Technical article, published in: Verfahrenstechnik (04/2021)

HANOVER FAIR DIGITAL EDITION 2021

# UNDER PRESSURE

**Adverse ambient conditions must be taken into account during the development of switching devices for extreme applications, and must also be tested as first prototypes are produced.**

Subzero temperatures, damp, vibrations, dust, risk of explosion, corrosion: these are all typical environments for switching devices having to work in selected application fields of process engineering. Examples include the chemicals industry, oil & gas, bulk goods handling, and hygiene-sensitive areas of foodstuffs production.

In such extreme conditions, conventional switching devices would not achieve anywhere near the lifespan verified and expected by endurance tests. Instead, extreme devices which have been developed specifically for these applications are required. Design features include the selection of materials, highly effective sealings, as well as special coatings for the housings.

Both the development process and controls during serial manufacturing involve tests in extreme ambient conditions. For this purpose, steute has a perfectly equipped laboratory in which the



steute Technologies GmbH & Co. KG
Brückenstr. 91
32584 Löhne, Germany
Phone: + 49 5731 745-0
Fax: + 49 5731 745-200
info@steute.com
www.steute.com

**01** *The corrosion resistance level of the switches is tested in a salt spray chamber*

**02** *Parallel to the laboratory tests, the switching devices are also tested in real-life conditions – here at an outdoor test centre on the island of Helgoland*

switching devices are tested with regard to all of the abovementioned parameters.

## WATER JETS AND SPLASH WATER

A feature often demanded from switches in the "Extreme" range is the ability to withstand water jets and splash water. This is the case with electromechanical switching devices and sensors used in rough ambient conditions, e.g. in agriculture and construction, in shipbuilding and offshore technology; but also with switching devices which are installed in hygiene-sensitive areas and thus regularly exposed to cleaning processes such as washdowns or high-pressure cleaning. In the steute laboratory, appropriate tests are conducted to document e.g. the IP class of the devices. Underwater tests can also be performed.

The switches must be designed not only to be protected from splash water, but also to have a long lifetime at subzero temperatures. Developers here face the challenge that at minus temperatures certain (plastic) housing materials can become brittle, and that conventional sealing materials can no longer be used. Tests in climate chambers prove that the switches in the steute subzero range achieve long lifetimes even at temperatures of down to –60 °C.

## DUST AND RUST

Extreme switchgear must take dust into consideration as an ambient condition because many devices have to comply with the regulations for dust explosion protection, and because in some applications, e.g. conveyor technology for bulk solids, dust levels can be very high. In the tests, the switching devices have to function in an environment filled with test dust.

An equally frequent demand is a high degree of protection from corrosion – e.g. for switchgear applications in offshore or shipbuilding technology. The offshore switchgear range, but not only this range,



steute Technologies GmbH & Co. KG
Brückenstr. 91
32584 Löhne, Germany
Phone: + 49 5731 745-0
Fax: + 49 5731 745-200
info@steute.com
www.steute.com

therefore has to pass salt spray tests to DIN EN ISO 9227.

Another test criterion is shock resistance. It is required when switching devices are used in conjunction with e.g. construction or drilling equipment. Here different test scenarios and requirements are applied, including those for emergency stop switchgear (latching tests) and for Ex switchgear (7-Joule impact tests to EN 60079-0). For both standards, steute has test equipment set up in its laboratory.

## THEORY AND PRACTICE

The demands made of extreme switchgear in theory become even higher in practice when multiple challenging ambient conditions occur simultaneously, all of which have to be mastered by a single switch. Offshore engineering, for example, usually involves both vibrations and corrosion, while the combination of dust and damp is often to be found in agricultural applications or at port terminals.

In addition, real-life conditions often fail to correspond to the official standards because they occur irregularly and not in the continuous manner tested in the laboratory. Or the switchgear standards fail to include particular conditions at all, for example the algae formation important for shipping and docking applications. This is why, independently of all the laboratory tests available, it is a good idea to take into account the "real-life" demands which occur in practice. Reality tests are an integral part of the steute testing process, whether conducted on site at customers or in cooperation with Fraunhofer Ifam, a renowned institute with an outdoor test centre for corrosion and wear and tear in maritime conditions on the North Sea island of Helgoland. Here the steute switching devices are exposed to changing conditions, such as salt spray, salt water and the tides, for months at a time. The test results provide additional information about corrosion resistance and thus valuable input for the optimisation and further development of switchgear for extreme applications.

**" OVERCOMING THE EXTREME**

*Special features in the design of switching devices for extreme environments include the choice of materials, highly effective sealings and the coatings of the housings.*

**RAINER LUMME**

Author: Rainer Lumme
Product Manager Extreme, steute Technologies

Images: steute Technologies GmbH & Co. KG



steute Technologies GmbH & Co. KG
Brückenstr. 91
32584 Löhne, Germany
Phone: + 49 5731 745-0
Fax: + 49 5731 745-200
info@steute.com
www.steute.com