

[Success Story]

Richards Bay Coal Terminal

Industry: Mining



“The approach, expertise and technologies used in this project and the results achieved so far are giving us the confidence that we’ve made the right choices. We can look forward to risk elimination and the freedom to choose what new improvements we want to make all within a stable plant environment.”

*Louis van der Merwe, Senior Manager
Electrical Technology, RBCT*



Large Terminal Control System upgrade at RBCT stabilises plant-critical operations

Goals

- Remove existing TCS risks
- Provide a centralised plant control environment.
- Integrated automation approach
- Increased asset efficiency
- Operational excellence
- Minimisation of risk and liability
- Plant stability
- Future scalability
- Improved system access control/security
- Software change control

Challenges

- Implementation of a highly complex and extensive control system modernisation initiative without process disruption
- Tight timeline
- Undocumented business rules
- The scepticism engendered by failed projects in the past

Solutions and Products

- System Platform
- Historian
- Application Server
- TOP Server

Results

- Removal of the risk of running obsolete products in a plant-critical system
- Alignment with RBCT’s engineering technology vision
- Improved system access control/security, software change control
- Improvements in genealogy, traceability and data archiving
- Centralised plant control environment
- Improved interaction between control room plant operators and C&A technicians
- Increased employee motivation and flexibility
- Establishment of plant-wide standards
- Closer integration between MIS/MES



“Some of the challenges of this project included minimal plant downtime, ensuring that the new and old systems worked in parallel and with one another, a tight timeline, undocumented business rules and the skepticism engendered by failed projects in the past.”

- *Ingrid-Gaye Osborne, Director Projects, Saryx Information Systems*

Richards Bay, Kwa-Zulu Natal, South Africa – This project consisted of upgrading and replacing parts of the Terminal Control System (TCS) at Richards Bay Coal Terminal and incorporating the result into a Wonderware System Platform environment. The existing TCS is not aligned with RBCT’s engineering technology vision and requires, in some cases, critical software upgrades and in others complete replacement of critical but obsolete products.

Background

Today, industrial automation systems boast of “openness”, “scalability”, “flexibility” and other attributes that assure their prospective users of a sound investment for the future. But what of systems that were developed and installed before such qualities were not necessarily given the importance they enjoy today? Some of them are no longer supported or may prove too difficult or impossible to integrate into today’s technology. To complicate things further, systems like this may have been rooted at the very heart of the enterprise for decades and influenced other systems around them. And talking of hearts, replacing such a system is a bit like performing a heart transplant – in either case, a botched job doesn’t end well for the patient. This was especially real to RBCT because previous attempts took five years and weren’t successful.

That’s why the TCS upgrade and replacement at RBCT is being done with the utmost care, the best engineering knowhow and proven future-proof technologies.

RBCT faces the following challenges with the existing system:

- Operators and maintenance personnel look at different plant screens, which makes fault finding and communication difficult when it should be transparent.
- There is no plant-wide standards-based strategy (such as between the TCS and PLCs).
- The system is mature and any change requires plant downtime. In addition, the lack of adequate documentation makes these changes highly risky.
- The Oracle (database) and Gensym G2 (real-time management of mission-critical systems) software require an upgrade to their latest versions.
- The plant HMI and plant data communication software is obsolete and failing due to the system upgrades around them.
- The existing Wonderware plant InTouch requires standardisation, easier deployment and a facelift.
- The existing UNIX-based TCS requires specialised technical skill in multiple areas.

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“In view of this, the project was justified and approved based on risk rather than new or improved functionality or capacity,” says Ingrid-Gaye Osborne, Director Projects, Saryx Information Systems. “During a recent computer controls risk audit, the current environment was identified as the number one risk that the organisation faces, with a very high likelihood of failure resulting in an extreme impact on the business should this occur. Preventing this scenario was the ultimate objective of this project.”

