Vale Malaysia Minerals - Teluk Rubiah Maritime Terminal
ABB Stockyard Management System
Bruno Cesar Silva, Automation specialist / Franz Rietschel, Product Manager
Headquartered in Rio de Janeiro, we have operations, research laboratories, projects and offices on five continents.
Vale has a diversified business portfolio

- #1 in the world
  - Iron ore
  - Logistics
  - Nickel
- #2 in the world
  - Coal
  - Copper
  - Fertilizers
Iron ore

Vale is the world’s largest producer of iron ore and pellets, essential raw materials for the manufacture of steel. Our mines are concentrated in Brazil, where we also operate pelletizing plants.

We are investing in technology to extend the lifespan of our iron ore mines, processing low-grade ores, expanding our production capacity and contributing to environmental preservation.

In Pará, the S11D project brings together the lessons Vale has learned from mining in the Amazon. The project, which will enable Vale to maintain its global leadership in the supply of iron ore, will use 93% less water, consume 77% less fuel and emit 50% less greenhouse gases than a comparable operation based on conventional methods.
VMM General Info
Malaysia Distribution Centre provides for a throughput of 60 million tons per annum through two berths:
- one import berth with the ability to discharge vessels, up to 400,000 DWT
- one export berth for loading vessels up to Capesize.

**STOCKYARDS**
- Storage capacity 3.2 Mton (5 yards)
- 1 Stacker
  - Nominal Capacity: 10,500 ton/h
- 1 Reclaimer
  - Nominal Capacity: 8,000 ton/h
- 3 Stacker-reclaimers
  - Nominal Capacity: 8,000 ton/h

**IMPORT BERTH**
- Import Wharf: 750 m
- Depth: 25 m
- 3 Ship Unloaders
  - Nominal capacity: 3,500 ton/h each

**EXPORT BERTH**
- Export Wharf: 560 m
- Depth: 22 m
- 1 Ship Loader
  - Nominal capacity: 8,000 ton/h
Malaysia Distribution Center facilities provides operational flexibility for handling and blending iron ore, in a high level of reliability and productivity.
Bringing the mines closer to the customers

Flexibility in quality and low carbon footprint
VMM Fully automated
Recent project highlight: Iron Ore Distribution Terminal for Vale in Malaysia

**Stockyard Management System**
- Material Tracking
  - Tracking from the source to the discharge point
  - Monitors the material flow by masses/volumes on belt conveyors
  - Real-time stockpile tracking by tonnage and quality
  - Stockpile Monitoring / Mass Balance

**Controller & Drives commissioning**
- PLC Programming for Material Handling Equipment with Minerals Library
  - 1 Stacker
  - 1 Reclaimer
  - 3 Stacker/Reclaimer
  - Belt conveyor system
  - Substation automation
  - Central Control Room integration
  - VFD Drives Commissioning

**Fully automated machine operation**
- MES Interface to global planning system (PIMS/GPV)
- Evaluate Jobs according to available space, material quality and quantity
- Delegate commands to machines & conveyors
- Execute material handling by fully automated yard machines
Material tracking
Stockyard management system features

Monitoring of the material flow

Tracking based on process data
- Monitoring of masses/volumes on belt conveyors
- Tracking of materials to the discharge point

Supplies real time stockpile tracking by tonnage and grade
- Dynamic display of belt load with color differentiation according material type
- Stockpile Monitoring
Stockpile modeling

Calculated pile model with scanner update

1. Calculated cuboid model
   - based on machine position, boom belt speed and tonnage

2. Comparison with the reality by
   - 3D-laserscanner data
Every material movement is a job
- Production Planning creates job in PIMS and exchange via web service to SYMS
- In addition, operators can also enter jobs manually in SYMS
- Delegation
  - All planned and actual jobs are displayed in a list
  - Operator can choose and delegate to start execution
  - SYMS evaluates job according to available space, material quality and quantity requirements
- Delegate job information to substation and machine controller
- Automation control receives information from machine controller and performs fully automated machine operation
- Moved material & qualities will be tracked
- Actual performance will be reported to PIMS/GPV
Stockyard management system

Features

Blending process

- Overview of the stockyard
- Slice view functionality
- Coordinates blending
  - Ratio control of 2 feeding machines to one source device
  - Online blending on belt conveyor
- Reach the quality goals with the best possible accuracy

Verification of actual material quality
Stockpile modeling

Stockpile Monitoring

3D-Pile Model for Pile Monitoring

- Overview of the stockyard
- Visualize stocks of the material
  - Mass and volume
  - Material properties (quality, density, etc.)
- Displays empty spaces
- Simplifies the accumulation of inventories
- Provides data for reporting
  \(\rightarrow\) enables process simplification
Stockyard management system

Features

Quality management

- All features enable reliable quality management
- No material contamination
- Create exact outgoing material
- Mass balance for inventory management
- Data for reporting
Automated Stacking Operation

Features of iSAM Technology

Fully automated stacking & reclaiming

- Fully automated stacking assures the execution of appropriate stacking method (Coneshell, Windrow, ..)
- Stacking exact into the specified stockpile profile
- Flat shaped piles for maximum performance
- No overrun of the pile area
- Reduced dust by adjustment of the boom close to the top of the pile
Automated Reclaiming Operation

Features of iSAM Technology

- Fully automated reclaiming based on stockpile shape and volume model
- Operation supported by 3D laser scanner for shape detection and RTK-GPS receivers for exact positioning
- Reclaiming also in worse environmental conditions due to continuously updated stockpile shape model
- Smooth continuous operation reduces wear and tear
Automatic vs. Manual Operation

Flow rate trend charts

Automatic operation

Manual operation
Lessons learned:
- Importance of collaboration with Terminal Management Team for process specification during software development phase
- Do realistic and detailed platform test (automation)
- Difficulties on dealing with a plant in operation

Benefits for the site:
- Reduced human interference resulting in cutting source of error by automated data exchange
- Reclaiming stability (longer lifespan / lower flow rate variability)
- Lower variability on quality control (for blending activities)
- Higher performance