# CASE STUDY

CUSTOMER
BMA BLACKWATER MINE

LOCATION
AUSTRALIA / JAN-NOV 2008

EQUIPMENT
KRESS COAL HAUL TRUCK, CAT 3508 ENGINE

APPLICATION
ENGINE OIL

ROI

$

ENGINE REBUILD PREVENTION

**$251,760 USD**

*"BMA Blackwater have plans to utilize similar technologies that will reduce contamination and operating costs in components such as final drives, transmissions, differentials and other mechanical gearboxes."*

**- Tim Rantin, Maintenance Manager**

## CHALLENGE

Extend the life of a Kress coal haul truck 3508 CAT engine; these engines have an expected operating life of 16,000 hours. At 13,000 BMA Blackwater performed an oil analysis and found high levels of wear contamination (PQ 12) which resulted in a rebuild diagnosis.



## SOLUTION

Install an OEI ADD-Vantage 9000 magnetic filter alongside two conventional CAT filters. It was determined that by replacing one of the three conventional CAT filters with a magnetic filter, iron wear particles could be more effectively removed from the engine system.

## RESULTS

BMA Blackwater, in conjunction with One Eye Industries, investigated alternative methods to reduce this type of oil contamination. It was determined that by replacing one of the three conventional CAT filters with a magnetic filter, wear particles could be more effectively removed from the engine system.

A trial using the magnetic filters commenced with the two most contaminated Kress engines. The magnetic filters were installed in these trucks, and the trucks were sent back to haul coal for 250 hrs (~2 weeks). This process has been ongoing every 250 hrs of operation, and to date has completed five cycles for both engines. Since the beginning of the trial, the trending results have shown a steady decrease in iron and wear particles from both CAT engines. Engines that maintain low levels of wear contaminates are more likely to reach and succeed their life expectancy. The potential saving of this simple alternative over the life of a Kress coal hauler could be the cost of an engine (~AU $350,000). The magnetic filters are completely reusable and will replace the traditional throw away units, thus will reduce the machines overall environmental impact.

BMA Blackwater have plans to utilize similar technologies that will reduce contamination and operating costs in components such as final drives, transmissions, differentials and other mechanical gearboxes.

In summary, to reduce the likelihood of premature component failure, Blackwater mine and One Eye Industries have successfully implemented magnetic filtration on its Kress coal hauling trucks. It is expected that further savings on a variety of machinery will be soon be realized.

ACTIONED BY Robert Jambor ON 24/01/2008
RESOLVED BY Robert Jambor ON 24/01/2008

Hastings Deering CAT
Condition Monitoring Centre

S·O·S Fluid Analysis Laboratory

BMA BLACKWATER MINE MOBILE
ATT: Mobile Planners

PRODUCT RECOMMENDATION

**ADD-VANTAGE 9000**

| | |
|---|---|
| Unit Number | **TKD6498** |
| Location | **BLACKWATER MINE** |
| Make | **KRESS** |
| Model | **CH200C** |
| Serial Number | **HBB-M079** |
| Compartment | **engine-primary** |
| Oil Brand/Type | **BP MINE MULTI 15W40** |
| Oil Changed | **Y** |

Lab Control Number **02925708**
Current Evaluation **A**

**CURRENT** EVAL: **A**

DAYS TAKEN TO REACH LABORATORY: 3

| DATE TAKEN | DATE REC'D | OIL ADDED | METER HRS/KM | HRS/KM ON OIL |
|---|---|---|---|---|
| **21-01-08** | **23-01-08** | | **13980** | **534** |

Wear Levels in the 5 Micron Range appear OK. Viscosity Normal for Oil Type Indicated. Infra-red analysis INVALID with oil on record at laboratory. Please supply sample of new oil to update our records. Continue Sampling at the Recommended Interval.

Oil change intervals extended to 534 hours after 3rd oil change interval with OEI filter.

