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DRY RUN

Why Chinese demand continues to dominate the dry bulk market

DUSTING DOWN

New solutions to prevent dangerous dust build-up

COVER UP

How the latest hull paints improve vessel performace

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TAKING CONTROL

Working closely with Martin Engineering Brazil, T-Grão Cargo – located at Latin America's busiest port, Santos in São Paulo, Brazil – saw its dust control efforts improve exponentially

Although fugitive dust particles from virtually any dry cargo can lead to respiratory issues, grain dust emissions possess allergenic properties over and above the common air quality concerns, increasing the number of people who experience negative effects. To prevent this having an impact on the local community and adjacent docks with dust caused by the transfer of agricultural commodities, T-Grão Cargo – located at the Port of Santos in São Paulo, Brazil – decided to seek professional help to mitigate the issue.

"We have a complicated geographic position, because we are between a passenger terminal to the north and the Brazilian Navy to the south, and across the street from the port authority," explains Vinicius Pina, operations director for T-Grão.

PORT AND TERMINAL

The Port of Santos is the busiest port in Latin America, spanning approximately 8km^2. With nearly 1,500 people working in the port on a daily basis and 1.1m passengers boarding and disembarking ships annually, the area is always bustling, so authorities monitor air quality closely to ensure safety.

Operating since 1998 at Terminal 26 on the Northern end of the quay

closest to the passenger terminal, T-Grão manages the import and export of over 4m st/y (3.6m mt/y) of malt, wheat, soy and maize. The company maintains 42 concrete silos and eight massive metal silos, totalling 126,000st (114,000mt) of storage capacity.

Spanning 14,000m^2 of dock space, the company is considered one of the smallest grain terminals in Brazil, but processes more grain per square metre than larger competitors, making it the most efficient operation of its kind in the country. Offering customs clearance, cargo delivery and reception, logistics and warehousing services, T-Grão serves a variety of customers from international importers to farmers across the State of São Paulo.

"As our production has increased over the years, so have fugitive dust emissions," says Pina. "We've worked closely with regulators and neighbours to address air quality issues."

PARTICLES AND PEOPLE

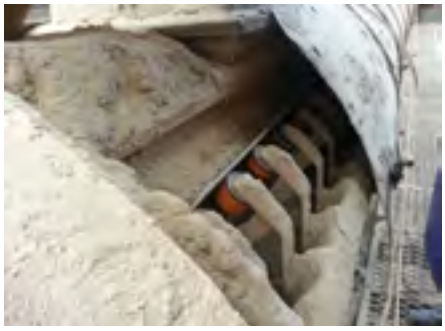
Transfer points at T-Grão range between 10-15m in height. As material was dropped from one belt to the next, the impact created turbulent air pressure that forced dust out of openings in the chute. The fugitive emissions significantly lowered air quality and visibility in the immediate work areas, forcing workers to wear protective masks when working around any part of the conveyor system. The dust often travelled beyond the site line.

The Santos Estuary — the waterway that serves the port — is partially protected from high winds off the Atlantic by a wind shadow created by high-rise buildings and hilly terrain along the coast. The placement of Terminal 26 in the northern part of the port, however, leaves it exposed to wind travelling up the estuary. Depending on the direction and force of the wind, dust created at the transfer points had the potential to travel long distances.

"Complaints were fairly common, and our proximity to the port authority allowed an immediate response from inspectors," Pina says. "When we received a complaint, we acted to address the issue right away, but we needed a long-term solution."

BATTLING DUST

Utilising a cleaning crew of 45 workers for 24 hours per month, the inner and outer areas were thoroughly cleaned on a regular basis. "The investment for



cleaning equipment just to control dust build-up was high," Pina explains. "Along with using brooms and other basic equipment, we purchased an expensive Italian-made sweeper. Overall, the cleaning took personnel away from other operations, spanned large areas of the dock and warehouse, and actually ended up mobilising the dust particles while it was being done."

Operators first sought an answer to the dust by bringing in an equipment manufacturer that installed a new transfer chute. This was intended to contain dust from the discharge flow as it fell on to the belt. What it did not do was control emissions at the loading zone where the impact would cause plumes of dust to escape. The dust filtration system attached to the settling zone chute was inadequate, due to the volume of emissions and the chute design.

"At one point, a breakdown caught us unprepared at a critical moment and resulted in costly unscheduled downtime," says Pina.

RETHINKING THE TRANSFER

With complaints still periodically coming in from neighbours and ongoing internal air quality issues, T-Grão turned to Martin Engineering Brazil and two other suppliers, asking all three to propose solutions within their budget. Martin technicians discovered that, due to the height of the transfer chute, dust created by the impact of material was most turbulent at the loading zone. When it hit the belt, pressure within the loading chute increased, pushing particulates at a high velocity out of any gap that was not sealed. Moreover, because of inadequate cleaning of the belt's surface at the discharge zone, fines clung to the belt causing carryback on the return side, which led to spillage and dust along the entire conveyor path.

