LEE PROCESS EQUIPMENT®

Bulk Material Handling Case Study for Technical Gelatin

Lee Process Equipment transforms bulk material handling process for leading glue manufacturer

LD Davis Plant Manager Patrick Bryant and Lee Process Equipment Principal Mathias Lee discuss the success of the new bulk material handling system.

About Adhesive Manufacturer LD Davis

The LD Davis manufacturing facility in Monroe, NC, was established in 1982.

LD Davis is one of the world's oldest and most prominent manufacturers and compounders of animal glues. The third-generation business was founded in 1926 in Bristol, PA, and the company has operated a manufacturing facility in Monroe, NC, since 1982. LD Davis' animal glue formulas are exceptionally environmentally friendly and are 100% non-toxic, recyclable, and biodegradable. These glues are commonly used in the manufacture of rigid boxes, bookbinding, and laminating.

If you have ever purchased a board game, a puzzle, fine jewelry, perfume, or chocolates, you have likely brought home a high-quality rigid box created with LD Davis animal glues. When you see rigid cases of food, juices, or wine at the grocery store, there is a good chance those cardboard cases were manufactured using LD Davis adhesives too.

Situation

The LD Davis manufacturing facility needed to replace four existing fountain blenders that were old, worn out, caused unwanted lumps, and no longer met their needs. The original equipment was spread out over two levels making the equipment cumbersome to access and operate. Heat generated from the mixing process often created lumps, resulting in material bridging. The facility needed a higher capacity system that was safer, faster, easier to run, more efficient, and able to process much higher volumes.

Mathias Lee, the principal of Lee Process Equipment® (LPE), has a long working relationship with Plant Manager Patrick Bryant that began well over three years ago. Knowledge and understanding of the application and Lee's industry expertise were crucial in being selected to design and implement the new bulk material handling system.

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Technical gelatin granules with various viscosities arrive at the Monroe, NC plant in bulk bags.

Technical gelatin granule, which comes in various viscosities, is mixed to precise laboratory specifications for each customer's individual needs.

Requirements

The new bulk material handling system needed to:

1. **Empty bulk bags of technical gelatin granules with various viscosities.**
2. **Convey the gelatin granules to a screener.**
3. **Screen the gelatin granules to filter out impurities and lumps.**
4. **Blend a significantly higher volume of raw materials with different viscosities to meet specific lab requirements without product degradation, clumping, or material bridging.**
5. **Fill bulk bags and smaller 50 lb. bags per customer needs.**
6. **Maximize safety with a hazard analysis and risk mitigation study for a system designed to the highest safety levels including SIL 4 safety measures.**
7. **Minimize operator time and be a 'one person operation.'**
8. **Minimize process time through every step, including raw material bulk bag unloading, conveying time, screening time, mixer loading time, mixing time, and bulk bag filling, and 50 lb. bag packing time.**
9. **Minimize the factory floor footprint.**
10. **Improve equipment accessibility and layout.**

Solution

Based on years of bulk material handling industry experience in conjunction with a strong mix of expert equipment suppliers, Lee Process Equipment was chosen to design and install a new bulk material handling system. Lee worked closely with Bryant and his team to thoroughly assess the existing challenges and needs of the Monroe plant. The result is a state-of-the-art, reliable bulk material handling solution that resolves all previous challenges and increases production capacity by 60%.

1. **LPE recommended the installation company that was contracted to manufacture a steel structure with a mezzanine to secure all equipment for maximum stability and safety safely.**
2. **Bulk bags of selected raw materials are emptied with a Spiroflow T2 bulk bag discharger.**
3. **The materials are conveyed from the bulk bag discharger to a screener via a Spiroflow FSC412-B flexible screw conveyor fitted with a flat spiral which can convey up to 275 cubic feet of material per hour.**
4. **Raw materials are fed through a screener that is located above a MIXSYS Ploughshare mixer. Large particles and foreign materials caught by the screen are discharged to a 55-gallon drum.**
5. **Screened materials are then mixed by the MIXSYS Ploughshare 3D mixer fitted with three chopper motors. The mixer is designed with air purged bearings and a specialty discharge design. This massive mixer can mix up to 3 bulk bags of material at a time.**

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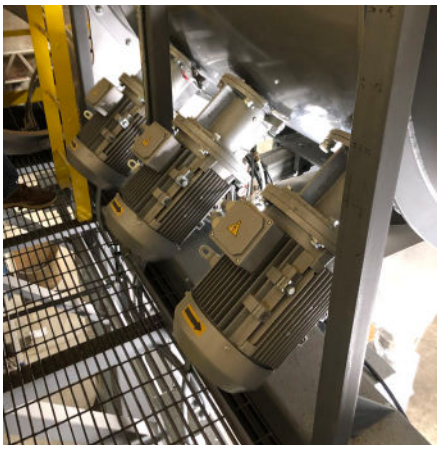
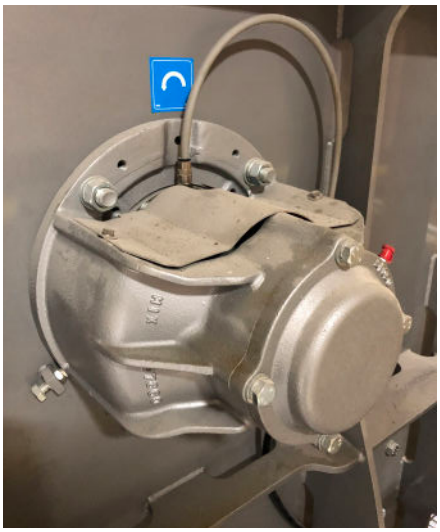


Three chopper motors on the mixer help incorporate liquids quickly.

An automatic sampler allows samples to be taken from inside the mixer without the need to open the mixer or stop the system.



