

# Managing a Major Maintenance Improvement Project - Experiences of the Central Queensland Ports Authority

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**SUMMARY:** This paper reviews the progress of a major maintenance improvement project at one of Australia's key strategic assets from inception just over a year ago to today. It highlights the many parallel strands of interlinked activity needed to provide a comprehensive and sustainable outcome and how the many challenges are being met. The successful completion of the project will position the Port to provide the service to its customers they have come to expect over 25 years of successful operation.

**Keywords:** 7S model; project management; Steering Group Review process; Integrated Production Team; reliability-centred maintenance; RCM2, risk assessment; plant condition assessment; maintenance management system; reporting systems; work management process; organisational restructure.

## 1 INTRODUCTION

The Port of Gladstone is Queensland's largest multi-cargo port, the fifth largest port in Australia and is managed by the Central Queensland Ports Authority (CQPA). The Port's major functions are to facilitate the export of resources from the Central Queensland region and to handle the import of raw material and the export of finished products from major industry established in the Gladstone region. The Port is a convenient point for the world wide distribution of the wealth of Central Queensland. The Port also serves important regional mineral and timber resources.

The largest unit under management at CQPA is the Reg Tanna Coal Terminal (RGTCT) which is currently handling approximately 40MT of coal per annum. The expected volume growth of the coal industry in Central Queensland will require RGTCT to handle up to 60MT per annum from 2006/7 through plant expansion and improved use of existing resources. In late 2003, CQPA made a strategic decision to gear for the forecast expansion and to overhaul its maintenance approach through a comprehensive Maintenance Improvement (MI) Project. The objective of the Project is to provide a unified best-practice approach to availability and reliability improvement on site, drawing together all activities into a well-resourced single programme. The Project has now been underway for a little over one year and covers:

- the development and application of a site-wide maintenance strategy using Reliability-centred Maintenance II (RCM2) including application of a comprehensive maintenance and operational risk analysis process;
- the assessment of plant condition and subsequent project management of equipment rehabilitation;
- the implementation of a revised area-focused maintenance organisation requiring recruitment, redeployment of existing staff and training;
- implementation of a new maintenance management system with supporting maintenance processes, policies and procedures; and
- implementation of operational and maintenance performance measures.

This broad range of activities is being undertaken as coal throughput is rapidly increasing and windows available for maintenance activities are shrinking. It continues to require the involvement and commitment of the whole organisation. This paper reviews the range of activities being undertaken and the management processes used to coordinate the high level of complexity involved.

## 2 PROJECT STRUCTURE

### 2.1 The Coal unloading, stockpiling and loading processes

Coal from local mines is delivered to the terminal by Queensland Rail and arrives at either of two Dump Stations. From these, feeders and underground conveyors deliver coal to an overhead conveying system which in turn delivers to an appropriate stockpile, (15 in total, allocated to 11 mines through leasing arrangements). This commercial arrangement guarantees that each mine is able to control its own coal chain with the appropriate level of quality assurance. The terminal layout provides the opportunity for each mine to blend coal to achieve exact

customer specifications through an on-line quality management process. Loading is achieved by dozing coal into stockpile dischargers and feeders which deliver coal through underground conveyors to ground level conveyors and on to the ship loading system, currently consisting of two ship loaders and associated wharf equipment. From a maintenance strategy perspective, much of the equipment is replicated, and allowing for differing operating contexts, ensures that a well-developed strategy on one plant item can be readily adapted to others.

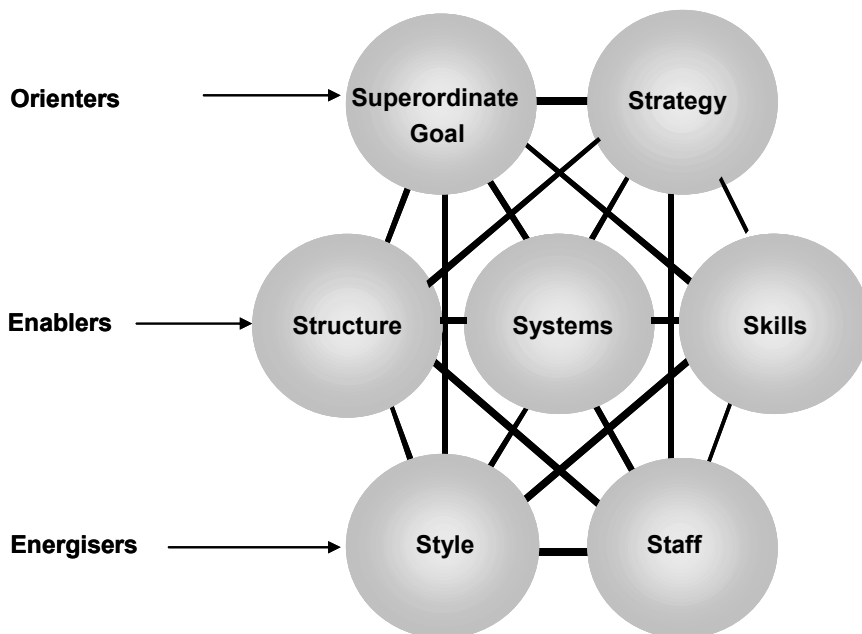
RGTCT operations are subject to two externally imposed schedules - one for coal unloading and the other for ship arrival. Both schedules are subject to last minute variations due to coal availability or quality of coal ex-mine. Subject to these factors, RGTCT schedules unloading to specific routes and loading sequences and ship berthing to maximise operational efficiency and throughput levels. Given last minute schedule changes, windows for both on- and off-line maintenance can be subject to last minute changes, providing challenges for maintenance planning and scheduling on site.

