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e.Guard

PREVENTIVE SAFETY

Intelligent residual current monitoring with e.Guard – fire protection, maintenance and safe operation in the timber processing industry

When it comes to fire protection, a particular challenge is posed by production sites with potential fire hazards. Electrical installations play a crucial role here, as a gradual insulation fault, for example, can soon escalate into a major risk in a timber processing plant. Residual current monitoring with the e.Guard system can help to reliably minimise fire risks and thereby improve safety. By detecting unusual currents that could signify earth or insulation faults, e.Guard makes it possible to act before it's too late. And if a suitable shut-off device is used in addition, even permanently connected machinery can be shut down automatically.

Requirements for protection systems in the timber processing domain

According to the relevant VDE regulations and VDS guidelines, even permanently connected machines should have RCDs with a rated residual current of 300 mA for fire protection. Unlike traditional personal protection, which is set at 30 mA, the fire protection limit is set at 300 mA, or 420 mA in the case of preventively increased fire protection. Frequency converters are often used in timber processing machines to control the drives. When combined with RCDs, this can lead to problems such as nuisance tripping or immediate tripping when the installation is switched on. There are several possible culprits behind this, such as the filter components used to maintain electromagnetic compatibility (EMC), as well as the frequency converters or sometimes even the installations themselves. In addition, the length of the motor cable between the frequency converter and the motor (shielded) significantly influences the magnitude of the leakage current. An effective way to overcome these challenges is to use a permanent monitoring system to safeguard installations with an elevated leakage current that causes the RCD to trip. Continuous monitoring makes it possible to detect potential problems at an early stage and take the necessary steps to ensure safety.

e.Guard for higher system availability and safe operation

Using retro-fittable residual current monitors (RCMs), e.Guard continuously monitors the live residual current data in different frequency channels of the downstream electrical installation.
These monitors provide an insight into the insulation condition of cables and lines, as well as that of electronic components such as inverters and controllers. The e.Guard Gateway offers various options for storing data. In the local variant (level 2), the recorded residual current data is saved directly on the device and can be displayed in the connected network by opening the browser. The data can be transferred to the cloud in encrypted form, where it can be stored in a traceable, read-only format (level 3). Once the data is in the cloud, it can be scanned for anomalies. This is done using data analysis based on machine learning (ML) algorithms. After a brief training phase, the system can independently distinguish between the normal residual current pattern and anomalies. If the values start to look concerning, it outputs an alarm, giving time to avert potential system failure or damage through preventive action (level 4).

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How the alarm is raised

The e.Guard software offers two different alarm triggers, which can be activated together or independently of each other. With the threshold-based alarm, each residual current monitor (RCM) can be assigned two configurable alarm thresholds (yellow, red) per frequency channel (Fig. 1). Since these are stored as static values, the system waits for the alarm threshold to be exceeded before setting off the alarm. This solution is primarily suited to installations that contain current-using equipment in static operation, in other words those without the highly dynamic changes caused by switching to other equipment or operating modes. The threshold-based alarm is available directly after the system has been installed and commissioned.

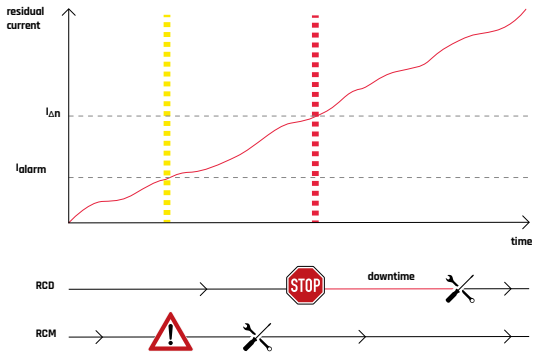

Fig. 1: Threshold-based alarm (levels 1–3)

In the case of anomaly detection, the data is collected during a training phase and is analysed using machine learning (ML) algorithms (Fig. 2). The algorithms use this training data to learn the behaviour of the installation.
If it detects a deviation from the normal behaviour, it can then generate an alarm. This type of alarm is particularly suited to highly dynamic installations, such as those involving production machines. Here, there are frequent variations in the behaviour of the installation itself and also of the residual current.

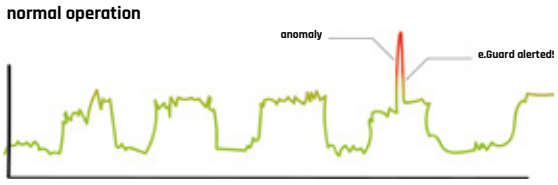

Fig. 2: Alarm based on anomaly detection (level 4 and up)

To find out more about the product and its areas of application, visit www.doepke.de/en/eguard