

Lubrication-related equipment failure causes as much as \$1 trillion a year in reactive maintenance, unplanned downtime and lost productivity across the United States. The failure rates associated with inadequate filtration have not changed in 2 decades.



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## THE COST-EFFECTIVE AND SUSTAINABLE SOLUTION TO INCREASED PROFIT MARGINS IN THE OIL SERVICING INDUSTRY

One Eye Industries Magnetic Filtration

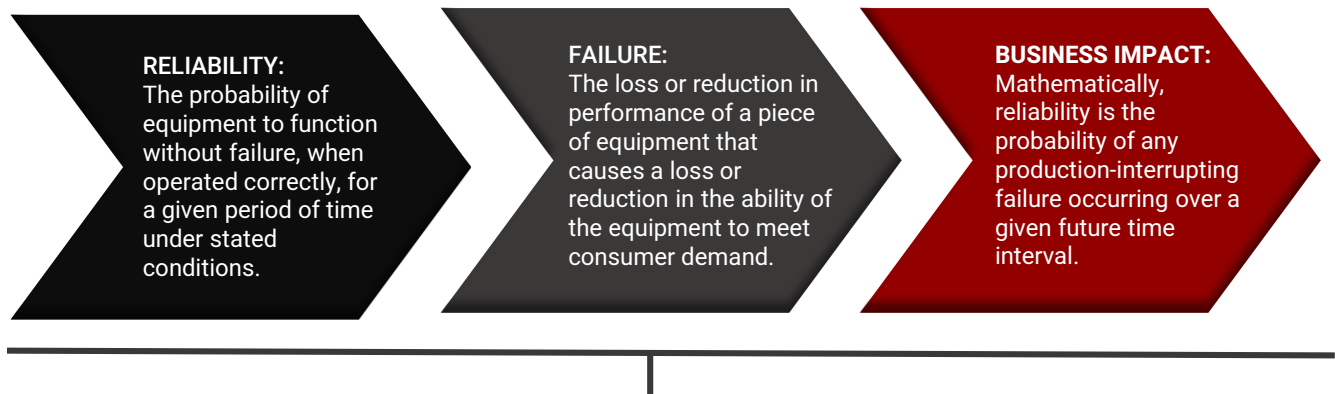


## THE SOLUTION TO OBSOLESCENCE

Businesses in oil and gas are challenged to identify ways to increase profit margins without significant capital investments. Industry leaders are turning to efficient and environmentally-beneficial technologies to gain momentum in increasingly competitive markets. The industry is subject to a global technological revolution; the mentality that reactive maintenance is adequate to maintain reliable equipment and efficient operations is no longer accepted.

To meet the challenges of profit loss as a direct result of unplanned maintenance and equipment failure, the oil servicing sector is focussed on preventative, predictive and proactive maintenance programs to meet best reliability practices. The most integral component to cost-effective operations in the oil servicing sector are Total Level Cleanliness programs for critical systems on oil servicing equipment.

## RELIABILITY EQUATED TO PROFITABILITY



## CONTROL COST WITH TOTAL FLUID CLEANLINESS PROGRAMS

### I. Extend life of critical systems

Protect critical systems against wear contamination ( $<1\mu$ ) to prevent equipment failure and component replacement.

### II. Reduction in wasted materials and supplies

Investing in industry-leading, reusable filtration offers an alternative to disposable depth-media filtration and ultimately a reduction or elimination of filter elements. Each filter produces 5-10 percent fluid loss which carries additional costs of fluid replacement and associated labour.

### III. Extend fluid life

Contaminated fluids are the source of component wear which is the source of equipment failure. Employing quality filtration prevents frequent wholesale oil disposal and replacement.

### IIII. Reduction in downtime and lost production

Employing a reliability program centered around quality filtration reduces the costs associated with complete oil changes, system failures, and labour intensive maintenance. Predicting then preventing unplanned maintenance ultimately adds to every business' bottom line.

## OEI MAGNETIC FILTRATION

One Eye Industries designs and manufactures reusable magnetic filtration systems as the solution to inefficient and costly operations.

The patented design allows for effective filtration of wear contamination at below 1 micron providing on average 2.5x fluid, system, component ultimately equipment life longevity.

Conventional filtration's inability to meet the cleanliness requirements for system protection is the primary source of equipment failure, unplanned maintenance and downtime.

## KEY FEATURES



- Cleanable and reusable for 17+ years with minimal consumables.
- Effective predictive maintenance tool because of the ability to capture and analyze contamination to determine system component failure.
- Filtration capability exceeds ISO fluid cleanliness standards.
- High dirt holding capacity allowing for longer service intervals.

## OEI TECHNOLOGY BENEFITS



Extended life of critical operating systems



Reduction in downtime and lost production



Extended fluid life



Reduction in waste materials and supplies

## PRIMARY APPLICATIONS

- Engine Oil
- Engine Coolant
- Fuel
- Transmission Fluid
- Hydraulic Open Loop Fluid
- Hydraulic Closed Loop Fluid
- Hydraulic Tank Return Fluid
- Gear Oil
- Fracking Fluids

## COMPARING FILTRATION METHODS

Variables to consider:

Filter Costs

Fluid Costs

Labour Costs

Disposal Costs

Standard Service Intervals

Expected Extended Service Intervals

OEI: 2.5x based on case histories

**COST COMPARISON**

**Conventional Filtration – OEI Magnetic Filtration**

\* For active cost calculator, please see Part 2 of report

This analysis is based on equipment and maintenance data from Ranglar Manufacturing to demonstrate the annual maintenance cost savings of OEI Magnetic Filtration.

