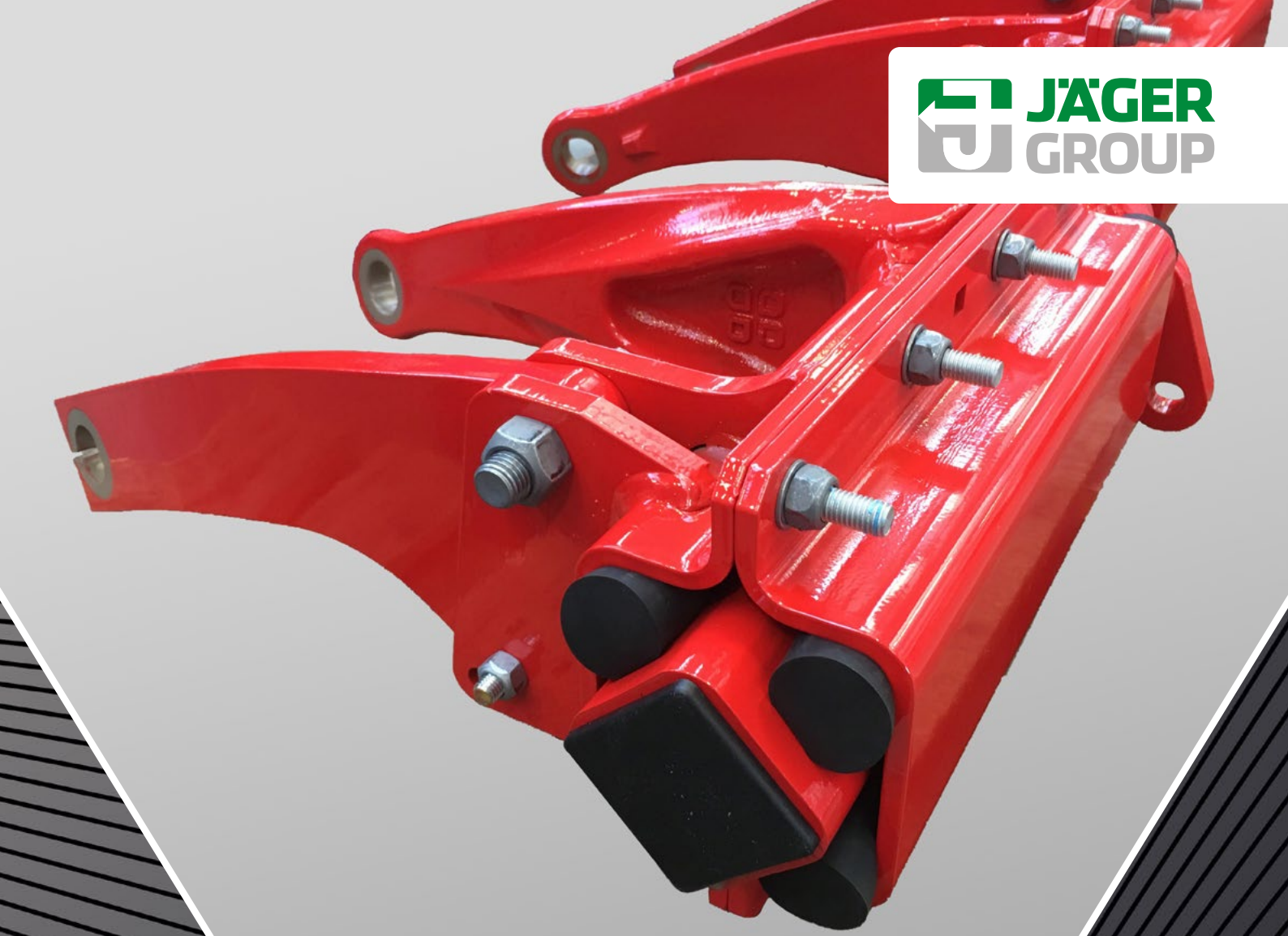


JÄGER GROUP

CASE STUDY

SPRING ELEMENTS FOR AGRICULTURAL TECHNOLOGY

REDUCTION OF ENERGY AND MATERIAL CONSUMPTION THROUGH COMPETENT MATERIAL ADAPTATION

CHALLENGE

Long heating times and high energy requirements during production

International standards prevent short-term adaptation of geometry

Previous manufacturing process produces high levels of waste

SOLUTION

Targeted adaptation of the rubber compound

Conversion of the production process to compression molding

Reduction of waste through cold runner technology

RESULT

Shorter heating times enable faster production times

Lower energy consumption and thus Carbon emissions

Consistent product properties at lower overall costs

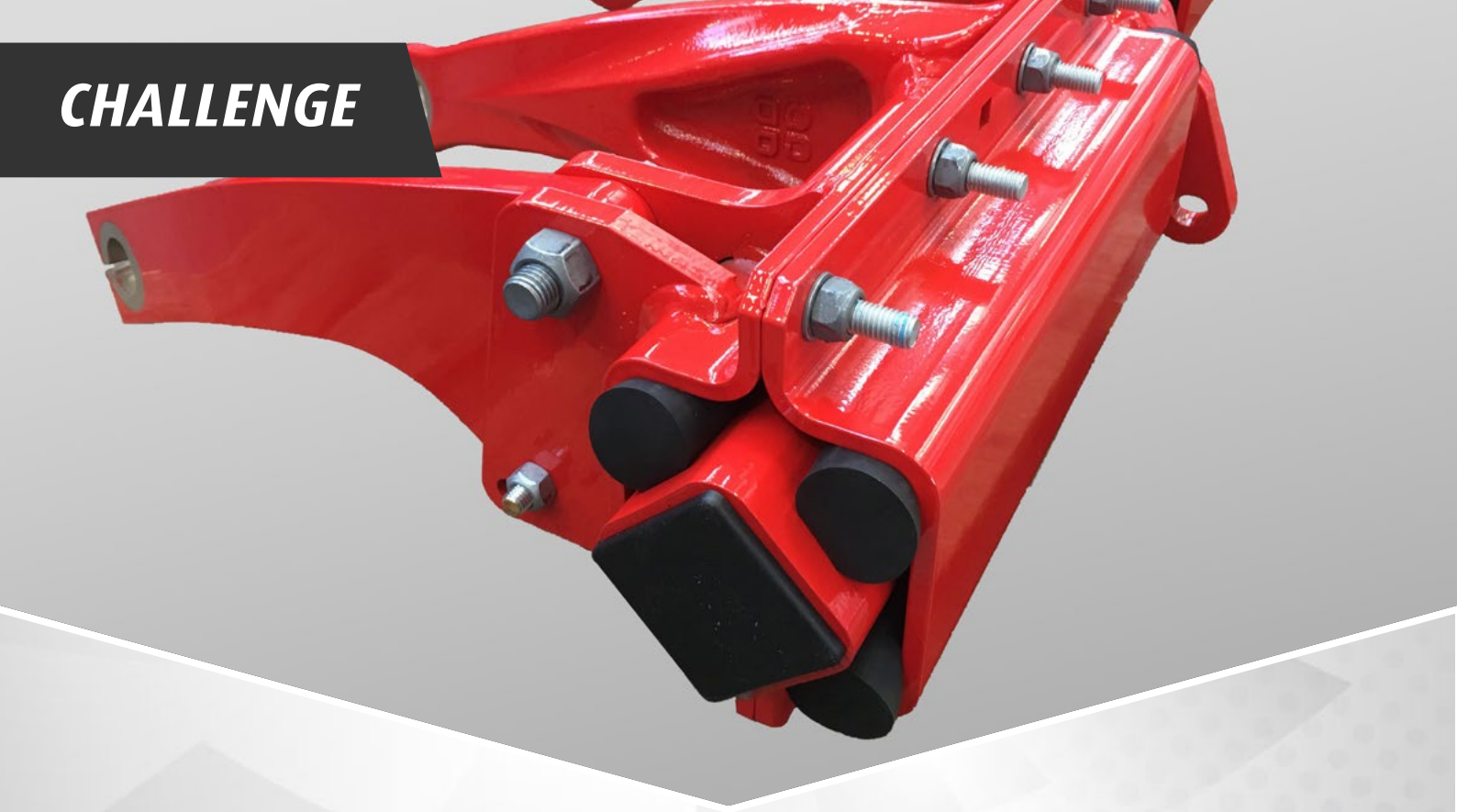
CHALLENGE

ESTABLISHED PRODUCT IN AGRICULTURAL TECHNOLOGY

In the field of agricultural technology, rubber spring elements are used for soil cultivation equipment, in particular for so-called “disc harrows”. Disc harrows consist of curved discs that rotate at an angle to cut and mix the soil, similar to a plow. Continuous contact with the ground must be ensured, even at increasing working speeds. Furthermore the steel discs must be able to avoid larger stones without being damaged.

The discs are therefore fastened individually or in pairs elastically to the disc frame with clamping shells, using torsion springs with rubber spring elements. Torsion springs are robust and easy to implement. They are based on a polygonal (usually 3- or 4-sided) axis around which clamping shells are arranged. Several shock-absorbing rubber spring elements are placed between these two components.

CHALLENGE



DIFFERENT PROCESSES INFLUENCE PRODUCT PROPERTIES