The project scope included a broad outline stipulating that the current environment must be replaced, like for like and resulted in a four-phase implementation:

- Phase I – TCS stabilisation (2014)
- Phase II – Single Sub – (2015)
- Phase III – Machine standards – (2016)
- Phase IV – Machine standards – (2017)

Goals

- The key business drivers for this project include:
- Remove existing TCS risks
- Provision of a centralised plant control environment
- Integrated automation
- Increased asset efficiency
- Operational excellence
- Minimisation of risk and liability
- Plant stability
- Future scalability
- Information reliability
- Historical data archiving
- Improvements in genealogy and traceability
- Compliance with the ANSI I SA-95 industry standard
- Improved data visualization
- Improved system access control/ security
- Software change control

Current RBCT plant overview

The existing plant software infrastructure (figure 1) is based on a Wonderware InTouch, Oracle database, Gensym G2 and Promace configuration. Two separate applications exist and these are included in the scope of works for this project: The Terminal Control System (TCS) is the MES/MIS Plant Control application familiar to the control room operators and other RBCT personnel and the Central Single-Sub (CSS) application, which is a supervisory Human Machine Interface (HMI) used

About Richards Bay Coal Terminal

RBCT is the single largest coal export terminal in the world. Opened in 1976 with an original capacity of 12 million tons per annum, it has grown into an advanced 24-hour operation with a design capacity of 91 million tpa.

Positioned at one of the world's deep sea ports, RBCT is able to handle large ships and, subsequently, large volumes. As such, it has gained a reputation for operating efficiently and reliably.

The 276-hectare site currently boasts a quay 2,2 kilometres long with six berths and has a stockyard capacity of 8,2 million tons.

RBCT shares a strong cooperative relationship with South Africa's national utility, Transnet, which provides the railway services linking the coal mines to the port and the shipping coordination of more than 700 ships per annum.

The company equipment includes 5 tipplers, 10 stacker-reclaimers, 4 ship loaders and a number of high-speed conveyors.

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by the PC&A department for maintenance. Several peripheral supervisory HMI applications exist across the plant but these fall outside the current scope of works for this project.

There are approximately 45 PLCs installed throughout the RBCT plant operation and these form the backbone of the plant's equipment control system. Three Top Servers from Software Toolbox are used exclusively by the supervisory level HMI InTouch Applications to connect to these PLCs. A custom Marex interface (driver) facilitates communication to each of the PLCs for communication to the TCS plant control application. This driver will be decommissioned during this project.

Wonderware's InTouch application runs on each of the various substations and for each of the major equipment types including tipplers, stacker-reclaimers and shiploaders, to allow for supervisory and control functions. One of these applications is created on the Central Single-Sub (CSS) and is being replaced. All InTouch applications connect to the plant via the Top Servers and store historical data in a central Wonderware Historian, which is being upgraded as part of this project.

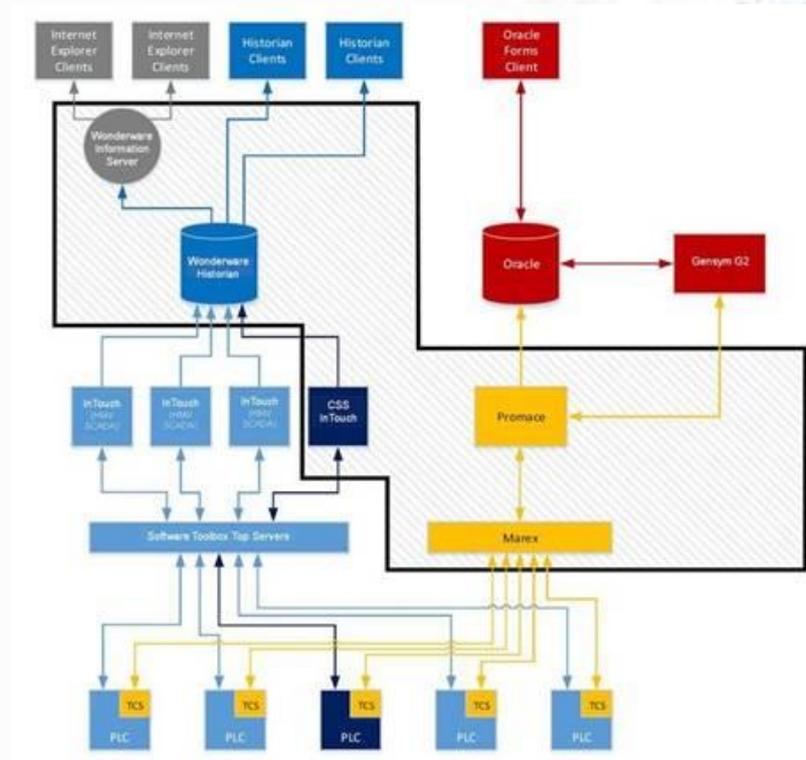
The Wonderware Information Server (WIS) is used as a Web Portal on top of the Historian. The Portal can be used to access historical reports and trends and for the visualisation of the live plant environment by linking directly to the InTouch Applications.

