PNEUTECH ENGINEERING

Industry Focus: Food

Sugar Conveying System for an Ingredient Supplier

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Automating Sugar Conveyance: A Clean, Efficient Solution for Ingredient Suppliers

This case study details the design and implementation of a horizontal and vertical screw conveyor system to reliably and hygienically transport granulated sugar into a sugar liquifying tank for an ingredient supply company. The manufacturer needed to replace its antiquated process, which posed contamination risks, created dust, and was constantly breaking down.

Client Overview

An liquid sugar supplier was experiencing bottlenecks and safety concerns related to its sugar-handling process. Workers manually loaded 50 pound bags and 2000 lb super sacks of sugar into an inclined auger that fed a liquifying tank, a process prone to human error and spillage. The existing process also created sugar dust, a combustible material, and did not meet the company's stringent food-grade hygiene standards.

Challenges Identified

- The client needed a clean, automated solution to feed granulated sugar into a mixing tank located on a mezzanine level 10 feet above the ground floor. The system had to meet strict food safety regulations and fit within a confined, existing plant layout. Key challenges included:
- • Preventing contamination: The system needed a sealed, food-safe design to prevent foreign material from entering the sugar stream.
- • Eliminating dust: The automated system had to operate without creating airborne sugar dust, reducing the risk of a combustible dust explosion and improving air quality.
- • Achieving elevation: The conveyor system needed to lift the sugar from a ground-level feeding station to the top of the mixing tank.
- • Space constraints: A standard inclined conveyor was not feasible due to the limited floor space.
- • Maintaining consistency: The system needed to deliver a consistent, metered flow of sugar to ensure batch accuracy for the final product.

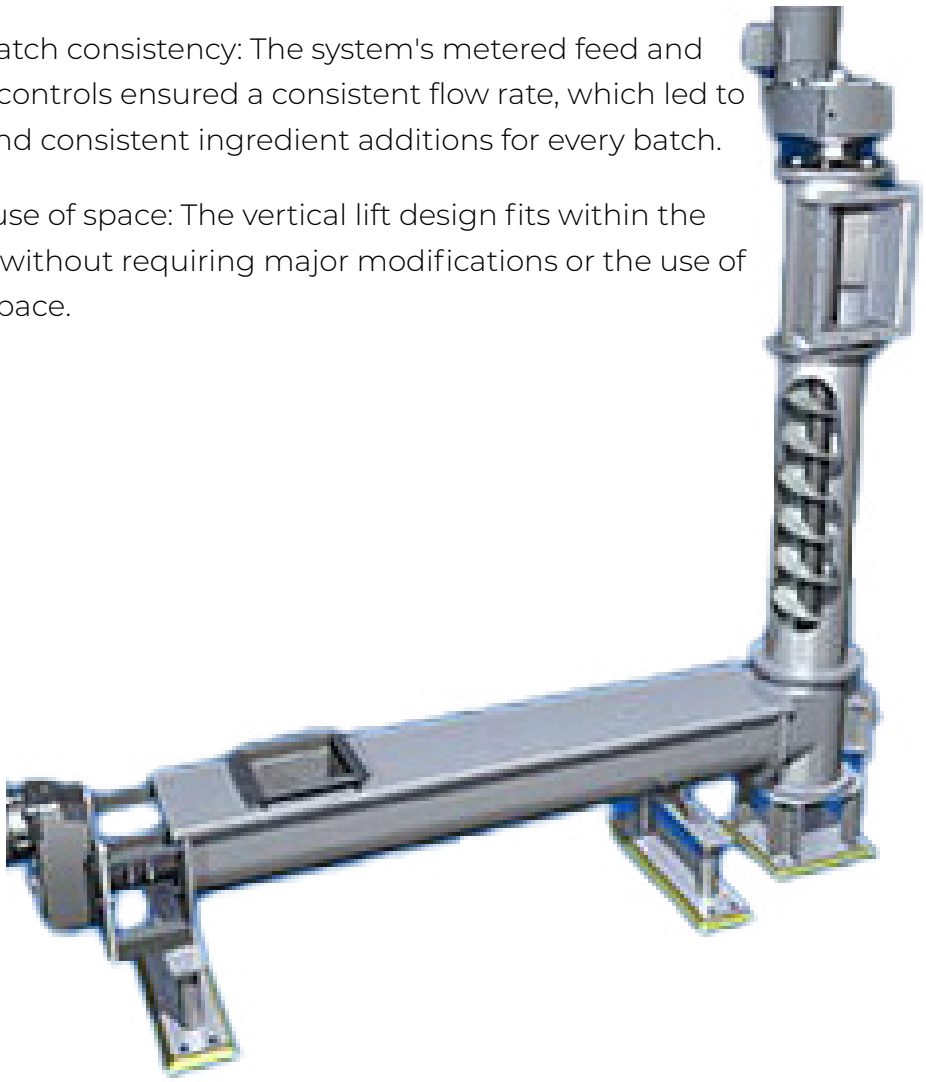
Solving Space & Safety Challenges with a **Vertical Screw Conveyor System**