Prior to the MI Project, RGTCT employed a centralised maintenance department with dedicated days and shift crews and no plant area focus. Contractors are being used for some Condition Monitoring activities, HV circuit and transformer maintenance, lift, crane, air conditioning, hoist and dozer maintenance, site structural work and pre-approved capital works. Operations have a multi-skilled, rotational workforce covering all CQPA activities on a 24/7 basis, working on a number of roster arrangements.

Operational and Maintenance functions are supported by an Engineering department which has successfully overseen the development of the RGTCT throughput from 7MT in 1979 to 40MT today.

## 2.2 Underpinning Change Methodology

The McKinsey 7S model shown in Figure 1 neatly describes the challenges any organisation faces in implementing change. The key to using the model is to understand that all seven S dimensions are interdependent. For example, a change in one dimension such as strategy will have a direct or indirect impact on all other dimensions. Hence there is a need to manage organisational transformation through each dimension simultaneously. Any change requires *orientation*, provided by superordinate goal and strategy, *enabling* through appropriate organisational structure, systems and skills development and *energising* through management style and availability of support staff.



**Figure 1: The 7S Model provides the basis for describing organisational change**

*Superordinate Goal:* The CQPA Mission statement, publicly available, sets out the goals of the organisation and the values which underpin its business objectives. No modification or clarification of these was deemed necessary in launching the MI Project.

*Strategy:* This involves an already approved major expansion of Port (Coal terminal) operations between now and 2007 and a need to meet increased throughput in the short term utilising existing assets. Additionally, the achievement of safe working practices and environmental compliance is a strategic imperative for Port operations.

*Structure:* At the time the project was started, there was a centrally located maintenance group with the usual mechanical/electrical split. Given the growing pressure on the Port and the three stage terminal process of train unloading, coal movements (through bulldozing) and ship loading, the existing amorphous functional structure was not judged sufficiently responsive for the strategic objectives to be met. A more responsive structure needed to be developed involving maintenance superintendents for each area together with a new reliability engineering function. Responsibilities and accountabilities would need to reflect organisational levels and restructuring would need to be done in such a way to reflect the manning needs of an expanded Port. Emphasis would be given in the new structure to developing a Operations/Maintenance/Engineering “Trilogy” approach to ensure new plant would be designed and built with operations and maintenance in mind.

*Systems:* At the start of the project, Port maintenance activities for fixed plant were managed through Paradigm, a stand-alone computerised maintenance management system and the mobile fleet through the CAT system. Paradigm had no links to financials or stores and would therefore limit the Port expansion programme. CQPA recognised the need for improved management information in all aspects of its business and therefore embarked on the selection and implementation of an enterprise wide system incorporating work management and stores, eventually choosing the Microsoft Navision suite. At the outset, relatively little management information was available on business, plant and maintenance performance, and, in addition to implementation of Navision, a major development programme would be needed to develop a “delays” database and reporting process.

RCM2 was to be used as centrepiece of the unified best-practice approach to availability and reliability improvement. Application of RCM2 would assist in capturing plant knowledge and developing the proactive and corrective maintenance activities for the future. This would take account of the considerable effort which had been put into the Port’s developing condition monitoring programme.

Full Risk Assessments to AS/NZS 4360 would be the basis for developing safe working practices within the maintenance and operations activities.

*Skills:* CQPA has a skilled and knowledgeable workforce which has supported the increase in throughput at the Port from 7M Tonnes in 1979 to the present throughput of 40M Tonnes per annum. However, much of the maintenance activity was reactive in nature. Recognising this, the strategy for the future would be to build a proactive maintenance regime which would require industrial experience being brought in to the organisation and a significant emphasis on training at all levels.

*Style:* Many change programmes were known to fail through poor communication and senior management commitment to what is often a lengthy process. This project was to be set up from the outset using the seven principles of major project management, including:

- A unified total project approach
- High impact items first
- Detailed metrics and timelines
- Best possible techniques: RCM2 used as the basis
- Best possible resources 100% of the time
- A single team, single location approach
- Monthly senior management reviews.

