

A detailed wireframe model of a helicopter, showing the rotor blades, fuselage, and landing gear. The model is rendered in a light gray wireframe style, allowing for a clear view of the internal structure and components. The helicopter is shown from a side-on perspective, angled slightly upwards.

Aerospace Applications



SOLVING TOMORROW'S CHALLENGES, TODAY.

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ONE EYE INDUSTRIES

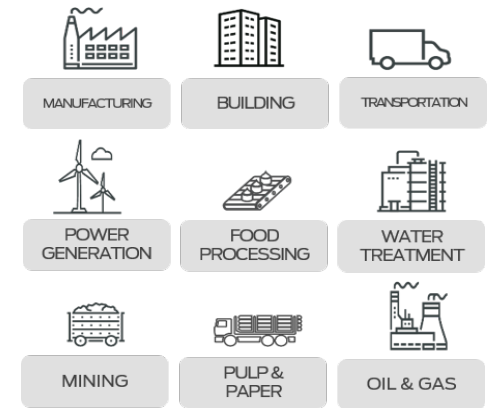
Design and manufacturing out of Calgary, AB Canada

Systems successfully employed for 18+ years

Distribution in over 40 countries

Deployed across all heavy industries

Installed on all rotating fluids, lube oils and gases



AN ESTABLISHED INNOVATOR IN THE FIELD
OF FLUID FILTRATION

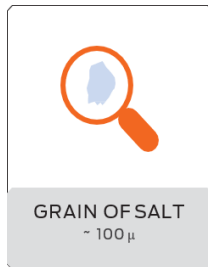


SOLVING TOMORROW'S CHALLENGES, TODAY.

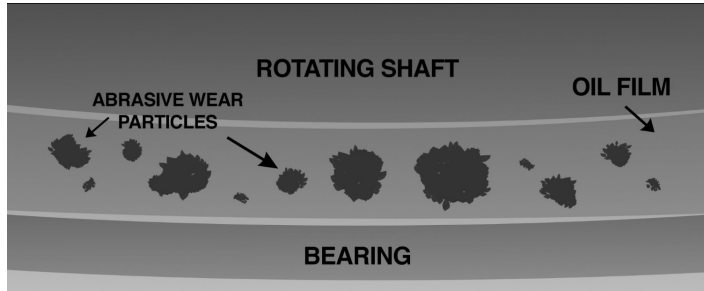
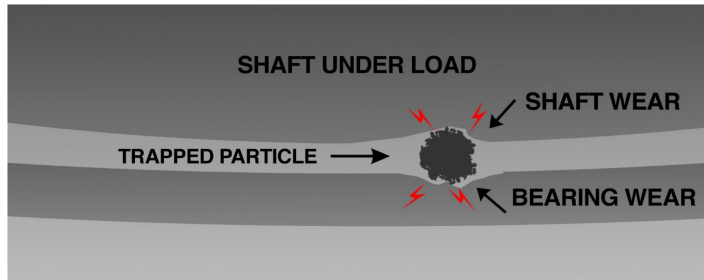
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Wear Contamination

Equipment components (ex. bearings, valves) have tolerances of less than 1 micron



SUB-MICRON LEVEL FILTRATION

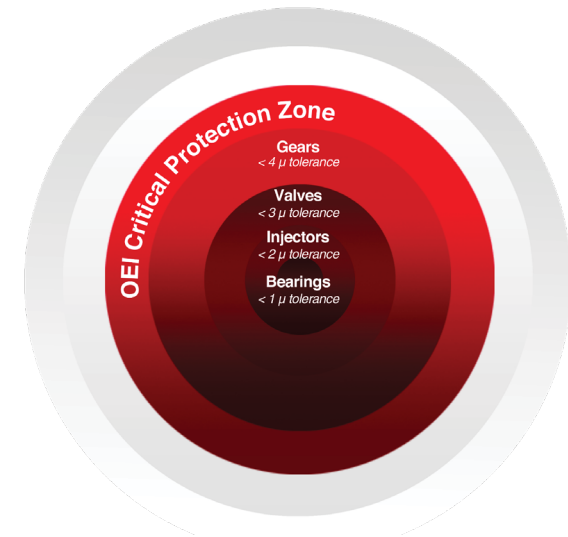


82%

Of mechanical wear
is due to wear contamination



TRADITIONAL FILTERS VS. OEI MAGNETIC FILTERS



MECHANICAL FILTERS

Planned obsolescence for parts replacement

Unable to filter the most damaging contaminants ($< 4 \mu\text{m}$)

