FUEL EFFICIENCY SOLUTION

CASE STUDY

OPENCAST MINING OPERATION
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Opencast Mining Case Study

Description of client activity
The client showcased in this case study operates in the Civil and Mining Industries and provides an array of services including opencast mining, crushing & screening, rehabilitation, bulk earthworks, road construction and plant hire.

The company owns a substantial fleet of equipment and currently operates in the coal, platinum, andalusite, chrome and gold sector. Diversification into other mineral sectors and growth of their geographical footprint is currently underway.

Fuel efficiency value proposition
The Fuel Efficiency Solution is based on deployment of a fuel catalyst, which when blended with diesel fuel, results in financial cost savings due to a reduction in the volume of diesel fuel consumed by combustion assets.

Initial engagement took place mid-2013 based on the following value propositions:

1. Reduction of fuel used and therefore reduction in fuel cost compared to current costs

2. Reduction of emissions; both as a result of reduced emissions during the combustion process and avoided emissions as a result of using less fuel

3. Reporting of live telemetry related to asset level fuel consumption and wetstock monitoring

4. On-going post-implementation fuel treatment costs based on actual fuel volumes treated

5. Provision of all engineering work required undertaken on a turnkey basis

6. Resultant Net Financial Benefit of 5% or more

Proof of Concept trial phase
In order to prove the effectiveness of our solution and the actual quantum of financial savings that would be achieved, a live field trial Proof of Concept (POC) exercise on selected assets was executed over a six month period during 2013.

In order to compensate for the variable, fluctuating factors that influence fuel economy on mobile load-bearing equipment assets such as driver behaviour, climactic & road conditions, topography, load carried and drive train / engine losses, it was agreed to use a Litres per Hour based approach to compare fuel economy across baseline (untreated fuel) and POC (treated fuel) periods.
The POC proved the effectiveness of our fuel catalyst in reducing fuel consumption, resulting in a Net Financial Benefit in excess of the originally stated 5%. The client therefore proceeded to contract for full deployment of our solution at an initial pilot site within the company.

**Site-wide deployment solution design**

The deployed solution consists of:

- Fuel catalyst injection Bulk Dosing System which automatically injects the correct amount of catalyst into the bulk fuel storage facilities when bulk fuel deliveries occur
- Tank gauging on all fuel & catalyst storage tanks
- A fixed fuel dispensing (pump, nozzle & fuel dispensed metering) solution located at the fixed filling bay
- A mobile fuel dispensing (pump, nozzle & fuel dispensed metering) solution integrated into a mobile fuel bowser
- Radio Frequency Identification (RFID) tags and work monitoring devices (hours or kilometres) installed on all assets that consume diesel on site
- Various communications equipment to uplink data onto a cloud-based database
- A Comprehensive Fuel Consumption Business Intelligence & Reporting Dashboard software application
- Supply of the fuel consumption reducing catalyst OptiDiesel™

The above can be visualised as follows:
**Bulk dosing system**

Although conceptually a single system, the Bulk Dosing System in fact consists of a number of components working in unison, controlled by our embedded, proprietary software. The site-specific implementation of the Bulk Dosing System can be seen below:
Additive Communications board RS 485 Modbus

MeterMatic Additive Controller

Pneumatic Additive Injector

Valves & Test Port

Frequency output Pulser

PD Flow Meter

Temperature Probe

Additive isolation valve & check valve
Tank level gauging
Tank level gauging to enable Wetstock reconciliation and variance reporting was installed on all bulk fuel tanks:

In addition the system monitors all tank levels, raising alarms linked to automatic notifications when re-order and critical levels are reached.
Fuel dispensing and asset work rate monitoring
RFID tags to automatically record fuel dispensed and work rate monitors were installed on all assets:

To automatically record fuel dispensed a pump & nozzle solution was deployed at both the fixed filling bay and on the mobile fuel bowser:
RFID tags installed on all assets automatically identify, authorise and record all fuel dispensing transactions, correlated to work rate (hours / kilometres):

**Communications and Internet connectivity**

Specialist communications equipment was deployed to overcome site-specific connectivity problems:
Post-implementation reporting
The client is provided with a customised reporting console affording authorised users a view of raw data & key indicators such as fuel volumes received / treated, fuel catalyst volumes consumed, Net Financial Benefit achieved, and more, presented in a Business Intelligence Reporting Dashboard format.

Continuous monitoring of live telemetry also caters for automated bulk fuel storage tank alarm & reaction management. In addition to providing visual indicators of re-order and critical volume levels, the system also sends automated notifications of tank level threshold trigger events to selected operational staff. Wetstock monitoring & variance reporting further enhances management insights.
Comprehensive reporting on fuel movement across operational sites is also provided. In addition to facilitating reconciliation of fuel received vs. fuel dispensed (as recorded via live telemetry), the system also caters for the import of client recorded manual data, enabling comparison of the data sets for verification and cross-checking purposes.

Environmental impact analysis is provided with the ability to track actual and avoided emissions impacts.
The client dashboard visualises the comprehensive Fuel Management System that affords extensive Business Intelligence insights on a near real-time basis.
Outcomes achieved
As can be seen below, the implementation has resulted in a significant Net Financial Benefit to the client:

During August 2014 the following results were achieved for the site in question:
- Gross fuel volume requirement reduced by ± 31,000 litres
- Gross fuel cost saving of ± 360,000 ZAR
- Net financial saving of ± 240,000 ZAR
- Net financial benefit percentage of 8.7%

Additional benefits realised
Further to the core financial benefits achieved, additional benefits have also been realised as a result of the deployment. By comparing fuel dispensed transactions to historical data the client has been able to immediately identify anomalous fuel dispensing transactions for investigation, resulting in the identification of:
1. fuel theft
2. assets requiring maintenance

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