

Press Release

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Voith SmartSet Coupling Enables Continuous Operation of Power Generation Plants Despite Power System Faults

- **Voith SmartSet Coupling limits the torque between the generator and the turbine in the event of a fault**
- **Tests with KAWASAKI Heavy Industries confirm ENTSO-E Grid Code compatibility**
- **Voith SmartSet Coupling is a suitable solution for continuous operation**

Hudiksvall, Akashi, Bad Homburg: The number of smaller power plants connected to the medium-voltage power system is rising due to the decentralization of the energy sector. As they have a lower generator mass, the power generation plants used in this case are more sensitive in responding to voltage fluctuations than large power plants. If a large consumer, for example an industrial plant with several large electric motors, starts to draw power from the system, there is the risk of a critical voltage dip in the power system environment. In case of such an event, a multiple of the rated torque acts on the generators involved and decelerates them abruptly. This can destroy the shaft and turbine of the power producer. With its SmartSet Coupling, Voith offers a solution that protects power plants during overload. As soon as the rated torque is exceeded, the SmartSet works as a friction coupling and limits the torque between generator and turbine. Following tests with KAWASAKI Heavy Industries, Voith confirms that the coupling satisfies the criteria of the European Network of Transmission System Operators for Electricity (ENTSO-E) and the various national regulations on grid stabilization.

The ENTSO-E, a consortium of national power system operators in Europe, defines transnational directives for electricity supply systems. One of these directives tightens up the requirements on energy producers when experiencing voltage dips known as "Low Voltage Ride Through" (LVRT). The outage of an electricity producer intensifies the dip even more. In the

worst scenario, a single energy producer may cause a chain reaction and paralyze large portions of the electricity supply system. To prevent power generation plants from dropping off the electrical power system due to a LVRT, in the future according to ENTSO-E criteria, they must generate reactive power continuously for a short time. The duration of this reactive power is specified at present in each country's Grid Code and is between 150 and 300 ms in the medium-voltage range.

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SmartSet Couplings Protect Both Plant and Power System

During a voltage dip, the generator is subjected to 7.5 to 16.5 times the rated torque. The Voith SmartSet Coupling acts immediately in this situation. As soon as the set slipping torque is exceeded, the SmartSet limits the torque between generator and turbine. The coupling stops slipping as soon as the critical load of the voltage dip has passed. Thus, the SmartSet Coupling is a lasting solution for protecting energy producers and electrical power systems against damage and outages, especially for smaller plants with a power range up to 60 MW.

Tested and Production-Ready Technology

The Voith SmartSet Coupling has already proven itself over many years as a starting coupling for synchronous motor applications. Here too, slipping prevents damage to the plant resulting from overload during the synchronization phase of the motor when starting. In power generation, Voith has cooperated with Kawasaki Heavy Industries (KHI) and Kawasaki Gas Turbine Europe (KGE). KHI manufactures gas turbines and complete gas turbine generator sets up to 30 MW. KGE assembles gas turbine generator sets in accordance with European norm and standards. In addition to various electricity producers, these are also used by the process industries as well as food makers, pharmaceutical and chemical industries and the oil and gas industry. By installing the Voith SmartSet Coupling, the KGE packages can satisfy the ENTSO-E Grid Code standards as confirmed by successful prototype tests. Further certification of the systems has already started.

More Suitable Solution to Satisfy ENTSO-E Grid Code Standard

The SmartSet Coupling differs fundamentally from the shear pin couplings due to the slipping function and automatic restoration of the connection. In the event of an overload, a shear pin coupling could abruptly disconnect the energy producer from the electrical power system, which could not satisfy the requirement of grid stabilization. In accordance with the regulations of the Grid Code, future power generation plants would encounter more difficulties to be certified, which would restrict a connection to the medium-voltage power systems.

SmartSet Also Increases Efficiency

While critical voltage fluctuations have been rare so far, their frequency is rising due to the increasing alignment of the energy mix toward renewable electricity generators and distributed small energy producers. After tripping of the shear pin coupling, that has been popular to this point, it takes between one and three days for a plant to come back on line. Depending on the severity of the fault, both generator and gearbox need to be checked and possibly realigned. No electricity is produced during this time. If the affected system serves as in-house power generation for a company, the operator also needs to purchase power elsewhere. With the SmartSet Coupling, in contrast, the plant seamlessly transitions to normal operation following an LVRT. Consequently, it doesn't just help satisfy the conditions of the Grid Code. Without the downtime, the maintenance time and costs following a fault, the coupling provides both manufacturer and operator with economic benefits. It is already amortized after the first LVRT.

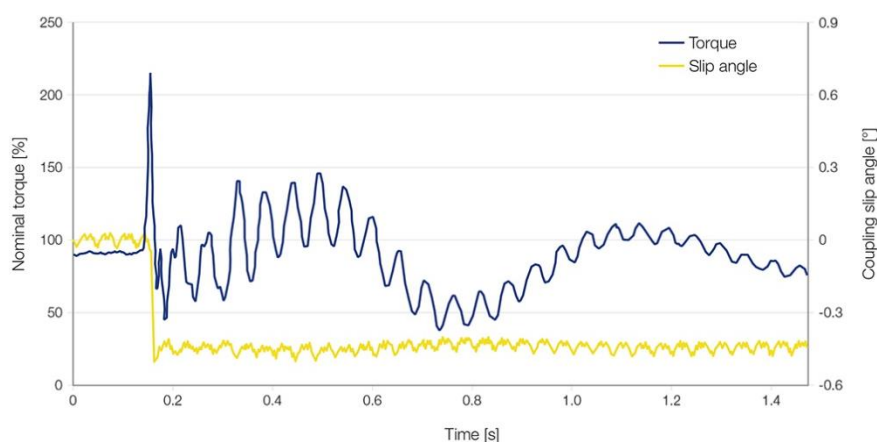
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Voith Turbo, a Group Division of Voith GmbH, is a specialist for intelligent drive solutions. Customers from highly diverse industries such as oil and gas, energy, mining and mechanical engineering, ship technology, rail and commercial vehicles rely on advanced technologies from Voith Turbo.

Voith sets standards in the markets for energy, oil & gas, paper, raw materials, transport & automotive. Founded in 1867, Voith employs more than 20,000 people, generates €4.3 billion in sales, operates in over 60 countries around the world and is one of the largest family owned companies in Europe.*

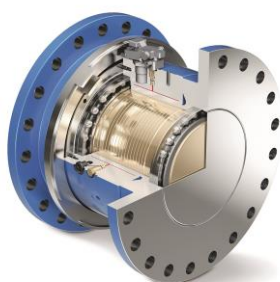
* Excluding the discontinued Group Division Voith Industrial Services; previous-year figures adjusted.



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Results of a real LVRT test with Voith SmartSet coupling.



The Voith SmartSet coupling protects power generation plants in the medium-voltage range during a voltage dip.

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