Costs associated with restocking, disposal, change-out labour

Flow restriction prevents protection of critical suction applications

OEI MAGNETIC FILTRATION

Cleanable and reusable for 18+ years with minimal consumables.

Patented radial field technology offers 95%+ filtration efficiency of wear contamination $< 1 \mu$.

Exceeds ISO fluid cleanliness standards.

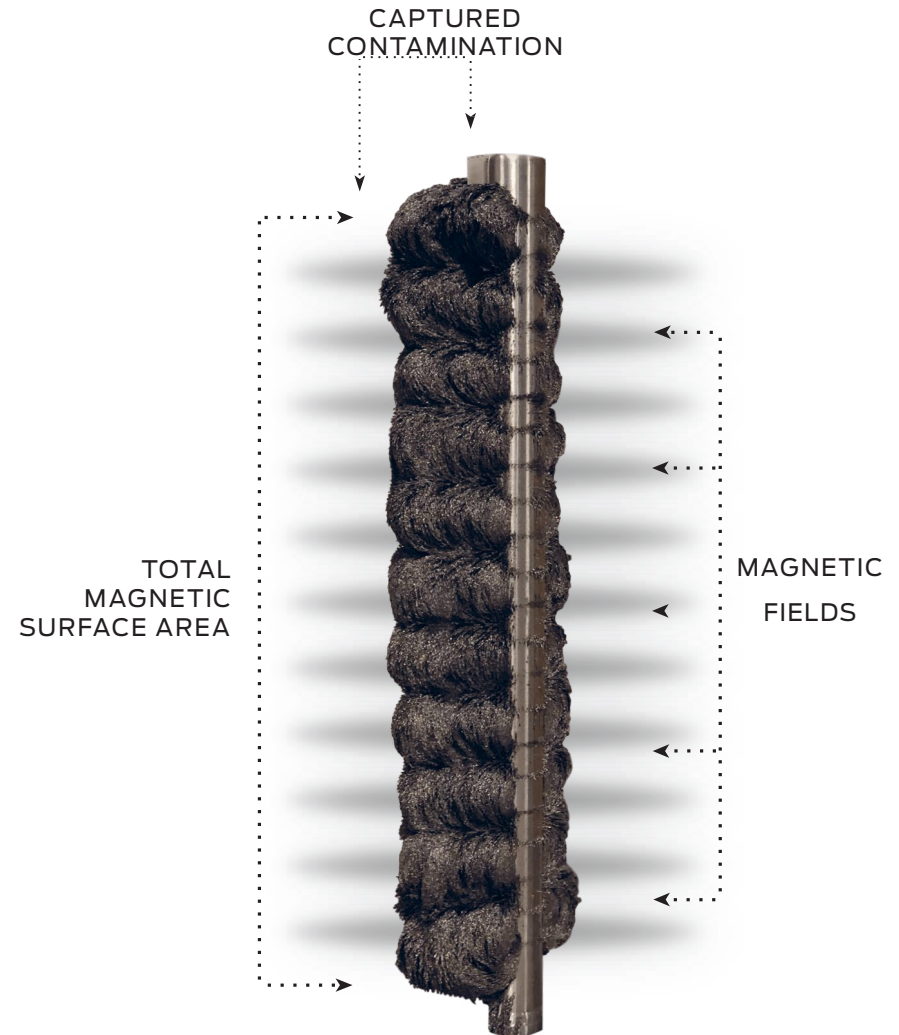
Effective predictive maintenance tool because of the ability to capture and analyze contamination to determine system component failure.

LEVERAGING PROPRIETARY DESIGN AND PRACTICE

The patented, magnetic filter element attracts ferrous wear particles down to and below 4 microns (μ) with up to 95%+ efficiency.

