

CASE STUDY:

Whey Protein Dryer Explosion Protection



When a leading U.S. manufacturer of processing equipment for the dairy industries had concerns about mitigating the consequences of dust explosions for a recent project, they turned to IEP Technologies for assistance with specifying the optimum explosion protection system solution for their customer – a Toll Manufacturer of dried whey protein products. The process equipment manufacturer had previously collaborated with IEP on various projects in Europe, however this was the first opportunity to propose a protection system which was fully compliant with North American standards and regulations.

Dust explosions can occur in many manufacturing processes when fine

particulates, dispersed in air, are subjected to an ignition source within a contained environment – for example a duct, vessel, or collector. Ignition can be generated by several factors, including hot surfaces, flames, welding, spontaneous combustion, friction or uncontrolled electrostatic discharges. These ignition sources should be minimised or eliminated by a combination of effective engineering controls, safety management and operator awareness but in many cases the explosion risk is ever present and therefore techniques to mitigate the potentially catastrophic effects must be employed.

In this particular case the project consisted of an installation of a completely new spray drying process, including a fluid bed dryer, dual, cyclones and baghouse for dust removal and collection was all of which were being added to an existing dairy facility. The operator of the plant was acutely aware of the risks of industrial explosions, as one of their competitors previously suffered an explosion event in a similar process, and while fortunately there were no injuries to personnel, it resulted in significant plant damage, downtime and financial consequences.

The first stage of determining a protection strategy was to conduct material explosion testing in the IEP Technologies' Combustion Research Center, based in Marlborough, MA. This independent laboratory has been specializing in the combustion characteristic testing of dusts, liquids, and gases for over 35 years, performed in accordance with the requirements of recognized standards bodies including ASTM, OSHA, US DOT and UN.

After collecting and testing representative samples of the product from the process, it was indeed confirmed as susceptible to ignition and categorized as having an explosive dust severity rating of high ST1, which meant that the process certainly needed an appropriate level of explosion protection.

The attention then shifted to specifying the various elements of the explosion protection system, but in order to do this there were a number of constraints that had to be accommodated.

Firstly, as the whey drying process was governed by USDA regulations, any devices or sensors coming into contact with the product had to be compatible with and suitable for the plant hygienic cleaning in place (CIP) regime which employed a high temperature/high pressure cleaning phase. These conditions also needed to be incorporated into the control logic for the explosion protection system selected so that the CIP system did not interfere with the detectors and trigger off spurious activations.

Secondly, in view of the relatively large vessel sizes and short runs of ductwork between vessels, multiple types of detection were required to shorten the isolation distances. This resulted in dual detection methods being used – combining pressure and infra-red techniques to allow for suppressor placement closer to vessel inlets and outlets and to prevent any explosive events from propagating to interconnected vessels. One beneficial consequence of using multiple detection methods was the ability to associate the same suppressors to isolate different vessels, thereby minimizing the total number of suppressors required within the overall system.



Furthermore, as the installation spanned several floors, there were some clearance issues which in some cases resulted in multiple small suppressors being used rather than larger single units.

Finally, as this was the end-user's first direct experience of explosion protection, there was considerable dialogue with corporate engineering and safety management in terms of current NFPA codes and OSHA guidelines to ensure that the IEP solution fully complied with all relevant safety standards.

The final explosion protection system selected consisted of dual high-temp detectors, rapid acting Piston Fire II and 5" High Rate Discharge suppressors and explosion relief panels, linked back to IEP's EX8000 multi-zone control panel and split into 6 operational zones which allow for future expansion up to a maximum of 16 zones.

By working in close collaboration with the drying process equipment manufacturer and dairy facility end-user, IEP engineers were able to successfully design a system which addresses the specific needs of the dairy industry and USDA while still providing effective protection against the potentially disastrous effects of dust explosions. As a result of this project, the operators of the dairy plant feel reassured that they are doing all they can to protect their people, plant and process, and this view is supported by the preferential insurance premiums from which they now benefit.

The highly collaborative nature of the project illustrates IEP's capability as a Trusted Industrial Explosion Protection Partner, comprising material testing, engineering review and design, system supply and ongoing maintenance, training and support. The Marlborough, MA based company is part of the global HOERBIGER Safety Solutions network, with sales, service and support centres located across North America, Latin America, Europe, 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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