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Press Release

Adaptive suspension systems for agricultural technology

Comfort at the push of a button

Weinheim. The front axles of tractors are subject to highly variable loads. As a result, hydropneumatic systems come into use in suspension systems, but they are adjusted to fixed spring rate characteristics. Freudenberg Sealing Technologies is now testing a new system that the driver can use to configure the suspension on an individual basis.

Modern tractors have to prove themselves on the road as well as in the field. This becomes clear from the forces that act on the front axle. The forces are low when the tractor pulls attached equipment over a field. They increase significantly when traveling on a road with a trailer. If the tractor is transporting a bale of hay using a front loader, the front axle is subjected to a very high load. In such cases, the forces range from 2,000 to 100,000 newtons, which corresponds to a weight of up to 10 tons. This places high demands on the front axle's suspension, which is for the most part executed with hydropneumatic systems in which hydraulic accumulators – and not conventional mechanical springs and dampers – are employed. In the process, the gas-side pressure in the hydraulic accumulator plays a central role in determining the suspension system's rigidity.

Freudenberg Sealing Technologies is continually advancing the development of suspension systems to ideally compensate for the tractor's various operating conditions and to offer the driver the best possible comfort. For example, the company's engineers are testing a new system in which the driver can configure the desired rigidity using an adjustment in the cockpit. Earlier hydropneumatic systems do in fact balance load changes automatically. But they are set to a fixed spring rate or can handle at most two different levels of rigidity. With the third

generation of the company's new suspension system, it is possible to freely adjust the suspension, which not only means greater comfort due to less vibration and noise but also increases productivity in the interaction of the tractor and its attached equipment. As a result, the ideal spring-damper adjustment increases the speed with which a field can be worked. In a further stage of development, the system can even set the spring rate automatically. A sensor unit continually measures the pressure on the cylinder, and the control unit accordingly adjusts the suspension of the chassis adaptively.

The hydropneumatic suspension is based on the principle of pressure and counterpressure. In this approach, the pressure produced by the excitation of the vehicle is balanced with a hydraulic counterpressure. Via the pistons of a hydraulic cylinder, the front wheels of the tractor are connected to a spring-loaded ball, which serves as a hydraulic accumulator. This spring-loaded ball is filled with hydrogen under high pressure; a membrane separates the gas from the hydraulic fluid. The new system from Freudenberg Sealing Technologies has the capacity to adaptively control the hydraulic counterpressure in line with the tractor's load. In the process, a valve block communicates with the vehicle electronic system and adjusts the counterpressure with the help of pressure control valves. The counterpressure builds up by means of the hydraulic fluid in the annular space between the cylinder wall and the piston.

Specialists from Freudenberg Sealing Technologies work closely with tractor manufacturers on the application of suspension systems to various vehicle concepts and provide the best possible suspension for each area of application. This includes the design and simulation of the system, prototype construction, technical trials and testing, and the application of prototypes to customer systems. To achieve the best possible driving comfort, the services of Freudenberg Sealing Technologies engineers are rounded out with test drives and development work to production readiness.

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About Freudenberg Sealing Technologies

Freudenberg Sealing Technologies is a supplier, development and service partner for customers in different market segments, such as the automotive industry, civil aviation, mechanical engineering, shipbuilding, food and pharmaceuticals, and agricultural and construction machinery.

Based on the Simmerring® which was developed by Freudenberg in 1929, Freudenberg Sealing Technologies has built up a broad and continuously expanding range of seals and vibration control technology products – from customized solutions to complete sealing packages. Together with its partners NOK Corporation, Japan, Sigma Freudenberg NOK, India and NOK-Freudenberg Group China, Freudenberg Sealing Technologies has formed a global network with the aim of offering products of the same high quality. The NOK-Freudenberg Group China is a 50:50 Joint Venture between the Japanese NOK Corporate and Freudenberg.

In addition, Schwab Vibration Control, Dichtomatik and Corteco fall under the Freudenberg Sealing Technologies umbrella. Schwab Vibration Control is a leading supplier of technology for vibration control components, wind energy solutions, agricultural and construction machinery and other industries. Dichtomatik is Freudenberg's sales organization in the market for technical seals. Corteco is the Freudenberg Group specialist for the Independent Automotive Aftermarket specializing in spare parts for seals and vibration control as well as service parts such as cabin air filters.

As Freudenberg's largest Business Group, Freudenberg Sealing Technologies generated sales of more than €2 billion in 2014 and employed some 15,000 people.

The company belongs to the Freudenberg Group which, with its Business Areas Seals and Vibration Control Technology, Nonwovens and Filtration, Household Products as well as Specialities and Others, generated sales of more than €7 billion in 2014 (The 50:50 joint ventures are consolidated on a pro-rata basis) and employed approximately 40,000 associates in around 60 countries.