking for the optimal solution from a technical standpoint. But off-the-shelf product is also very important to R+W to help keep cost and lead time to a minimum. This balance helps keep R+W agile, as the focus on short lead times for high performance products also puts the company in a position to deliver some special products more quickly. Over the past few years, R+W has actually been increasing its inventory, especially in the United States, tripling the number of unique SKUs in stock over the past two years."

"Lovejoy is unique in that we pride ourselves in offering a deep catalog of standard products while having the ability to provide custom highly engineered solutions. This gives us the ability to quickly determine if an off-the-shelf solution will meet a customer's application or if a custom designed product will provide additional benefits. For instance, one recent power generation application enabled Lovejoy to provide a mixture of custom and off-the-shelf products to meet the user's needs without having the long delivery timeline typically associated with a custom engineered solution," Petruska says.

"We are shipping special couplings on a daily basis," Hewitson says. "While there has been a push to standardize as many products as we can, there are always variations that customers want. Commonly they include customizations to finishes, bore sizes or tolerances, materials, performance, and hardware. Manufacturing all of our products ourselves gives us the ability to accommodate a wide variety of specials with short lead times."

"Altra Couplings provides a full range of couplings solutions from off-the-shelf products to very highly-engineered products. A significant part of our business involves taking standard, off-the-shelf products and modify-



Ruland rigid couplings do not introduce misalignment into the system, which is vital in servo driven applications.



The Torsiflex coupling from Altra is designed for process pump applications.

ing them to meet specific customer requirements. One of the advantages of our wide range of product offering is that a customer can build an entire plant with couplings from one company. Whether it's a critical process compressor running at 15,000 rpm or a fractional horsepower pump, all needs can be met with one supplier with established pricing," says O'Neil.

Customer Feedback

Faster lead times seem to be top of the list when it comes to customer demands, followed by technical support, larger inventories and longer life. "Customers are generally looking for the coupling that best fits their application parameters," Hewitson says. "This could be bore sizes, coupling dimensions, misalignment capabilities, maximum speed, or torque. It is important that all this information can easily be found on the website with an associated part number. Being able to compare different parameters between product lines is also a critical part of coupling selection. We have customized our website (www.ruland.com) to make this as easy as possible.

"Additionally, customers look for other supporting activities such as technical support, inventory, multiple coupling styles, configurations, and CAD models. In the last five years the web has made it easier for us to address all of these needs in one place. For example, we have added over 5,000 new coupling configurations to the website including keyed bellows and disc couplings as well as beam, bellows, and disc couplings with inch to metric bore combinations. (Hardcopy) catalogs could not have effectively de-

livered this information to customers. This has also forced us to be more flexible in manufacturing and to keep more WIP inventory that can be made to order on short notice," Hewitson says.

"Our customers are looking for longer life from couplings to reduce their downtime. They are looking for shorter delivery to reduce their inventory costs. They are looking for greater misalignment capability to reduce the time to install the equipment. They are also looking for more power density: smaller, lighter couplings that transmit more torque with less impact on the drive and driven equipment," O'Neil adds.

"One need, which may go without saying, is for the product to be more readily available. Not only are engineers required to develop products and bring them to market faster, but the tendency to reduce inventories across the supply chain has not gone away in our industry either, making short lead times ever more critical. As new equipment does continue to get smaller, faster and more efficient, the need for compact, backlash-free couplings are also increasing. Maintenance is another key issue, especially in larger couplings, which require periodic lubrication or replacement of flexible elements. Plant managers and maintenance professionals in all industries are increasingly looking for fatigue resistant flexible couplings which require zero maintenance," Lechner adds.

Future Considerations

Couplings will continue to get more compact, with efforts to make them

more easily configured for quick delivery. But what else will be contributing factors to the success of coupling manufacturers in the near future?

"For small, low performance, and standard couplings, marketing automation and online sales continue to be the big push. For high performance couplings, configurable CAD and sizing apps are also important, but the human interaction will have to remain in many cases. Technical service and response times to engineering inquiries will also have to get shorter in those instances. As the industry evolves, many companies will focus exclusively on streamlining the commercial aspects of their businesses, while some will also be increasing their technical resources and capabilities," Lechner says.

"The coupling industry will continue to evolve with service as a major selection factor. Service is evolving from just producing a coupling to fully supporting the customer in the engineering, manufacturing and service phases of the equipment. We have created a series of tools, from our coupling selector app to placing our catalog of couplings into a searchable on-line database to enable the customer to quickly access information," Petruska says.

"The coupling industry has seen a significant amount of consolidation in the last five years, and we would expect to see continued movement in that direction. Additionally, we would expect to see continued global expansion of those established companies into the non-traditional manufacturing countries," O'Neil says.



R+W's Survivor high performance disc pack couplings are intended for demanding industrial power transmission applications.

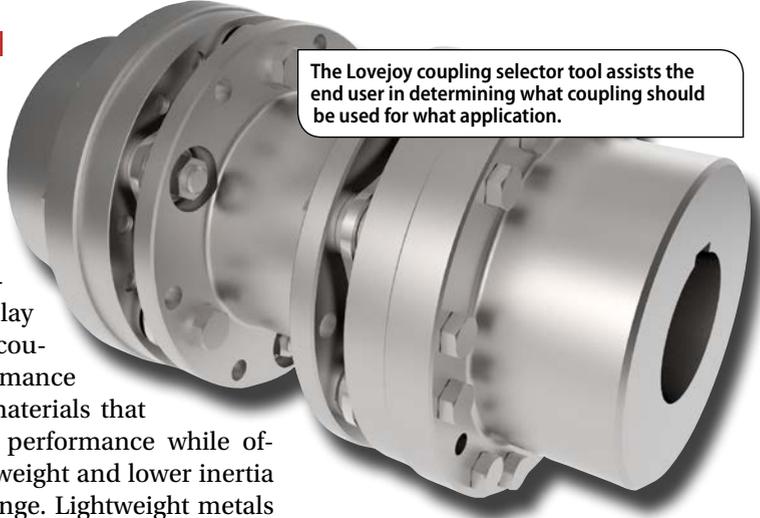
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“Materials are one of the biggest development areas for couplings. They play a key role in coupling performance and finding materials that can maintain performance while offering lighter weight and lower inertia is a big challenge. Lightweight metals such as titanium and high strength plastics may be suitable alternatives to aluminum, steel, and stainless steel commonly used today. Mechanical automation using servo driven systems is becoming more prevalent in industries such as oil and gas and aerospace where the use of these materials is common. The high speeds, harsh environments, and high temperatures found in these industries has traditionally limited coupling selection to disc, bellows, or zero-backlash jaw couplings. As the material types advance there is opportunity to increase the performance characteristics of these couplings, while also allowing more forgiving couplings such as oldham and beam to be used.

What about 3-D printing technology for couplings? It’s already in play so to speak.

“Additive manufacturing, such as 3-D printing, will give us the ability to produce designs that have not been practical to machine in traditional ways. This also has the potential for us to create coupling designs that have not been imagined yet, which is the definition of game changing,” Hewitson says. “We are already beginning to use rapid prototyping as a way to test proof of concepts on experimental couplings and see this developing into custom production type couplings.”

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The Lovejoy coupling selector tool assists the end user in determining what coupling should be used for what application.

For more information:

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