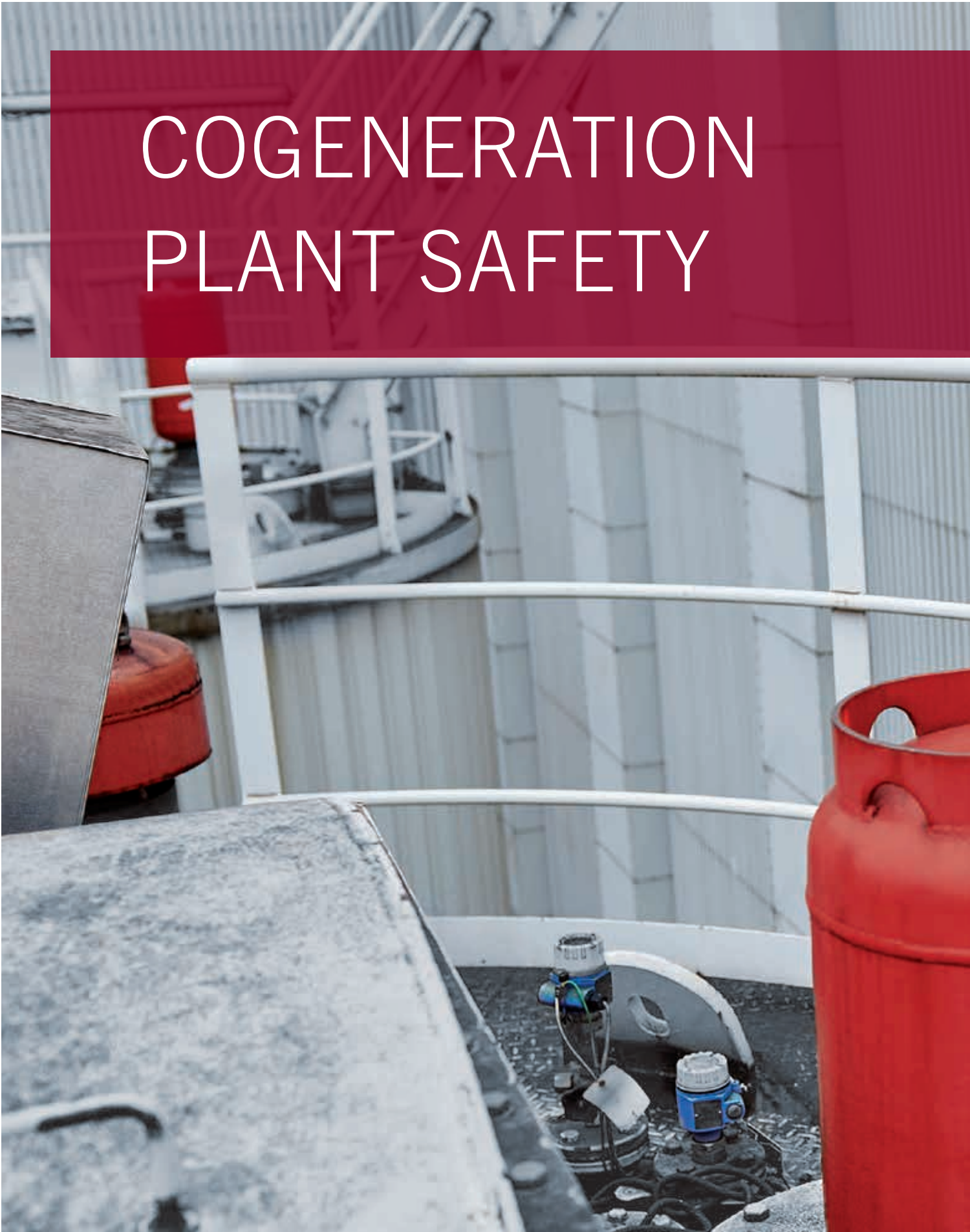


COGENERATION PLANT SAFETY



The cogeneration plants at Stadtwerke Duisburg AG produce heat and power for the city's inhabitants and the region. When it came to protecting the fuel silos, the utility company opted in favor of an explosion suppression system made by IEP Technologies – for the benefit of the residents and the environment.

Text: Catrin Jansen-Steffe Photography: Marcel Billaudet



The primary fuel used in the cogeneration plant is coal, yet secondary biomass fuels like dried sewage sludge and wood are also employed. The materials, which are in part pulverized, are transported via four silos and one docking station to the boiler. The energy released during the combustion process is converted into electricity and district heat by way of a combined heat and power process. Stadtwerke Duisburg generates a total of 5.4 million kilowatt hours of electricity per day. Since some of the materials stored in the silos are potentially explosive substances, the risk of an explosion caused by dust/air mixtures combined with an ignition source is possible. Appropriate protection measures by the operators are therefore not only required by law, but are also considered part of due diligence together with adequate implementation.

In his quest for a suitable safety solutions provider, Michael Nies, plant engineer for Stadtwerke Duisburg's boiler plants, came across the experts from IEP Technologies in Ratingen, a company of the HOERBIGER Group. With assistance from IEP Technologies, the municipal utility company was able to implement explosion protection solutions that fully satisfy its requirements. "We wanted systems that not only stood out with their sustainable and clean operation, but also met our need for safety," Nies explains, continuing: "In IEP we found a supplier we could trust that would equip the silos with explosion mitigation solutions." The protective system installed by IEP can extinguish explosions as they are in the process of developing and reduce the risk of catastrophic damage.

