

Tailor-Made

The Role of Coupling Technology in Current Developments in Industry

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The individually equipped car, one's own home or, most appropriate in the literal sense to this article's heading—the tailor-made suit: all are things that are designed according to one's own, quite special ideas.

What does this have to do with coupling technology?—A whole bundle.

Indeed, the solutions and processes in industry are becoming more and more individualized, driven by the increasingly varied requirements of users. Coupling manufacturers react and provide an active impetus with innovations of their own.

“Industrial production is characterized by a high level of customization of the products under the conditions of highly flexibilized (large-series) production,” according to the declaration of the Federal Ministry for Research and Education on the subject of Industry 4.0. Individualization and flexibility need freedom. Coupling technology is very closely intermeshed with the numerous industries for which it delivers solutions and opens up perspectives for future development. For the R+W Antriebs-elemente GmbH this means one is pleased to have access to the numerous technological possibilities that the company has acquired over the past decades—and at the same time is aware of the growing challenges—as well as the rising expense—that pertain to these requirements. Thus the standard product range is constantly expanding; more and more special solutions are being developed.

Efficiency Stands in the Foreground

The starting point is the request from the design engineers. One first considers the overall context in order to understand what the user requires. What is the requirement? How can the couplings meet this requirement? Coupling manufac-



Figure 1 Precision safety couplings; e.g., the SK series, suitable for torques between 0.1 and 2,800 Nm (all photos courtesy of R+W).

turers must find and work out solutions for the existing demand. A wealth of ideas, seeing the big picture, and practical experience play an important role here. Over the years R+W has developed a wide range of standard solutions for precision and industrial drive couplings, enabling it to cover different applications directly.

R+W offers various solutions in the area of precision safety couplings; e.g., the proven SK series (Fig. 1), suitable for torques between 0.1 and 2,800 Nm. It is available for direct and indirect mounting by clamping hub, conical clamping ring or keyway mounting, and in a torsionally stiff, metal bellows version, as well as in a vibration-damping elastomer version (ES). The different models are available in each case with different operating principles: single-position, multi-position, load locking and with full disengagement.

To (address) the constantly changing requirements of the market, for example—lower mass moment of inertia, higher operating speeds or more efficient processes—R+W had already developed in 2010 lightweight safety couplings (SL Torqlight series) (Fig. 2), and thus set standards on the market. Torqlight has higher power density, lower weight, and costs less than the models of the standard series. R+W achieves this by intelligent, lightweight design in combination with high-tech materials using the latest manufacturing techniques. Such examples show how (ongoing) or completely new developments are constantly being added to the product range—thus responding to the needs of users with a view to functions, equipment and material used in production.



Figure 2 R+W lightweight safety couplings (SL Torqlight series) also provide higher power density at less cost than the standard series models.

Figure 3 Metal bellows couplings.



Solutions for Production and Automation

Apart from the actual production processes, material flow and handling also profit from suitable coupling solutions. Torsionally stiff or vibration-damping zero backlash servo couplings are a natural for use in automation, since they fulfil the main requirements of highly dynamic servo-axes. Over the years, solutions from R+W have proven themselves a thousand times over in this area. The role in automation of metal bellows (Fig. 3), elastomer (Fig. 4) and safety couplings—as well as universal shafts (Fig. 5) for safe and in the final analysis efficient processes—is small in a physical sense, but significant as far as functions are concerned.

Applications that R+W cannot cover directly with a standard product require a special solution. The motto in the development department here is: as efficient as possible and as individual as necessary, to keep the investment and lifecycle costs within bounds for the customer. For example, in a comparatively short development time of a few weeks, the company developed a metal bellows coupling of press fit design for the largest machine in the world, the CERN research project, and a safety coupling for the ISS space station. A metal bellows coupling suitable for peak torques of up to 850,000 Nm was developed for wind turbines (Fig. 6)—clearly more than is possible with standard products.

Figure 5 Elastomer couplings.



Mechanical Safety Couplings Fit for the Future

These practical examples demonstrate the relevance of coupling technology for numerous applications in different industries. To prevent damage to machinery, one also uses electrical versions. For example, (they are used) in machine and plant construction, apart from mechanically functioning elements; from current-dependent overload protection, through voltage and power monitoring components, and up to torque control devices. If one considers the two operating principles in detail, it becomes clear that mechanical elements have clear advantages compared with electronic control systems.

