

Safe Reactor Charging of Bagged Powders Using the Powder Pump System

Specialty chemicals manufacturer improves safety, ergonomics, and process control by replacing manual gravity feeding with a contained Powder Pump conveying system.

Overview

A specialty chemicals manufacturer contacted De Dietrich seeking to improve its existing process for charging cellulose powder into solvent-filled reactors. Because cellulose is a combustible dust, the customer was concerned about the potential for a hybrid mixture to form during charging operations. At the same time, the existing gravity-fed process created ergonomic concerns, housekeeping issues, and limited control over material transfer.

To evaluate an alternative approach with minimal risk, the customer first implemented a Powder Pump rental unit. Following successful testing, De Dietrich supplied a permanent powder transfer system consisting of a centralized bag dump station and two dedicated Powder Pump systems capable of feeding independent reactors.



About

The customer is a global manufacturer of specialty chemical products serving a variety of industrial markets. Their operations involve the handling of dry bulk materials and specialty powders used in the production of high-performance chemical formulations. Maintaining safe, consistent, and repeatable charging operations is critical to supporting both product quality and production efficiency.

Challenges

The customer's existing process relied on manually charging cellulose powder into reactors using a

gravity-fed method. While functional, the approach presented several operational and safety challenges. As a combustible dust, cellulose required careful handling to minimize the risk of dust generation and the potential formation of a hybrid mixture when introduced into a solvent-containing vessel. The manual charging process also exposed operators to ergonomic risks associated with handling and lifting 50 lb. bags. In fact, a previous operator injury had highlighted the need for a safer material handling solution.

In addition, the process required charging two separate reactors located within a classified operating area. The existing arrangement offered limited control over feed rates, created housekeeping concerns due to dust

generation, and made it difficult to achieve consistent, repeatable charging operations.

The customer required a solution capable of safely conveying cellulose powder to multiple reactors while improving operator safety, reducing dust emissions, and providing greater process control. Additionally, the area classification to make the charges was Class 1, Div 1 and Class 2, Div. 2.

Solution

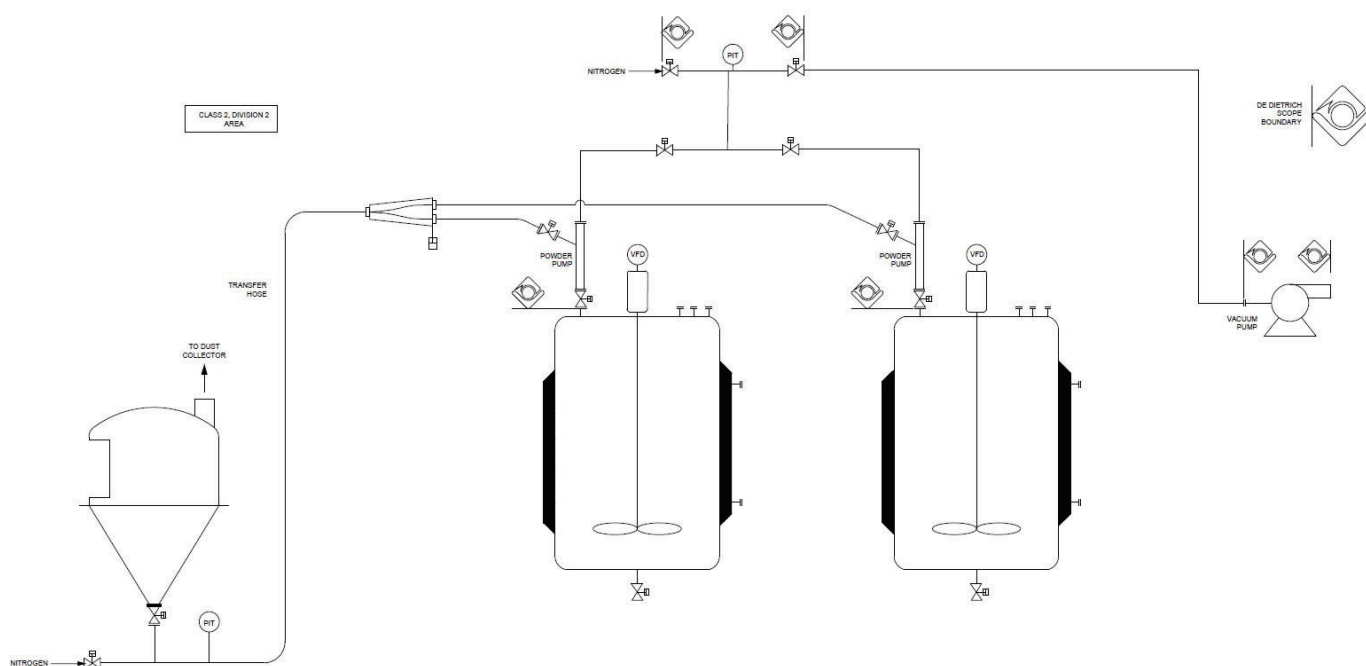
To validate the proposed approach before committing to a full-scale installation, the customer first utilized a Powder Pump rental system to evaluate performance under actual operating conditions. The successful trial demonstrated the system's ability to reliably convey cellulose powder while maintaining containment and consistent material flow.

Based on these results, De Dietrich engineered and supplied a permanent powder handling system consisting

of a centralized bag dump station and two dedicated Powder Pump conveying systems. The bag dump station provided a controlled location for introducing cellulose from 50 lb. bags while reducing operator exposure and improving housekeeping.

Each reactor was equipped with its own Powder Pump unit, allowing material to be transferred in a contained manner while maintaining independent control of reactor charging operations. Material distribution between the systems was managed through an automated diverter arrangement, providing operational flexibility while minimizing equipment requirements.

To further enhance safety, the system was designed to utilize nitrogen as the conveying gas, reducing oxygen concentration within the transfer line during operation. Combined with proper grounding and bonding practices, the design significantly reduced the likelihood of ignition while supporting safe powder transfer. A custom control system was also integrated with the site's existing DCS (Distributed Control System), providing improved process visibility, repeatability, and operator control.



Results

By replacing the gravity-fed charging process with a Powder Pump-based conveying system, the customer achieved significant improvements in safety, reliability, and operational efficiency.

Contained powder transfer reduced airborne dust generation and improved housekeeping throughout the process area. Operators no longer needed to manually handle material in the same manner as the previous system, helping address ergonomic concerns and improve workplace safety.

The controlled conveying process provided more consistent and repeatable material transfer, improving batch-to-batch consistency and reducing variability associated with gravity feeding. The dual-reactor design also enabled reliable distribution of material to multiple vessels while maintaining operational flexibility.

Finally, the rental program allowed the customer to validate system performance before making a capital investment, reducing project risk and providing confidence in the final solution.

The project successfully transformed a manual, gravity-fed charging operation into a safe, contained, and repeatable powder handling process capable of supporting the customer's long-term production requirements.