Gensym G2 is the MES platform at RBCT and will be upgraded to the latest version as part of this project while the Oracle database is host to the Operational Planning and Control (OPC) System and the TCS.

Implementation

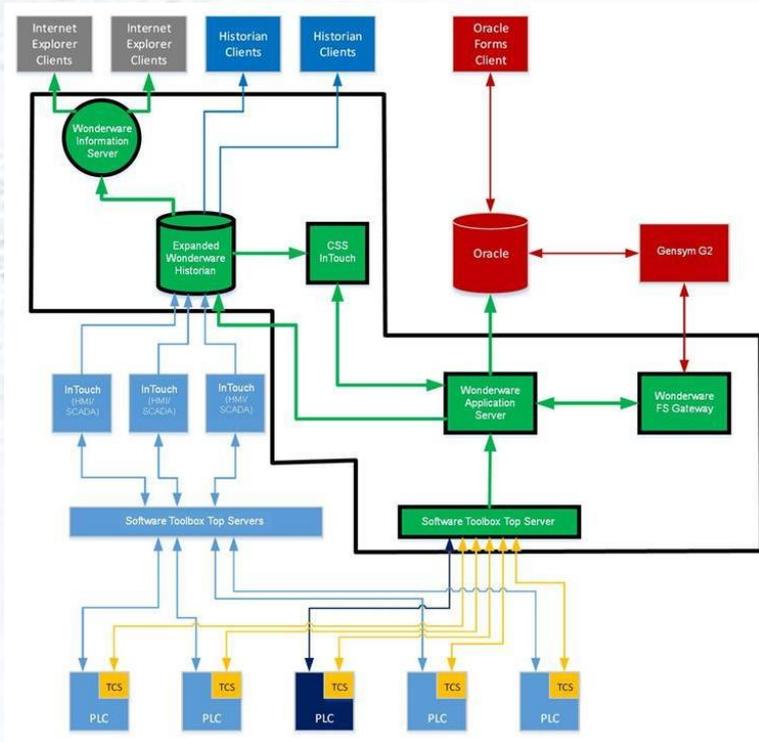
The project was initiated at the beginning of 2014 and is expected to end in December 2015. Project development started on 1st September 2014. The project timing is critical and constricted as equipment replacement of two stacker-reclaimers and two shiploaders begins in 2016 and development for this equipment must be incorporated in the new software prior to that date.

The new topology is shown below where an additional Top Server layer will provide connectivity to the PLCs for the TCS application. The CSS application will also be routed through this layer.



Current Topology showing the portion to be replaced/upgraded (shaded)

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The Wonderware Application Server is the backbone of System Platform and connects to the plant using the new Top Server layer. The Application Server hosts the various applications according to a hierarchical model. FSGateway is the Wonderware I/O router. It provides a DDE, SuiteLink and OPC server on top of Application Server. This will make all the attributes in Application Server available to Gensym G2 via OPC.

InTouch is the new visualisation client running inside the System Platform framework. The InTouch applications are not connected to the plant directly but get information from the Application Server. InTouch is the HMI for the TCS as well as the CSS applications.

The current Historian is being replaced with a larger version of itself and forms part of System Platform. The Application Server sends historical data to the new historian and all the existing InTouch Application data will be redirected to the new historian server for historical purposes. Existing historical data can also be transferred to the new Historian.