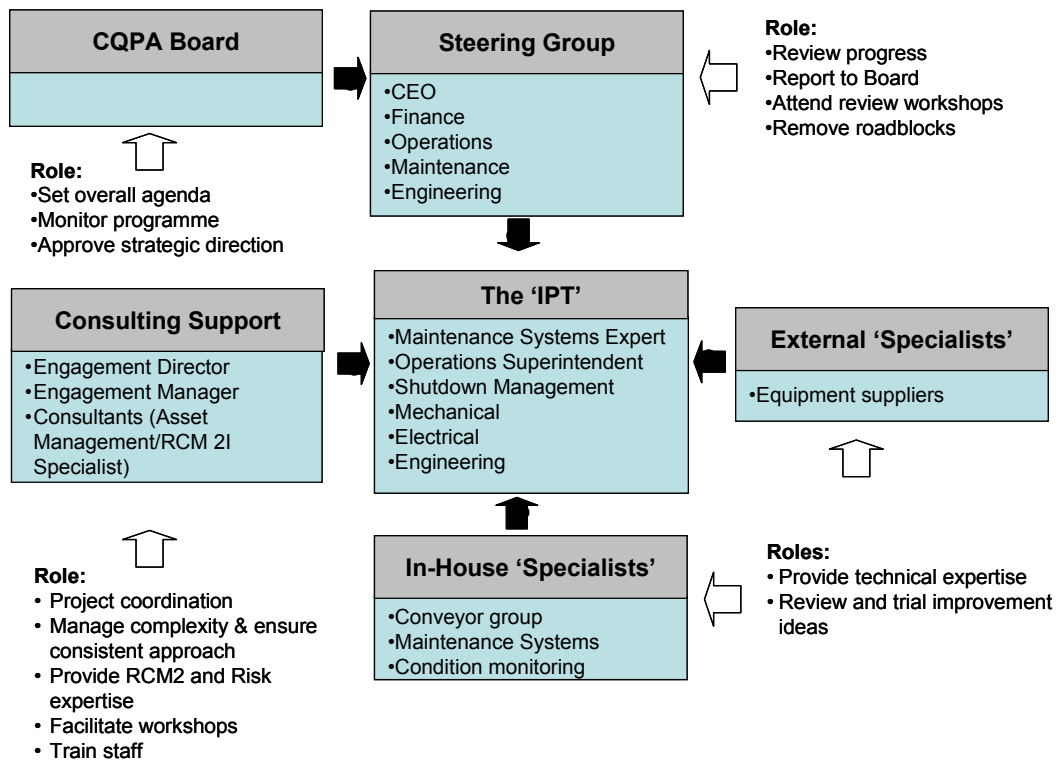
Adopting these principles would ensure knowledge was shared, captured and maintained and would challenge any insularity of the various departments and individuals concerned. The project structure is discussed in more details below.

*Staff:* CQPA recognised from the outset that the primary role of its own staff would be to keep pace with the fast increasing throughput levels. Consequently, a range of support specialists were engaged within the total project approach covering consulting resources and specific equipment expertise. Approval for the recruitment of Superintendent level and reliability engineering staff was gained at an early stage in the change programme.

### **2.3 The Project Organisation**

The Project structure is shown in Figure 2 and enabled all levels within the CQPA organisation to be engaged. Central to the success of the process has been the continuing emphasis on a *Steering Group* review process

involving the CEO and senior functional managers within the business. This meets on a monthly basis to hear formal presentations on progress from the *Integrated Production Team* (IPT) composed of representatives from all functional areas within operations and maintenance. IPT membership is largely full time for the duration of specific project phases. Monthly reviews with the Steering Group are 'pressure cooker' sessions which involve presentations directly from the IPT members, rather than the consultant support team. In house and external specialists are required to attend as appropriate. Up to the time of writing this paper, seven formal reviews of the project have taken place, each review lasting a full morning.



**Figure 2: The Project Organisation has been central to the enduring success of the programme to date**

The Steering Group supported on occasions by the Consulting team provide regular reviews of overall project direction to the Board.

## 2.4 Project Streams

The complexity of the change programme required a number of separate, related streams to be launched. These included:

- **RCM and Risk Management:** This involved developing a comprehensive proactive and corrective task maintenance programme, taking account reduced maintenance windows as Port activity levels increased. RCM2 was to be the underlying RCM methodology with an innovative, parallel risk assessment and management process providing the safety precautions needed for each maintenance item. The risk assessments outputs would include Job Safety Analyses for each maintenance activity.
- **Plant condition assessment:** Prior to implementing each element of the new maintenance programme, a review was to be conducted of the condition of each item of plant. A prioritised plan of action would be developed for each item with refurbishment managed through shutdown programmes.
- **Work Management Process development:** Work management processes were to be mapped and implemented in parallel with the new area-based maintenance organisation, with responsibilities and accountabilities defined for each level and functional group.
- **Maintenance Management System selection and implementation:** Replacement of the existing Paradigm system with Navision entailed a complete review of the asset hierarchy and proposed reporting systems. This project involved a system implementation partner together with internal CQPA resources.
- **Development and implementation of operational and maintenance performance measures:** Although various measures of Port performance existed, these were limited in scope, required substantial clerical effort to produce and did not provide the detailed window on plant and equipment performance required. A

new delays reporting system would be required to provide a “drill down” capability into each item of plant at the terminal.

- **Safety and environmental compliance:** Audits revealed a number of non-conformances with current legislation requiring a substantial programme of engineering changes and training.
- **Spillage reduction:** Plant reliability and unreliability were known to be affected by spillages at various points in the unloading and loading processes. A programme to correct root causes of spillage was launched early in the overall Project to have a positive, early impact on reliability levels and to achieve the quick wins essential to a successful overall outcome.

As part of the overall project management activity, fortnightly Project Coordination meetings were convened. These were chaired by the Operations Support Services Manager and involved each Project stream leader. A key outcome was the sharing of current and proposed stream activities with the aims of avoiding duplication and managing staff effort.

This paper now reviews two of the major elements of the Project.

### 3 THE RCM2 AND RISK MANAGEMENT PROGRAMME

#### 3.1 Establishing the Order of Play

Much has been said in recent years of the “difficulties” of completing an RCM programme for a large facility. Some of this stems from a fundamental lack of understanding of the RCM process itself and the remainder from folklore surrounding poorly managed implementations.

In order to ensure a successful outcome with the least amount of effort, a criticality analysis was conducted on the whole of the R G Tanna Coal Terminal to identify those items which would provide the maximum payback in the shortest time. The Asset Partnership’s Criticality Toolkit provides a flexible, easy to use method of ranking plant items taking account of Operational, Non-Operational, Safety and Environmental (RCM) consequences. Over a period of 2 weeks at the outset of the Project, this method was deployed to identify high risk plant items.

