

Fertilizer handling: combining productivity with a clean environment

With the value of the global fertilizer market exceeding more than US\$150 billion in 2019, this industry is a key player in the economies of many countries worldwide, says materials handling and niche process plant specialist DemcoTECH Engineering. At the same time, however, the fertilizer industry faces many challenges from sustainability to regulatory hurdles, with the biggest plant issues being that of corrosion and particle degradation, according to DemcoTECH GM, Paul van de Vyver. Therefore, chute design and corrosion protection on fertilizer installations are key design elements to mitigate any negative impact on the product while being both conveyed and stored, as well as on the plant life.

“In addition, skilful design of materials handling systems and the careful selection of appropriate materials and technologies not only limit particle degradation but also dust generation by thorough attention to the number of transfer points,” adds van de Vyver.

DemcoTECH's wide experience in the design of storage and conveying systems for fertilizer and related materials includes a mobile ship offloading and warehouse distribution system for Grindrod Terminal's fertilizer distribution and storage facility at Maydon Wharf in Durban, KwaZulu-Natal (KZN), South Africa. The system replaced a trucking system with major improvements in the productivity and costs of the existing operation.

“We designed a high level of flexibility into the system, making use of mobile (grasshopper) conveyors on the jetty and multi-point continuous discharge shuttle conveyors retrofitted into the existing



Grindrod Terminal's fertilizer storage facility at Maydon Wharf: mobile ship offloading using 'grasshopper' conveyors.

warehouse,” says van de Vyver.

The four 800tph (tonnes per hour), 1,050mm mobile (grasshopper) tyre-mounted conveyors are easily positioned along the jetty at locations to suit the various ship size and docking requirements. The fertilizer is offloaded using the ship's grabs which feed fertilizer into receiving hoppers located on the grasshopper conveyors. The fertilizer is then conveyed to a central 36m-long pivoting and retractable conveyor straddling the quayside, which in turn feeds fertilizer into the existing warehouses.

The existing warehouse roof structure was modified to incorporate the five 98m-long, reversible, multi-point discharge shuttle conveyors. These conveyors feed product into the individual warehouse bays,

with fully sequenced automatic starting and stopping of the systems ensuring a seamless operation.

“As a result, this design eliminated blockages or hang-ups, and the facility also has the ability to handle different types and grades of fertilizer.”

Also contracted by Grindrod for a project located in KZN, DemcoTECH was responsible for the entire design and supply of the materials handling for a 4mtpa (million tonnes per annum) multiple product terminal at Richards Bay. In addition to rock and coal, the terminal handles phosphates and sulphur, being two critical components in the fertilizer industry.

“The use of pipe conveyors and enclosed warehouse storage with trippers, amongst other technologies, protects the environment and the product from mutual contamination from storage through to ship loading,” notes van de Vyver.

In a recent project, DemcoTECH delivered a complex EPC contract, awarded by the SYS & McConnel Dowell joint venture (SMJV), for the sulphur handling system for the refinery and petrochemical integrated development (RAPID) project and associated facilities in Pengerang, Southern Johor, Malaysia.

The contract covered design and engineering through to commissioning of a granular sulphur handling system, which had stringent environmental regulations that had to be adhered to.

“The materials handling system offloads sulphur prills delivered by tip trucks, to stack the material onto a 30,000-tonne



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capacity stockpile and then innovatively reclaims and transports the sulphur in an environmentally friendly manner via a multi-curved pipe conveyor and mobile ship loader into 15,000dwt vessels,” says van de Vyver.

“In order to meet the strict environmental regulations, we designed advanced features into the sulphur handling system, including a multi-curved 2.2km-long pipe conveyor system, enabling optimisation of the system in order to reduce the number of transfer points and enhancing the plant significantly for the client.

“The inclusion of a state-of-the-art telescopic chute on the shiploader also reduced the potential for spillages and dust generation.”

Johannesburg-based DemcoTECH has extensive experience working on major international projects, particularly in South-east Asia. As a result, adds van de Vyver, it was able to bring this experience to overcome the various risks the project posed, such as language barriers, monsoon weather conditions and inclement weather patterns. In addition, a major risk to the engineering phase was sourcing the design of the structures’ members in the region to suit the climatic conditions.

ADVANCED TECHNOLOGIES

DemcoTECH provides a total solution to the storage and handling of bulk materials,

with its expertise and range of advanced technologies enabling it to provide a custom design tailored to the client’s needs. Such solutions include both enclosed and open storage, conveying open and enclosed systems, mobile conveyors and stackers on dumps, as well as ancillary equipment such as dust suppression and control. All equipment it designs and installs complies with international environmental and safety standards.

“Systems such as warehouses and enclosed stockpiles are ideally suited to sectors such as the fertilizer industry, preventing contamination of product by the external environment and vice versa,” says van de Vyver.

“Similarly, conveying technologies, such as the DemcoTECH pipe conveyor and aero conveyor technologies provide an environmentally friendly and highly efficient solution for such industries, offering opportunities to reduce the number of conveyor flights, eliminate transfer points, minimise spillage, reduce the conveying distance and save total costs.

“Comprising both fabric and steel cord belting, and with up to 2,250tph conveying capacity, pipe conveyors can be designed using a triangular tubular gantry fitted with a mobile maintenance trolley, thus eliminating walkways along the conveyor length.

“We also engineer and supply two-way and multiple curve pipe conveyors having

drives distributed at the head and tail end,” says van de Vyver.

Resembling a conventional troughed conveyor at its tail end where the material is loaded, the pipe conveyor’s open belt is formed into a tubular shape as it passes through transition idlers, giving it its ‘pipe conveyor’ name. This ‘pipe’ shape enables the conveyor to be curved through vertical and horizontal curves that are far tighter than is possible with troughed conveyors, while at the same time retaining the high-capacity, long-distance conveying capability of troughed conveyors.

At the terminal point the belt opens up for material to be discharged in the same way a troughed conveyor is discharged. On the return-side, the belt is also formed into a ‘pipe’ shape and can be used to transport material in the opposite direction, with significant cost advantages.

DemcoTECH offers its services to the power generation, fertilizer, cement, mining, metallurgical, manufacturing and port handling industries through flexible contracting mechanisms from EPCM to lump sum turnkey, including studies from concept design through to detailed feasibility studies. After-sales services include spares, maintenance, refurbishments and operational readiness packages covering procedures, systems and workplace tools required to successfully operate and maintain a new or upgraded plant.