

FORTNA

White Paper Series

How to improve safety into your sorting center



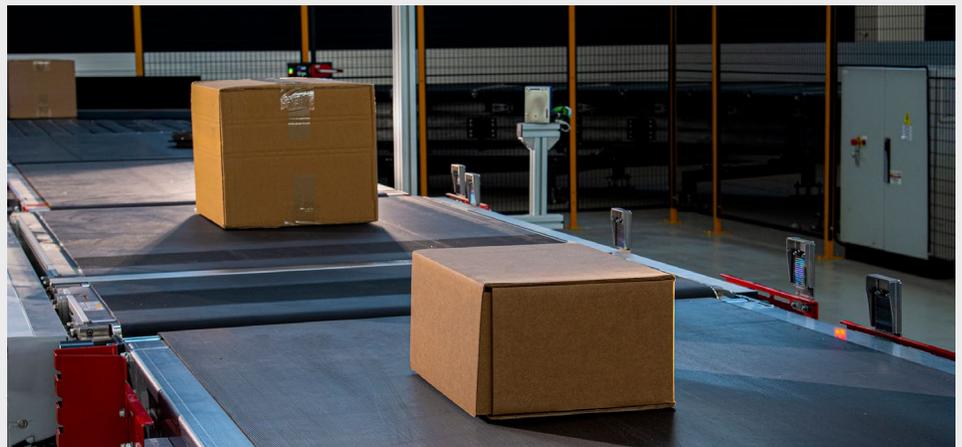
Abstract

In the automation world, safety is of the utmost importance. On the one hand, automated material handling systems perform difficult tasks that keep operators out of hard and unsafe conditions, but on the other hand the same automation equipment must be intrinsically safe for operators to work around.

Manufacturers and integrators do have a legal responsibility to ensure material handling systems fulfill the safety requirements in accordance with regulations, standards and directives. But it is much more important to provide an overall concept where safety meets functionality according with customer's satisfaction.

An overall safety concept shall be realized for people, machinery and environment by implementing state-of-the-art solutions. Material handling systems shall be designed in such a way that safety meets functionality and realizes customer's satisfaction in accordance with the needs and expectations. A safe working environment shall be guaranteed to prevent persons exposed to hazards and risks.

This whitepaper gives guidance for a safe design and/or integration of material handling systems. It contains relevant information which shall be considered to design a material handling system in a safe manner. Secondly, it describes practical examples which can be useful for reference.



From the early definition phase

A safe material handling system starts in the early design phase. During the design phase the project scope shall be clearly defined to analyze the project boundaries and limits of machinery and equipment.

The design lay-out shall be based on the needs and expectations of the customer and shall contain the integrated machinery and equipment. Priority shall be given to system accessibility, the segregation of operator working areas, restricted areas, public and dangerous areas. This to ensure the material handling system can be accessed in a safe manner. Other attention points can be found by implementing emergency escape routes, this to ensure all persons can escape in a safe manner in case of an emergency.



An effective Risk Assessment shall be generated to analyze the potential hazards and risks related to the material handling system. The Risk Assessment shall be based on the integrated machinery and equipment and shall contain an overview of the identified hazards and risks from a mechanical, electrical, controls and safety perspective. Important attention points can be found by the user phases of machinery:

- Normal operation
- Jam breaking and trouble shooting
- Preventive maintenance
- Cleaning
- Inspection

Secondly, the Risk Assessment provides a clear description of the applicable design safety measures to be implemented. These measures shall be selected based on the applicable product Directives and (safety) standards.

The results of an effective Risk Assessment will be the starting point of an overall safety concept in accordance with the applicable legislation.

Practical examples

Practical examples of a safe material handling system in the early design phase are the following:

- System can be easily accessed by platforms, stairs and ladders
- Selection between means of access is based on the access frequency
- Height restrictions are prevented at high frequent access areas
- Unauthorized access to dangerous parts of machinery and equipment is prevented
- Operator working areas, dangerous areas, restricted and public areas are segregated
- Machinery and equipment can be properly maintained, access to critical parts is considered
- Dangerous machinery will be stopped before entering these areas
- All areas can be evacuated in a safe manner without any restrictions
- Operators do have sufficient working clearances along the system
- Operators do have a clear overview of the area for safe operation
- Ergonomic workplace principles are considered by safe machinery design
- Safety distances to dangerous parts of machinery are considered.

Why considering safety from the early definition phase

Considering machinery safety in the early definition phase brings several benefits to the entire project. When the design risk assessment is created and evaluated properly and when the safety hierarchical structure is implemented correctly, it is possible to prevent issues in a later stage that can affect not only safety but also lead time and cost.

From the design perspective:

- Preventing lay-out changes in a later stage which might have a big impact on planning and milestones;
- Preventing modifications during the installation phase on site;
- Ensuring the material handling system is operating in a safe manner.

From the safety perspective:

- Ensuring a safe working environment for the end-users;
- Preventing hazardous situations and incidents on site.

Safety hierarchical strategy

Material handling systems shall be designed by following the design safety measures of the hierarchical strategy in the following order:

1. Implementation of mechanical measures in the first place
2. Secondly the implementation of the electrical and controls measures
3. Last but not least the implementation of instructions

That is to say:

1. Ensuring a safe machinery design by preventing hazards and risks by its source. Access to dangerous parts of machinery and equipment is fully prevented by safeguarding. Persons cannot be exposed to hazardous conditions.
2. Implementing interlocks on safety doors to detect persons entering dangerous areas, programming machinery and equipment in such a way the machinery will be stopped before persons are exposed to dangerous parts of machinery.
3. Providing safety procedures and instructions for persons operating and working along the system. This to ensure they have the right skills, knowledge and experiences to perform their activities in a safe manner without creating additional hazards. These instructions shall be documented properly in a user manual, operation manual, installation manual or maintenance manual.

An important remark shall be given in relation to safety procedures and instructions as this can be defined as a last resort safety measure.



Safety is teamwork

Machinery safety has an integral character. Safety concepts shall be created by a multidisciplinary approach, input shall be given from a mechanical, electrical, controls and safety perspective.

Providing a safe concept is strongly depending on the following factors:

- Lay-out
- Machinery speeds
- Integrated machinery and equipment
- Human intervention to machinery (including access frequency)
- Environmental conditions
- Results of the Risk Assessment (detailed hazards and risks involved)
- User phases of machinery (examples: normal operation, maintenance, jam breaking, cleaning and inspection)

All these factors shall be considered by persons with the right skills, knowledge and experiences.

Based on a multidisciplinary approach the right decisions can be made in relation to the selection of design safety measures.

Providing a concept which contains all safety related elements is teamwork.

How predictive maintenance can help

As technology has improved in recent years, it has become possible to create new valuable services by applying various devices and sensors that can be combined to improve not only the performance of the system. Predictive maintenance is a new helpful function that uses data analysis, tools and techniques to detect the possible defects along the system.

In this case, an estimation can be given when corrective maintenance should be scheduled and performed improving both system performance and safety.

By successfully addressing issues before potential fallouts, it is possible not only to increase availability thanks to managed maintenance windows, but also optimize and prioritize maintenance resources by using real-time information, and reduce safety risk by improving asset reliability and lessening human interface.

Conclusion

A high level of safety can be guaranteed only by making the right decisions for an optimized implementation of safety measures, considering the functionality of the system. A safe concept can be realized only by cooperating closely with the involved disciplines, by understanding the needs and expectations in relation to functionality and safety. Also involving the customer into the safety design of the system, helps you to take the right decisions for an optimized implementation of safety measures, considering the overall functionality of the system.

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