coating International

Anlagen und Verfahren zur Beschichtung und Veredelung

Machinery and Processing for Coating and Converting

Sonderdruck aus 3-2019

www.coating.ch

Charged with safety – requirements and technical solutions for a safe production process

By Marc Rechberger, Saales and Marketing Manager Static Control, Eltex-Elektrostatik GmbH

Uncontrolled static charges are frequent hindrance and hazard in the production process and can be eliminated using a wide variety of methods. The most reliable of these is active discharging bars, which can eliminate even high charges in fractions of a second. Many of the bars available on the market are protected against contact to prevent any danger to the user as long as they are installed and handled properly.

CHARGING – APPLICATION EXAMPLES AND POTENTIAL HAZARD. Targeted electrostatic charging improves quality and processing speed in the production process. In film production, charging is used to prevent the film from shrinking on the chill roll, to carry out reel winding without adhesive and to fix the film in place on the reel with edge-to-edge accuracy. Directed applications of charging help to speed up processes in many other industrial areas, including converting, the furniture industry, packaging and printing, and to increase the value of the finished products. Depending on the application, in terms of charging, voltages from 20 – 60 kV and amperages of up to 7.5 mA are used in industrial environments. For the specified amperages, direct personal harm from an electric spark-over is ruled out, but consequential harm from being startled is possible. The irritating effect of the stimulus results in an uncontrolled movement, which, depending on the installation point of the apparatus, can result in anything from painful bumping of body parts to serious injuries.

Charging bars that are developed for optimum safety reduce the energy transmission using series resistors to prevent any risk of injury from electricity in case of contact.

Despite this, there is the sensation of an electrical shock and the danger of being injured due to the aforementioned startle response. To ensure personal safety, corresponding protection against contact must be provided when installing charging bars. This may differ depending on the specific application, but must be configured in accordance with the applicable trade association regulations, e.g. DGUV regulations in Germany.

REQUIREMENTS FOR A SAFE HIGH-VOLTAGE GENERATOR. In addition to the mechanical protection against contact of the bars, the technical requirements for high-voltage generators have increased continually in recent years. In this regard, we can distinguish between three safety-related characteristics: personal safety, process reliability and intrinsic safety/device safety.

For personal safety, in addition to the mechanical and electrical configuration of the generator and plug connector, the function for enabling the high voltage is of particular importance. Systems used to date usually have a feature for enabling the high voltage manually using a button – optionally, a hardware-side enable via an external signal can be incorporated. If the installation is less than ideal or in case of incorrect handling, for example, connected charging bars are still under high voltage in case of maintenance work. A vastly higher level of safety is offered by state-of-the-art systems, which require, as a mandatory step, an enabler of the high voltage

Overview Eltex discharging bars

Charging in film production (Image: SML Maschinengesellschaft mbH)

through two separate channels. A central point when considering the safety of high-voltage components is how the generators behave in case of possible system errors, such as component failures. The greatest possible level of safety is currently provided by systems that are put into a defined safe state, such as switching off the high voltage, in all expected cases. The evaluation of the reliability of safety-related functions is calculated using the metric called Performance Level. This is in accordance with EN ISO 13849-1 safety standard.

The process reliability of a charge generator is determined using multiple factors. For example, it is necessary to ensure that the charge is applied only when required by the process. Charge at the wrong time may hinder the material flow and can have a negative impact on product quality. Problems when further processing materials, including everything from injuries due to spark-overs of an incorrectly used charge, can incur risks and high costs. Problems in the charging process, such as electrical arcs caused by incorrect settings or qualitative changes within the material used, can be detected by a state-of-the-art generator, adjusted for and optionally output to the user via an external interface. Quickly compensating for the high voltage helps the process to be optimal. The recorded information is used for further optimization. For the best possible charging, state-of-the-art high-voltage generators are optimized for specific applications using various parameters. The generator must be reconfigured when changing the materials to be charged. Conventional systems usually offer only rudimentary protection of the configured parameters. As a result, the generators can be incorrectly configured by the operators, which can again cause problems in the process. The optimal setup is to safeguard parameter settings at various access levels. For example, the operating personnel can change only approved parameters, while process-relevant parameters, in turn, can only be changed by users with the next higher approval level.

The generator has a high level of self-protection, which offers users a reliable system and low failure rates. High-voltage generators have to work in a wide variety of installation environments and withstand process-related problems for the long term. Voltage peaks from electrical arcs are a tremendous load on the high-voltage cascades. They should be detected quickly and adjusted for reliably. The heat resulting from high-voltage generation must be dissipated reliably. If the generator overheats, it must be shut down without exception.

Eltex-Elektrostatik GmbH, D-79576 Weil am Rhein
www.eltex.com, at ICE Europe: Hall A5, Booth 1250