**PREVIOUS #1** EVAL: **A**

| DATE TAKEN | DATE REC'D | OIL ADDED | METER HRS/KM | HRS/KM ON OIL |
|---|---|---|---|---|
| **10-12-07** | **12-12-07** | | **13446** | **508** |

acceptable for Hrs/Kms. Viscosity Normal for Oil Type Indicated. All other Test Results appear Acceptable. Continue Samplingat the Recommended Interval.

**PREVIOUS #2** EVAL: **B**

| DATE TAKEN | DATE REC'D | OIL ADDED | METER HRS/KM | HRS/KM ON OIL |
|---|---|---|---|---|
| **27-11-07** | **29-11-07** | | | **350** |

Iron is HIGH for the Hrs/Kms on the Oil, Lead isIncreasing, Oxidation is HIGH, Oxidation resultcan be from Overheating/Blow By. Viscosity Normal for Oil Type Indicated. Investigate and Evaluate Compartment Condition. These results may be dueto an Extended Oil Change period. REDUCE the OilChange Interval. Resample at 250 hours.

**PREVIOUS #3** EVAL: **A**

| DATE TAKEN | DATE REC'D | OIL ADDED | METER HRS/KM | HRS/KM ON OIL |
|---|---|---|---|---|
| **23-11-07** | **26-11-07** | | **13186** | **248** |

Wear Levels in the 5 Micron Range appear OK. InfraRed Analysis appears acceptable for Hrs/Kms. Viscosity Normal for Oil Type Indicated. All other Test Results appear Acceptable. Continue Samplingat the Recommended Interval.

Oil changes required after 248 hours of operation without OEI filter.

ELEMENTS:- Concentration in ppm (weight/weight)

| | Wear metals | | | | | | | | | | | Additives | | | | | FLUID CONDITION/CONTAMINANTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE TAKEN | Cu | Fe | Cr | Pb | Al | Si | Sn | Ni | Na | K | Ca | Mg | Zn | P | W | F | ST | OXI | SUL | PQ | VSC |
| 210108 | 2 | 19 | <1 | 2 | 1 | 3 | <1 | <1 | 3 | 3 | 2486 | 8 | 1188 | 1076 | 0.1 | <3.0 | 41 | | | <1 | 111 |
| 101207 | 2 | 19 | <1 | 2 | 2 | 4 | <1 | <1 | 3 | 4 | 2214 | 7 | 1077 | 933 | 0.1 | <3.0 | 35 | 27 | 34 | 1 | 110 |
| 271107 | 9 | 46 | <1 | 5 | 7 | 15 | <1 | <1 | 4 | 2 | 2611 | 9 | 1233 | 1091 | 0.1 | <3.0 | 59 | 41 | 49 | 2 | 110 |
| 231107 | 6 | 32 | <1 | 3 | 6 | 12 | <1 | <1 | 3 | 2 | 2330 | 8 | 1116 | 958 | <0.1 | <3.0 | 40 | 23 | 37 | <1 | 111 |
| 081107 | 3 | 21 | <1 | <1 | 3 | 7 | <1 | <1 | 3 | 1 | 2333 | 8 | 1088 | 988 | 0.1 | <3.0 | 20 | 17 | 26 | <1 | 106 |
| 031107 | 12 | 90 | 2 | 4 | 8 | 19 | <1 | <1 | 5 | 2 | 2650 | 9 | 1155 | 1000 | 0.1 | <3.0 | 64 | | | 12 | 106 |

After 3 oil changes intervals with OEI filtraiton, 1 ml of oil had a PQ of < 1 and 19 ppm Fe.

Prior to OEI filtration, 1 ml of oil had a PQ of 12, and 90 ppm Fe.

Cu - Copper Fe - Iron Cr - Chromium Pb - Lead Al - Aluminium Si
Sn - Tin Ni - Nickel Na - Sodium K - Potassium Ca - Calcium Mg
Zn - Zinc P - Phosphorus W - % Water F - %Fuel Dilution ST - Soot OXI - Oxidation
SUL - Sulphur product PQ - PQ Index VSC - Viscosity DEP - Visible Dep. V100 - Viscosity 100C Mo - Molybdenum