Solution

- The proposed solution featured an arrangement of two screw conveyors: a horizontal feeder and a vertical lift, both constructed from food-grade 304 stainless steel.
- 1. Horizontal screw feeder
- • Function: To collect sugar from the bulk-bag unloader and deliver it to the inlet of the vertical conveyor.
- • Design: The horizontal conveyor was designed with specialized flights to ensure smooth, consistent material flow.
- o Cut flights: Used at the inlet to create a shearing action, helping to break up any small lumps that might form in the stored sugar.
- o Standard flights: At the end of the conveyor, standard flights ensured a smooth, controlled discharge into the vertical conveyor's inlet.
- • Benefits: This configuration prevented material bridging and ensured a uniform feed rate into the vertical lift.
- 2. Vertical screw conveyor
- • Function: To elevate the sugar from the horizontal feeder's outlet to the inlet flange on the mixing tank 10 feet above.
- • Design: A tubular casing with a single, continuous, close-fitting screw was selected.
- o Compact footprint: This design was chosen specifically for its minimal footprint, making it ideal for the confined space of the mezzanine.
- o Inlet and outlet: The vertical conveyor's inlet received the sugar from the horizontal feeder, and a top-mounted angled outlet discharged the sugar directly into the mixing tank.
- • Benefits: The vertical design saved significant floor space compared to an inclined model and provided an efficient, enclosed method for vertical material transfer.

