CASE STUDY

AllScan®

Online PGNAA Elemental Analyser

Online Coal Quality Monitoring
Bowen Basin Coal Mine

The coal mine that is the focus of this case study is situated in the Bowen Basin in Central Queensland, Australia. The mine is owned and operated by a major global mining company.

The mine currently produces six million tons of high grade thermal coal each year which is drawn from five distinct coal seams. Plans are to significantly increase capacity over the next two years. By 2015 it is expected that the mine will supply international markets with up to 10 million tons of high grade thermal coal annually.

Depending on the ash level, crushed coal from the open cut mine is sent to the washplant or onto a 13km overland conveyor for product stockpiling. From here it is loaded onto trains for transport to Dalrymple Bay Coal Terminal where it is shipped to international customers.

In late 2011, the coal mining company installed an [AllScan® online PGNAA elemental analyser](#) on the conveyor from the mine to provide real-time information on coal quality.

Meeting Coal Quality Requirements of Customers

The mine has strict contracts with international customers that specify a maximum ash percentage. The company receives heavy penalties if coal is shipped out of specification.

Before the AllScan® was installed the ability of operators to effectively manage coal production was restricted due to a lack of accurate, timely information on the quality of the coal being mined. Operators chose which part of the mine to draw coal from based on historical survey data and periodic sampling, the results of which typically to up to 4 hours to process. Further, lab samples were taken irregularly and as the coal chemistry is quite variable, even within a seam, samples taken were not necessarily representative of the coal being mined.

What was needed was a technology that accurately measured coal chemistry in real-time providing valuable information that control room operators could act on immediately.

Implementing such technology would allow operators to:

- Select which pit or seam to mine coal from according to ash content
- Direct coal either to the wash plant or bypass the washplant and send coal directly to the overland conveyor
- Set washplant wash-ability parameters according to ash content
- Direct coal to various stockpiles according to ash content

An additional benefit of the AllScan® is that gives an indication of the accuracy of the mine survey. If the coal chemistry reported by the AllScan® is significantly different from what it should be according to the mine survey results, a re-survey of the coal pit in question may be issued.
Online Elemental Analysis

There are several online technologies that measure elemental composition of coal. The choice of technology depends, among other factors, on the variability in coal chemistry and the accuracy required. Where ash chemistry is variable and accuracy is paramount, the ideal technology is PGNAA (Prompt Gamma Neutron Activation Analysis).

AllScan® is RTI’s most recent edition to their range of online instrumentation.

The AllScan® is installed on a 1400mm width conveyor immediately downstream of the tertiary crusher and prior to the feed to the washplant. A cross-belt sampler is located just after the analysers. Once the coal on the belt is analysed by the AllScan® it is either sent to the washplant stockpile for subsequent beneficiation or it is diverted to an overland conveyor for transport directly to the train loadout stockpile. From here it is shipped by train to Dalrymple Bay Export Coal Terminal.

AllScan® installed on 1400mm belt with crushing station in background
Why chose AllScan®

The coal mine undertook a comparative study of PGNAA technologies on the market. Process engineers where familiar with other online elemental analysers having had experience with a number of instruments at other Bowen Basin operations. The decision to purchase the AllScan® was based on performance, service and price. Although the AllScan® was very price competitive, performance was at the top of Bowen Basin’s list of requirements followed by service capability.

AllScan® Performance

The AllScan® has been operational since February 2012. Since the analyser was calibrated it has consistently achieved a high measurement performance for the key parameters of interest:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Accuracy (Standard Error @1 SD) (%)</th>
<th>Range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>0.8</td>
<td>3 – 28</td>
</tr>
<tr>
<td>Moisture</td>
<td>0.65</td>
<td>10-15</td>
</tr>
<tr>
<td>Fixed Carbon</td>
<td>0.8</td>
<td>40-60</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.035</td>
<td>0.20-0.60</td>
</tr>
<tr>
<td>Calorific Value</td>
<td>0.31Mj/Kg</td>
<td>20-30Mj/Kg</td>
</tr>
</tbody>
</table>
Total Ash

\[ y = 0.9139x + 0.6295 \]

\[ R^2 = 0.9761 \]

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On-line Ash Analysers  Elemental Analysers  Moisture Analysers  Density Gauges  Belt Weighers  Metal Detectors
Total Moisture

![Total Moisture graph with linear fit and calibration points.](image1)

![Total Moisture graph showing TM and calibrated TM data.](image2)
Fixed Carbon

\[ y = 1 \times 10^{-11} \]
\[ R^2 = 0.9328 \]
Total Sulfur

![Graph of Total Sulfur](image)

- **Equation:** \( y = 1 \times 10^{-14} \)
- **R^2:** 0.6458

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![Graph of Total Sulfur over Time](image)

- **Total Sulfur**
- **Calibrated Total Sulfur**

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On-line Ash Analysers  
Elemental Analysers  
Moisture Analysers  
Density Gauges  
Belt Weighers  
Metal Detectors
Calorific Value

![Graph showing calorific value over time](image)

**Equation:**

\[ y = 0.9305x + 1.8502 \]

**Correlation Coefficient:**

\[ R^2 = 0.9805 \]
Application Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>AllScan™</th>
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</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Prompt Gamma Neutron Activation Analysis</td>
</tr>
<tr>
<td>Installation Location</td>
<td>After tertiary crusher</td>
</tr>
<tr>
<td>Belt Width</td>
<td>1400mm</td>
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<tr>
<td>Belt Speed</td>
<td>3.4 metres per second</td>
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<tr>
<td>Coal Type</td>
<td>High-grade thermal coal</td>
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<tr>
<td>Ash Range</td>
<td>5-25</td>
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<tr>
<td>Number of Coal Seams</td>
<td>5</td>
</tr>
<tr>
<td>Moisture Range</td>
<td>10-15%</td>
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Further Information

For further information please do not hesitate to contact us.
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