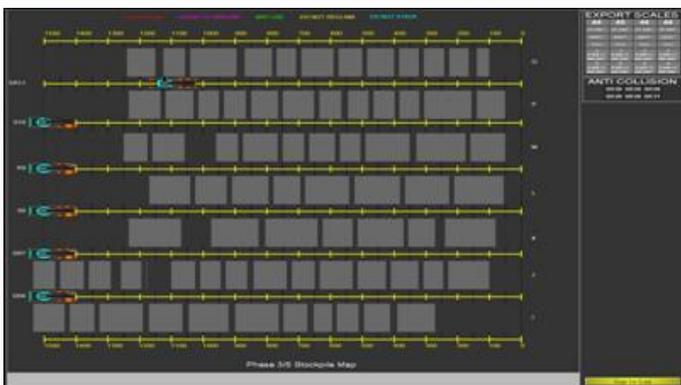
The existing Wonderware Information Server is being replaced with a newer version and will form part of System Platform. This web portal allows users to connect to it via a web browser and provides access to published trends, reports, process graphics and a generic trending tool.

In addition to the above (see figure 4), ACP ThinManager will be incorporated in order to provide Remote Desktop Services for the new InTouch clients. At a future stage, the existing InTouch Applications may then also be migrated into the ACP ThinManager environment.

MDT AutoSave will be included to serve as the change control system that monitors the development taking place on all 45 PLCs. It stores versions of the PLC software and allows an authorised user to roll back to previous working versions in the case of a problem. Companion product AutoSave for System Platform will do the same for Application Server and the new InTouch.

