CASE STUDY

Cost Effective and User-Friendly Passive Explosion Protection for the Wood Industry

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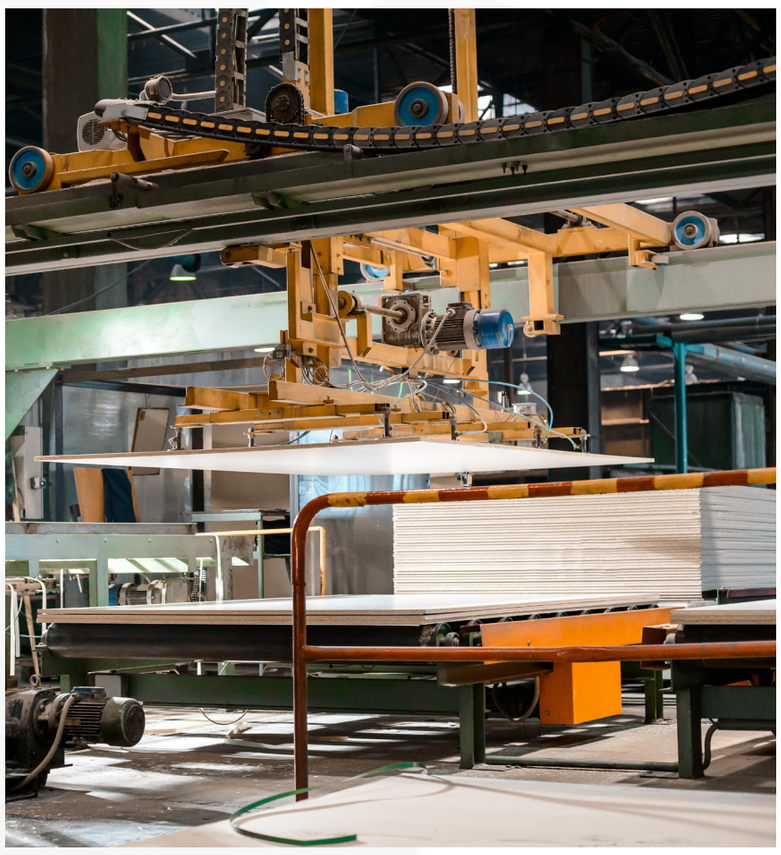
A specialized manufacturer of Wood Products based in the North Eastern United States consulted IEP Technologies when installing a new process line which needed protection against the potentially dangerous and costly effects of industrial explosions. As part of the plant expansion, a new Dust Collector was to be installed in an outside location.

The new equipment was already fitted with explosion venting panels from the dust collector manufacturer to protect against explosion overpressure. Following an internal assessment and to comply with the prescriptive requirements of NFPA 69, it became clear that further protection measures would be need to reduce the risk of an explosion event from propagating upstream from the dust collector, endangering connected equipment and personnel working close to the line.



In addition to Lumber Processing and Wood Products industries, many manufacturing processes are at risk of dust explosions which may occur when fine combustible particulates, dispersed in air, are exposed to an ignition source within a contained environment. These types of contained environments are commonly present throughout industry – in addition to dust collectors they may include piping and ducting, process vessels, and numerous other types of special process machinery. The ignition source may originate from various commonly found conditions, including hot materials or surfaces, flames, welding, friction or uncontrolled electrostatic discharges. Such ignition sources should always be minimized or eliminated through a combination of engineering and safety controls, effective management and operator training and awareness. However, even with these measures in place, the explosion risk cannot be ignored, especially in abnormal or fault conditions, and therefore and therefore techniques to mitigate the potentially catastrophic effects of such an event must be employed.

In view of the positioning of the Dust Collector in an outside location with a safe exclusion zone for personnel, the main technical challenge for this project was focused on the potential for explosion propagation to associated equipment and open manned areas. As previously mentioned, the Dust Collector was delivered with explosion relief panels already fitted with to enable an explosion occurrence to vent safely (however it is worth noting that there is a developing conversation within the industrial safety community and NFPA about the potentially harmful effects of thermal heat extending further than the flame front in open venting situations). In order to provide a reliable explosion barrier at the inlet between the Dust Collector and the rest of the process line, both passive and active isolation techniques were evaluated. Process material samples were also analyzed to determine the explosion properties and potential severity of an explosion and this resulted in a dust deflagration index of ST1 (Kst value less than or equal to 200 bar.m/sec). Fortunately for the manufacturer, as the project was in the early stages, it was possible for IEP Technologies to provide the installation requirements to incorporate into the duct layout a self-actuating passive solution incorporating a DN250/10” ISOFLAP™-M Explosion Isolation Valve to be used, capable of delivering four key safety and financial benefits to the client:

