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Press release

CIMAC World Congress 2025: Kistler Presents Cylinder Pressure Sensors for Reducing CO_2 Emissions

At this year's CIMAC World Congress, Kistler is presenting new piezoelectric cylinder pressure sensors for use in closed-loop combustion control (CLCC) for monitoring and combustion control of slow-running large engines.

Winterthur, May 2025

This year's CIMAC Congress will be held in Zurich, Switzerland, from May 19 to 23, 2025. The event takes place every three years and is an opportunity for the international large engine and drive technology industry to present its innovations to the entire sector. As a leading manufacturer of cylinder pressure sensors for large engines, Kistler is an association member and will be represented at the congress. The 175 member states of the International Maritime Organization (IMO) have made it their goal for international shipping to achieve net zero emissions by around 2050. Solutions from Kistler for the monitoring and control of large engines are already playing a crucial role in reducing CO_2 emissions today – whether these engines are running on heavy fuel oil, natural gas or "future fuels." Kistler has developed new, highly precise and extremely robust cylinder pressure sensors that can reliably withstand the enormous loads involved in continuous use in large engines and which are suitable for operation with nearly any kind of fuel.

CIMAC stands for "*Conseil International des Machines à Combustion*" and is the leading non-profit association for promoting the development of ship propulsion, train drives and power generation. Its members from 27 countries around the world are made up of national associations as well as manufacturers and operators of this technology. The CIMAC World Congress, which is held every three years, offers the industry a unique platform for exchanging information and presenting innovations. International shipping, in which large combustion engines represent the standard drive technology, has been in the spotlight for many years when it comes to CO_2 emissions in transportation. The ambitious goals that the IMO has set in terms of achieving climate neutrality can only be reached through the use of innovative technology. For that reason, this year's congress will focus on the latest developments in connection with alternative fuels in particular.

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Reducing CO_2 through continuous monitoring and control of large engines

Around the globe, more than 10,000 ships are equipped with cylinder pressure sensors from Kistler. Today, it is common for these slow-running large motors to be operated in what is referred to as closed-loop combustion control (CLCC). Cylinder pressure sensors from Kistler allow for this kind of control and must reliably provide precise measurement data under difficult conditions – as they are in continuous operation, they are therefore exposed to extreme vibrations and temperatures. Continuous combustion analysis is carried out on the basis of the measurement results obtained from these sensors. On the basis of this analysis, the automatic engine control intervenes in real time, adjusting the engine to balance the combustion processes in all cylinders. This decreases the mechanical strain on the engine, improves fuel efficiency and reduces emissions. A marine engine controlled in this way emits an average of 2,000 (metric) tonnes less CO_2 in one year. Multiplied by the total number of ships equipped with Kistler cylinder pressure sensors, the annual CO_2 savings amount to more than 20 million (metric) tonnes of emissions.

New cylinder pressure sensors for future requirements

At the CIMAC Congress, Kistler is presenting its new piezoelectric cylinder pressure sensors for slow-running large engines, which have been designed not only for current requirements but also for those of the future. With the new sensor types (6636A2 and 7636A2), Kistler is setting benchmarks in this sector. Compared to their predecessors, Kistler was able to dynamically expand the overload range to 450 bar coupled with resistance to temperatures of up to 350°C. The use of Kistler's unique PiezoStar crystal technology plays a key role here. This technology uses crystals that are grown by Kistler in Winterthur and which are up to five times more sensitive than the quartz crystals normally used in these kinds of sensors. PiezoStar crystals offer excellent measurement stability at nearly any temperature. Continuous operation of the sensors for combustion monitoring in large engines requires an extremely robust design. Conventional plug connections for signal transmission have been replaced by welded connections, making the sensors far less sensitive to vibrations and guaranteeing significantly more stable transmission of measured values. Moreover, the unique anti-strain design of the new cylinder pressure sensors offers superior stress resistance. The advantages of this new generation of sensors are evident not only in marine engines operated with heavy fuel oil and natural gas; they are also suitable for engines using hybrid fuels or "future fuels" like methanol, ammonia and hydrogen.

Kistler paves the way for sustainable energy solutions with cutting-edge research

Miika Jussila, Head of the Business Unit Engine Marine & Stationary at Kistler, explains: "At the moment, it's not clear which fuel will prevail in the future. In the coming years, we will likely have an ecosystem with different fuels." Regardless of the fuels used, cylinder pressure sensors from Kistler will play an even more important role than they already do today. Currently, dual-fuel engines are

already in use. They can be switched from conventional liquid fuels to liquid natural gas as needed. To ensure that these engines can provide optimal power, the internal combustion processes must be monitored and regulated. “No matter which fuels are combined, sensors are indispensable,” emphasizes Miika Jussila. For Kistler, it is extremely important to be directly involved in these developments. For this reason, the company continuously invests in research and development so that it can contribute to achieving climate goals through innovative solutions. At the CIMAC World Congress, the latest findings from research in the field of next-generation fuel mixtures – specifically, a combination of ammonia and hydrogen – will be presented. The research will then be published in the form of a white paper, demonstrating how cutting-edge research is paving the way for sustainable energy solutions.

Technical Tour will visit Kistler location in Winterthur

One of the particular highlights of this year’s CIMAC Congress will be the Technical Tours. These tours will take participants on a journey through several technology companies. On May 23, the tour will spotlight four companies in Winterthur, including a Kistler location. Kistler will offer visitors a fascinating program along with exclusive insights into its Research and Development and Production divisions – a unique opportunity to speak with experts on location.

Kistler with information booth at the CIMAC World Congress

This year, Kistler’s booth (booth No. 16) will be located in the entrance area of the Zurich Convention Center. Specialists will be on hand to provide visitors with qualified information. Kistler’s CIMAC Congress Team looks forward to lively discussions with the attendees.

Image material (please name the Kistler Group as picture source)

The optimization of combustion can be performed on large engines of various designs. The cylinder pressure sensor 6636A2 has a smaller sensor body and an M10 thread, while the sensor type 7636A2 is equipped with an M14 thread. On the right side, the sensor (6635A1) for use in four-stroke large engines is shown.

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Closed-Loop Combustion Control (CLCC) enhances combustion efficiency in the operation of large engines. Continuous monitoring of cylinder pressure with Kistler pressure sensors plays a crucial role in optimizing combustion efficiency. This results in a longer engine lifespan, reduced fuel consumption, and lower emissions.

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About the Kistler Group

Kistler is the global market leader for dynamic pressure, force, torque and acceleration measurement technology. Cutting-edge technologies provide the basis for Kistler's modular solutions. Customers in industry and scientific research benefit from Kistler's experience as a development partner, enabling them to optimize their products and processes so as to secure sustainable competitive edge. Unique sensor technology from this Swiss corporation helps to shape future innovations not only in automotive development and industrial automation but also in many newly emerging sectors. Drawing on our extensive application expertise, and always with an absolute commitment to quality, Kistler plays a key part in the ongoing development of the latest megatrends. The focus is on issues such as electrified drive technology, autonomous driving, emission reduction and Industry 4.0. Some 2,000 employees at more than 60 facilities across the globe are dedicated to the development of new solutions, and they offer application-specific services at the local level. Ever since it was founded in 1959, the Kistler Group has grown hand-in-hand with its customers and in 2024, it posted sales of mCHF 448. About 9 percent of this figure is reinvested in research and technology – with the aim of delivering innovative solutions for every customer.