

Achieving Net Zero Fugitive Dust Emissions in Port Environments



Respirable Dust vs Visible Dust (Inhalable)



Human Hair

89 microns
0.089 mm



Inhalable Dust

< 100 microns
0.1 mm



Respirable Dust

< 10 microns
0.01 mm

- Visible dust, also known as inhalable dust can be up to 100 micron in size. Inhalable dust enters the nose or mouth during breathing and can settle anywhere in the respiratory tract.
- Respirable dust is too small to be seen with the eye, typically particles 10 micron or smaller, including PM10 and PM2.5
 - Respirable particles have the potential to penetrate the nose and upper respiratory systems and settle and deposit on the lungs.
 - Chronic exposure to respirable dust particles has the potential to impair many cellular functions throughout the body.

- PM10 refers to particulate matter 10um and below.
 - Highly regulated globally in mines and power plants.
 - This type of dust can easily reach the lungs without being blocked by the nasal passage or mucus membranes.
- PM2.5 refers to particulate matter 2.5um and below.
 - Less regulated globally, but even more dangerous due to the ability to bypass the mucus membranes and nasal passage filters completely.
 - Sources of particles include crushing or grinding operations.
 - May be formed in the air from the chemical change of gases. They are indirectly formed when gases from burning fuels react with sunlight and water vapor.

- Quartz particles
 - Can cause fibrous or scar tissue formation in the lungs, which reduce the lung's ability to extract oxygen from the air
 - Possible causes of lung cancer
- Silica in the dust
 - OSHA limit of 2.4 mg/m³ exposure (with 5% SiO₂)
 - Cause of pneumoconiosis, chronic obstructive pulmonary disease, and silicosis
- General Dust
 - Irritation, sneezing, general respiratory problems like bronchitis
- Explosion and fire hazards

- **Conduct a Site Survey listing all dust sources**
- **Estimate Uncontrolled Dust Emissions using EPA AP-42, “Compilation of Emission Factors”**
- **Specify RACM (Reasonably Available Control Measures) for each dust source.**
- **Estimate Controlled Dust Emissions to set a goal for control efficiency**
- **Implement the Plan with accountability for results.**
- **Monitor Performance to keep dust and dollars under control**





BENEFITS OF DUST CONTROL



- **MORE PRODUCTION** – Good dust control is good process control. If material is not removed from the process, it becomes useable later in the down the process stream.
- **MACHINERY LASTS LONGER** – Idlers, rollers, bearings and other machine components last longer when they are not spinning in dust.
- **BETTER MORALE** – Employees do not like working in dusty environments
- **FEWER ACCIDENTS** – It is safer to work in a cleaner environment where employees can see what they are doing. Insurance companies may reduce rates for plants the install dust control.
- **BETTER HEALTH** – Fewer sick days mean improved productivity