The mixer's shaft bearings are air purged to prevent material from damaging them.

MIXSYS Ploughshare Mixers are the most efficient mixers globally and consist of a horizontal cylindrical container with multiple plow-shaped shovels mounted on the main shaft. The mixer volume can vary by 15 - 85%, allowing for various batch sizes and increased flexibility in only one machine. The size, number and positioning, geometric shape, and peripheral speed of the mixing elements are precisely coordinated to produce a three-dimensional whirling cross action for optimal, efficient product movement. The complete mixing chamber becomes an 'active zone,' whereby the entire product is constantly involved in the mixing process. This eliminates 'dead zones' or low-movement zones inside the mixer. The design and construction guarantee fast, precise, predictable, and homogenous mixing.

The mixing tools are specially designed to lift the material from the internal wall of the mixer without smashing the particles against the chamber wall. This reduces the risk of product degradation resulting in an ideal mixer for LD Davis' products and applications, particularly the need to mix multiple materials of varying bulk densities.

6. The mixed material is then released into an existing bulk bag filler fitted with a floor scale or an existing 55-lb sack packer.
7. The filled bags are removed and shipped to the customer.
8. All equipment is operated via a custom programmed Spiroflow Automation Solutions control system utilizing various safety relays for simple, safe, and reliable operation.
9. Various Lorenz clamps were included in the design.
10. Lee Process Equipment supplied flexible connections where required.

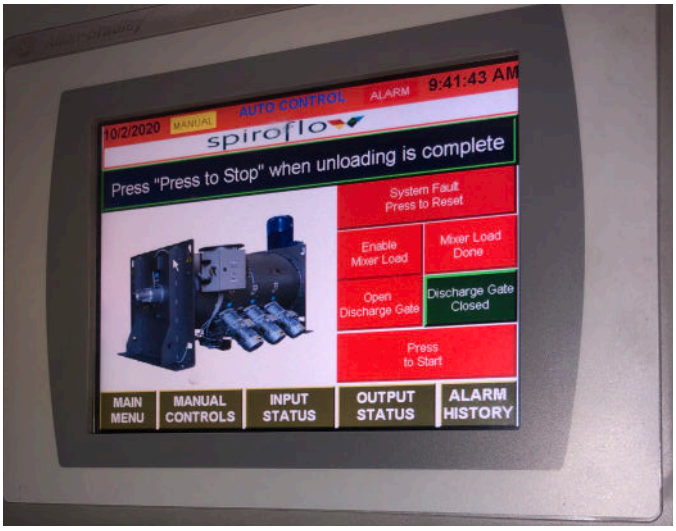
Results

The new bulk material handling system meets and/or exceeds all of the original requirements. Patrick Bryant and his team couldn't be happier. Bryant stated, "*LPE and their associate vendors could not have made this project any more accessible. We have a system design that will last well into the future, creating the best product possible for our customers. We look forward to future projects with LPE.*" Measurable improvements include:

- Operator safety was significantly increased with Spiroflow's comprehensive control systems fitted with safety relays to operate each new piece of capital equipment.
- Operator labor was reduced by 40%.
- Mixing capacity increased from 3,000 lb. to 4,000 lb. (33% improvement).
- The time to fill the mixer was reduced from 30-40 minutes to 10-15 minutes (64% improvement).
- Mixing time was exponentially reduced thereby exceeding LD Davis' expectations.
- Material degradation was eliminated.
- Material bridging is no longer an issue, and the resulting mixture is free from lumps.
- Ergonomic Footprint: The original configuration was spread out over two levels and required 640 sq ft of factory floor space. The new system occupies a compact area requiring only 240 sq ft (62.5% reduction). Access to the top of the flexible screw conveyor, screener, and mixer is provided via the steel mezzanine.

The Spiroflow T2 bulk bag unloader with an integral sack tip station and FSC412-B flexible screw conveyor delivers raw materials to the screener on the mezzanine level above.

The top of the flexible screw conveyor, screener, and mixer is easily accessed from the mezzanine level.

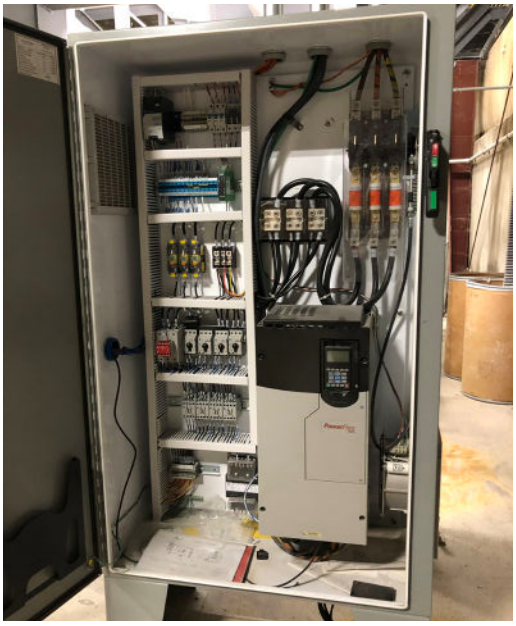


The custom Spiroflow Automation master control panel enables the safe operation of the entire bulk material handling system.

The heavy-duty, interlocked door on the front of the MIXSYS mixer allows for safe operator access.

LD Davis' new bulk material handling system meets and/or exceeds all of the original requirements.

Plow-shaped mixing tools inside the MIXSYS Ploughshare mixer carefully and thoroughly mix high volumes of materials with different particle sizes with minimal product degradation.



All of the mixer motor starters and drives are housed within this well-designed Spiroflow Automation control panel.

How can Lee Process Equipment help your business?

Contact us today to discuss your specific processing needs.