The magnetic filter element attracts both ferrous and non-ferrous particles.

The radial magnetic field design offers incredible holding strength, and a high dirt holding capacity.



RISK ANALYSIS. FAILURE MODE AND EFFECTS ANALYSIS

Magnetic Filter Elements vs. Mechanical Filters

Risks

Temperature

Standard: Curie point of 300° F High temperature: Curie point of 600° F

Vibration

Benefits

Failure mode is loss of magnetism; probability is 2000 year half-life.

95%+ efficiency of removing wear contamination < 4 microns protects bearings from premature wear and failure.

Risks

Lose filtration capability in bypass

Flow Restriction

Installation Requirements

Frequent Changeouts

- Curie Point: the temperature above which certain materials lose their permanent magnetic properties
- * Cold environments improve magnetic capability

PROVEN TECHNOLOGY &
PROVEN RESULTS



SOLVING TOMORROW'S CHALLENGES, TODAY.

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VAPOUR RECOVERY UNIT: PIONEER SCREW COMPRESSOR

CHALLENGE

Premature wear of screw compressor components (bearings, seals) because of inadequate filtration of the compressor lube oil.

SOLUTION

Replace the installed mechanical filter with an OEI magnetic filter scrubber.

RESULTS

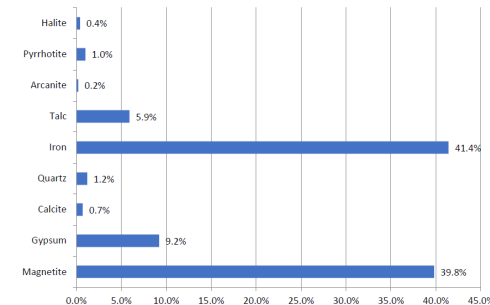
Analysis of contamination captured on the magnetic filter element after 8 days of operation showed a decrease in:

Iron

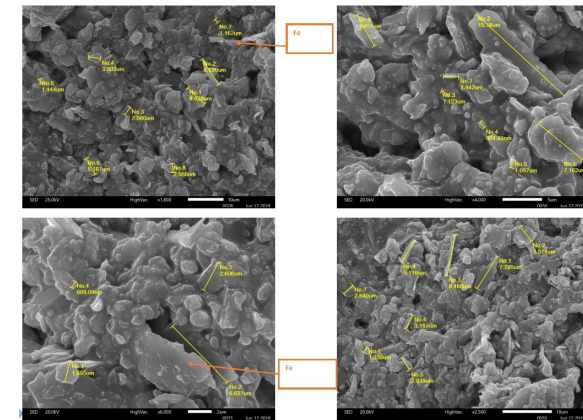
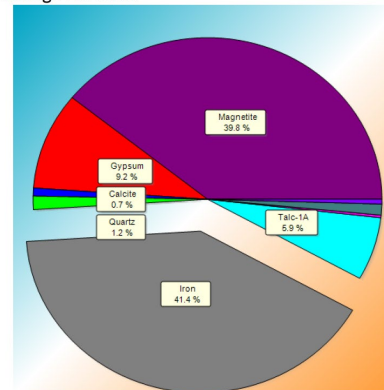
- Copper
- Sodium
- Calcium
- Magnesium
- Phosphorous
- Water

91.2% of the contaminants captured were under 4 microns. 45.6% of the contaminants were under 1 micron.

