Upgrading an African terminal: Terminal de Carvão de Matola (TCM)

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The Grindrod-owned and operated Terminal de Carvão de Matola (TCM) commissioned ELB Engineering Services (Pty) Ltd to reinstate, refurbish, upgrade and build certain aspects of their coal terminal in Maputo, Mozambique.

What follows is a summary of the presentation as presented at the CoalTrans Conference in Johannesburg in September of 2009, touching on a few of the key points of the project and is printed here with the kind permission of Grindrod Terminals.

Phase 1 & 2: Doubling capacity

Phase 1 & 2 consisted of upgrading the terminal to increase the capacity of the plant from two million tons to four million tons per annum, and was completed in March 2009. Phase 3 began shortly after and is due for completion in the third quarter of 2010. This will increase the capacity of the terminal to six million tons per annum.

The terminal, which is situated on the Catembe Channel, a few kilometers upriver from the City of Maputo in Mozambique, is an open storage dry bulk handling terminal customised to handle coal and magnetite.

Currently the terminal is capable of loading Handysize vessels up to about 45,000 tons, but future plans are to dredge the port to 11.0m, which, with the tidal range, will allow for the loading of Panamax vessels.

TCM has its own berth, ship loader, stockpile area, rail tipplers, stacker-reclaimer and conveyor handling system. The recent major refurbishment and construction undertaken during Phase 1 & 2 project increased throughput capacity and operational reliability. These phases included:

- Refurbishment of the rail yard.
- The stacker-reclaimer was rebuilt and refurbished.
- Re-instatement of the centre line conveyor.
- Locomotives and tractors were introduced to eliminate fly shunting.
- Tipplers, charges, apron-feeders and conveyers were also refurbished.

Figure 1. Grindrod Terminals Terminal de Carvão de Matola (TCM).

Figure 2. Photographic project overview of Phase 1 & 2.

Phase 3:

The third phase of the terminal upgrade is currently underway and is due for completion by the third quarter of 2010. This project includes:

- Installation of a new ship loader, with a maximum design capacity of 2,500mt/h.
- A new combination bucket wheel stacker-reclaimer with capability of 2,500mt/h will be installed.
- The existing ship loader will remain allowing for increased efficiency.
- All conveyors that have been out of commission for many years will be refurbished and re-instated, which will allow both ship loaders to be used simultaneously.
- The remainder of the operational equipment and facilities will also be re-instated.
- A world-class integrated computerized materials handling software system will be implemented.

Upon completion of Phase 3, TCM will have an overall capacity of 6 million tons per annum.

Background to Phase 1 & 2

A project of this nature, although complex and diverse in itself, was complicated by the fact there were minimal drawings and basic data available. The terminal had been exposed to many challenges from civil war, change of ownership, loss and damage to key equipment and floods, including the loss of a ship loader in the 1980s, due to a storm. Furthermore, the terminal was originally designed for iron ore in the 1960s, and now had switched to magnetite and coal.

The two main challenges of the project were the reinstatement of the centre conveyor line and the combination bucket wheel stacker-reclaimer.

Figure 3. Conveyor C8 before and after refurbishment.

Project workshops

To ensure that the project team would deliver a sound project, a number of workshops were scheduled. The objective was to hone in on some of the basic project inputs, such as the rail schedule; shipping schedule, vessel sizes, wagons type and size, material specification, target throughputs, number and quality of staff – to name but a few.

From these workshops a simulation expert was tasked with reviewing the output from the workshops. Working from a 'pull/pull' philosophy, and taking into consideration the current equipment and its existing condition and related performance, he commenced the process of statistically defining the correct equipment required. The results of the simulation study were discussed further in yet another series of workshops based on the future volumes and the strategic direction Grindrod wanted to follow for TCM. An agreement was then reached on the size and type of equipment, as well as listing the items that would be repaired, refurbished, replaced or upgraded.

Site visit

Parallel to the workshops and simulation studies, a task team was seconded to go to the site to review the actual local conditions and collect as much data and drawings as possible, which included liaising with the Mozambican rail authorities (CFM – Caminhos do Ferros de Mocambique), under whose responsibility the terminal fell.

Where no drawings were available or were of insufficient quality and detail, a decision was made to redraw where possible. In some cases, 3D laser scanning of the equipment structure was undertaken to obtain a geometrically accurate CAD model.

Rebuilding of the combination bucket wheel stacker-reclaimer

The terminal required a third combination bucket wheel stacker-reclaimer, to ensure a target throughput of four million tons per annum. However, the combination bucket wheel stacker-reclaimer that was to be refurbished had been 'scrapped' back in the early 1980s, as it had suffered severe structural damage after collapsing soon after being commissioned, and was being stripped of spares and components to keep the other two machines operational. After careful reviewing and analysis of the various audit reports conducted on the machine, a decision was made to rebuild the machine and that a Finite Element Analysis (FEA) would be created and used to support its reconstruction process.

