



Everything in view, even in hazardous areas

Camera monitoring systems for plants in explosion hazardous area

by Horst Friedrich



Figure 1: With a diameter of 55 millimetres, the EEx Compact CCC95 camera is the smallest explosion-proof monitoring camera in the world

Often a picture says more than a thousand words. Particularly in physically large plants, if in addition to the usual process images, operators are to be provided with a view of important parts of the plant and their surroundings at all times, considerable effort is required. In the past for applications in hazardous areas it was very difficult to realise a proper monitoring system with the explosion protected components that were available. With its new camera system, R. STAHL HMI Systems can now supply a complete package for such applications. Using this package it is possible to keep an eye on what is happening in large production plants in the pharmaceutical industry or chemical industry, along pipe-

lines, on drilling platforms, on tankers, and in many other plants with large hazardous areas. Maximum safety can then be ensured.

The new system solution from R. STAHL is suitable for most of these applications. The core of this solution is the CCTV SMART Display, a touchscreen HMI system that displays live pictures from the plant being monitored. The second element of the camera system is a SMART Board unit with control and power electronics for the connection of up to eight cameras. This unit transfers video signals to the screen in less than 120 milliseconds, which in effect means in real-time.

Up to eight colour cameras can be connected as image sources. The cameras can

be installed at a distance up to 200 metres from the SMART Board. The system currently offers a choice of two different camera models, the compact camera EEx Compact CCC 95 and the zoom camera EEx zoom 80 AF.

Optimally designed explosion protection and protection against environmental effects

For installation in hazardous areas, the electronic components for the SMART Board unit are fitted in a flameproof enclosure.

The cameras are protected mechanically by robust steel housing with the high protection degree IP69 against the ingress of dust and water. The electronics for the compact camera comply with the requirements of type of protection encapsulation »m« with the marking II 2G EEx m II C T4. The zoom camera is designed in type of protection »p« based on the concept »Static Pressurization« when one part, capable of causing ignition, is moulded. The marking is II 2G EEx pm II C T5.

The Smart Display is of modular design with various types of protection, to help keep the weight as low as possible. The electronics and the power supply for the panel PC are built in small flameproof enclosures. Connections and connectors are designed in the type of protection increased safety »e«. Keypads, touchscreen, and some interfaces are designed as intrinsically safe »i«. As displays with background lighting require high power, it was necessary to encapsulate the related inverter in accordance with type of protection »m«. Optical fibres were used for the Ethernet connection due to the special requirements on length and robustness; the fibres were designed in type of protection inherent optical safety »op is«.

As a result the explosion protection of the individual components for the overall system are optimally designed to suit the requirements in use.



Figure 2: A high-resolution image from hazardous areas is provided by the camera EEx zoom 80 AF, which has an 18/12-times zoom and a night-vision function

Small, smaller, EEx Compact CCC95

The EEx Compact CCC 95 camera with a diameter of 55 millimetres is the world's smallest monitoring camera suitable for use in hazardous areas (Figure 1). The optical system is protected by a chemically hardened lens. Despite the steel housing, it has a total weight of only 435 grams and resists both ambient aggressive chemical substances and even significant mechanical stress, such as vibration. The EEx Compact CCC 95 is also able to withstand extreme temperatures and is therefore of almost universal use: It remains reliable in arctic conditions at a minimum temperature of -30°C just as well as in a desert climate at 75°C . The $1/3''$ CCD sensor in the device produces a PAL or CVBS image with either 470 or 580 TV lines. A fixed field of view covering $\pm 90^{\circ}$ horizontally and 68° vertically in front of the camera is acquired. Power is supplied to an EEx Compact CCC 95 using the SMART Board unit to which it is connected.

Good visibility even in the dark

With its autofocus, an 18-times optical zoom and 12-times digital zoom, and its pan – tilt mounting, the EEx zoom 80 AF camera (Figure 2) covers considerably more options and provides much more application flexibility than the smaller camera type. This camera model, which is equipped with an automatic heater, can also withstand ambient temperatures between -30°C and $+75^{\circ}\text{C}$.



Figure 3: Industrial plants with hazardous areas can be monitored very easily on a touchscreen operator interface using the SMART camera system

It is suitable for surveillance around the clock, as a zero-lux night vision mode enables a useable image to be acquired and provided even in the darkest environments.

Zoom and pan at the touch of one finger

Convenient remote control of the cameras connected is possible from the HMI station (Figure 3). Commands for moving the camera as well as for zooming in or out are available in the form of easy to understand touchscreen symbols. While the EEx Compact CCC 95 camera cannot be moved, EEx zoom 80 AF cameras can be panned and tilted via the touchscreen, specific objects can be inspected in more detail using the zoom, or they can be viewed in the context of the surrounding environment. Depending on the design of the system, the screen displays the images from one camera, or the images from two cameras in a split-screen format, or a quadruple view is possible on request. PC-based HMI systems with a Windows XP embedded operating system are used for the SMART Display. Depending on requirements and the place installed, a standard or explosion-protected monitor with a 10", 15" or 19" screen can be selected from the Open HMI segment.