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SMART MEASURING TECHNOLOGY FOR SMART AGRICULTURE

Kubota opts for wheel force transducers from Kistler
to test its new tractors





Largest wheel force transducer from Kistler, the RoaDyn S6XT, will be applied for the further development of Kubota tractors, too.

To optimize use of the RoaDyn S6XT wheel force transducer, Kistler provided Kubota with special mechanical adapters for various tractor types and installation conditions.

Global agricultural and construction machinery manufacturer Kubota puts its trust in heavy-duty RoaDyn S6XT wheel force transducers from Kistler for load measurements in tractor development. Wide measuring ranges, flexible adaptation to different tractor types and technical support: even under tough conditions, these advantages ensure precise and reliable measurements on the test track.

Tractors have spearheaded the successful development of the agricultural sector: ever since the dawn of the twentieth century, they have helped to ensure soaring yields while reducing the amount of heavy labor involved. Just like automobiles, tractors are undergoing an evolutionary process that is also closely linked to the digitalization of farming – the trend towards Smart Agriculture.

Kubota, the Japanese mechanical engineering group, is one of the world's leading suppliers of tractors – and it has already delivered more than five million of these tractors worldwide. Originally established at Osaka in 1890 as a water pipes supplier, Kubota's present-day portfolio comprises construction and agricultural machinery, engines, pipes utility vehicles and related industrial products. In its Engines division alone, Kubota has delivered over 30 million units. With more than 43,000 employees and annual sales in excess of EUR 15 billion, the company leads the tractor and harvester markets in particular: Kubota sells its products in over 120 countries across the globe.

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Toru Fujikura, Sales Engineer at Kistler Japan

Precise measurement of all wheel forces and moments

To support continuous innovation and the development of new tractors, the Central Development Department of Kubota's Agricultural Machinery division contacted Kistler. It had become clear that the measurement technology in use until then did not meet the requirements for new tractors. This led to the launch of a pilot project with Kistler to investigate the suitability of the Swiss measurement expert's RoaDyn S6XT wheel force transducer.

Toru Fujikura, Sales Engineer at Kistler Japan, takes up the story: "We were faced with dual challenges: wide measuring ranges were needed for the wheel forces and moments, and we also had to adapt the measuring system mechanically for different types of tractors and wheels. To solve these problems, we were able to draw on our long years of experience with the many wheel force transducers we have already delivered and installed." The RoaDyn S6XT from Kistler was easily able to meet all the requirements even for the most powerful models in the range – thanks to measuring ranges of up to ± 250 kN (Fx, Fz) and ± 150 kN (Fy) for forces, and ± 50 kNm (Mx, Mz) and ± 80 kNm (My) for moments on the rotating wheel.

Optimized components plus flexible adaptation

High loads were not the only challenge: mechanical integration in the utility vehicle also raised some complex issues. Special wheel adapters were needed due to the different sizes of the front and rear tires as well as several differences in tire and rim dimensions. "We responded by collaborating with the customer on the adaptations needed to provide an optimal, comfortable measuring system for the road and field tests. The modular structure of the RoaDyn S6XT, with its six exchangeable measuring cells, makes it easier for us to adapt the system to customers' specific circumstances," Fujikura adds.



Toru Fujikura, Sales Engineer at Kistler (left) and Satoru Hiraki, Head of Kistler Sales Center Japan (right), in front of a tractor from Kubota: RoaDyn S6XT wheel force transducers by Kistler were used for the measurements.

Kistler also made every effort to support Kubota with installing the external transmission for the data flow from the wheel force transducer to the onboard electronics (see Figure 4): here too, the customer was fully satisfied with the solution that was developed. Kistler applies scientific methods to calculate the loads on the sensors and all the adaptations in advance, so the individual components are optimized in terms of weight, safety, reliability and durability. Development collaboration ensures high customer satisfaction

Development collaboration ensures high customer satisfaction

Following successful completion of the test phase, Kubota purchased four RoaDyn S6XT sets from Kistler. Short after, they were successfully used to measure loads on large tractors under harsh conditions on test tracks in Japan. "The customer was highly satisfied with our consistent support – not only during the test phase but also during actual use of the equipment later on," Fujikura reports. "Thanks to our support, problems were solved quickly and the required measurement data was collected in line with expectations. The simple installation and easy operation of the wheel force transducers also helped to make the project a success."

Because collaboration has been so smooth and efficient, Kubota is likely to opt for solutions from Kistler for the future development of its tractors – for example, to drive its vision of Smart Agriculture ahead against the backdrop of demographic and structural changes in Japan. "The largest wheel force transducer from Kistler – the S6GT – will probably be used for even higher maximum loads – to support the ongoing development of tractors for Europe and America, for instance", Fujikura concludes.



The RoaDyn S6XT is a 6-component wheel force transducer for high loads; it measures forces and moments on the rotating wheels of heavy trucks, construction and agricultural machines, and also special-purpose vehicles.

Accurate and efficient measurements of wheel loads on utility vehicles

The 6-component S6XT wheel force transducer can accurately measure all wheel forces and moments in the three spatial directions – and thanks to its wide measuring ranges, it is equally suitable for heavy trucks, construction and agricultural machines, and other utility vehicles. Key features:

- Modular structure comprising six exchangeable and individually calibrated 3-component heavy-duty load cells based on strain gauge technology
- Flexible adaptation to different rim sizes, hub geometries and wheel offsets
- Self-identification, signal amplification and digitization already integrated
- Digital telemetry with data conversion from the rotating wheel into the vehicle coordinate system (variable analog and digital data output)

The S6XT is available in single wheel, supersingle and dual wheel versions, and in a version for test stand use. All mechanical components are strength- and weight-optimized.



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