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## Enviromist dust suppression system for NSS Townsville Rotabox operations

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A t Northern Stevedoring Services (NSS) the ever-increasing need to control dust emissions was recently tackled head on. NSS appointed the award-winning dust suppression company EnviroMist to develop a specialised system for its needs.

NSS handles a range of bulk mineral cargos within the Port of Townsville, which is in close proximity to the Townsville community and Great Barrier Reef Marine Park. Paramount to the success of NSS's operations is the management of air emissions; the company strives to be at the forefront of emissions control technology.

One of the main emissions challenges for NSS at its Townsville Port facilities is the control of fugitive dust during Rotabox ship loading operations. In order to combat this issue NSS challenged EnviroMist to develop a solution that would provide effective dust capture, efficient water use, and quick setup time.

EnviroMist is a provider of water spraying dust suppression solutions. The company won Bulk Handling Awards in 2015 and 2016 for systems developed for a West Australian iron ore mine (2015) and a Queensland underground coal mine (2016).

The EnviroMist high-energy micro-mist system is based on new research in the application of dust control technology. The techniques used focus on accurately identifying material properties and flow dynamics so that a total solution can be developed that is effective across the application's full operating range.

EnviroMist's use of simulation modelling allows efficient and accurate designs to be developed which results in systems producing high dust capture efficiencies without the need for huge water consumption. The new technology, proven to significantly reduce emissions of bulk loading and unloading operations, complements the state-of-the-art Qube Rotabox bulk loading system already employed by NSS.

The Rotabox system in use at NSS Townsville combines the use of a rotating frame and purpose-designed bulk containers with lockable lids to ensure zero fugitive dust emissions during transport.

The challenge set for NSS and EnviroMist was the design and implementation of a system that mitigates dust during Rotabox loading operations of lead, zinc and copper concentrates. The key objectives were:

- Reduction of exposure to TSP, PM10 and PM2.5 dust emissions
- Reduction in the weight of the spray bars to significantly reduce manual handling risk

- Fully conversant system, also compatible for unloading and hopper operations
- Control moisture addition to products
- Design and fabricate an effective dust suppression solution, including a quick installation and removal method (under 1hr)
- Design and fabricate mobile pressure booster unit to supply water from the wharf to the ship's deck level and to be able to service loading operations at two hatches simultaneously
- Remote operation of the system by crane operator with the ability to manually control sections based on wind direction/pressure

As always, the most important factor for any business is the wellbeing of its employees and the wider community. For this reason the reduction of particulate matter (dust) is of vital importance. PM10 and PM2.5 are commonly used size fractions referring to particulate matter that is particularly hazardous to humans due to its ability to be drawn deep into the lungs.

In order to reduce fugitive dust emissions of this size, EnviroMist, with the help of the University of Wollongong, analysed the droplet size of various sprays so that the droplets produced by the systems could be reduced to a size that would be optimum for capture of these dust particles. The droplet size distribution for the nozzle selected is shown in Figure 1.

In addition to analysing the droplet size it is important that the sprays are also positioned and operated such that they can deal with the airflow conditions present during the loading processes. In order to achieve this, measurements were taken of the airflow and the operating pressure required to deal with these conditions was selected accordingly.

As is often the case with designing systems like this there are competing variables, in this case using water spraying nozzles to reduce dust while trying not to increase the moisture content of the material. EnviroMist was able to achieve this requirement by balancing water flow and pressure so that the moisture content limitations were adhered to while still providing enough pressure to the sprays to ensure they would be effective in all conditions. especially challenging crosswinds.

Design of a system that would allow for quick install (<1hr) onto ships of varying size and hatch configurations was another



Figure 1: Droplet size distribution.



Figure 2: Quick installation system for spray bars.

**DUST CONTROL** 



Figure 3: EnviroMist pressure booster unit.

challenge. The solution EnviroMist developed was to utilise Magswitch technology to create a unique mounting system where the specially designed sprays are able to be lowered quickly into the hatch by personnel on the ship's deck.

The sprays are held in place at the desired position by the Magswitch magnets, which are on/off magnets able to hold in excess of 150kg. Figure 2 shows the set-up of the spray system on a single wall of a generic hatch; the spray is attached to the hatch via cables connecting to the Magswitch magnets on the ship's deck. The use of the Magswitch system was a key innovation that allowed not only quick set-up but also the flexibility to set up the system in all different hatch configurations.

System set-up speed was further enhanced by the pressure booster system that EnviroMist supplied in collaboration with Dana-Brevini. The pressure booster system is a completely mobile, diesel driven, twin pump unit. It allows up to two hatches to be operated at any one time. Finally, the unit was fitted with a wireless communication system allowing it to be operated wirelessly by the crane operator, with each pump being able to



Figure 4: Installed dust suppression system.



Figure 5: Installed dust suppression system.

be independently switched on and off depending on the loading sequence occurring. The completed pressure booster unit is shown in Figure 3.

Upon installation, the objectives have been achieved to the satisfaction of NSS. The system is easily and quickly installed within the one hour time frame that was set. Dust levels have been reduced effectively with no dust escaping the hatch, as a direct result of the combination of the EnviroMist dust suppression system and Rotabox loading system. Moisture levels have been controlled effectively with much of the mist that isn't contributing to dust capture simply evaporating or excessively wetting products. The system operating as installed is shown in Figures 4 and 5.

AWARDS 2016

Winner 2015

## NEW DEVELOPMENT IN DUST SUPPRESSION TECHNOLOGIES

## COAL MINES AND HARD ROCK MINES APPLICATIONS:

- ROM Bins
- Transfer Points / Chutes
- Crushers
- Conveyors
- Ship Loaders / Unloaders
- Construction Machinery
- Mining Machinery

- TURN-KEY PROJECTS TO CLIENT'S SPECIFICATION:
- System Design & Simulation
- Dust Flow Analysis
- Dust PSD Analysis
- Purpose Built Spray Nozzles
- Pressure Booster Units
- Installation
- System Commissioning

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