#### Criticality - Equipment Only

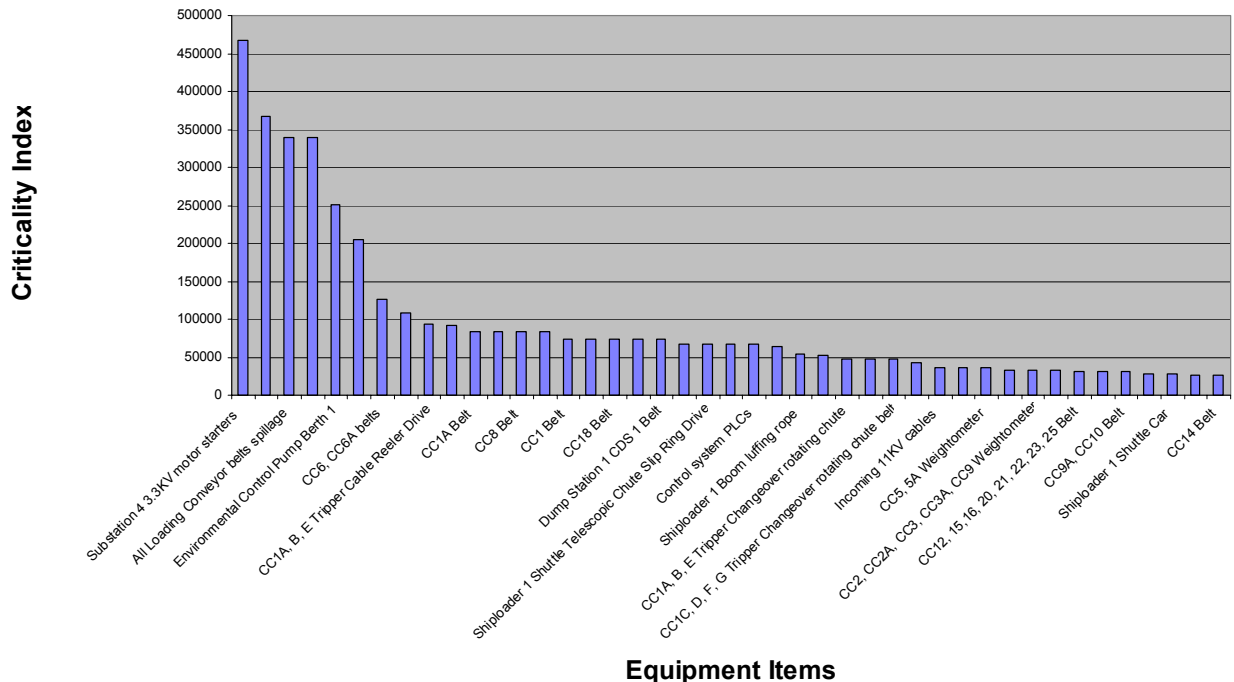


Figure 3: The Criticality Toolkit was deployed to rank assets

Based on the outcomes, the RCM2 programme was configured to take maximum advantage of templating opportunities. High criticality items included wharf conveyors and some ship loader systems. Application of the Toolkit identified a number of chronic failure modes associated with spillages and chute blockages. IPT activity was used to begin tackling a number of these ‘Quick Wins’.

### 3.2 RCM2 Implementation

Initial briefings on the proposed methodology were made to site managers through the Steering Group process. Following this, analysis team members attended a three day RCM2 training course to teach the RCM 'language' and introduce the implementation plan.

RGTCT has many similar assets, including conveyors, dump stations and ship loading systems, allowing substantial use to be made of RCM2 templates. Starting with one of the wharf conveyors, detailed RCM2 templates were developed for the conveyor and drive systems commonly used across the site. This approach was carried across to the coal reclaim systems comprising tunnels beneath the stockpiles, stockpile dischargers, feeders, weightometer systems and ventilation and lighting systems. In this way, the amount of analytical effort required from team members was minimised, with the consulting team conducting much of the templating off-line. Figure 4 shows the structure of the asset hierarchy in the Toolkit and the range of templates developed for the site.

The Asset Partnership's RCM Toolkit permits the maintenance programme to be summarised at any level in the asset hierarchy and includes a task development module in which detailed RCM Job Cards can be developed. Using this module, it was possible for the analysis teams to develop the 'PMs' for all site equipment together with the corresponding major corrective tasks. In accordance with the site strategy of ensuring safe working practices, it was mandated that all maintenance tasks, both proactive and corrective were subject to a full risk assessment to AS/NZS 4360 (see section 3.3 below).

