



Inherently Safer Design in Wood Pellet Production

Inherently Safer Design (ISD) is based on four principles: Minimization, Substitution, Moderation, and Simplification.



Minimization

Minimize horizontal surfaces where combustible dust can accumulate.



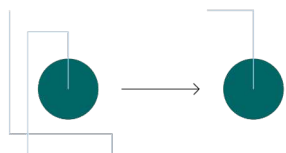
Substitution

Consider alternate separators for foreign material removal that would be less likely to jam to reduce an ignition hazard.



Moderation

Operate rotating elements, such as screw augers, below a tip speed of 1 m/s to prevent the generation of sparks and the dispersion and suspension of combustible dust clouds.



Simplification

Design processes, processing equipment and procedures to eliminate opportunities for errors.

Did You Know?

ISD treats hazards at the source rather than only through add-on equipment.

What Can You Do?

1. Where possible, implement ISD options to eliminate or reduce dust hazards.
2. Evaluate ISD options during management of change (MOC), process hazard analysis (PHA), and incident investigation.
3. Consider an ISD workshop to identify ISD opportunities in your facility and enhance the implementation of ISD within your operation.

The hierarchy of controls (Figure 1) is the preferred order of consideration of risk reduction measures. The most effective is ISD, followed by passive engineered, active engineered, and lastly administrative.

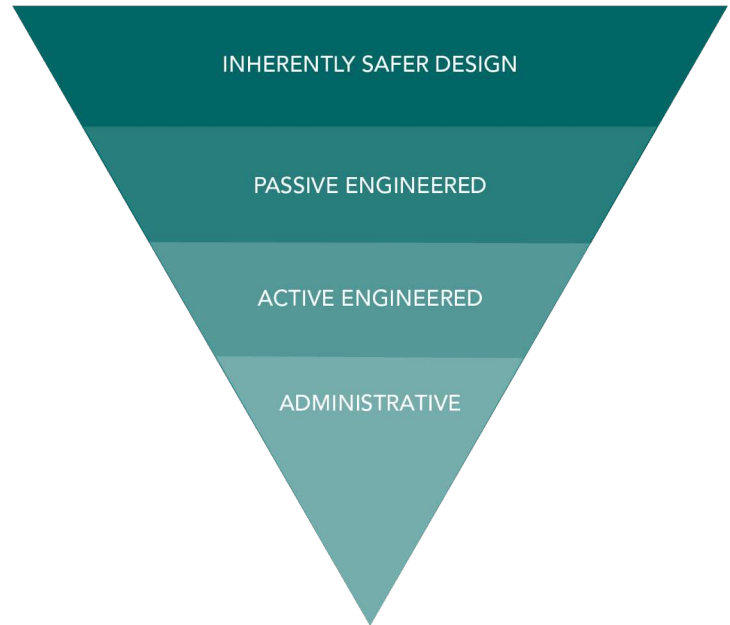


Figure 1: Hierarchy of controls

Effective combustible dust risk reduction involves the use of ISD as well as passive and active equipment, and procedural measures.

For example, reduce risk by eliminating dead spaces at the end of lines where fine dust can accumulate (ISD - minimization), and use explosion venting (passive), spark detect and deluge (active), and a hot work program (procedural).

NFPA 652 (2019) states that ISD options should be considered during the design or evaluation of processes involving combustible dust.

References:

- Amyotte, P. and Khan, F. (2020). The role of inherently safer design in process safety. *Canadian Journal of Chemical Engineering*. 99 (4), 853-871.
- CCPS (Center for Chemical Process Safety). (2005). *Guidelines for Safe Handling of Powders and Bulk Solids*. American Institute of Chemical Engineers, New York, New York, US.
- NFPA 652 (2019) Standard on the Fundamentals of Combustible Dust. NFPA (National Fire Protection Association), Quincy, MA.