

Wonderware MES solution: An important component of Operations Management at SAB brewery

by Wonderware Southern Africa

“Users have been impressed with the functionality... they see something that is elegant, supports their needs and will provide the necessary information for the management of brewing operations”

Liz Bird,
Project Manager,
SAB Newlands



VALUE DRIVERS	KEY METRICS	Company Overview
<p>Goals</p> <ul style="list-style-type: none"> • Maintain an annual capacity of 4,5 million hectolitres; • Improve brewery yield by isolating the processes responsible for material loss. <p>Challenges</p> <ul style="list-style-type: none"> • Improve system capability and robustness; • Consistency: The new functionality had to be consistent with the installed base of 6 other breweries. 	<p>Wonderware Solutions</p> <ul style="list-style-type: none"> • Wonderware Manufacturing Execution Module; • Wonderware Historian <p>Results</p> <ul style="list-style-type: none"> • Brewing Material loss saw a 0.8% step change year-on-year contributing ~R1.5m to the bottom line; • Brewing factory efficiency improved by 3.8% year-on-year, freeing up 171,000 hl capacity per annum; • Overall Sigma saw a recovery to 2006 performance levels with an improvement of 0.08 over 2007 meaning 19,000 less defects per million opportunities. 	<p>The South African Breweries Ltd. (Newlands Brewery) – Cape Town, South Africa</p> <p>SAB Ltd. is the South African operation of SABMiller plc and currently produces 26 million hectolitres of beer per annum and sells 14 million hl of other beverages through its soft drinks division, ABI. Newlands Brewery, located near Cape Town, has a capacity of 4.5 million hl using 2 brewhouses and a cellar of 118 vessels. It brews most SAB brands of beer and Redd's flavoured alcoholic drinks.</p> <p>With the acquisition of Grolsch, SABMiller plc has become the largest brewer in the world by volume. Carling Black Label was voted SA's Favourite Beer, followed by Castle Lager and Hansa Pilsener in the Sunday Times / Markinor "Top Brands" survey.</p>

Newlands is SAB's first brewery and with an annual capacity of 4,5 million hectolitres, accounts for nearly 20% of the company's total SA production. High on the brewery's agenda is the improvement of brewery yield by isolating the processes responsible for material loss. To achieve this, Newlands has implemented an MES solution using Wonderware Manufacturing Execution Module.

Although better suited to discrete manufacturing than batch, Wonderware Manufacturing Execution Module (formerly known as Intrack software). was selected in 1999 to form the basis of SAB's Product and Quality Tracking (PaQT) application deployed at 6 breweries. Newlands was the last brewery to receive PaQT, yet it already enjoyed its own bespoke application which had a larger functional footprint and which supported all necessary operations (barring Planning and Automated Execution). This was an application that was seen as a source of competitive advantage and that helped Newlands win the Best Brewery award for two consecutive years. Designing some of PaQT's new functionality provided an opportunity to extract more value from its Wonderware Manufacturing Execution Module component. The challenge at Newlands was to maintain or improve performance while replacing their regional MES with the corporate solution

"Brewing operations was not the original intent of Wonderware Manufacturing Execution Module, yet it plays a pivotal role," says SAB Manufacturing Systems Architect Lamont Theron. "Wonderware Manufacturing Execution Module was already used in the previous version of the application and it was originally chosen for its model-based structure and configurability. Wonderware Manufacturing Execution Module provides a framework for tracking lots through the brewing process."

Solution requirements

Enhancements to the existing MES solution related to three operational threads, namely:

- Material loss management solution;
- Schedule and efficiency related solutions;
- Quality assurance solutions to manage deviations and notifications.

The first requirement had a profound effect on the whole solution. *"Material loss management requires data at extreme levels of detail, accuracy and completeness, across multiple measurement and time lines to enable short interval control and cyclic review that ultimately impacts the bottom line,"* says Theron. *"Wonderware Manufacturing Execution Module's transactional basis for all material movements is fundamental to yield and loss management as it ensures rigorous data collection and a mass balance. Also, clear business benefits have been realised since implementing the MES."*

System implementation

The system was implemented over 24-months during which time the legacy and new systems ran in parallel. While data clerks kept the legacy system alive, brewing

used the new system. *"In this particular implementation, system capability and robustness were more important than delivery time,"* says Theron.

All designs endeavoured to use Wonderware Manufacturing Execution Module as their basis. The material loss solution used database triggers so that it was reasonably independent of application development and due to retrofit considerations. Shop floor information is manually entered to supplement real-time process data and events automatically captured. Production performance is reflected on clients, web reports and weekly submissions to finance for product costing.

As shown in figure 1, the electronic Quality Management System (eQMS) has 3 main subsystems: Product and Quality Tracking (PaQT), Laboratory Information System (LIMS) and intranet-based web reports that can be launched remotely.

A Batch Tracking Engine works with real-time Wonderware Historian (formerly known as IndustrialSQL Server or InSQL) to collect process and event data. New functionality had to be consistent with the installed base of 6 other breweries. Implementation at the 7th, namely Newlands, was in parallel with their existing system and changeover was implemented once eQMS was stable. It should be noted that eQMS underwent a significant overhaul across 70 work packages.