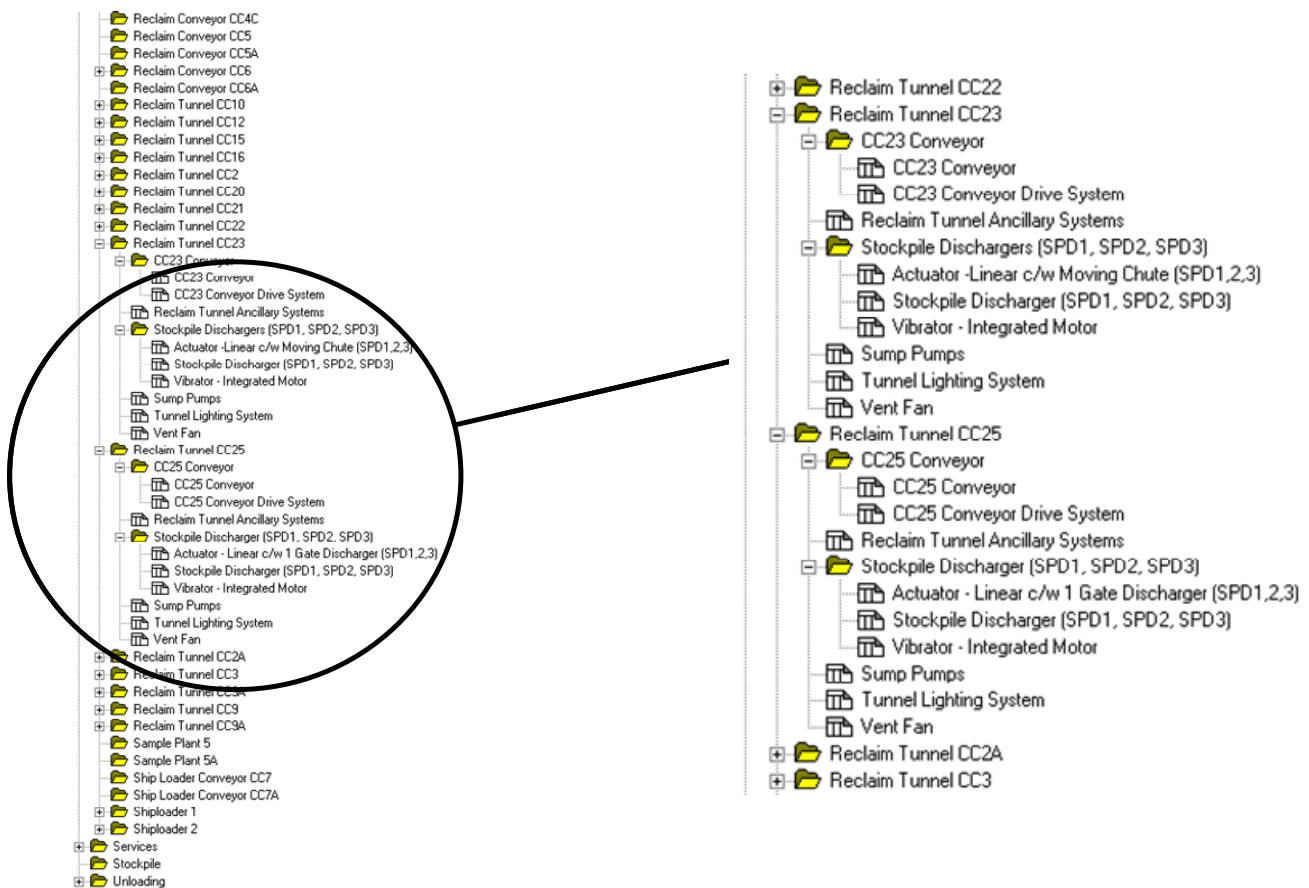


Figure 4: Layout of RCM2 templates within the RCM Toolkit

### 3.3 Risk Assessment

Queensland industrial legislation and CQPA's internal need for safe working practices requires Job Safety Analyses (JSA) to be completed for all site maintenance activities. Traditional JSAs tend to reflect only those risks associated with on the job activities and are not as comprehensive as risk assessments conducted to AS/NZS 4360. A full risk assessment:

- Is usually facilitated
- Covers a broader range of risks including those associated with equipment design and operation

- Involves a broader range of skills
- Assesses whether risks are tolerable and if not, assesses risks after treatment options have been explored
- Assigns responsibilities and addresses follow up actions
- Is formally verified by responsible managers

In line with the project strategy, therefore, all operational tasks and all RCM maintenance tasks, both proactive and corrective were risk assessed to the AS 4360 process using the The Asset Partnership's QRA Toolkit database for recording outputs. This enabled all existing controls to be identified, assessed, and where inadequate, to be treated (see Figure 5 and 6).

Consequence	Likelihood				
	A	B	C	D	E
1	1	2	4	7	11
2	3	5	8	12	16
3	6	9	13	17	20
4	10	14	18	21	23
5	15	19	22	24	25

Risk Ranking	Categories
1 - 8	Extreme Risk - immediate action required
9 - 16	High Risk - senior management attention needed
17 - 20	Moderate Risk - management responsibility to be specified
21 - 25	Low Risk - managed by routine procedures