XRD Weight Percentage Bar Graph



XRD Weight Percentage Pie Chart



Lubricant Inspection Record

METRO TECH SYSTEMS LTD.			Client	
Petroleum Products, Consultants			One Eye Industries Inc	
New 132, 1421 - 11th Street N.E.			Bridgeview A 36-35H	
Telephone (403) 291-8800 Fax (403) 291-2849			Unit Number	
E-Mail: metrotech@metrotechsystems.ca			VRL-555	
			Component	
			Screw Compressor	
			Make/Model	
			TS-LR/SH N012 SCREW	
			Serial #	
Lab Number:	ZF3102	ZF3103	New Oil	
Sample Date:	Apr 11/19	Apr 11/19		
Unit:				
Oil:				
Oil Type:	LP6 WG 150	LP6 WG 150		
METALS (D5185): Milligrams per Kilogram (PPM)			Highlighted Test Results Indicate Abnormal Concentrations	
Tin	0	0		
Lead	0.6	0.8		
Copper	0.6	0.5		
Aluminum	0.4	0.6		
Silicon	0.1	0.3		
Iron	8.7	4.3		
Chromium	0	0		
Silver	0	0		
Zinc	6.6	6.7		
Magnesium	4	2.3		
Nickel	0	0		
Barium	0	0		
Sodium	46.8	27.2		
Calcium	16.2	12.7		
Vanadium	0	0		
Phosphorus	320.9	325.8		
Molybdenum	0	0		
Boron	0	9.8		
Manganese	0	0		
PHYSICAL PROPERTIES				
Viscosity (D445) @ 40°C	123.4	119.1		
Viscosity (D445) @ 100°C				
Water (D4007) (% v/v)	0.5	0.4		
Solids (D4007) (% v/v)	**	**		
Glycol				
Fuel Dilution				
OTHER PROPERTIES				
Acid No. (D946)				
Base No. (D2896)				
Base No. (D4739)				
Oxidation				
Nitro Compounds				
Organic Nitrates				
Particle Count (ISO 4406)				
Oil Changed?				
COMMENTS			RATING SYSTEM: A is LOW B is LOW to MODERATE C is MODERATE D is HIGH E is SEVERE	
ZF3102 - Send in New Oil for Reference.				
ISO 4406 is >28/26/25. ISO4406 is obscured by water. Before				
ZF3103 - Send in New Oil for Reference. Oil dilution (A).				
ISO 4406 is >28/26/24. ISO4406 is obscured by water. After 10 days				
Laboratory Telephone (403) 291-8800			Results were verified on Jun 11/19 by P Sabat Shrivastava	
			109150 09	



BELL MEDIUM MR TRANSMISSION RUN STAND

CHALLENGE

Evaluate the effectiveness of the airframe and transmission mounted mechanical filters for a Bell Medium main rotor transmission run stand.

SOLUTION

OEI Magnetic Filter placed downstream of airframe and transmission filters to determine what was not caught by the standard mechanical filters.

RESULTS

Analysis of contamination captured on the magnetic filter element after 45 minutes of operation:

