IFA
Institut für Arbeitsschutz der
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Focus on IFA's work

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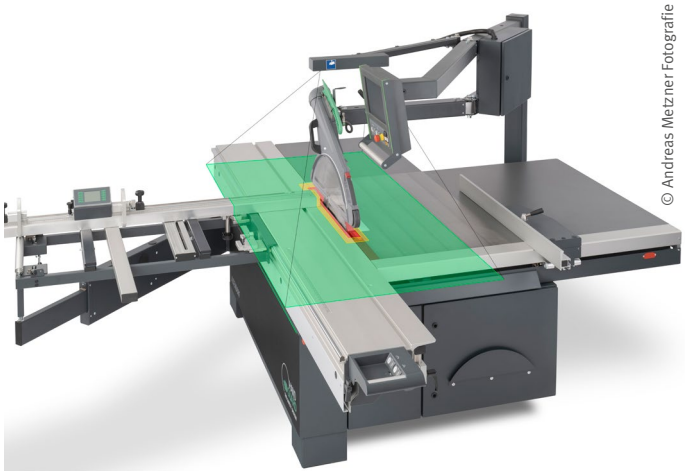
AI-based assistance system for dimension saws

Problem

Serious accidents repeatedly occur on dimension saws, and on table-type circular saws in general, as operators typically work with their hands very close to the saw blade. The safeguard required by standards on such saws takes the form of a saw blade guard. This saw blade guard has two functions. Firstly, it provides protection against wood chips and sawdust, which are exhausted from underneath. Secondly, it shields the saw blade above the material being sawn from contact with the operator. Unfortunately, this safeguard is often not adjusted correctly, with the result that serious hand injuries repeatedly occur in spite of it. According to the German Social Accident Insurance Institution for the woodworking and metalworking industries (BGHM), a total of 177 accidents occurred between 2014 and 2017 on table-based circular saws in use in trade and industry.



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Monitored work area on a dimension saw

Activities

In 2019, the BGHM tasked the IFA with evaluating a saw manufacturer's concept for a camera-based assistance system. The camera system is to initiate a safe state when a hand approaches the danger zone. For detection of a hand, the company developed software employing artificial intelligence (AI) to inspect camera images for the presence of human hands. As soon as the AI detects a hand in the camera image and thus identifies a dangerous situation, the saw blade is lowered beneath the work table within a fraction of a second, thereby preventing contact between it and the person. From this safe state, the machine can be returned to the operating condition within a short time and work can be continued without damage to the dimension saw or the material being sawn. To ensure that the system functions correctly and provides a high level of protection for the operating personnel, the BGHM and the IFA formulated the requirements for such a system. By May 2022, the IFA had tested implementation of these requirements both in the concept phase at specification level and in a type examination. One of the main focuses lay on function tests employing a range of factors influencing hand recognition: skin colour, skin soiling, tattoos, lighting and various possible hand positions.

In operational practice, a start-up test also ensures that the system is working reliably. When the machine is started, the test must detect both the operator's hands; should it fail to do so, the machine's saw blade must be prevented from starting. Since the system is capable of detecting more than two hands in the same image, a second operator is also protected. Where an additional person is working on the

machine, however, they should first test manually that they are also detected. The purpose of the hand recognition tests is solely to determine whether the operators' hands can be recognized on the day of the test. No further training of the system or learning by it during runtime occurs.

Results and use

At the IFA, the concept phase was completed successfully and the type examination was passed. Owing to the safety system's AI component, it was assessed as an assistance system rather than as a protective device. Classification as a protective device would require demonstration that all hands are recognized in every work situation. Naturally, this proof cannot be provided in a scenario employing artificial intelligence and machine learning.

The safeguard required by the standard, i.e. the "saw blade guard", which also protects against other hazards, must therefore continue to be present. However, this combination now enables practical experience to be gained in the field. The system has been available on the market since May 2022 in a fixed combination with a specific model of dimension saw. The BGHM has performed an EC type examination with certification on the machine as a whole.

The system was awarded the 2021 German Occupational Safety Award in the "operational use" category. In November 2023, the International Social Security Association (ISSA) presented the system's manufacturer with its triennial Safety Award.

For the system to be transferred to other applications, it would of course require adaptation to the respective framework conditions.

User group

Operators of dimension saws, labour inspectors at all Social Accident Insurance Institutions

Technical enquiries

- IFA, Department Accident Prevention: Digitalisation – Technologies

Literature enquiries

- IFA, Department Interdisciplinary Services

Further information

- Manufacturer: Altendorf Group

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