Figure 5: AS 4360 Risk Assessment Process

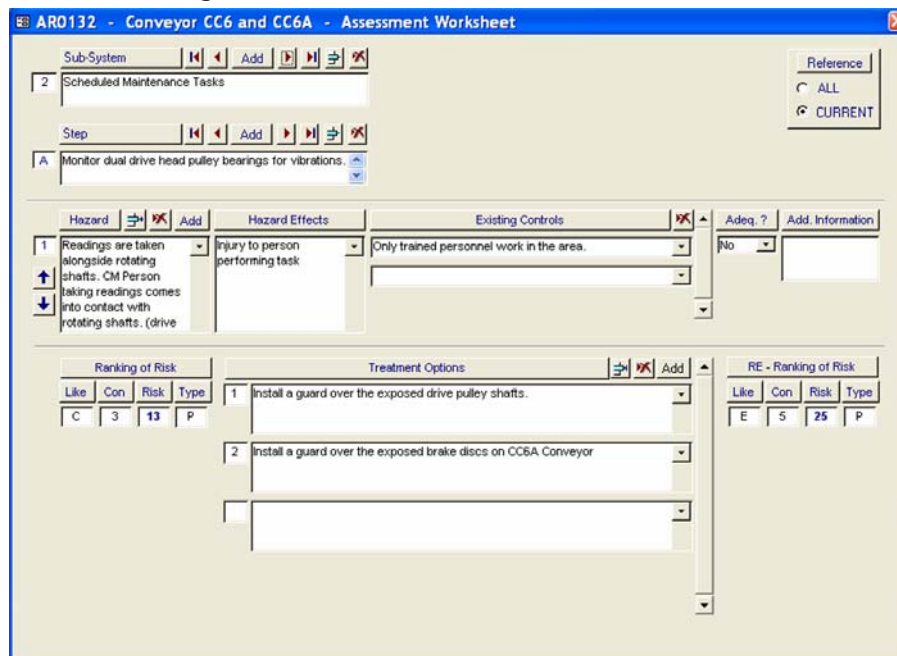


Figure 6: The QRA Toolkit database was used to record all risk assessments

JSAs are automatically generated from the QRA Toolkit for each maintenance task identified through RCM2 and are attached to maintenance work orders triggered from the Navision maintenance management module.

### 3.4 RCM2 Job Cards


RCM2 Job Cards were developed in the RCM Toolkit software for triggering directly from the Navision maintenance management module. Each Job Card (example shown in Figure 7) contains the following elements:

- *Skills and time to complete the Card:* RCM2 task outputs are packaged into logical groupings taking account of site geography, skill requirements and whether equipment must be running or stopped. Tasks are grouped to maximise throughput and minimise the size of maintenance windows.
- *Manuals and Handbooks:* Reference is made at the top of each Card to any documents containing additional detail. In the reference is to the underlying JSA.
- *Safety Precautions:* These are taken from the QRA risk assessment conducted on each RCM2 task. For corrective actions, the safety precautions can be extensive. Tick boxes are included for field feedback.

- **Task Details and Job Description:** Each Job Card involves a considerable level of detail. This has been completed by the Project team under the guidance of the external RCM Facilitator.
- **Parts and Tools requirements:** The requirement to add parts and tools into the Job Card ensures that bills of materials for proactive and corrective tasks are developed. This work remains to be completed at the time of writing this paper.
- **Associated Failure Modes:** Each Job Card identifies the specific RCM2 failure modes which are being managed through the Card. In this example, this includes failure modes on the conveyor itself and the conveyor drive system. This feature is particularly useful in guiding the tradesmen involved.
- **Measurements:** Space is allocated on the card for specific measurements to be recorded. Information from the completed Job Card is logged in the maintenance planning and scheduling office.
- **Drawings:** The reverse side of the Job Card is used for inclusion of relevant drawings in bitmap format. In this case, this included condition monitoring points on the conveyor drive.

In total, over 1500 proactive and corrective RCM Job Cards have so far been developed and issued, representing roughly 70% of the total expected for the site.

The programme is now being expanded to include electrical distribution systems.

No.	Task Title				
9	CC6 - 3 Monthly Condition Monitoring (CM Mech or Elec) - RUNNING				
<b>Skills and Time Required to do the Task</b>			<b>Manuals and Handbooks</b>		
<b>Skill</b>	<b>No.</b>	<b>Time Required</b>	<b>Manual or Handbook</b>	<b>Issue</b>	
CM Mech Tradesperson	1	1 Hours	AR0132 - CC6-6A Operational Risk Assessme	A	
Contractor	1	4 Hours			
<b>Safety Precautions</b>					
1	Hearing and eye protection MUST be worn for all tasks				<input type="checkbox"/>
2	Ensure adequate safeguards are taken to avoid contact with moving parts				<input type="checkbox"/>
<b>Task Details and Job Description</b>					
1	Ensure CSI 2120 equipment is in calibration				<input type="checkbox"/>
2	Using general purpose magnetic base accelerometer, collect vibration signatures at positions indicated on attached Drawing for main motor drives, fluid coupling and gearbox				<input type="checkbox"/>
3	Apply 10 shots of LE5375 grease to Drive end and non-Drive end bearings on electric motors				<input type="checkbox"/>
4	Using general purpose magnetic base accelerometer, collect vibration signatures in an axial direction at marked points on dual drive head pulley, bend pulleys, lead in and lead out pulleys and tail pulley plummer blocks				<input type="checkbox"/>
5	Access counterweight pulley accelerometer connection from terminal box above counterweight and collect vibration signatures				<input type="checkbox"/>
6	Download data, analyse and report exceptions to Supervisor				<input type="checkbox"/>
7	Raise Work Requests in Navision for vibration related exceptions				<input type="checkbox"/>
8	Take oil samples from fluid coupling and main gearbox and enter results into FLEETOIL database. (Conditions to be tested to include oil condition, viscosity and contamination)				<input type="checkbox"/>
9	Raise Work Requests in Navision for oil analysis exceptions				<input type="checkbox"/>
<b>Parts Required</b>					
<b>Part Number</b>	<b>Part Description</b>			<b>Quantity</b>	
LE5375 grease				1	
<b>Tools</b>					
<b>Tool Part Number</b>	<b>Description</b>			<b>Required</b>	
Grease gun				1	
Vibration Monitor Device	Vibration Monitor Device			1	
<b>Associated RCM Failure Mode(s)</b>					
<b>Analysis Reference</b>	<b>FM Ref</b>	<b>Failure Mode</b>			
CC6	1A5	Dual drive head pulley bearings fail for other reasons			
CC6	1A10	Bend Pulleys pulley bearings fail for other reasons			
CC6	1A15	Lead In Pulleys pulley bearings fail for other reasons			
CC6	1A20	Counterweight pulley bearings fail for other reasons			
CC6	1A25	Lead out Pulleys pulley bearings fail for other reasons			
CC6	1A33	Tail pulley bearings fail for other reasons			
CC6 Drive System	1A2	Main drive motor bearing fails due to insufficient quantity of lubrication.			
CC6 Drive System	1A5	Motor bearing fails due to inherent failure			
CC6 Drive System	1A9	Fluid coupling bearings fail			
CC6 Drive System	1A12	Fluid coupling oil deteriorates			
CC6 Drive System	1A30	Gearbox bearing fails due to contamination.			
CC6 Drive System	1A31	Gearbox bearing fails due to inherent failure			
CC6 Drive System	1A34	Gear teeth fail due to spalling			
CC6 Drive System	1C3	Fluid coupling oil deteriorates			
<b>Measurement Parameter</b>		<b>Value</b>			
Belt scraper wear		_____			
Belt scraper wear		_____			
Belt scraper wear		_____			

