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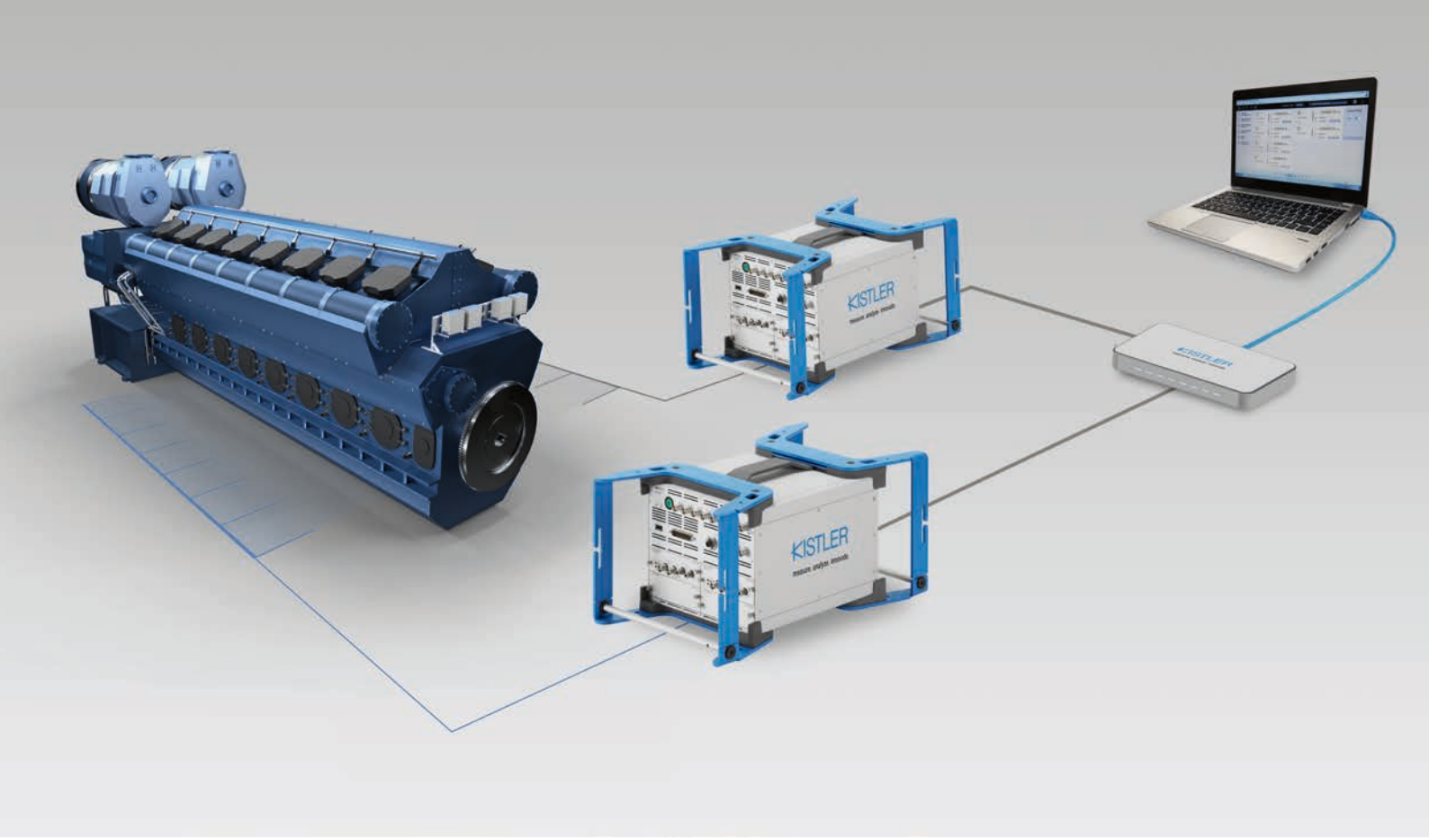
Innovative KiBox setup for large engine development

Weichai is relying on measurement technology from Kistler to optimize a new marine engine

WEICHAI



Efficient monitoring of cylinder pressure in Weichai's marine engine was implemented with measurement technology from Kistler.

Weichai, the major Chinese corporation, relies on measurement technology from Kistler to optimize the performance of a new V16 unit for marine applications that it is currently developing. The engineers are using a setup that combines different technologies to ensure optimal interaction among the 16 cylinders, even in case of fluctuating temperatures.

Founded in 1946, the Weichai Group has 80,000 employees; with 2018 sales of RMB 160 billion (equivalent to USD 23 billion), it ranks among China's 100 largest enterprises. This multi-field and multi-industry group comprises six business segments: Powertrain, Intelligent Logistics, Commercial Vehicles, Construction Machinery, Luxury Yachts, and Finance & After-Services. Kistler can already look back with pride on two decades of collaboration with Weichai; many of our products and solutions – from individual pressure sensors to complete systems for in-engine combustion analysis – ensure that the Chinese manufacturer delivers top quality and best performance. Many of Weichai's test stands are equipped with technology from Kistler.

Innovative KiBox setup for large engine development

Weichai is currently developing a new V16 diesel engine for marine applications – a project that is attracting widespread attention from the Chinese public. To meet the demanding requirements, Weichai's developers put their trust in the latest high-performance products from Kistler. The Swiss measurement technology expert offers convincing benefits with its tried-and-tested piezoelectric sensors backed by comprehensive service throughout the measurement chain – from hardware to software. Thanks to support from Kistler, work on the prototype was completed successfully, so production activities have already begun. The challenges here: how to monitor cylinder pressure and injection behavior with very high precision, and how to guarantee stable engine operation even in case of major temperature fluctuations.