1. Reduced initial and ongoing cost – the upfront cost of the ISOFLAP™-M Isolation Valve solution was determined to be significantly less capital outlay for an equivalent protection scheme involving active explosion isolation techniques, such as a high-speed gate valve or chemical isolation.
2. High reliability – the ISOFLAP™-M is a self-monitoring device with continuous dust accumulation and flap position monitoring with interface to plant control/alarm/shutdown systems, to provide the NFPA 69-required outputs should a material buildup condition occur that could compromise the valve’s effectiveness.
3. Reduced maintenance costs – the ISOFLAP™-M does not require invasive testing and can be maintained by qualified local plant personnel.
4. Approved by notified safety bodies – the ISOFLAP™-M is 3rd party certified as a protective system according to the ATEX Directive 2014/34/EU, and it’s integrated monitoring functions meet the requirements of NFPA 69.

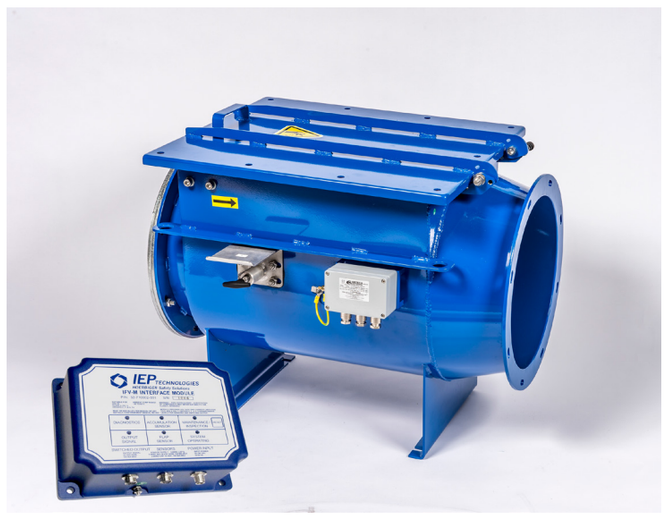
Before concluding that this flap-style valve was suitable for this application, the limits of applicability as certified by a third-party testing laboratory were reviewed. Some of the parameters considered included:

- Kst of the material
- Pred of the vented vessel
- MIE (minimum ignition energy)
- MIT (minimum ignition temperature)
- Number of elbows from the protected vessel to the valve
- Air velocity
- Dust Loading
- Pressure drop
- Construction of valve

Ensuring that the valve met each of these application parameters was critical in the decision to use the ISOFLAP™-M isolation valve for this application. Other valves were considered, but dismissed, as they did not meet the minimum requirements. Another key limitation is the maximum allowable dust loading in the airstream. These limitations are called out on the approvals certificate that accompanies the explosion isolation flap valve, a critical document to review in full when making a decision on what passive valve to incorporate for a specific application.

A key parameter for any explosion protection system or device is the range of dust reactivity (Kst) that is applicable. For explosion isolation valves there will be a minimum and a maximum Kst value that the device can be applied to. For this reason, whenever a client is evaluating passive isolation explosion protection proposals from alternative vendors and specialists, they should always scrutinize the vendors’ test certificates to verify that the flap valve has been approved for use at the upper and lower Kst values, and satisfy themselves that their ultimate purchase decision is based on sound evidence of such 3rd party notified body testing.

In this case, IEP Technologies was awarded the contract to supply a DN250/10” ISOFLAP™-M Explosion Isolation Valve. The Wood Products company also incorporated a monitoring interface unit with the valve, to easily integrate with the plant control system so that in the event of an explosion occurring, the dust collector is signalled to immediately shut down. The fact that the unit incorporates this monitoring function within the scope of its approval negates the requirement for the user to conduct a documented risk assessment and inspection protocol and frequency that is acceptable to the “authority having jurisdiction”, which in practice can be difficult and costly for the user to provide.



The equipment was supplied in Q3, 2019 and has since been installed, commissioned and is in full operation. Qualified local plant personnel conduct the quarterly inspections as required by NFPA 69, in addition to planned annual checking of the explosion venting panels fitted on the Dust Collector per NFPA 68.

The robust, reliable and user friendly features of the ISOFLAP™-M Explosion Isolation Valve, coupled with the extensive testing and approvals for the product across a wide range of potential applications illustrates IEP’s continued investment and long-term capability as a Trusted Industrial Explosion Protection Partner, comprising material testing, engineering review and design, system supply and ongoing maintenance, training and support. IEP Technologies is part of the global HOERBIGER Safety Solutions network, with sales, service and support centers located across Europe, North America, Latin America, Middle East/Africa and Asia/Pacific.To learn more about Industrial Explosion Protection or to find your local IEP sales, service and support centre visit www.ieptechnologies.com or contact +1 855-793-8407.

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