Jäger Gummi und Kunststoff has developed specific rubber spring elements in cooperation with many European manufacturers of disc harrows. The rubber qualities used, based on natural rubber, generate a uniform contact pressure as well as a constant penetration depth and offer a balanced relationship between damping and rebound elasticity. Rubber spring elements can basically be manufactured as extruded or molded parts.

In extruded spring elements, the long-chain rubber molecules are primarily arranged laminarly in the direction of extrusion, and vulcanization takes place without pressure in long heating channels.

Molded spring elements have higher strength and elasticity when using the same rubber compound, because the rubber molecules crosslink more strongly in steel molds under high pressure and there is no alignment of the polymer chains in the extrusion direction.

CHALLENGE

HOW CAN SPRING ELEMENTS BE MANUFACTURED MORE SUSTAINABLY?

At Jäger, spring elements are generally manufactured as molded parts, so the cross-section of the spring elements can be reduced while maintaining the same performance, and customer-specific details, such as assembly aids, can also be implemented.

In addition, as part of the sustainability strategy, energy requirements and resource consumption are to be further reduced, which at the same time also entails a reduction in manufacturing costs.

SOLUTION

OPTIMIZED MANUFACTURING PROCESSES LEAD TO THE DESIRED RESULT

The long periods required for field testing and ensuring the international supply of spare parts, prevent the geometry from being adapted at short notice. Therefore a reduction of the spring cross-sections, with simultaneous use of optimized rubber qualities and thus consistent product behavior