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Figure 7: The RCM2 Job Card (3 monthly Conveyor Condition Monitoring, Running)

## 4 THE MEASURES REPORTING PROGRAMME

To date, CQPA has successfully managed a 400% increase in coal throughput over the period 1979 to the present. As identified in the 7S model, however, a further 50% increase on current levels would require smarter work processes and improved management information to be available. As part of the overall MI Project, a measures programme was started in mid-2004 to ensure that all levels in the new organisation are provided with relevant information in a timely manner with the minimum level of clerical effort. This involved projects in both operations and maintenance.

### 4.1 Principles of Reporting Systems

Six key principles of reporting were embraced in the programme:

1. The prime purpose of a reporting system is to monitor performance at each level and function. Reports are used for problem “identification”, not for “problem solving”. Where problem solving is the focus, this leads to confused accountabilities, over reporting and upward delegation.
2. Contextual information is included in reports in memo form.
3. Reports derive from a ‘mathematically verifiable, cohesive whole’. In the absence of this principle, the relative importance of data and the relationship between data elements cannot be determined with confidence.
4. The mathematically cohesive whole approach must be lined up as much as possible with the authority and accountability of each layer of management, reflecting their individual areas of ownership.
5. All reports must display prior year information, YTD and MTD (actuals and targets) and be ‘dollarised’ where possible.
6. The content and form of reports should reflect levels of responsibility to avoid confusion and upward delegation.

The new reporting system would need to take account of multiple databases and eliminate the levels of duplication which existed.

### 4.2 Operations Reporting

All train arrival and shipping information is recorded in databases accessible through the CQPA intranet. Whilst this database provided a high level of detail on each coal movement, it did not pass a number of tests including being based on clearly defined data standards and being a ‘mathematically cohesive whole’ (for example, accounting for each minute of each year accurately and completely). As a starting point in the measures programme, new standards were developed as the basis for each measure.

Little detail was available on location and causes of equipment downtime. In order for operations and maintenance to focus in on problem areas, the measures programme incorporated the development and implementation of an SQL delays database for unloading and loading operations. This now provides drill down capability on delays reported by the Operations staff in unloading and loading processes, enabling availability and reliability figures to be calculated and trended for each item of equipment.

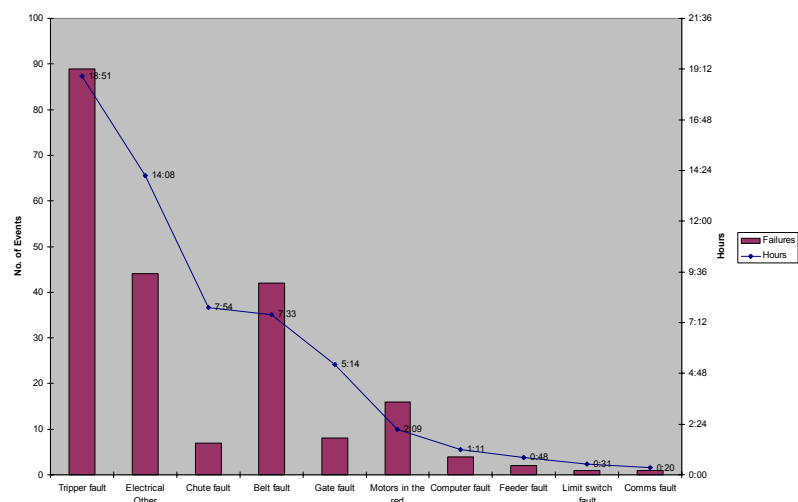
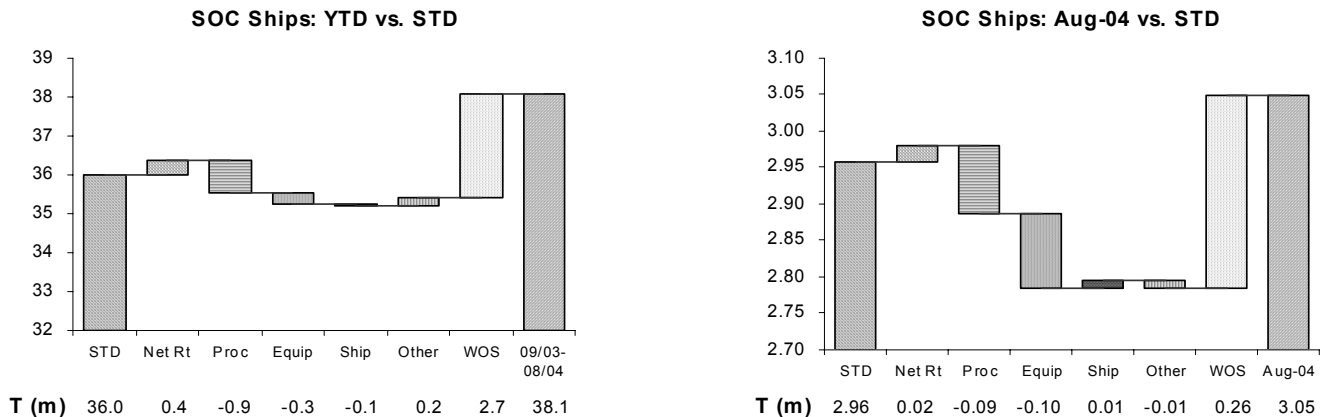