Reasonably Available Control Measures



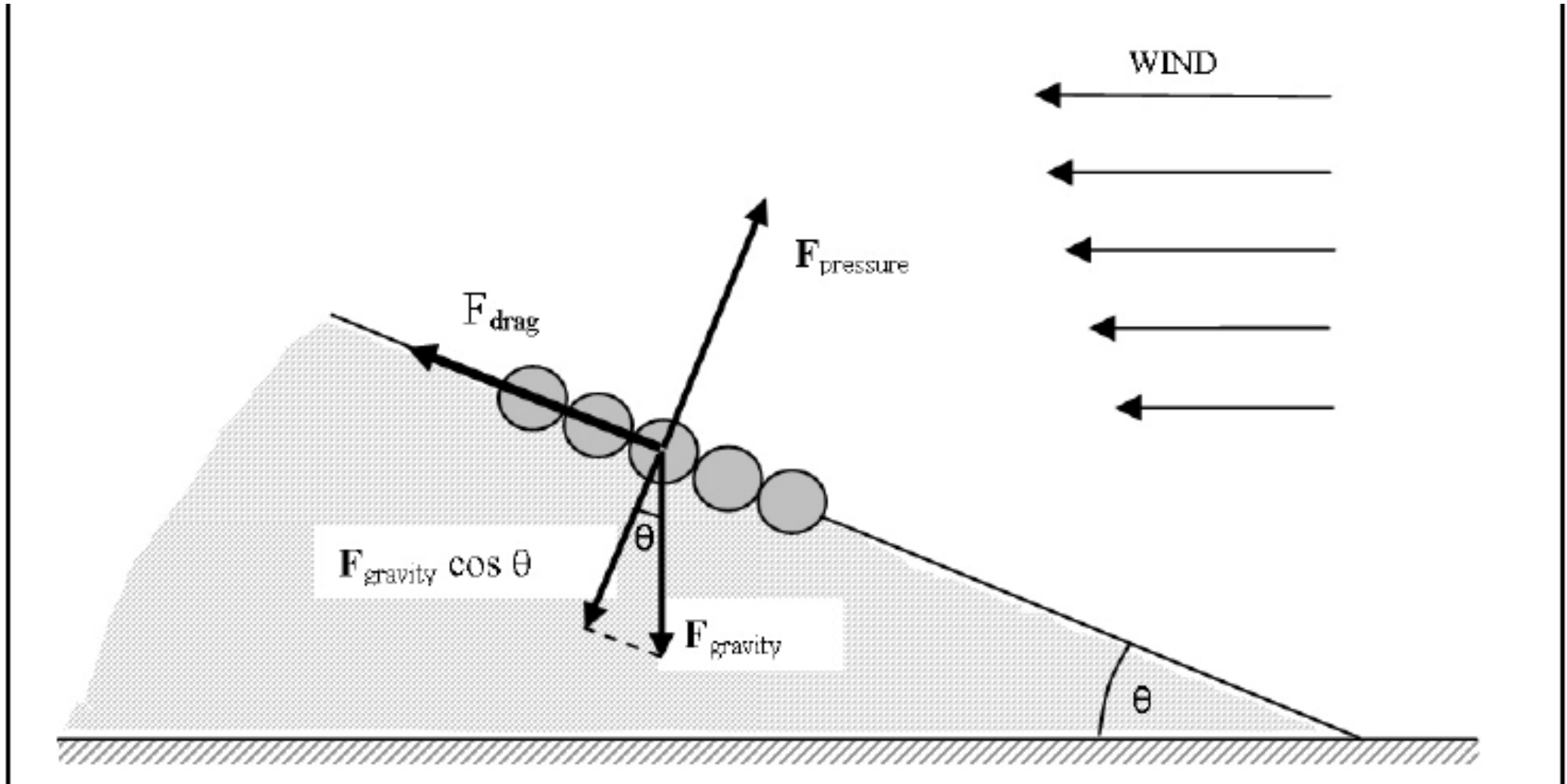
- **Operational Controls:** Train operators to minimize dust. Speed control is a good example.
- **Engineered Controls:** Enclosing and containing dust sources can often be done with in-house labor and material.
- **Wet Suppression Systems:** Water is the most common dust suppressant to control dust from roads, piles and processing.
- **Chemical Suppression Systems:** Chemicals that reduce the surface tension of water can be used to absorb into material and create product that is less likely to create fugitive dust.
- **Collection Systems:** Baghouses, cyclones and other collection devices are high efficiency and may be the only alternative for hazardous or reactive dusts.