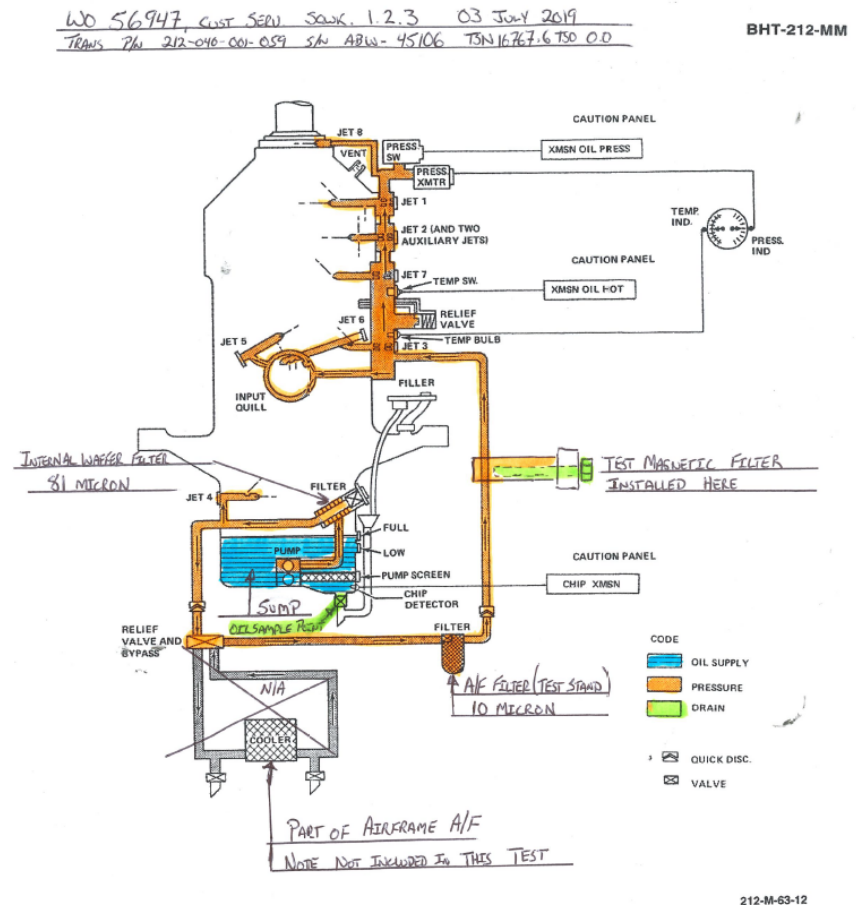


Figure 63-12. Transmission oil system schematic

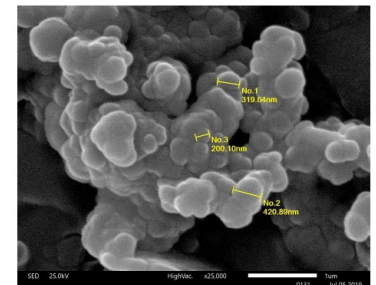
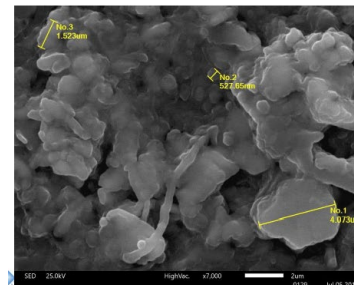
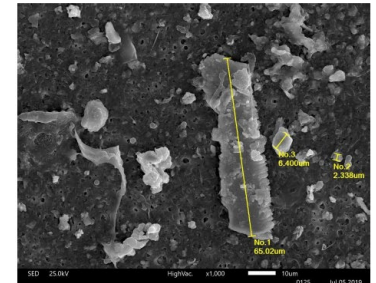
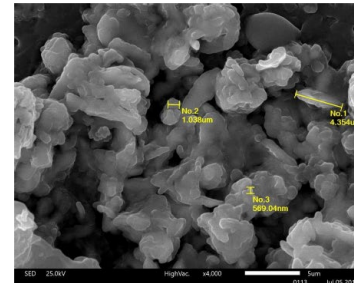
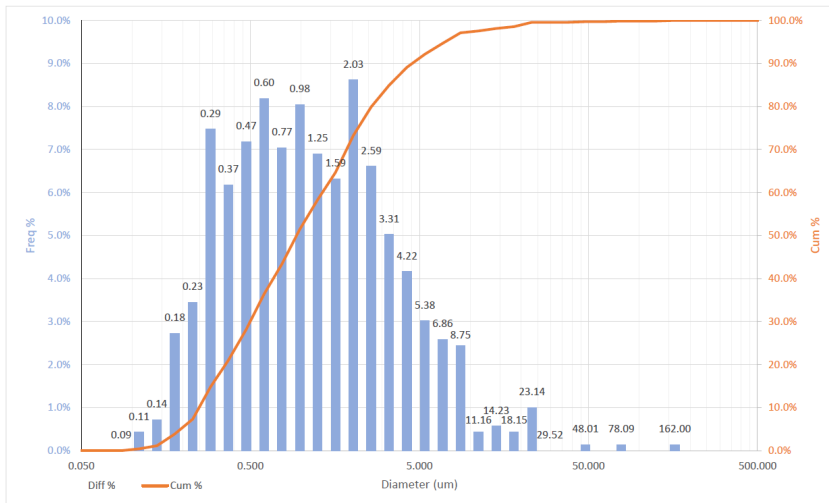
BELL MEDIUM MR TRANSMISSION RUN STAND

Paper Towel Samples, 45 minutes Run Time SEM/PSD

Summary

- One paper towel sample was received by SEMx Incorporated for particle size analysis using scanning electron microscopy (SEM).
- The paper wipe samples were put into ultrasonic cleaning to separate the particles from the paper and subsequently filtered to create one analysis sample. A representative portion of each sample was taken for PSD analysis.
- SEM was used to observe and count the particles in the sample to obtain the particle size distribution. Size is measured by length in micrometers. Statistics and analysis is based on total counts measured by SEM. SEM was conducted on a JEOL - JSM300 LV.