The result was large amounts of fugitive dust in the area, reducing air quality and visibility, settling on all surfaces and fouling rolling components. Seizing idlers contributed to belt mistracking and spillage, further increasing operating costs for cleaning, maintenance and downtime.

After preparing a detailed report and proposal, Martin Engineering was chosen to install a series of components that together created a total transfer point solution. Beginning with a tail sealing box, the approach also included a skirt board cover, dust bags, impact cradle, slider cradles, track-mount idlers and a belt tracker, completed by a heavy-duty belt cleaner.

"We found that Martin offered the most effective and easily maintained solution within our budget," Pina says.

CONTROLLING AIRFLOW

Uncontrolled airflow and improper sealing through the loading and settling zone is the main culprit in the creation of dust and spillage in the transfer area, and it starts with the tail pulley. Protecting the tail pulley is important because fouling of the pulley's surface can lead to belt slippage and drift as the belt is entering the loading zone. Uneven loading worsens mistracking and breaks down the belt seal on the skirt board, causing spillage and dust emissions. Installed on the rear of the chute work, the tail sealing box effectively stops dust emissions from the rear of the chute, protecting the pulley.

A vital component of the design was containing, lengthening and increasing the interior space of the settling zone. Along the entire length of the chute is Martin's unique apron seal, designed to mitigate dust emissions and spillage

due to turbulence and cargo shifting. A skirtboard cover is used to contain even fine dust particles and further reduce debris "shedding". The structure controls airflow so fine particulates are directed toward two new dust bags installed above the chute, while heavier airborne dust is given space to settle without leaving the chute environment.

To control the turbulent pressure build-up from material dropping on to the belt, a heavy-duty impact cradle features a top layer of low-friction UHMW polymer moulded to a base of impact-absorbing SBR rubber, all reinforced with a steel support structure able to withstand as much as 17,000 pounds (53.4 to 75.6 kN) of force. The cradle protects against impact and friction wear on the belt as it glides over the bars, with no rolling components to break down, which reduces maintenance and prolongs operational life.

Extending from the impact cradle down the length of the settling zone are slider cradles that retain a tight belt seal and a smooth path through the settling zone to mitigate dust creation. Using a smooth UHMW polymer "box bar" engineered to prevent heat build-up, the unique design provides dual-wear surfaces for extended equipment life.

By supporting the edges of the belt to eliminate sag, the cradles prevent spillage, stabilising the belt's path and helping the skirting retain a tight seal. To offer further belt support, Martin's track-mounted idlers are placed in the tight spaces between cradles to retain a straight belt profile, preventing "pinch points" that can damage the belt over time and sag points that allow spillage. Designed with sliding frames on a stationary base, rolling components are easily installed and serviced.

After the belt leaves the settling zone, a belt tracker minimises the belt wander that can be caused by uneven cargo loading. Precise alignment keeps the belt from contacting the conveyor structure and causing edge damage and spillage, ensuring that the material enters the discharge zone properly centred for optimal flow, transfer and belt cleaning.

To conclude the total system solution, Martin Engineering technicians installed a primary belt cleaning blade and spring tensioner system designed to keep a tight seal across the blade profile with minimal wear on the belt or splice. Utilising the Constant Angle Radial Pressure ("CARP") curved blade, the system maintains the most efficient cleaning angle through the life of the blade. Mounted with a minimal footprint on the head chute, the cleaner improves discharge of fine material, reducing carryback, spillage and dust emissions along the return path.

As a compliance measure, technicians also installed safety guards to prevent reach-in hazards. To inspect and monitor the system operations, sealed access hatches allow safe observation and maintenance of components.

RESULTS

When the conveyor was activated, operators immediately observed significant results. As material moved through the system, particulates remained within the enclosure and either collected in the dust bags or settled back into the cargo flow.

Along with less carryback on the return side of the belt, dust was drastically reduced in the immediate area around the conveyor system at both the loading and discharge zones.

"It was a substantial improvement over the previous design," Pina says. "The staff no longer need to wear protective gear just to enter the area and visibility is improved."

After a lengthy observation period, operators report that there has been less downtime for clean-up and maintenance, as well as improved workplace safety. In addition, managers have enjoyed a reduction in complaints from neighbours and less scrutiny from authorities inspecting the port for air quality.

"Our dust control efforts have set an example that is now being considered by terminals up and down the port," Pina concludes. "We are now planning to install a similar design on several of our other transfer points."