Figure 8: Drill down capability from Delays database

Management reports based on the intranet arrival and shipping information and the delays database are now under development. The CEO level reporting package has now been completed and provides trended historic information on coal movements including 'sources of change'. An example of the type of automated reporting now available is shown in Figure 9 for 'Sources of Change' on Ship Loading.



**Figure 9: Automated reporting of loading and unloading measures have been completed for senior management levels**

Over the coming months, it is intended to extend the reporting to Superintendent levels in Operations and Maintenance taking account that reports are intended to identify rather than problem solving. A management development programme is planned to develop problem solving skills at each level.

### 4.3 Maintenance Reporting

At the start of the MI Project, CQPA maintenance processes required substantial change. The starting point could be characterised in a number of ways:

- Maintenance activities were not always formally assessed for job steps, work content or risk prior to being conducted.
- The existing backlog of unplanned and planned work required considerable cleansing.
- The planning focus was on shutdown activities rather than day-to-day maintenance.
- Maintenance windows were subject to short term changes due to last minute operational requirements, making maintenance scheduling a considerable challenge.
- Work packages were not sized in such a way to support the effective use of the available maintenance windows.
- Coordination between workgroups was limited on a day-to-day basis, resulting in ineffective use of available windows and resources.

In order to achieve the changes required, existing and proposed work management processes were mapped in detail with full involvement of the maintenance staff (as noted above). A series of standard management reports are now being developed and implemented in the Navision maintenance management module to monitor how well the work management processes are being performed. Some of the basic reports being developed include:

- *Labour and materials records for all maintenance activities:* It is intended that by mid-2005, all work orders will have recorded labour and materials costs available, measured against estimate (as contained on Job Cards). In due course, it is intended to develop a bottom-up budget using this information. In order to collate materials costs, a significant effort is under way to develop fully costed bills of materials in the Navision software.
- *Backlog by function and type:* This will provide a list of open Preventive, Corrective and Breakdown work orders (containing estimated hours and materials) which will be executed in the future and will encourage closure of work orders on completion.
- *PM Schedule compliance:* Considerable effort has been put into the development of the PM programme at RGTCT. It is intended that all PMs issued within the planning and scheduling process are completed within the assigned maintenance windows.
- *Roller statistics:* Conveyor health is one of the keys to high levels of plant availability and central to this is the timely and accurate reporting of roller defects. Given the considerable length of the conveying system

at the terminal and the varying levels of use of each conveyor, it has been necessary to revamp the roller inspection programme and defect reporting process. This now uses a priority rating depending on the severity of the defect and permits operations and maintenance to examine success in treating category 1 and 2 defects (the most severe). Through the delays reporting system and the Navision maintenance management module, roller delays are trended and reported back to the operations and maintenance workforce. The goal is zero unplanned downtime from roller failure.

## **5 BENEFITS AND CONCLUSION**

### **5.1 Benefits**

Many benefits are flowing from the MI Project at CQPA's R G Tanna Coal Terminal. Overall, the project is enabling CQPA to:

- Ensure that in the short term, equipment availabilities and reliabilities at the terminal are able to meet the quickly increasing coal throughput from the mines in the region.
- Conduct necessary maintenance activities in substantially reduced windows.
- Prepare the terminal's operations and maintenance functions for a 50% increase in coal volumes with minimal increase in overall workforce numbers.
- Improve safety performance and environmental compliance levels through plant modifications, implementation of revised operational and maintenance procedures and identification of training requirements for employees.
- Document all maintenance strategy and associated operational and maintenance risk management decisions.
- Develop strategies for Port expansion and other Port assets from the extensive equipment database now available at the R G Tanna Terminal.

Many other benefits will be realised in the light of experience.

### **5.2 Conclusion**

The MI Project is a key component of the Central Queensland Ports Authority's strategy of meeting customer needs in the short and longer terms. It is also vital in ensuring Australia has infrastructure assets which operate at world class levels.

The enhancement of CQPA's operational and maintenance systems will ensure that the Port has an efficient, safe and environmentally sound operation at the R G Tanna Coal Terminal, able to meet the increasing demands placed upon it by Australia's successful minerals and minerals processing industries.