Exxaro’s Grootegeluk mine opts for intelligent production reporting with help from Wonderware

**Goals**
- Automatic data extraction from plant PLCs
- Develop a calculation and aggregation engine for reporting
- Strict validation of data manual and automatically-derived data
- “Back filling” of data from existing systems
- Static and dynamic reporting

**Challenges**
- Elimination of traditional spread sheets while establishing confidence in the new system

**Solutions and Products**
- Wonderware Intelligence
- Wonderware Historian
- FLOW

**Results**
- Greatly improved decision making
- Single version of the truth
- Replaced Excel as a reporting solution
- Independence from system integrator and ease of use
- Collation of data from multiple sources
- “Back fill” capability leverages existing Historian data allowing back-tracking as far as needed
- Validation of all data and the ability to go back in time and correct errors

“The Intelligence Analytics Client is essentially the authoring tool for dashboard visualisation. But it’s more than that; it’s a “Self-service” analytical tool that is so powerful that I believe everyone should have it on your desktop. Throw away spreadsheets and put this on your desktop – it’s incredible!”

Graeme Welton, Director, Advansys (Pty) Ltd.
Lephalale, Limpopo Province, South Africa - An operation the size of Exxaro's Grootegeluk coal mine depends on accurate and timely contextualised plant-level information to be effective. With the necessary expansion of the processing plant to supply the new Medupi power station, traditional manual methods and spreadsheets would no longer be able to cope and Exxaro looked for a solution that would give them the necessary reporting for effective decision support.

Background
With the construction of two new world-class beneficiation plants (GG7 and GG8), Exxaro's Grootegeluk Medupi Expansion Project (GMEP) will, in terms of an agreement with Eskom, supply the Medupi power station with an average of 14.6Mtpa of power station coal over the next 40 years. Both plants are dedicated to meeting this considerable production schedule.

On completion of the expansion project, Grootegeluk will be the largest coal beneficiation complex in the world, producing some 33Mtpa of power station, coking and steam coal.

Grootegeluk’s production reporting was historically and traditionally an Excel-based system which involved manual data capturing onto a number of spreadsheets. From there a series of links and macros did a number of calculations and aggregations which were passed onto more spreadsheets which were then pulled together to generate reports.

It’s no wonder that the project mandate was simply to: “Replace this Excel reporting system.” But any new system would have to meet an extensive list of requirements including:

- **Automatic data extraction from plant PLCs** - this would include levels and information from belt scale counters, flow meters, etc.

- **Calculation and aggregation engine** – the engine would have to be configurable with respect to calculations as well as time intervals over which the reports would be based. Examples of information that could be included in reports are KPIs, production ratios and even raw values.

- **Validation of data** – a key requirement was that data needed to be validated before consideration for use in reports. So manual data (e.g. scaling factors or readings from instruments not connected to the PLCs) would have to be checked for validity. In addition, provision was to be made for the retrospective updating of data – for example, in the event of an instrument malfunction or absence for maintenance purposes, its incorrect readings would have to be overridden manually. Once manual data entry is involved, it’s important to introduce a level of version control and change control logging.

- **“Back filling”** – it was necessary to leverage the historical data in the existing systems to bring the information up to date.

- **Static and dynamic reporting** – static reports were those reports that managers could take into meetings, for example, whereas dynamic reports were analytical and interactive in nature and performed from a desktop or laptop PC.

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Figure 1: High-level solution architecture

“You have built Excel into an automation platform!”

Louis Steyn, Engineering Manager
Implementation
Exxaro selected Wonderware-endorsed system integrator Advansys (Pty) Ltd for the project because the company has manufacturing systems experts and, more to the point for this project, business intelligence specialists.

“The FLOW product provides all the necessary calculations, validation, backfill and connection to multiple data sources,” says Graeme Welton, Advansys director. “Wonderware Intelligence provides a dimensioned data model. For example we can reference plant area, material, planned or actual production values and any number of other dimensions. It also has a CSV plug-in which we use to download the daily plan from the mine planning system. But most importantly, it has dashboard-based visual analytical tools which will help personnel design their own reporting dashboards.”

Wonderware Historian
The Historian is a high speed, high resolution (i.e. < 1 second) and high performance data logger and database that gathers data from sensors, meters and transmitters.

FLOW
This is a configuration-driven reporting solution that integrates into and extends the Wonderware suite (in this case Historian and Intelligence) and that provides for:
- Calendar definition, allowing creation of “time buckets” (e.g. define different shift patterns)
- A data aggregation and calculation engine
- Connection to multiple data sources
- A drag-and-drop configuration environment
- Data validation, manual entry and retrospective updating

Wonderware Intelligence
Wonderware Intelligence is a “real-time” data warehousing solution (dimensions and measurements). It comprises two distinct components: the first is concerned with data collection and organisation into a dimensioned model and the second is an interactive visualisation and dashboarding tool.

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“From my point of view, one of the greatest success factors of this project is that Exxaro personnel have taken ownership of the reporting solution. Process and system engineers alike are using the system themselves with little or no involvement from us.”

Graeme Welton, Director, Advansys (Pty) Ltd.
Reports
Reports can also be made available on mobile devices if required:

**Benefits**
- Greatly improved speed and confidence of near-real-time decision making
- Single version of the truth
- Replaced Excel as a reporting solution
- Independence and ease of use as users can configure their own reports and dashboards – solution is also now used outside of GMEP in most of the Grootegeluk plant
- Collation of data from multiple sources to provide a cohesive and contextual view of production
- “Back fill” capability leverages existing Historian data allowing back-tracking as far as needed
- Validation of all data and the ability to go back in time to correct invalid or missing manual or automatically-derived data
What’s next?
The success of this project could mean that it will be expanded into the greater Grootegeluk plant. “It can possibly be used beyond production reporting in other areas such as finance or legal compliance with respect to safety and incident reporting,” says Welton. “Anything that is time-based and can be attached to a dimension inside Wonderware Intelligence can be reported with this system.”

The next step is to consider Tier 2 which would entail replicating this solution at different mines and processing plants and being able to aggregate all or part of that information for head office to create a divisional reporting solution.