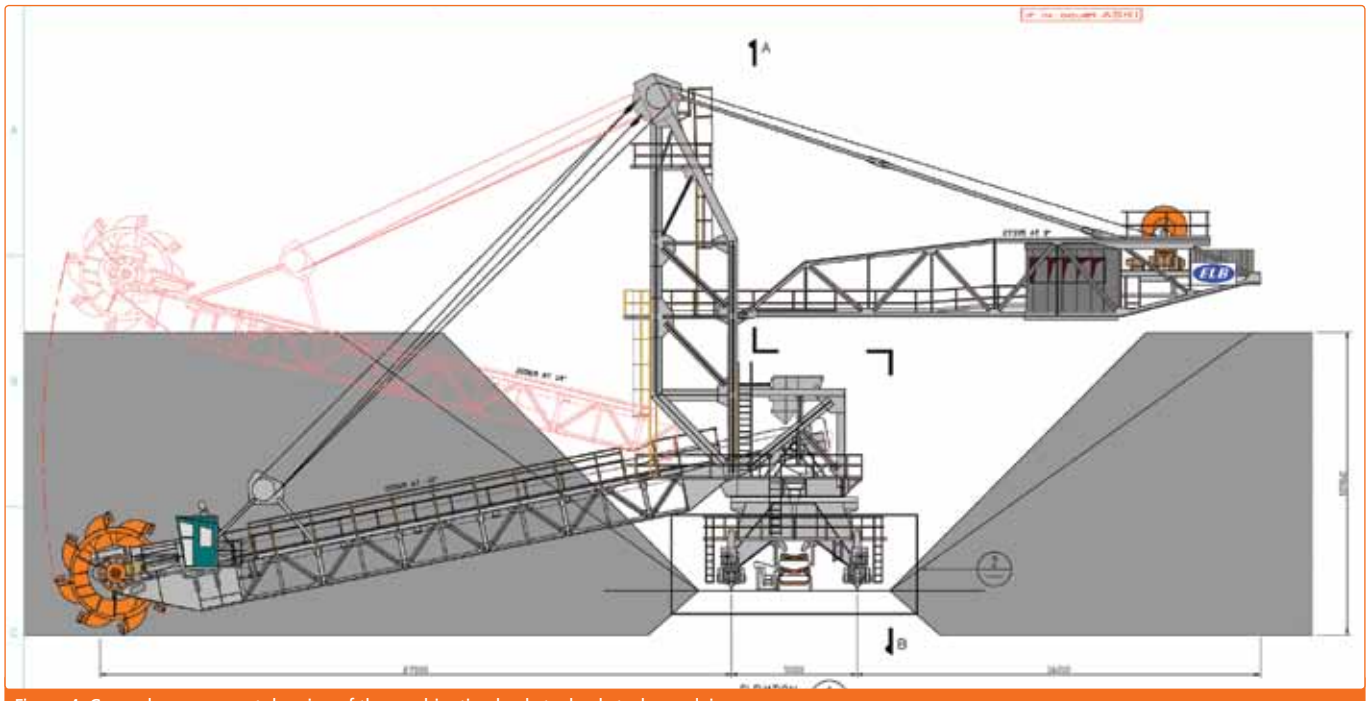

Figure 4. General arrangement drawing of the combination bucket wheel stacker-reclaimer.

Figure 5. Before: A tired and collapsed combination bucket wheel stacker-reclaimer from 1964.

Figure 6. After: The rebuild of the SR02 machine is complete (March 2009).

Areas of high stress were identified by the FEA model, which the engineer then investigated, to visually examine if there was indeed stress or damage to the sections. If the FEA model did identify damage, a section was cut out on the model and a replacement section spliced in instead.

In some cases, the model may dictate a thicker or different type of section, due to the unavailability of the particular material type. Once the model had 'endorsed' the section, the physical process of replacing the section was tackled. This, however, was done under the guidelines of the Method Statement, which is a document that shows how the specific section will be supported, cut and replaced, taking into account safety, time, risk, and cost.

Local support

Working outside your head office country requires that you identify, where possible, good local partners and engage their services, but still work within the project constraints of time, quality and cost. To ensure these elements were under control, key resources had to be planted in some of the manufactures. The resources ranged from Quality Control, Project Planners, Project Engineers, Draughtsman and Safety.

What followed next was a process of training the local suppliers to think and behave like world-class manufacturers or suppliers. To ensure that we minimized risk wherever possible, a series of Risk Assessment Workshops were conducted to ensure we were as focused as possible on the project, but never took our eye off the task at hand, as there could have been a risk of damage to equipment and plant as well as people.

Resources

As already indicated, the use of local services is a key success factor in ensuring the project is covered from a local base. Furthermore, an indirect benefit of working with local companies is the up-skilling and development of people and companies. To ensure that this takes the natural course, key personnel must be employed who share the same vision and passion as the contracting company and drive the change required.

ABOUT THE AUTHOR

Tony Pinto is the General Manager of the Bulk Materials Handling division within ELB Engineering Services. Tony has extensive experience in supply chain logistics, manufacturing, distribution, global marketing and more recently in the upgrade and refurbishment of port bulk materials handling equipment and infrastructure.

ABOUT THE COMPANY

The **ELB Group** is a total solutions provider to the mining, minerals, power, port, construction and industrial sectors in the field of materials handling and appropriate process plants. ELB generates innovation and works closely with world-class partners in equipment and technology. The Group operates in Africa and Australia. ELB Engineering Services trades in intellectual property, which it uses to build solutions to the benefit of its clients.

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