This is particularly evident in the response time of both versions. Here mechanical safety couplings are a few mil-



Figure 4 Safety couplings/universal shaft.

liseconds faster and thus clearly better. Finally, speed is the decisive factor in safety systems. The faster the control shuts off, or the component interrupts torque transmission, the less consequential is the damage to the components or even to the entire machine. When it comes to protecting investments and avoiding downtimes, fractions of a second are decisive. Mechanical safety couplings give users a valuable advantage.

Another advantage of mechanical safety couplings is that they have a lesser number of possible sources of error. In order to equip plants with electronic controls, a multitude of sensors is necessary to ensure optimal protection. In addition to the sensors, torque-measuring instruments are fitted at important places within the system. This arrangement of several safety devices accounts for sources of error, and the system must be maintained on a regular basis. In addition, sensors offer no absolute guaran-

tee of safety, for correct operation cannot be guaranteed due to dirt, deflection of infrared rays or masking of the sensors, for example.

Mechanical safety couplings also win due to their ease of use and easy adjustment. If, for example, the mass moments of inertia in the entire drive line are too high—so that the safety coupling would respond regularly when decelerating and accelerating the drive line—then the disengagement torque can be adapted to the circumstances without difficulty, thanks to the large adjustment range. Thanks as well for the variable installation possibilities; design engineers can use the coupling exactly at the place in the drive line where the probability of an overload is the greatest.

Safety through Quality

Against the background of the subject of “safety,” the requirements on quality are correspondingly high. R+W responds to this challenge by employing in-house test stands (Fig. 7) that provide speedy feedback between quality assurance and development. On this basis, quality and functionality can be assessed, documented, and, if necessary—improved. The test stands offer testing capacities for different applications to obtain the wanted data as quickly as possible. R+W operates four types of test stands: a vibration test stand; one for universal shafts; one for special applications; and a heavy-duty test stand. The test stands deliver reliable results in the shortest time and under the company’s own roof.

Couplings are designed in a dialogue with customers according to their specific requirements. In close contact with the engineers of the user companies, R+W develops and improves its products continuously in order to offer specific solutions to meet the requirements in each case. The company’s own R&D department and prototyping, in co-operation

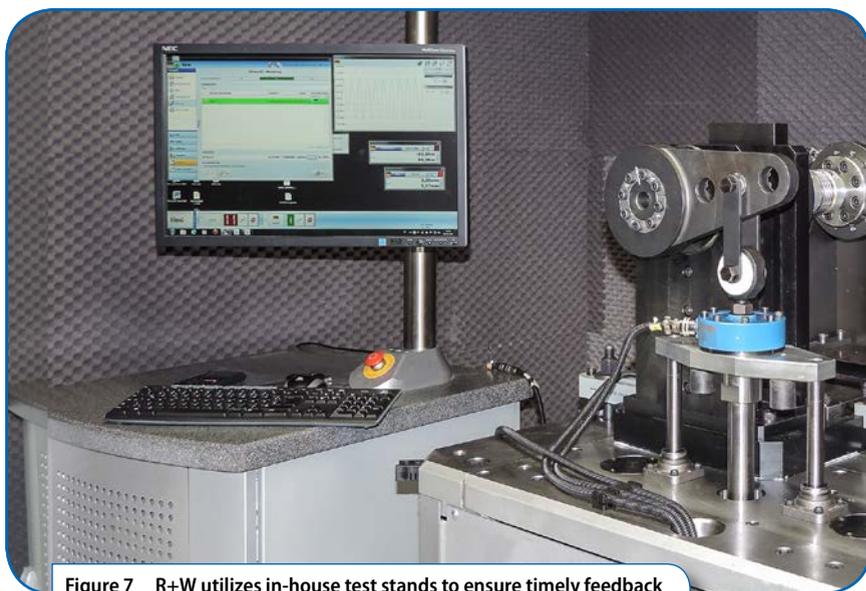


Figure 7 R+W utilizes in-house test stands to ensure timely feedback between quality assurance and development.



Figure 6 Developed for wind turbines, a metal bellows coupling suitable for peak torques of up to 850,000 Nm.

with universities and colleges of applied science, also makes its contribution. It is a question of solutions that provide a secure investment in the efficiency and reliability of equipment. Technological competence in the field of couplings and consideration of the customer’s application form the basis for the correct and best solution.

Freedom for Innovations

In the so-called “Internet of Things,” objects like machines and robots exchange information among one another and make it available to mankind. Numerous new opportunities have opened up with a view to further developments and innovations. With regard to the demand for increasingly strong individualization of products and flexibility of production capacities, networked and highly automated production assures companies competitiveness in high-wage environments.

Whether standard or special solutions, couplings play an important role today, and in the future, for flexible, efficient, and intelligent processes. **PTE**

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