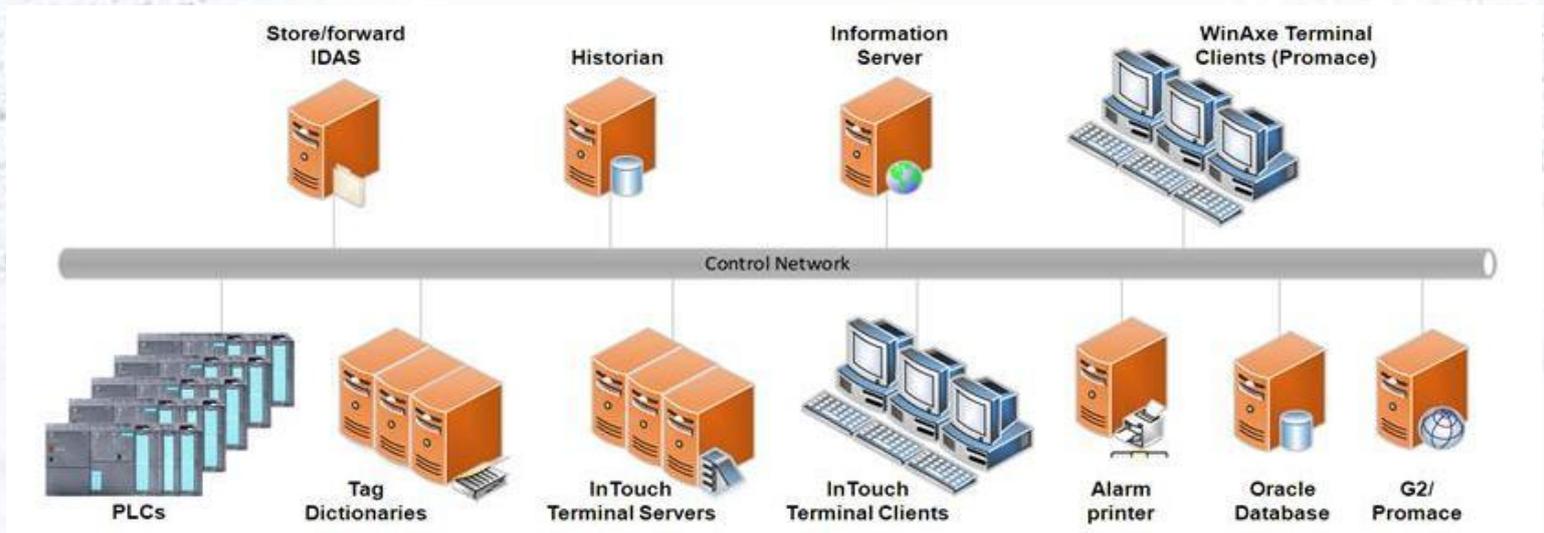


Proposed RBCT plant overview

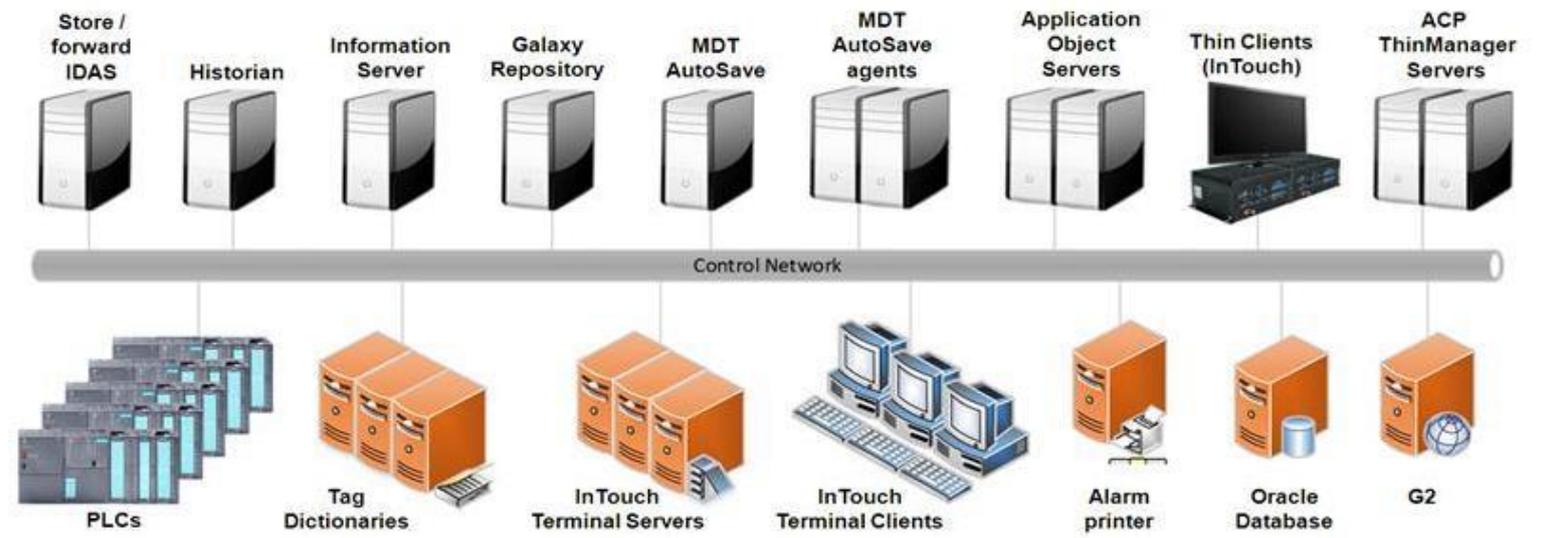


Stockpiles are represented geographically correct as per the database and their status is updated every 30 seconds

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Existing architecture overview



New architecture overview



“I believe that, quite apart from the benefits already realized, the success of this project is due to the collaboration and shouldering of the individual responsibilities between RBCT, Wonderware and ourselves as the system integrator.”

- *Ingrid-Gaye Osborne, Director
Projects, Saryx Information Systems*

Benefits

This extensive and complicated project was designed to provide RBCT the following benefits:

- Removal of the risk of running obsolete products in a plant-critical system
- Alignment with RBCT's engineering technology vision
- Improved system access control/security, software change control
- Improvements in genealogy, traceability and data archiving
- Centralised plant control environment
- Better efficiency and effectiveness in the maintenance of information and calculations by reducing human errors
- Improved interaction between control room plant operators and C&A technicians
- Increased employee motivation and flexibility due to improved efficiency through their use of modern, user-friendly interfaces
- Establishment of plant-wide standards
- Closer integration between the MIS/MES layer and the PLCs
- All the chosen technologies are widely used, proven, widely supported and can be managed with RBCT's existing internal technical skills, providing improved plant stability and future scalability

Wonderware Southern Africa

Block E, EOH Business Park
1 Osborne Lane
Bedfordview
South Africa

www.wonderware.co.za

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