

**Utmost safety
for plant,
people and the
environment**



Precise measurements of ignition processes and pressure wave propagation

Bang&Clean puts its trust in Kistler's measurement expertise

Bang&Clean Technologies AG: the name says it all. This Swiss company uses controlled gas explosions to clean industrial plants in a variety of sectors. What makes Bang&Clean so special? Cleaning is carried out while the plant is actually running, in compliance with the strictest safety regulations. Bang&Clean puts its trust in Kistler's measurement technology know-how – not only to optimize the safety and efficiency of this patented process, but also for the development of new products. Kistler's sensors supply valuable insights into ignition processes and pressure wave propagation.

Markus Bürgin is the founder and Managing Director of Bang&Clean Technologies AG. Back in 2000, he developed and patented the Bang&Clean system for cleaning with controlled and dosed explosions. Since 2001, this process has been used in virtually every sector of industry where fuel-fired energy and power generation plants are in operation. Typical examples include waste-fed heating plants, biomass power stations and hazardous waste incineration plants, as well as chemical and pharmaceutical facilities. Ash and slag deposits must be removed regularly from plant components such as boilers, catalytic converters and reactors – otherwise, performance will be reduced, faults will occur and operators will be faced with high outage costs. "With our services and products, we aim to increase the availability, efficiency and performance of industrial plants and components. Our customers benefit from longer service lifetimes for their plant components, and they avoid downtime," Bürgin explains.

Another advantage: plant components continue to operate during the cleaning process. As Bürgin points out: "Shutting the plants down for every cleaning operation would saddle our customers with enormous costs."

Maximum safety for people and plant

How does Bang&Clean's patented explosive cleaning system work? The company's experts introduce a water-cooled lance (pre-fitted with a special bag) through the boiler's doors or portholes, near the heating surface to be cleaned. The bag is inflated with a combustible gas mixture which is then ignited to cause an explosion. This generates a highly dynamic pressure wave and causes vibrations in the pipes and walls that dislodge deposits of ash and slag.

Throughout the process, Bang&Clean accords top priority to safety for people and machines. "Our cleaning equipment is CE-compliant, and it is inspected by the German Federal Institute for Materials Research and Testing (BAM). Our certified experts only prepare the explosive gas mixture a few moments before the detonation in the boiler. This guarantees maximum safety for people as well as plant," Bürgin emphasizes.

Special assignment near a nuclear power plant

Cleaning systems by Bang&Clean are in operation every day, throughout the world. "Most of our deployments are planned well in advance. But customers occasionally call on us to deal with emergencies or carry out special assignments with only a few days' or hours' notice," Bürgin notes. This is exactly what happened last fall, when an American plant operator contacted Bürgin with a request to clean its components. "That really was a very special case, because our customer's facility was in the immediate vicinity of a nuclear power plant," he recalls. "To obtain approval for cleaning the plants, our customer had to submit advance proof that the cleaning method was safe."

Vast application expertise in blast pressure measurements

Bang&Clean did not have the measurement expertise required to provide the necessary proof, so Bürgin decided to call in a co-operation partner – and he chose Kistler: "We've known Kistler for quite a few years already, and we're well aware of their vast application expertise in blast pressure measurements. When we received this inquiry from the US at such short notice, we immediately realized that we couldn't handle this project unless we called in the measurement technology specialists from Winterthur."

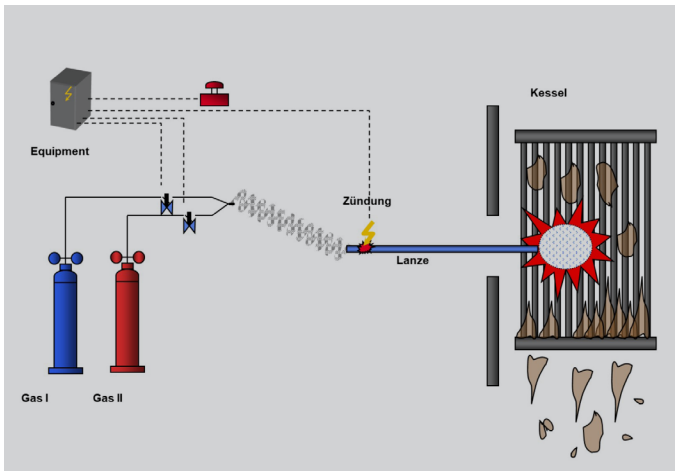
Simple test setup in a test gallery

Given the time pressure, Bang&Clean and Kistler had to prepare a measurement campaign within the shortest possible time. Philipp Schenkel and David Weber, Kistler's development engineers, provided support and advice for the team headed by Bürgin throughout the project. To ensure correct measurement of the pressure values required, they opted for a relatively simple test setup in an experimental gallery at Lungern. Weber

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Markus Bürgin, Founder and Managing Director of Bang&Clean Technologies AG

Bang&Clean Technologies AG, Bünzweg 15, 5504 Othmarsingen, Schweiz, www.bang-clean.ch



Since 2001, this cleaning process has been used in virtually every sector of industry where fuel-fired energy and power generation plants are in operation

describes the procedure: "For the test setup, we attached a bag to a lance, filled the bag with a gas mixture and then detonated it." The parameters under examination included different distances, the gas volume and the bag material. About 30 test cycles were needed to arrive at a full understanding of the ignition processes and the propagation of the pressure waves.

Measuring precise pressure signals in extremely harsh environments

To measure the pressure values, Weber and Schenkel chose the Type 6233A pencil probes from Kistler. These piezoelectric sensors are ideal for measuring highly dynamic pressures in blast tests. "In our tests, we aligned the pencil probes radially in relation to the detonation source. That allowed us to measure the pressure of the propagating blast wave directly and precisely," Schenkel explains. As their name suggests, these sensors have a characteristic pencil shape: this feature minimizes the influence of the sensor geometry on the propagation of the blast wave and the measured signal. Rugged structural design and minimal bending sensitivity make these sensors ideal for measuring high-precision pressure signals in



Pencil probes from Kistler are ideal for measuring highly dynamic pressures in blast tests

very harsh environments. An integrated amplifier circuit (IEPE) converts the charge signal into a voltage – another advantage for applications with severe vibrations.

Successful proof of safety

Bürgin and his team are more than satisfied with the measurement results. "Thanks to Kistler's measurement results, we proved that our explosive cleaning system poses no danger either to people or the environment. So we were able to carry out the cleaning operations at our customer's plant safely and promptly," Bürgin comments. And there was another benefit: the measurement results helped Bürgin and his team to achieve a better understanding of the product and its effectiveness. "In the future, we shall make use of the know-how we've acquired to optimize our products and continue developing them." For this purpose, Bürgin is planning additional measurement campaigns in the coming months. "We'll be taking advantage of Kistler's expertise for those measurements too – but hopefully this project will be more straightforward than the last one," says Bürgin with a knowing wink.

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Eulachstrasse 22
8408 Winterthur
Switzerland
Tel. +41 52 224 11 11

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