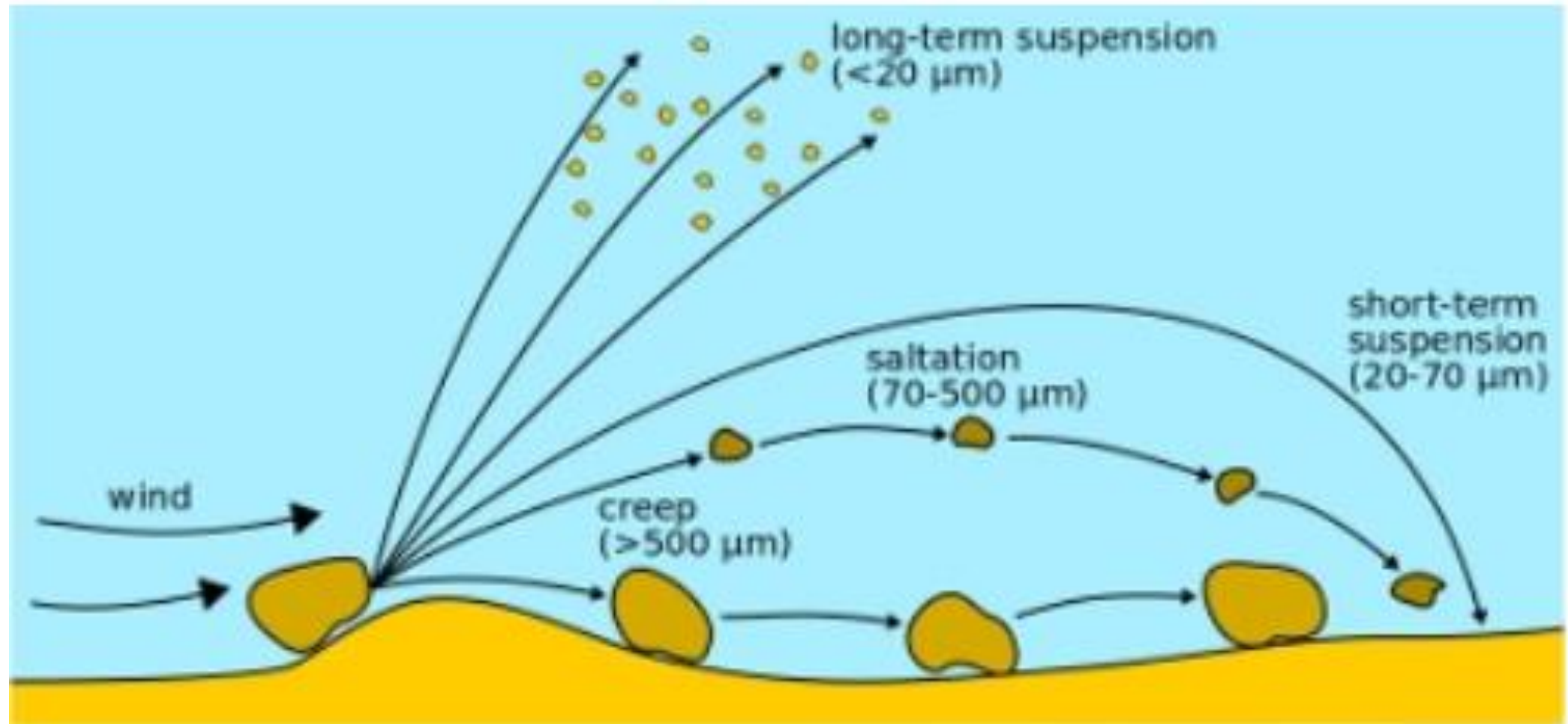


Technology Comparison

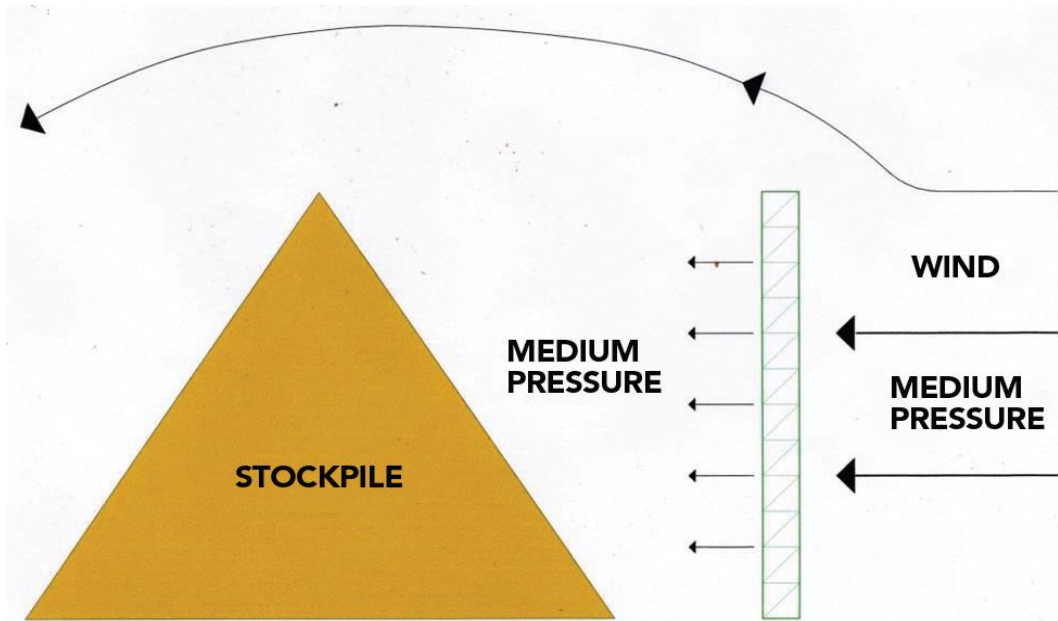


	Medium to Low Pressure Spray Systems	High Pressure Spray Systems	Dry Fog Systems	Chemical Systems	Dust Collectors/Wet Scrubbers
Visible Dust	Effective	Effective	Effective	Effective	Effective
Respirable PM10	Only downstream, not airborne	Airborne somewhat effective	Airborne effective	Only downstream not airborne	Airborne effective
Respirable PM2.5	Only downstream, not airborne	Not effective	Airborne effective	Only downstream, not airborne	Moderately airborne effective
Carry Over	Effective	Not effective	Not effective	Effective	Not Effective
Capital Cost	Low	Moderate	Moderate	Moderate	High
Maintenance Cost	Low	Low	Very Low	Moderate	High
Operational Costs	Very Low	Very Low	Low	Very High	High
Water Usage	Moderate to High	Very Low	Very Low	Moderate to High	Very Low to Low
Product Loss	None	None	None	None	Depends on efficiency and redeposit site
Installation Cost	Low	Low	Low	Moderate	High
Freezing	Can Freeze	Less Likely to Freeze	Will not Freeze	Can Freeze	Will not Freeze
Product Contamination	None	None	None	Yes	None