Simultaneous monitoring of the 16 cylinders is handled by 6045B pressure sensors. Two cascaded KiBoxes are used to record and evaluate their signals. Reliability and high-quality measurement results are key attributes of the indication system from Kistler. With its compact and rugged design, KiBox is ideal for mobile use as well as test stand applications. It delivers detailed information on combustion quality in each individual cylinder and makes all the key engine development data available in real time – synchronized with other measurement data and ECU control variables.

> "Thanks to the integrated TEDS and the intuitive software, we were efficiently able to install and parameterize this complex setup comprising various sensors, cables and modules – and as far as I know, this is the first ever application with cascaded measurement technology in China."
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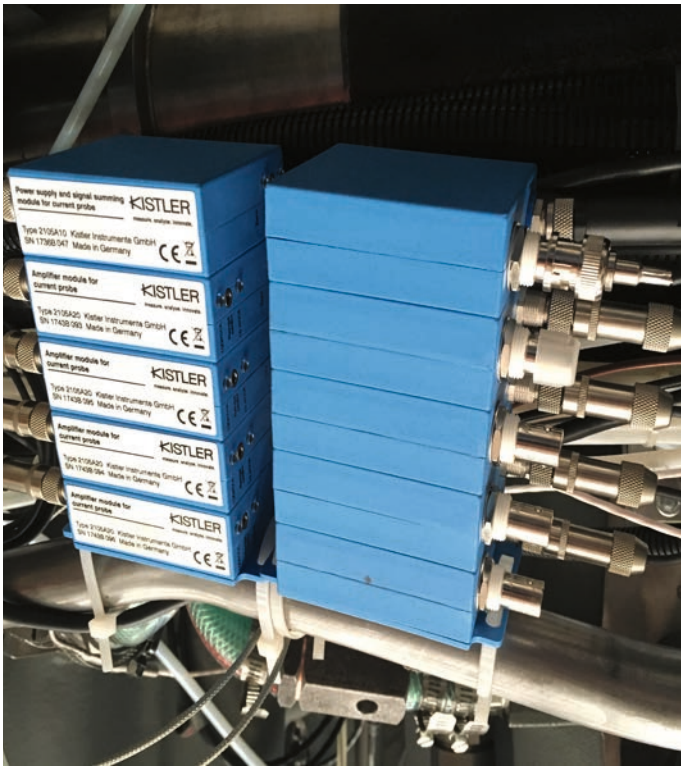
> Jiangtao Xu, Project Manager V-16 at Weichai



The 2105A current impulse sensor from Kistler helps to optimize injection and ignition timing.

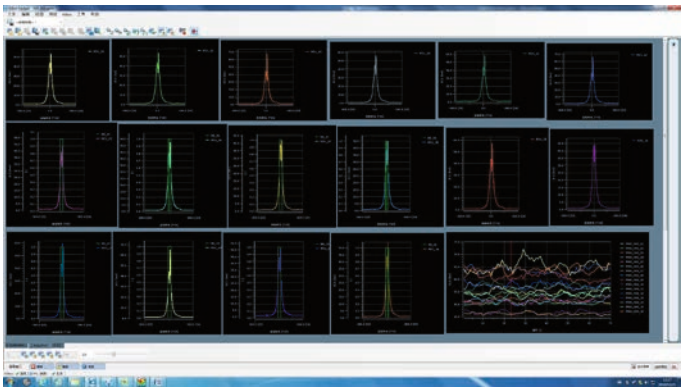
Using two cascading KiBoxes from Kistler, it was possible to monitor and optimize all 16 cylinders simultaneously.

Plug & Measure with TEDS (Transducer Electronic Data Sheet)
All the cylinder pressure sensors are equipped with the Transducer Electronic Data Sheet – or TEDS for short. Based on the standard IEEE 1451.4 requirements that apply to all manufacturers, TEDS ensures fast and easy handling of the sensors. The integrated electronic data sheet eliminates the need for manual input of calibration values. Sensors are detected automatically and the index values are read by the measurement module. This Plug & Measure function guarantees high data quality. TEDS can also be used to record and document sensor runtimes.

Jiangtao Xu, V-16 Project Manager at Weichai, comments: "Thanks to the integrated TEDS and the intuitive software, we were efficiently able to install and parameterize this complex setup comprising various sensors, cables and modules – and as far as I know, this is the first ever application with cascaded measurement technology in China."

Monitoring engine performance – the key to optimization
The setup also includes one critically important element to support optimization of injection and ignition timing: the current impulse sensor (2105A) from Kistler, which features up to eight cascadable measuring channels. Based on the Hall effect measurement principle, this sensor supplies the KiBox with a summation signal that can then be used to determine the impulses per channel. For this purpose, the 16 cylinders were divided into four segments with four channels each.

Weichai's engineers were able to use the data on cylinder pressure and electric impulses to arrive at an in-depth understanding of the engine. Armed with this knowledge, it was easy for them to set the engine ECU so as to ensure optimum cylinder balancing during operation. Xu sums up his impressions: "Solutions from Kistler played a key part in this successful development. The experience we've gained has helped us to broaden our R&D expertise – but that's not all. It will also enable us to design new types of marine diesel engines in the future."



Measurement technology from Kistler allows simultaneous monitoring of injection and internal pressure on all 16 cylinders.

Find out more about our applications:
www.kistler.com/applications

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