in use, is not possible. Jäger elastomer chemists are tackling the task of modifying the existing rubber formulation so that the spring element vulcanizes faster in the mold while maintaining the same geometry. To achieve this, the crosslinking rate of the rubber must be accelerated. The shorter vulcanization time proportionally reduces the electrical energy requirement and thus also carbon emissions.

Image: Mymemo - stock.adobe.com

SOLUTION

COMPRESSION MOLDING FOR LOWER ENERGY REQUIREMENTS

The process engineers at Jäger Polska have identified further potential in production: In the injection molding process used to date with multi-caliber molds, the rubber must be injected into the individual calibers via distribution channels. Although at Jäger the distribution is partially cooled by means of cold runner technology and thus significantly less material already vulcanizes out in the inlets to the mold, there is still a so-called sprue spider. This sprue spider with vulcanized material cannot be reused, and valuable raw materials have to be disposed.

For this reason, the blanks are prefabricated on a cooled extruder and then manually inserted into a compression mold with a precisely metered insert weight. This adaptation of the manufacturing process eliminates the need for sprue spinning and significantly reduces waste. To shorten service life tests, all formulation and production variants were verified on a service life test rig.

RESULT

REDUCTION OF HEATING TIME (15-35 %)*

LOWER ENERGY CONSUMPTION AND THUS CO_2 EMISSIONS

REDUCTION OF PROCESS-RELATED WASTE

OPEN POTENTIAL

With additional reduction of product-diameter:
Less material used

*depending on variant

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