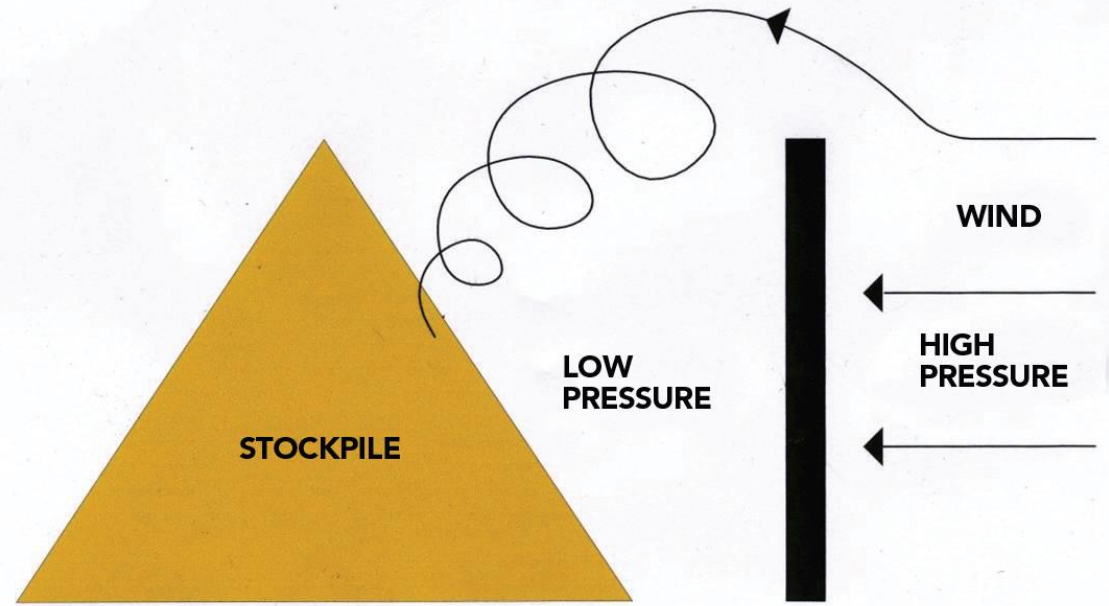




EFFECT OF WIND WITH DSI FENCE



EFFECT OF WIND WITH SOLID WALL





Wind Fences



Wind Fences





Using Water Sprays Only

Reclaimer Before/After



Before Fogging



After Fogging