Particle Size Graph



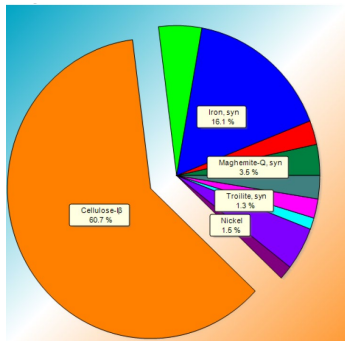
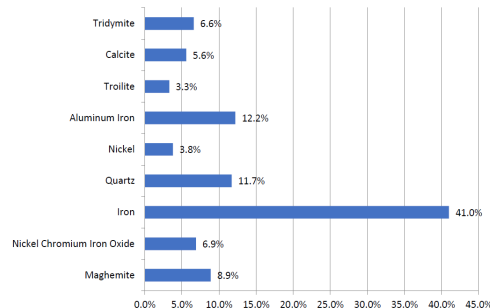
BELL MEDIUM MR TRANSMISSION RUN STAND

Paper Towel Samples, 45 minutes Run Time XRD / EDS

Summary

- One paper wipe sample was received by SEMx Incorporated for analysis using X-ray diffraction (XRD) and energy-dispersive X-ray spectroscopy (EDS).
- The paper wipe samples were put into ultrasonic cleaning to separate the particles from the paper and subsequently filtered to create one analysis sample. A representative portion of each sample was taken for EDS analysis.
- The sample was finely crushed and ground using an Agate mortar and pestle in preparation for XRD and EDS analysis. XRD was employed to identify and quantify the phases present in the sample. XRD data was collected using a PANalytical Aeris X-ray diffractometer. Qualitative XRD analysis and Rietveld Refinement was performed using HighScore Plus XRD analysis software. Rietveld Refinement produces more accurate results as it uses the full XRD profile.
- EDS was used to determine the elemental composition of the sample and helped to verify the results obtained with XRD quantification. EDS was conducted using a JEOL JED-2300 DRY SDD EDS detector.
- XRD shows majority of particles are iron, iron oxide and silicon oxide. PSD analysis shows majority of particle are in the range between 0.1-9 um.

XRD Weight Percentage Bar Graph



XRD Quantitative Results

Ref. Code	Mineral Name	Compound Name	Chem. Formula	Weight %
00-025-1402	Maghemite	Iron Oxide	Fe ₂ O ₃	8.9
04-017-2616		Nickel Chromium Iron Oxide	Cr ₂ Fe ₁₈ NiO ₄	6.9
04-003-3330	Iron	Iron	Fe	41.0
04-015-7194	Quartz	Silicon Oxide	SiO ₂	11.7
00-060-1502		Cellulose* (from paper towel)	(C ₆ H ₁₀ O ₅) _n	Excluded
04-014-0268		Nickel	Ni	3.8
04-001-2403		Aluminum Iron	Fe ₃ Al	12.2
04-004-7981	Troilite	Iron Sulfide	Fe ₉ S ₈	3.3
04-013-2116	Calcite	Calcium Magnesium Carbonate	Ca _{0.938} Mg _{0.062} (CO ₃)	5.6
01-071-0261	Tridymite	Silicon Oxide	SiO ₂	6.6

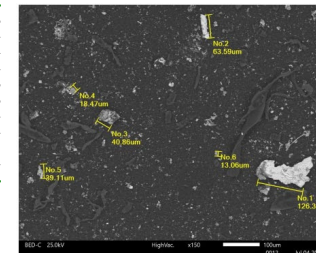
Cellulose: Tiny sample is sitting on the paper towel, Cellulose is contamination from paper towel and is excluded from quantification

