

How a maintenance improvement project improved the business culture and reduced production resource usage at a ferrosilicon plant

Case study: Maintenance improvement project reduces resource usage

DMS Powders in Meyerton, Gauteng, produces and markets ferrosilicon powders for application in dense media separation (DMS) technology. DMS is a process involving the suspension of dense powder in water to form a “heavier liquid” and so to separate mineral particles in a sink-float process.

Poor business culture

The company outsourced its maintenance functions over a number of years, which led to a very poor business culture within the maintenance department, between the department and upper management, as well as between departments.

DMS Powders approached M-Tech Consulting Engineers to implement a maintenance improvement project to improve the business culture at its maintenance department.

Maintenance improvement project

Today, some four years later, M-Tech has performed a 3-phase maintenance improvement project at DMS Powders. The phases, which were initiated in 2011 and completed in 2016, involved “basic”, “intermediate” and “advanced” improvement.

They were preceded by audits to establish progress during the previous phases, and to identify specific issues to be addressed in the current phase.

The information gained in each phase was augmented by SWOT analyses, where DMS personnel evaluated the organisation, took stock of the improvements made since the

by Gerrit Coetzee, M-Tech Consulting Engineers

previous phase and determined which additional concerns needed to be addressed.

Team building

A “top-to-bottom” team-building technique was employed to improve the business culture in the maintenance department. This involves working with small groups of personnel from across the organisation (typically engineers, supervisors, planners and artisans) to

improve the quality of top-to-bottom and bottom-to-top interaction within the department.

The corporate culture was changed in this way to create a unified outlook within the department. The new culture developed in the department during phase one promotes taking individual responsibility for the department’s woes.

A culture of problem solving was



From left are Jaco Venter, André Hefer and Solly Nkosi, DMS Powders, and Dr. Jasper Coetzee, M-Tech Consulting Engineers.

cultivated in phase 2 while phase 3 promoted a "reliability culture".

The "small group activity" enabled the development of the first level requirements for the strategy, which was then developed further by M-Tech and refined by the DMS maintenance management team.

Management procedures

This strategy was supplemented by some 20 management procedures, all of which were developed in conjunction with the DMS maintenance management team. These procedures included work order flow; shutdown management; condition-based maintenance; root cause analysis; maintenance plan development (reliability-centered maintenance or RCM); continuous improvement; configuration control; documentation control; skills matrix (training) and others.

Job profiles were also developed for the important positions in the maintenance department. This was done in conjunction with the maintenance management team. Profiles were developed for engineers, supervisors and for the various classes of artisan (a total of ten job profiles).

Maintenance plan

A maintenance plan was developed for the organisation. This was done in a phased manner, using RCM to

determine which preventive tasks should be incorporated into the plan.

During the first phase, a total hardware breakdown structure of the business was developed and prioritised to determine the "maintenance significant" items (MSIs).

In phase 2, all these MSIs were subjected to a full FMEA/FMECA analysis to determine the critical failure modes that should be addressed.

In phase 3, these critical failure modes were subjected to RCM analysis and maintenance task analysis (MTA) to determine the constituent tasks/task content to be included in the maintenance plan.

Condition-based maintenance assessments and recommendations were made by a condition monitoring expert.

Maintenance management

An important component in the development of the organisation concerns the managerial focus on maintenance management. The first phase of the project aimed to develop the organisation towards basic care, with a focus on the MSIs. Phase 2 developed the organisation towards a condition-based focus with respect to the critical failure modes of the business. This was followed by a move to pro-activeness in phase 3.

A management focus was developed,

starting with a people focus through leadership in phase 1, improved management processes in phase 2, and full management excellence in phase 3.

Training

At the same time, a considerable number of DMS personnel were trained by M-Tech's Terotechnica Maintenance College in Pretoria. The training focused on various aspects of the discipline and prepared them for their contributions to the business. One of the DMS engineers is also reading a Diploma in Maintenance Management through the Terotechnica Maintenance College and more engineers may soon follow.

The plant's top management supported the process by requesting the inclusion of cross-departmental training as part of the total approach. This included training in root cause analysis for the personnel of the production department and the maintenance personnel.

This approach promoted a new set of values, especially in the area of equipment care, and led to a reliability culture as opposed to the historical breakdown management culture.

This resulted in a huge improvement in the performance of the department (from 31% World Class before the project started to 48% at the end of the first phase; 61% at the end of the second phase, and 75% at the end of phase 3).

Results

The results of the exercise included a reduction in production resource consumption. A master's student at the University of Pretoria used DMS Powder's actual data to prove a reduction in the use of raw material including power, water, and production time inputs as the maintenance situation improved.

This was submitted for his master's thesis and corroborated by two asset management specialists. DMS Powders experienced a 16% increase in income of over this period (adjusted for the Production Price Index, based on 2011 = 100%).

Added to this reduced maintenance cost was a significant increase in plant output.

Contact Mariana Jacobs, ICMEESA, Tel 011 615-4304, icmeesa@icmeesa.org.za ♦

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