Digital transformation of technical systems with explosion risk

using the example of storage and processing of bulk materials (e.g. grain) with assessment of the dust explosion risk of complex systems

The English publication on this topic will be available soon (German version is already out).

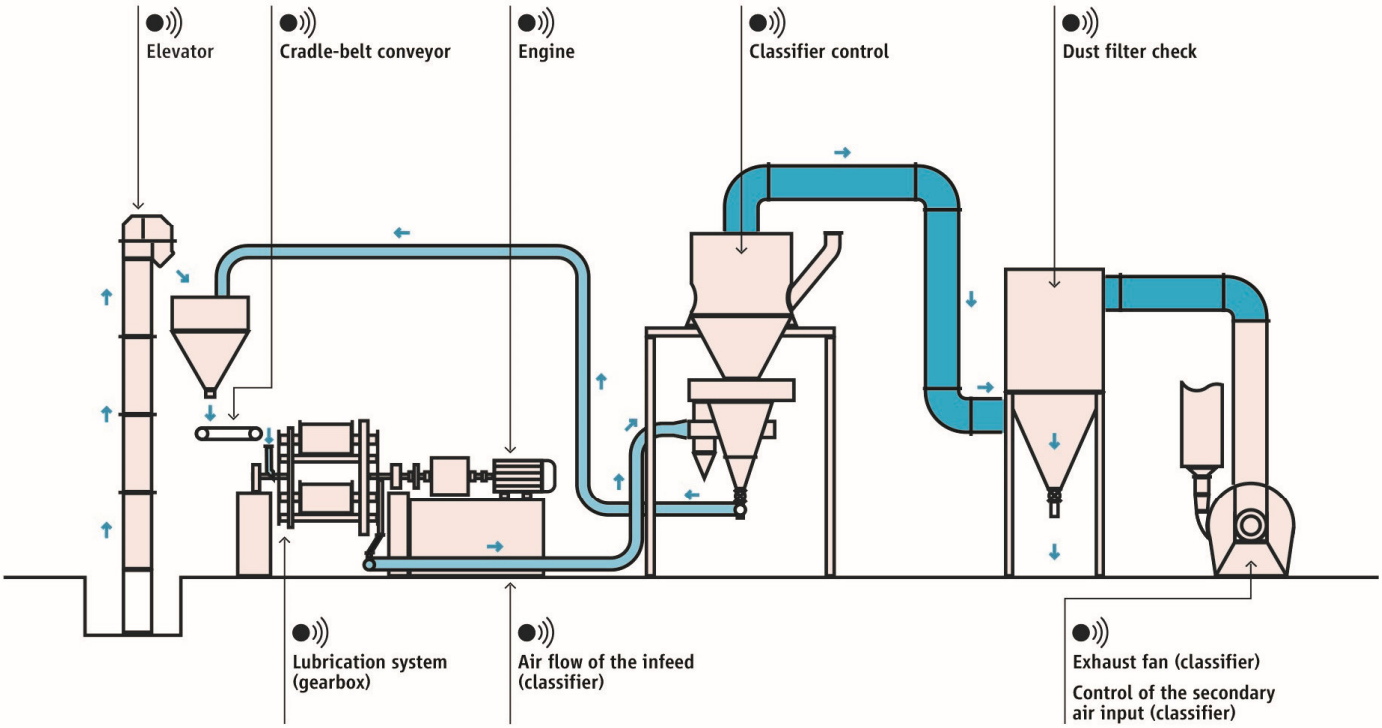
Prof. Radandt, nationally and internationally renowned expert for explosion protection points out the chances and risks for safety and productivity of technical systems through digital transformation. Using the indicated example.
Describing: Grinding plant, complex silo installation for combustible bulk materials, silo systems, transport systems, processing, cleaning systems, other processing options, weighing, pelletising, packaging, assessment of machine elements as components for machines, complete explosion protection plant, questions concerning the complex assessment of explosion risks, methodological approach to explosion protection, constructional explosion protection, fire monitoring of other machines, silo system with fire and explosion protection equipment.

To prepare the user/reader better for this largely OSH-topic the basics of digitalization are described. As well as the importance of the human factors role of the human being within the digital system regarding the psychic, cognitive and social factors of influence on socio-technical systems and man-machine-systems. Human factor technology is a multi-disciplinary field including psychology, engineering, ergonomics.

To control complex cyber-physical-production-systems new approaches for user-interfaces are needed. Man-machine-interfaces must be user-friendly considering work tasks, adapted to capabilities and capacities of users, like match information, display with receptivity/capabilities/dialogue steps in harmony with human cognition.

To reach a “safe system” risk analysis of possible faults, errors, unwanted events and its effects on system behaviour is needed. It must be based on reliable information, in particular concerning probabilities. This allows developing strategies to deal with risks and to take risk reducing measures, i.e. probabilities and consequences as low as possible. After taking the measures a new risk assessment of the system is necessary.

How to meet these requirements, especially in complex systems, is shown best in practical examples, also distinguishing process steps (modules) via a modular description.



Possible modularisation of a grinding plant: Control points for the placement of sensors

Assessment of explosion risks and risk treatment needs to be done for all modules. In digitalized systems safety criteria already need to be considered when “building” the algorithm.
We show the principles of sensor technology and the description/contents of algorithms in some selected examples.

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