XRD/EDS Elemental Comparison

Element	Fe	O	Ni	Si	Al	Ca	Cr	S	Mn	Cu	Mg
EDS Result	48.68	42.81	2.07	1.60	1.23	1.00	0.81	0.46	0.38	0.37	0.23
XRD Result	35.67	53.16	3.20	4.90	0.96	1.19	0.17	0.70	-	-	0.04

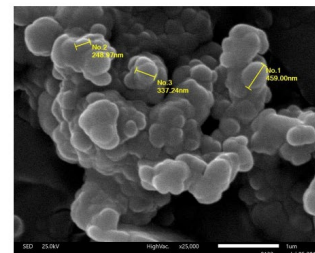
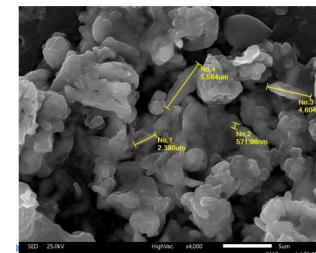
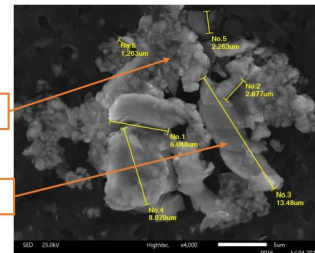
Element	P	Cl	K	H	C
EDS Result	0.21	0.08	0.07	-	Excluded
XRD Result	-	-	-	Excluded	Excluded

Fe - Iron	Mn - Manganese
O - Oxygen	Cu - Copper
Ni - Nickel	Mg - Magnesium
Si - Silicon	P - Phosphorus
Al - Aluminum	Cl - Chlorine
Ca - Calcium	K - Potassium
Cr - Chromium	H - Hydrogen
S - Sulfur	C - Carbon



Iron Oxide

Fe



EXTENDING ENGINE OPERATING LIFE

EQUIPMENT

Kress Coal Haul Truck

APPLICATIONS

CAT 3508 Engine

CHALLENGE

Extend the life of a Kress Coal Haul Truck's 3508 CAT Engine that was diagnosed for rebuild at 13,000 hours because an oil analysis showed high levels of contamination: particle quantifier (PQ) 12.

SOLUTION

Install an OEI ADD-Vantage 9000 magnetic filter (200 Beta efficiency rating) alongside two conventional CAT filters.

RESULTS

- The oil analysis on the next planned maintenance (PM) interval identified the PQ of < 1.
- With OEI filtration, the haul truck remained in service, and the CAT 3508 engine lasted an additional 17,200 hours before a glycol leak contaminated the oil and seized the engine.
- The maintenance intervals extended first to 350 hours, then to 500 hours.
- The extended maintenance intervals recovered the cost of the ADD-Vantage 9000 filter within 250 hours of operation.