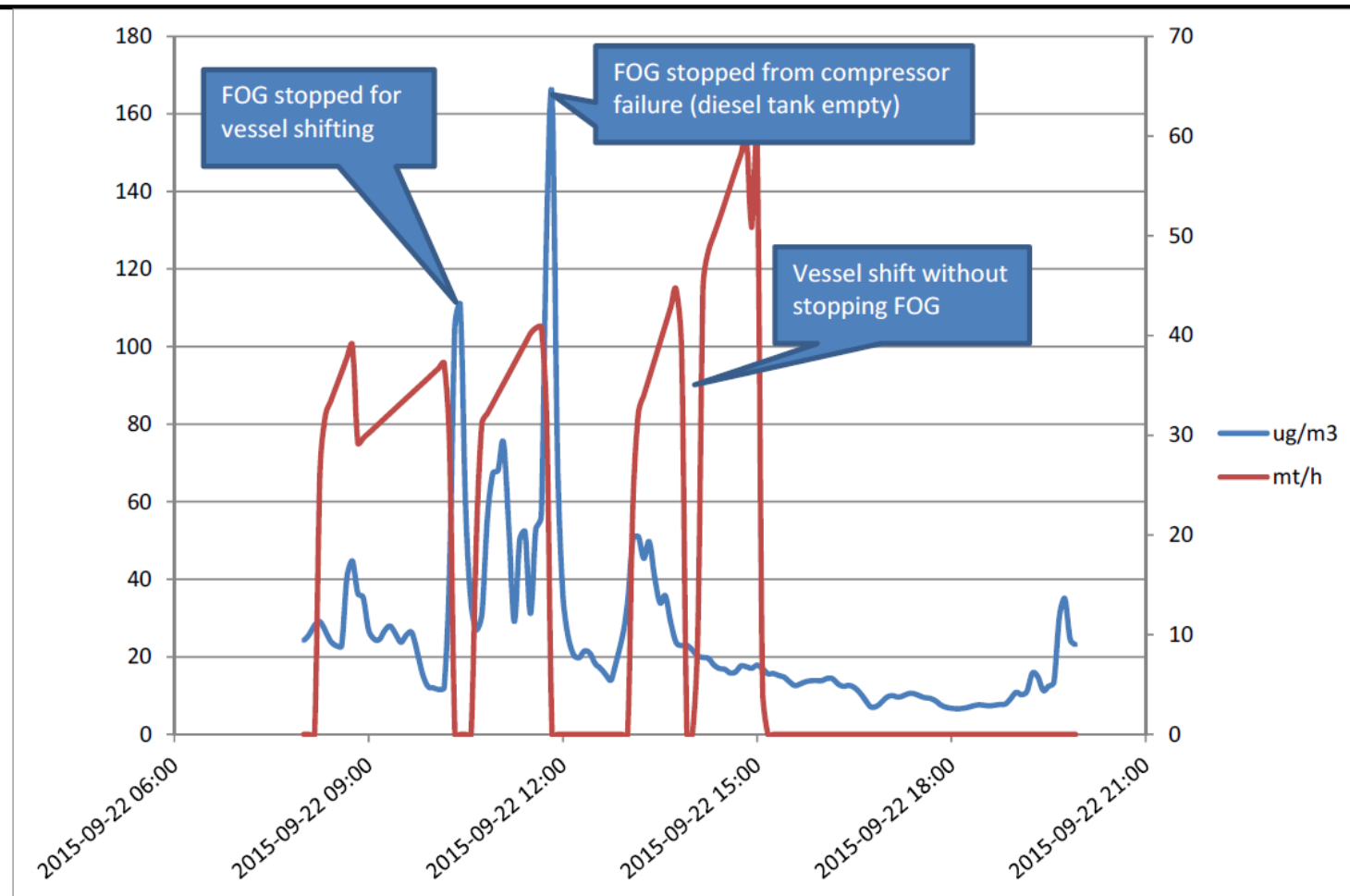


Ship Unloading

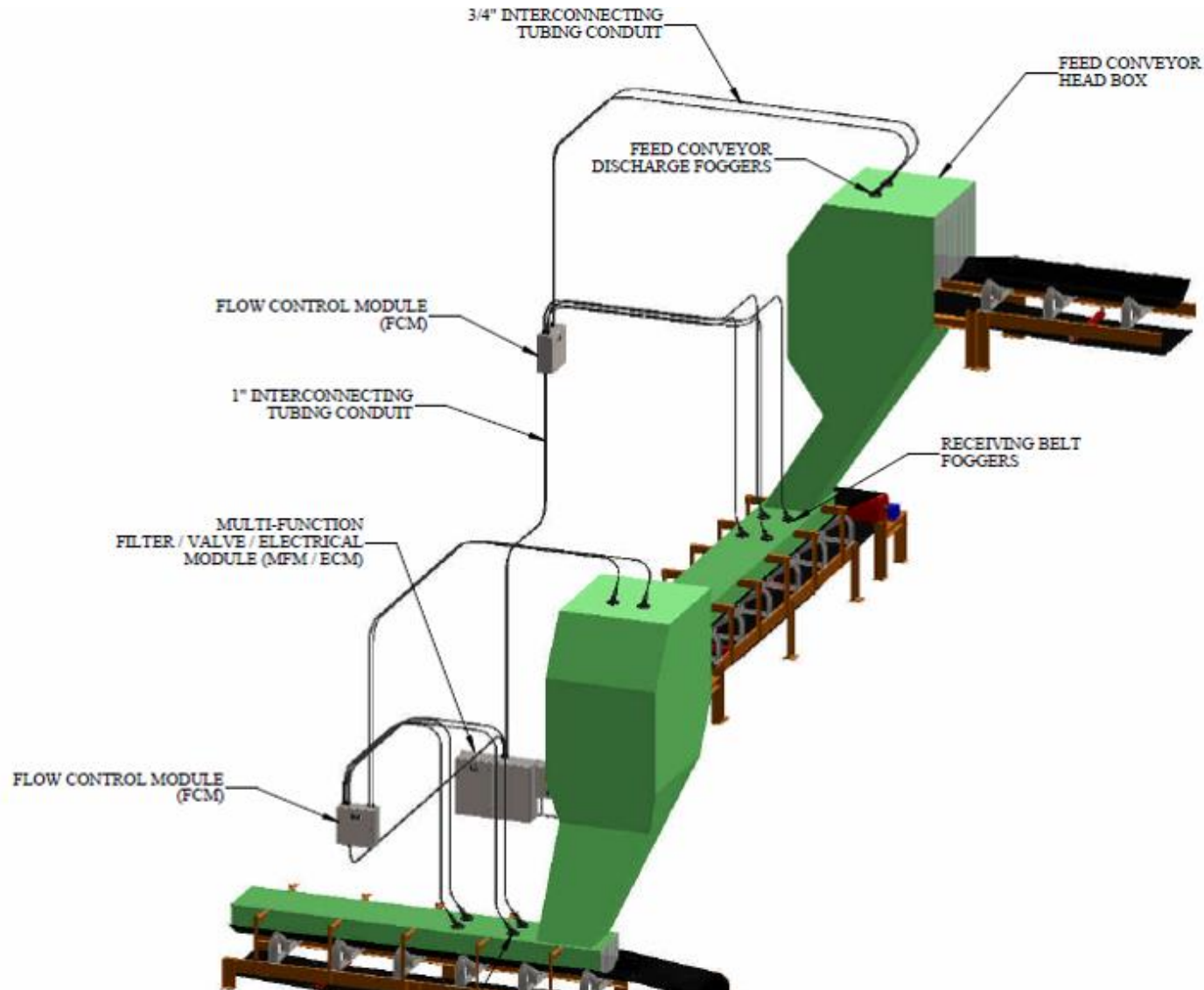




PRODUCTION







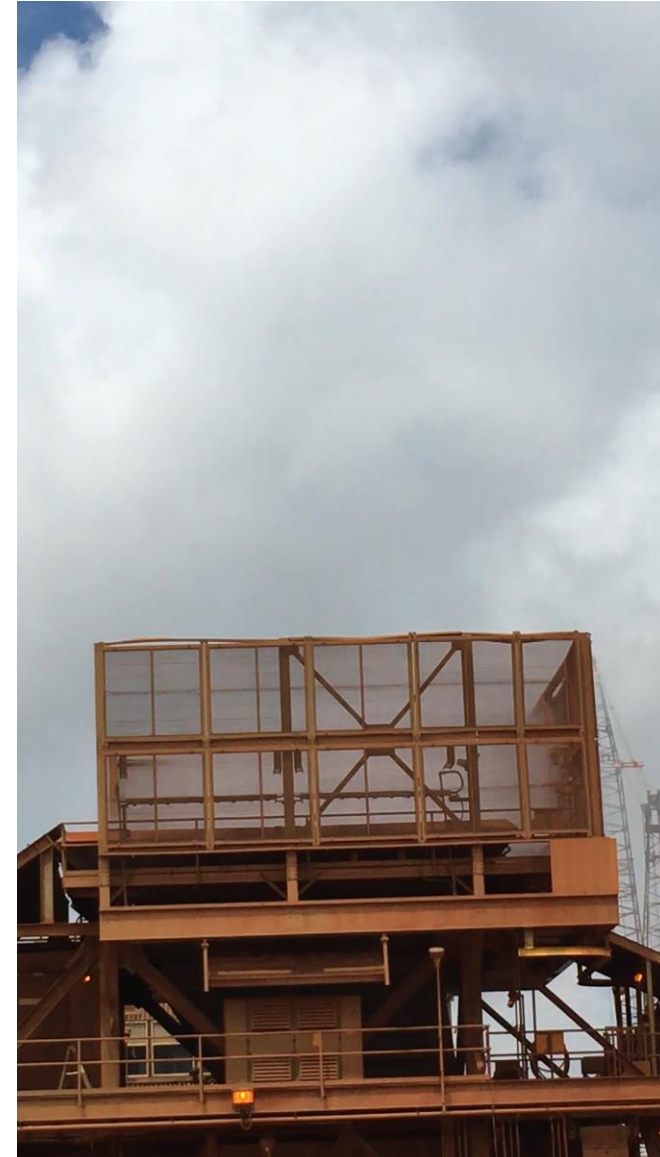
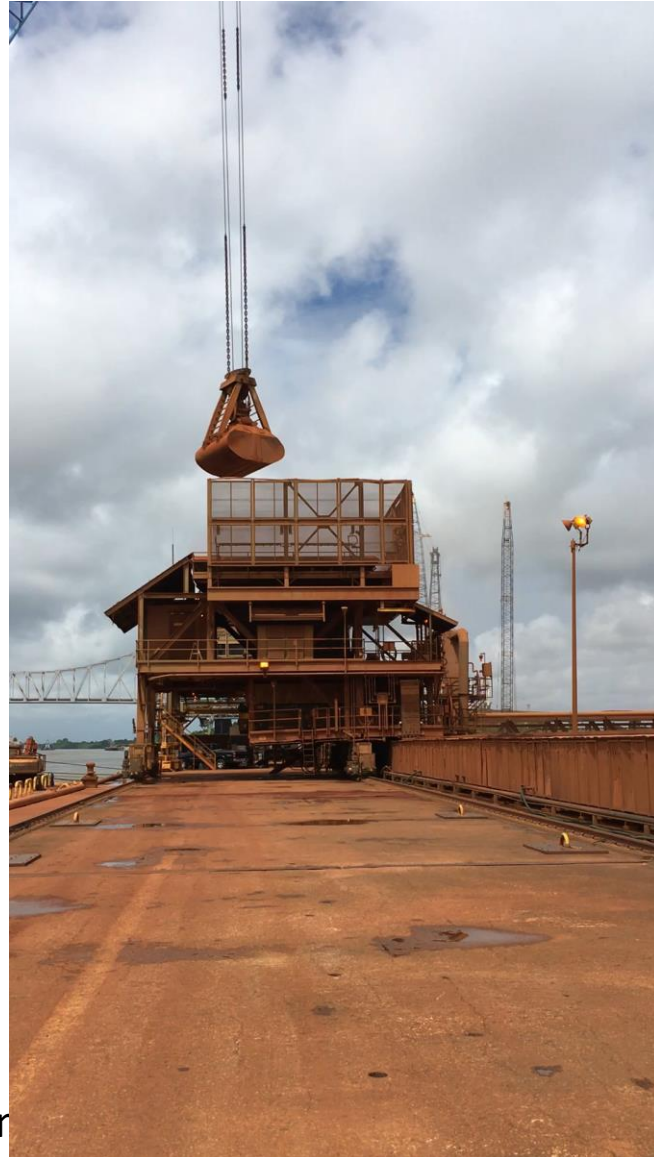




Hopper Before Fog



Hopper After Fog





Stacker





Stacker



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Stacker



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www.ardust.com



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