The plans of Stadtwerke Duisburg originally provided for explosion relief venting at the silos. However, since the company wanted to emphasize not only safety but also protect the surroundings, the explosion suppression variant was selected. "Given the proximity of the site to residential areas, we decided in favor of this solution for the benefit of the citizens and environment," Nies explains. Explosion relief venting dissipates the explosion pressure to the outside through flaps. In contrast, the suppression system that is used mitigates flames, pressure, and the fuel itself from being able to escape from the silo.





- 1 The system is inspected every 12 months as part of a maintenance agreement. Pictured here is Daniel Gerbracht, service technician at IEP Technologies, Ratingen.
- 2 The protective system installed by IEP can extinguish explosions as they are in the process of developing and reduce the risk of catastrophic damage from the outset.
- 3 The suppression system that is used mitigates flames, pressure, and the fuel itself from being able to escape from the silo.
- 4 IEP Technologies received a follow-on order when Stadtwerke Duisburg needed another silo.

Effective explosion protection

As part of equipping the plant with the protective measures, the silos were appropriately prepared and all requirements were coordinated in detail with the equipment manufacturer in charge. Adapted precisely to IEP's solutions, the systems include a total of six extinguishing cylinders per silo. During the onset of an explosion, the dynamic pressure detector senses the rapid rise in pressure within milliseconds and initiates the explosion suppression system. Upon detection, the sensor is designed to prompt the suppressant storage cylinders to open and disperse extinguishant powder. The extinguishing agent penetrates the fireball and suppresses the explosion at an early stage. At the same time, the

control unit, which is responsible for initiating the suppression measures, ensures that the instantaneous situation can also be displayed in the control room and monitored by the employees. “The explosion suppression system is activated when the pressure rises 40 millibars within 190 milliseconds, ensuring rapid action to mitigate the effects of the explosion,” Nies adds.

Understanding protection

Since the fill levels of the silos change constantly as their contents are continuously delivered to the combustion boiler, the explosion protection measures also had to be adapted accordingly. “Approximately six tons of material is withdrawn from the silo on an hourly basis. The inside volume therefore fluctuates significantly,” Nies explains and adds that possible explosion trouble spots can originate in a wide variety of locations. Since the time elapsed from a



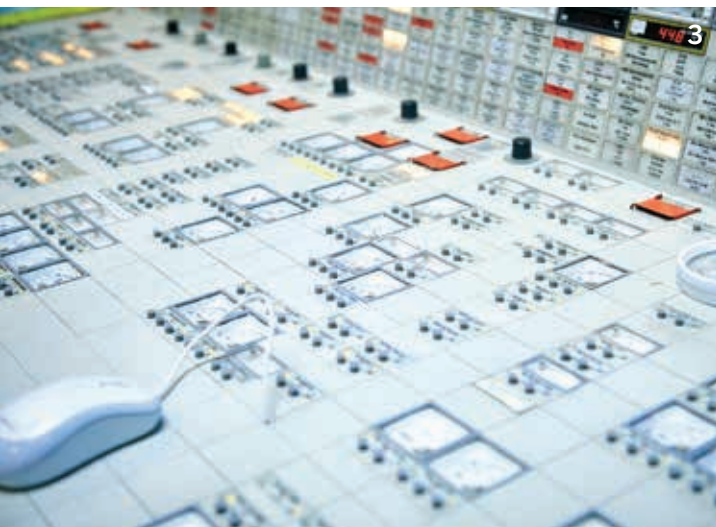
“In IEP Technologies we found a supplier we could trust.”

Michael Nies, plant engineer,
Stadtwerke Duisburg





- 1 Explosion protection also has to be ensured when the silos are being loaded. Thanks to a high-speed isolation valve, the line can be closed within fractions of a second.
- 2 Adapted precisely to IEP's solutions, the system includes a total of six extinguishing cylinders per silo. In an emergency, the dynamic pressure detector senses the rapid rise in pressure within milliseconds and initiates the explosion suppression system.
- 3 The control unit, which is responsible for initiating the suppression measures, ensures that the situation can also be displayed in the control room and monitored by the employees.



pressure increase until detection must be extremely short, regardless of where the ignition source is located, the utility company again sought the know-how of the explosion protection specialists. This was the only way to optimally tailor the system to these conditions.

A convincing solution

Explosion protection must also be ensured when the silos are being loaded. "The silo truck fills the containers as many as eight times a day, each time moving some 25 tons of powder material," the boiler plant supervisor emphasizes.

As soon as the truck is connected to the silo, material is pumped pneumatically through a pipe into the container. Since hazardous dust/air mixtures pose an elevated risk of explosions during the transfer, appropriate measures have also been taken in this area. As soon as the explosion suppression system is triggered, an isolation system closes automatically. Thanks to a high-speed isolation valve, the line can be closed within fractions of a second. Isolation reduces the risk of the explosion from being able to propagate from the pipe to the vehicle.

When the municipal utility company needed another silo, it again chose IEP Technologies to supply the explosion protection measures. "The company impressed us in every respect during the previous project. The fact that IEP, given its proximity, is able to respond very quickly and flexibly when we need maintenance work or other services was another factor for us to build on the existing relationship," Nies comments.

Last but not least, the price-to-performance ratio that IEP offered Stadtwerke Duisburg also played an important role in the decision to commission the specialists again. "The installation of the new explosion suppression system took a total of three to four days; after that, everything was completely operational," Nies recalls. Additionally, the system is being inspected at twelve-month intervals as part of a maintenance agreement. "We are very satisfied with the entire implementation as well as the follow-up service of the project and would decide in favor of this partnership again," Nies sums up.