Technical article, published in: Schüttgut (6/2018)

Exposed to the elements

Switchgear for handling of bulk goods in ports

Switching devices used for the handling of bulk goods in ports need to meet high demands regarding corrosion resistance. But theoretical standards and practical experience do not always amount to the same thing. With this in mind, steute has had several switchgear series in its "Extreme" range tested in real-life conditions – on the South Mole of the island of Helgoland. Here the Fraunhofer IFAM (Fraunhofer Institute for Manufacturing Technology and Advanced Materials) has a test facility for just such tasks.

Foot switches are prepared for one-year corrosion test at IFAM test facility

Bulk goods such as coal and minerals, but also grain and animal feed, are classic examples of goods transported en masse by ship. Dockside cranes or automated loading and unloading equipment are used to handle their arrival in ports. The switches and controls inside this equipment must be resistant to corrosion and saltwater. Their sealing is also crucial. Various switch and sensor designs in the steute "Extreme" range have been developed especially for such adverse conditions. They are used in offshore applications such as oil rigs and supply ships, but also onshore on docks, for example in anchor systems and loading equipment.

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The design features of these switches and sensors include highly effective sealing and use of highly reinforced plastic or special aluminium coating for the housings. Screws and other fastening elements are manufactured from high-quality stainless steel (V4A).

The standard tests conducted in this field document that all necessary requirements have been met. They include, for example, splash water impact to ascertain IP protection class, or salt spray testing to DIN EN ISO 9227.

Most of these tests can be conducted in the steute laboratory or by specialist third-party service providers and certification bodies. They deliver solid information about the suitability of steute Extreme switchgear, such as foot switches, pull-wire switches, position switches and sensors, for use in ships, on oil rigs, in anchoring systems on docks, as well as in loading and handling equipment in ports.

However informative such tests are, they do not always reflect real-life situations. Scientists at the Fraunhofer IFAM in Bremen recently pointed out, and not for the first time, that the results of e.g. salt spray tests as a standard procedure "cannot always sufficiently reproduce the ability of coatings to fail". The researchers believe that one of the reasons for this is the fact that the corrosion tests are conducted in unvarying conditions, whereas in practice the impacting forces often fluctuate considerably. Since the 1990s, tests such as the corrosion resistance of steel have therefore been performed with stresses which come and go in cycles.

A good idea, but not 100 % meaningful for switchgear in adverse environments: corrosion tests in the laboratory

Corrosion tests conducted in (precisely defined) real-life situations are therefore desirable because they are meaningful. With its remote test facility on the exposed island of Helgoland, IFAM is able to offer precisely such tests. Components can be tested in "genuine" conditions, such as those on docks in ports. This refers particularly to dynamic, stormy weather conditions, but also includes factors such as fouling (algae growth).

In order to investigate the suitability of its Extreme switchgear for such environments, steute commissioned IFAM in Bremen to conduct a one-year weather test at its Helgoland site.

The test set-up: several examples each from selected "Extreme" switchgear series – including position switches, foot switches and pull-wire switches – were fastened to the South Mole in an exposed position hit by splash water. Some devices were installed within the tidal range, i.e. alternately above or below the water, in order to discover their limitations in the water movements of the North Sea. Answers were needed to questions such as: Where will algae grow? Will it impact the functionality of the switchgear?

The ultimate aim of these tests was to expose the switching devices to extreme and dynamic conditions beyond those of the standard tests required for certification, in

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order to detect any weak points the devices should have.

These tests have now been completed, but the final report is not yet available. However, the appearance of the switches after one year in splash water and salt spray, as well as first performance tests already demonstrate: after one year, the various devices from different series are saltwater-proof and still functioning perfectly. Even the labels and laser markings are still existent and even legible. The pre-treated and powder-coated housings of e.g. the foot switches are still in a very good condition, and also the "innards", such as switching inserts, plungers and pedal axes, are free of corrosion. This speaks for the high quality of both the surfaces and the sealing.

Outlook: As soon as they are available, the steute developers will evaluate the test results in detail and use them for further optimisation of existing product series, as well as development of new "Extreme" switchgear. First conclusions can already be drawn, however. For example, the plastics used by steute for housings and also actuators unrestrictedly comply with Extreme demands. For this reason, the designers will increasingly be substituting plastic for metal in the future – also in switches subjected to considerable mechanical wear and tear.

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