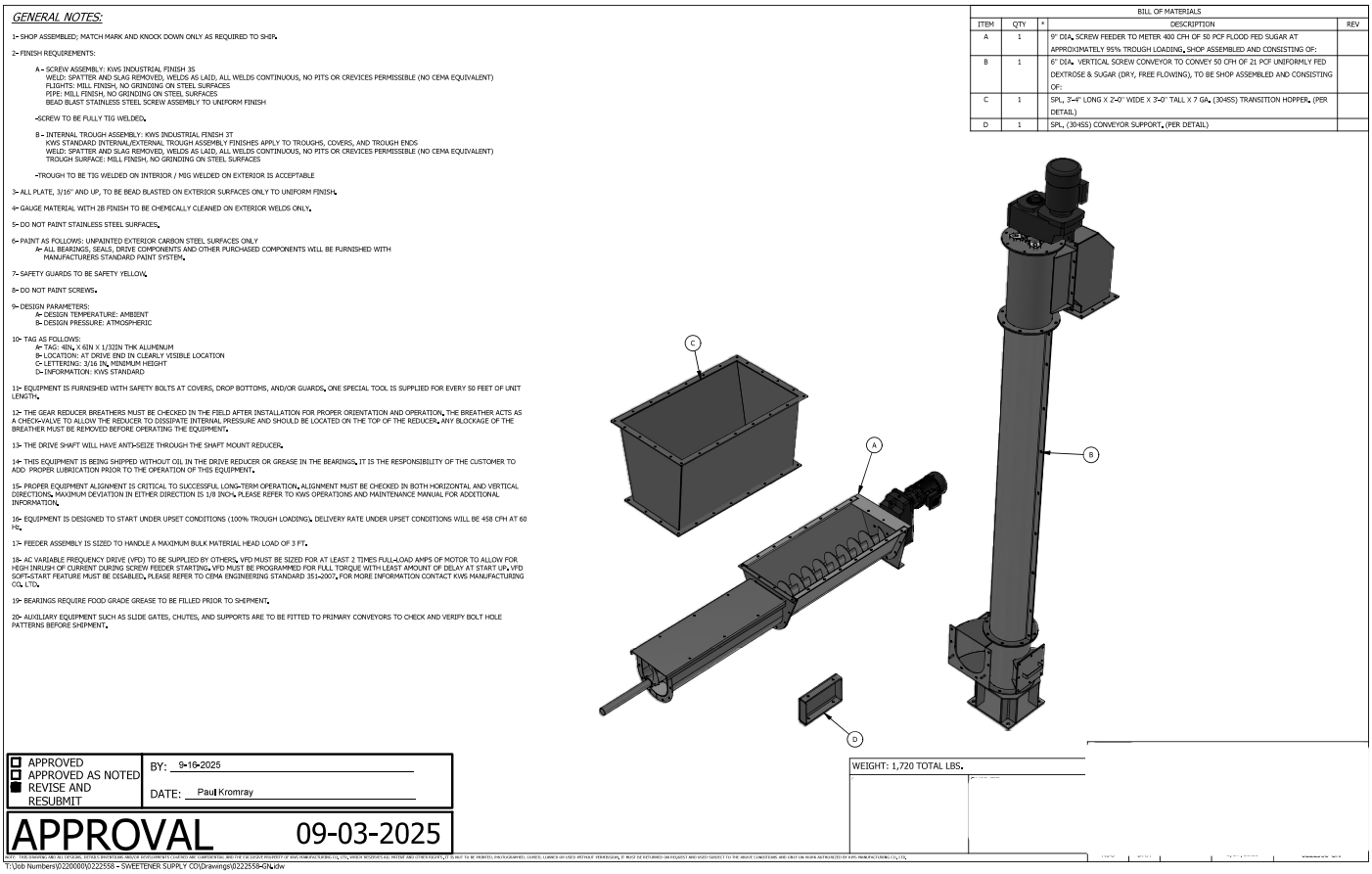
Results

- The installation of the horizontal and vertical screw conveyor system resulted in immediate and measurable improvements for the ingredient manufacturer:
- · Enhanced safety: The completely enclosed system eliminated manual lifting, significantly reducing the risk of injury. Furthermore, the contained transfer of sugar eliminated the danger of airborne dust, creating a much safer work environment.
- · Improved hygiene: Constructed from 304 stainless steel with smooth, easy-to-clean surfaces, the system met all food-grade requirements and allowed for fast and simple washdowns.
- · Increased efficiency: The new automated system eliminated production delays caused by manual feeding and spillage. This allowed operators to focus on other tasks, improving overall productivity and helping the company meet production goals.
- · Improved batch consistency: The system's metered feed and variable speed controls ensured a consistent flow rate, which led to more precise and consistent ingredient additions for every batch.
- · Optimized use of space: The vertical lift design fits within the existing facility without requiring major modifications or the use of valuable floor space.



Conclusion

- By implementing a specialized horizontal and vertical screw conveyor system, the ingredient supplier successfully transitioned from a manual, inefficient, and unsafe sugar-handling process to a automated, hygienic, and safe solution. The project not only solved a critical production bottleneck but also improved worker safety and ensured the consistent quality of the final product.



GENERAL NOTES:

1- SHOP ASSEMBLED; MATCH MARK AND KNOCK DOWN ONLY AS REQUIRED TO SHIP.

2- FINISH REQUIREMENTS:

A - SCREW ASSEMBLY: KWS INDUSTRIAL FINISH 3S
WELD: SPATTER AND SLAG REMOVED, WELDS AS LAID, ALL WELDS CONTINUOUS, NO PITS OR CREVICES PERMISSIBLE (NO CEMA EQUIVALENT)
FLIGHTS: MILL FINISH, NO GRINDING ON STEEL SURFACES
PIPE: MILL FINISH, NO GRINDING ON STEEL SURFACES
BEAD BLAST STAINLESS STEEL SCREW ASSEMBLY TO UNIFORM FINISH

-SCREW TO BE FULLY TIG WELDED.

B - INTERNAL TROUGH ASSEMBLY: KWS INDUSTRIAL FINISH 3T
KWS STANDARD INTERNAL/EXTERNAL TROUGH ASSEMBLY FINISHES APPLY TO TROUGHS, COVERS, AND TROUGH ENDS
WELD: SPATTER AND SLAG REMOVED, WELDS AS LAID, ALL WELDS CONTINUOUS, NO PITS OR CREVICES PERMISSIBLE (NO CEMA EQUIVALENT)
TROUGH SURFACE: MILL FINISH, NO GRINDING ON STEEL SURFACES

-TROUGH TO BE TIG WELDED ON INTERIOR / MIG WELDED ON EXTERIOR IS ACCEPTABLE

3- ALL PLATE, 3/16" AND UP, TO BE BEAD BLASTED ON EXTERIOR SURFACES ONLY TO UNIFORM FINISH.

4- GAUGE MATERIAL WITH 2B FINISH TO BE CHEMICALLY CLEANED ON EXTERIOR WELDS ONLY.

5- DO NOT PAINT STAINLESS STEEL SURFACES.

6- PAINT AS FOLLOWS: UNPAINTED EXTERIOR CARBON STEEL SURFACES ONLY
A- ALL BEARINGS, SEALS, DRIVE COMPONENTS AND OTHER PURCHASED COMPONENTS WILL BE FURNISHED WITH MANUFACTURERS STANDARD PAINT SYSTEM.

7- SAFETY GUARDS TO BE SAFETY YELLOW.

8- DO NOT PAINT SCREWS.