ROI



PROFIT

ENGINE REBUILD PREVENTION

\$251,760 USD



Unit Number	TKD6498																							
Location	BLACKWATER MINE																							
Make	KRESS																							
Model	CH200C																							
Serial Number	HBB-31079																							
Compartment	Engine-primary																							
Oil Brand/Type	BP MINE MULTI 15W40																							
Oil Changed	Y																							
			Lab Control Number 02925708																					
			Current Evaluation <input checked="" type="checkbox"/>																					
CURRENT																								
EVAL:		A																						
DAYS TAKEN TO REACH LABORATORY: 3																								
DATE	DATE	OIL	METER																					
TAKEN	REC'D	ADDED 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.																								
PREVIOUS #1		EVAL: A																						
Wear Levels in the 5 Micron Range appear OK. Infra-red Analysis appears acceptable for Hrs/Sm. Viscosity Normal for Oil Type Indicated. All other Test Results appear Acceptable. Continue Sampling at the Recommended Interval.																								
DATE	DATE	OIL	METER																					
TAKEN	REC'D	ADDED HRS/KM	ON OIL																					
10-12-07	12-12-07	13446	508																					
PREVIOUS #2		EVAL: B																						
Iron is HIGH for the Hrs/Sm on the Oil, Lead is increasing, Oxidation is HIGH, Oxidation results can be from Overheating/Blow By. Viscosity Normal for Oil Type Indicated. Investigate and Evaluate Compartment Condition. These results may be due to an Extended Oil Change period. REDUCE the Oil Change Interval. Resample at 250 hours.																								
DATE	DATE	OIL	METER																					
TAKEN	REC'D	ADDED HRS/KM	ON OIL																					
27-11-07	29-11-07	350																						
PREVIOUS #3		EVAL: A																						
Wear Levels in the 5 Micron Range appear OK. Infra-red Analysis appears acceptable for Hrs/Sm. Viscosity Normal for Oil Type Indicated. All other Test Results appear Acceptable. Continue Sampling at the Recommended Interval.																								
DATE	DATE	OIL	METER																					
TAKEN	REC'D	ADDED HRS/KM	ON OIL																					
23-11-07	26-11-07	13186	248																					
ELEMENTS: CONCENTRATION IN PPM (weight/weight)																								
DATE	Cu	Fe	Cr	Pb	Al	Si	Sn	Ni	Na	K	Ca	Mg	Zn	P	W	F	BT	OXI	SUL	PQ	VOC	DEP	V190	M0
TAKEN																								
218108	2	19	<1	2	3	3	<1	<1	3	3	2486	8	3188	1076	0.1	<3.0	41		<1	111	OK	14	<1	
101207	2	19	<1	2	2	4	<1	<1	3	4	2214	7	1077	933	0.1	<3.0	35	27	34	1	110	OK	15	2
271107	9	46	<1	5	7	15	<1	<1	4	2	2411	9	1233	1091	0.1	<3.0	59	41	49	2	110	OK	15	1
231107	6	32	<1	3	6	12	<1	<1	3	2	2330	8	1116	958	<0.1	<3.0	40	23	37	<1	111	OK	15	2
081107	3	21	<1	<1	3	7	<1	<1	3	1	2333	8	1088	988	0.1	<3.0	20	17	26	<1	106	OK	14	1
031107	12	99	2	4	8	19	<1	<1	5	2	2450	9	1155	1000	0.1	<3.0	64			12	106	OK	14	3



CHALLENGING ISO FLUID STANDARDS

EQUIPMENT

550 Komatsu Shovel

APPLICATIONS

Hydraulics operating at 4500 PSI with 6000 L of hydraulic fluid at an ISO rating of 25/24/16

CHALLENGE

In a limited kidney-loop interval of 3 hours, improve the Komatsu Shovel's hydraulic fluid ISO rating 25/24/16 to the standard 18/16/13.

SOLUTION

Run an OEI Kidney Loop System on a 3 hour trial.

RESULTS

Fluid samples were taken before and after the trial then sent to 3 independent labs.

Common results showed that OEI exceeded ISO standards and cleaned the hydraulic fluid to 17/14/10.

Contamination Analysis

88% ferrous contamination

12% non-ferrous (carbon and calcium)

ROI



PROFIT

EQUIPMENT FAILURE PREVENTED
ISO LOWERED FROM:
25/24/16 TO 17/14/10 IN 3 HOURS.



NEXT STEPS



SOLVING TOMORROW'S CHALLENGES, TODAY.

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**Bringing
New
Technology
to Market**



Partnering Engine & Airframe Manufacturers



Working with Transport Canada for certification (vs. FAA or EASA)



Bell has large operations in Canada

INITIATION OF AEROSPACE PROTOTYPES



BENEFITS TO AEROSPACE OPERATORS

- ✓ Extended component life
- ✓ Extended lube oil and fluid life
- ✓ Extended meantime to failure
- ✓ Cleaner fuels and reduced emissions
- ✓ Reduced supply chain transactions
- ✓ Reduced power by the hour operational costs
- ✓ Fewer touch points
- ✓ Reduced failure modes
- ✓ Reduces opportunity for failure while in service
- ✓ Reduced power by the hour operational costs
- ✓ Reduced bearing replacements
- ✓ Advancement of the state of technology