Figure 1: The three main subsystems of eQMS.

Material loss management

The Material loss management solution was driven through 4 design approaches aimed at complete, detailed and accurate data:

■ **Improving the User Experience** – this was achieved by enhancing the Visual Basic front end in four areas. Firstly, by adopting the look-and-feel of Microsoft Outlook. Although navigation is more sophisticated to allow for improved data collection and analysis, it is simplified through the familiar layout. Secondly, the new multi-document interface allows users to analyse and correct data in the same environment. Users also get graphical feedback on the data collection status of configured items. Finally, dialogues were enhanced to predict the outcome of a transaction before committing it thereby helping users ensure the integrity of data capture;

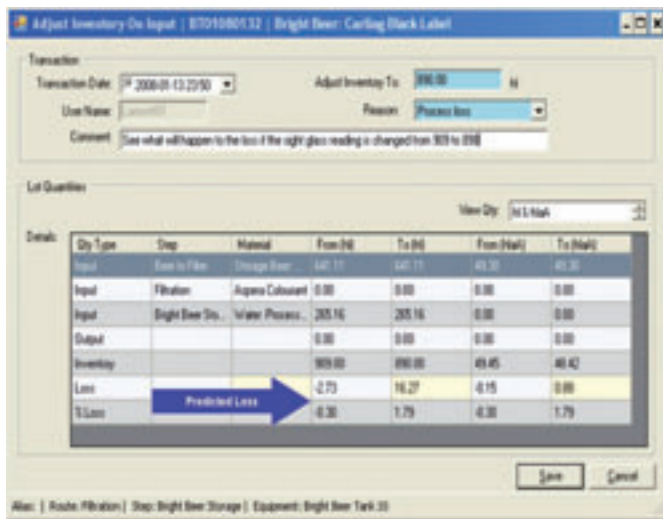


Figure 2: Improving the user experience. Dialogues were enhanced to predict the outcome of a transaction before committing it. For short intervals of control, each transaction represents the minimum time to detect an error. Hence all material movement dialogues predict the impact on inventories and/or losses.

■ Extending Wonderware Manufacturing Execution Module's Route Model to track across multiple steps

– this unlocked 3 new capabilities: Displaying the current step of in-process lots and material inputs, highlighting abnormal input and production paths and analysing material losses by step and/or by equipment item;

■ Adapting some Wonderware Manufacturing Execution Module concepts

– two Wonderware Manufacturing Execution Module concepts were adapted: the first is to do the transaction after the lot is finished by “zeroing” two weeks later; The second is adjusting transaction quantities when “undo” is not viable or desirable;

■ Interpreting and complementing Wonderware Manufacturing Execution Module transaction logs

– Wonderware Manufacturing Execution Module transaction logs are interpreted through database triggers which create complementary logs and together with these complementary logs, provide the sole source of material loss reports.

Schedule and efficiency related solutions

In addition to Material Loss, InTrack contributed to 4 other operations related to scheduling and efficiency:

- Allocate racking sequence;
- Allocate packaging lines to Bright Beer Tanks;
- Record production stoppages;
- Record equipment utilisation.

Quality assurance solutions to manage deviations and notifications

Although Wonderware Manufacturing Execution Module did not contribute directly to the management of deviations and notifications, this new functionality was key to providing a complete MES solution.

Realised benefits

- Brewing Material loss saw a 0.8% step change year-on-year contributing ~R1.5m to the bottom line. In providing real time access to reliable information, eQMS is an important part of a range of other actions that drove this improvement;
- Brewing factory efficiency improved by 3.8% year-on-year, freeing up 171,000 hl capacity per annum. Overall Sigma saw a recovery to 2006 performance levels with an improvement of 0.08 over 2007 meaning 19,000 less defects per million opportunities;
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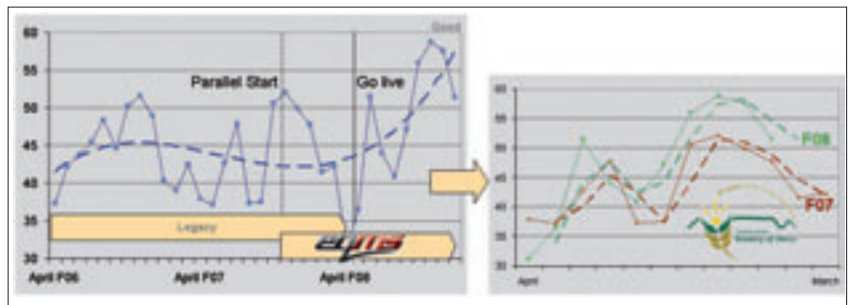


Figure 3: Realised benefits - Brewing factory efficiency improved by 3.8% year-on-year, freeing up 171,000 hl capacity per annum.

Conclusion

“To develop an effective MES solution requires a holistic and thorough review of all functionality, especially the user experience,” adds Theron. “Extending Wonderware Manufacturing Execution Module is a viable alternative to stand-alone custom development within the overall MES solution. InTrack concepts can be applied to complementary components to drive consistency in the overall MES solution and limit ad lib development.”

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