9- DESIGN PARAMETERS:
A- DESIGN TEMPERATURE: AMBIENT
B- DESIGN PRESSURE: ATMOSPHERIC

10- TAG AS FOLLOWS:
A- TAG: 4IN. X 6IN X 1/32IN THK ALUMINUM
B- LOCATION: AT DRIVE END IN CLEARLY VISIBLE LOCATION
C- LETTERING: 3/16 IN. MINIMUM HEIGHT
D- INFORMATION: KWS STANDARD

11- EQUIPMENT IS FURNISHED WITH SAFETY BOLTS AT COVERS, DROP BOTTOMS, AND/OR GUARDS. ONE SPECIAL TOOL IS SUPPLIED FOR EVERY 50 FEET OF UNIT LENGTH.

12- THE GEAR REDUCER BREATHERS MUST BE CHECKED IN THE FIELD AFTER INSTALLATION FOR PROPER ORIENTATION AND OPERATION. THE BREATHER ACTS AS A CHECK-VALVE TO ALLOW THE REDUCER TO DISSIPATE INTERNAL PRESSURE AND SHOULD BE LOCATED ON THE TOP OF THE REDUCER. ANY BLOCKAGE OF THE BREATHER MUST BE REMOVED BEFORE OPERATING THE EQUIPMENT.

13- THE DRIVE SHAFT WILL HAVE ANTI-SEIZE THROUGH THE SHAFT MOUNT REDUCER.

14- THIS EQUIPMENT IS BEING SHIPPED WITHOUT OIL IN THE DRIVE REDUCER OR GREASE IN THE BEARINGS. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO ADD PROPER LUBRICATION PRIOR TO THE OPERATION OF THIS EQUIPMENT.

15- PROPER EQUIPMENT ALIGNMENT IS CRITICAL TO SUCCESSFUL LONG-TERM OPERATION. ALIGNMENT MUST BE CHECKED IN BOTH HORIZONTAL AND VERTICAL DIRECTIONS. MAXIMUM DEVIATION IN EITHER DIRECTION IS 1/8 INCH. PLEASE REFER TO KWS OPERATIONS AND MAINTENANCE MANUAL FOR ADDITIONAL INFORMATION.

16- EQUIPMENT IS DESIGNED TO START UNDER UPSET CONDITIONS (100% TROUGH LOADING). DELIVERY RATE UNDER UPSET CONDITIONS WILL BE 458 CFH AT 60 Hz.

17- FEEDER ASSEMBLY IS SIZED TO HANDLE A MAXIMUM BULK MATERIAL HEAD LOAD OF 3 FT.

18- AC VARIABLE FREQUENCY DRIVE (VFD) TO BE SUPPLIED BY OTHERS. VFD MUST BE SIZED FOR AT LEAST 2 TIMES FULL-LOAD AMPS OF MOTOR TO ALLOW FOR HIGH INRUSH OF CURRENT DURING SCREW FEEDER STARTING. VFD MUST BE PROGRAMMED FOR FULL TORQUE WITH LEAST AMOUNT OF DELAY AT START UP. VFD SOFT-START FEATURE MUST BE DISABLED. PLEASE REFER TO CEMA ENGINEERING STANDARD 351-2007. FOR MORE INFORMATION CONTACT KWS MANUFACTURING CO., LTD.

19- BEARINGS REQUIRE FOOD GRADE GREASE TO BE FILLED PRIOR TO SHIPMENT.

20- AUXILIARY EQUIPMENT SUCH AS SLIDE GATES, CHUTES, AND SUPPORTS ARE TO BE FITTED TO PRIMARY CONVEYORS TO CHECK AND VERIFY BOLT HOLE PATTERNS BEFORE SHIPMENT.

BILL OF MATERIALS

ITEM	QTY	*	DESCRIPTION	REV
A	1		9" DIA. SCREW FEEDER TO METER 400 CFH OF 50 PCF FLOOD FED SUGAR AT APPROXIMATELY 95% TROUGH LOADING. SHOP ASSEMBLED AND CONSISTING OF:	
B	1		6" DIA. VERTICAL SCREW CONVEYOR TO CONVEY 50 CFH OF 21 PCF UNIFORMLY FED DEXTROSE & SUGAR (DRY, FREE FLOWING), TO BE SHOP ASSEMBLED AND CONSISTING OF:	
C	1		SPL. 3'-4" LONG X 2'-0" WIDE X 3'-0" TALL X 7 GA. (304SS) TRANSITION HOPPER. (PER DETAIL)	
D	1		SPL. (304SS) CONVEYOR SUPPORT. (PER DETAIL)	

APPROVED
APPROVED AS NOTED
REVISE AND RESUBMIT

BY: 9-16-2025

DATE: Paul Kromray

APPROVAL 09-03-2025

WEIGHT: 1,720 TOTAL LBS.

T:\Job Numbers\0220000\0222558 - SWEETENER SUPPLY CO\Drawings\0222558-01.idw

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ENGINEERING

30W270 Butterfield Rd,
Warrenville, IL 60555

P. +1 630.983.6111

E. jdorjath@pneutechengineering.com

E. dgawlik@pneutechengineering.com