Ranglar Manufacturing advises and implements CBPM programs as well as Condition Monitoring Systems with additional programs to educate on set up of lube rooms, storage systems and sampling to meet best reliability practices.

**Equipment: ISX15 with a 4700 OFS**

Annual Service Costs with:	
Conventional Media Filters	\$ 43,377.93
OEI Magnetic Filter Costs – with Initial Investment	\$ 46,200.00
OEI Magnetic Filter Costs – after Installation	\$ 9,126.50
OEI Magnetic Filter Costs with Ranglar Manufacturing CMS	\$ 6,357.21

Annual Cost Savings with:	
OEI Magnetic Filters	\$ 34,251.43
OEI Magnetic Filters and Ranglar Manufacturing CMS	\$ 37,020.72

- These costs reflect filter and fluid replacement; they do not reflect the additional savings associated reduced parts replacement and downtime.
- These costs are based on the extension of service intervals with OEI Magnetic Filtration and Ranglar Manufacturing CMS based on historical average experience.

**AVERAGE EXTENTION OF INTERVALS**

**OEI Magnetic Filtration**

- Fluid and component replacement: 2.5 x
- Service Intervals: 2.5x

**OEI Magnetic Filtration & Ranglar Manufacturing CMS**

- Fluid and component replacement: 3.5 x
- Service Intervals: 3.5x

\* CMS: Condition Monitoring System  
 \* CBPM: Condition Based Preventative Maintenance program

## **COST COMPARISON**

### Conventional Filtration – OEI Magnetic Filtration

#### Cost analysis of system components repair, replacement

- Repairs are general and subject to internal damage – these are estimates based on historical data.
- Filter changeouts are grouped, the number of filters is dependent on system design.
- Shop rates differ from shop to shop, data listed is based on average oilfield and truck shops.

Hydraulic Components	Repair	Replace	Rate Total
Main Drive Pump - CTU	\$6,500.00	\$27,000.00	\$5,750.00
Typical charge pump	\$400.00	\$2,200.00	\$920.00
Typical servo valve	\$200.00	\$1,250.00	\$690.00
Standard HP Filter (each)	NA	\$750.00	\$115.00
Standard LP or return filter (each)	NA	\$250.00	\$115.00
Standard charge filter (each)	NA	\$400.00	\$115.00
Drive Motor	\$1,200.00	\$6,500.00	\$690.00
Directional Control Valve	\$500.00	\$6,500.00	\$4,600.00
Hydraulic system flush due to failure	\$5,000.00	\$5,000.00	\$13,800.00

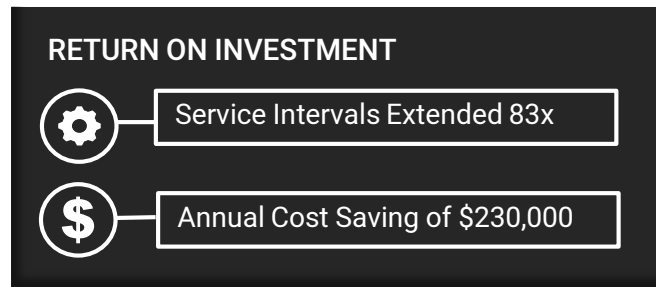
Hydraulic Components	Repair	Replace	Rate Total
Main Drive Pump - CTU	\$6,500.00	\$27,000.00	\$225.00
Typical charge pump	\$400.00	\$2,200.00	\$ 600.00
Typical servo valve	\$200.00	\$1,250.00	\$300.00
Standard HP Filter (each)	NA	\$750.00	\$600.00
Standard LP or return filter (each)	NA	\$250.00	\$1,800.00
Standard charge filter (each)	NA	\$400.00	\$15,000.00
Drive Motor	\$1,200.00	\$6,500.00	\$1,800.00
Directional Control Valve	\$500.00	\$6,500.00	\$9,200.00
Hydraulic system flush due to failure	\$5,000.00	\$5,000.00	\$6,900.00

## CASE STUDY

Basic Energy  
One Eye Industries

September 2014 – May 2015

Equipment: Coil Tubing Unit  
Application: Bi-directional Hydraulic Line



### Problem

Hydraulic cartridge valves on the bi-directional hydraulic lines of coil tubing units have <math><1\mu - 3\mu</math> tolerances. In this application, the unilateral conventional filtration was incapable of removing the contamination that was causing valve failure every 6-12 hours. Each cartridge valve cost \$480.00 with downtime costs associated to every failure.

### Solution

Arthur Fekete, Maintenance Manager for National Oilwell Varco recommended an OEI bi-directional, high-flow magnetic filter scrubber to increase filtration efficiency and protect the hydraulic cartridge valves.

### Results

Since the installation of the magnetic filter scrubber, there have been no cartridge valve failures resulting in an annual cost savings of \$230,000 (not including downtime costs or reduced maintenance costs).

The dirt holding capacity of the magnetic filter scrubber allowed PM periods for the hydraulic system to extend to 250 hours and the hydraulic cartridge valve life to extend to over 1 year.

After 5 weeks of failures twice a day, we needed a solution to remove the contamination to below tolerance levels and extend the life of the valves to the expected 8-12 months.

Arthur Fekete, Maintenance Manager  
National Oilwell Varco

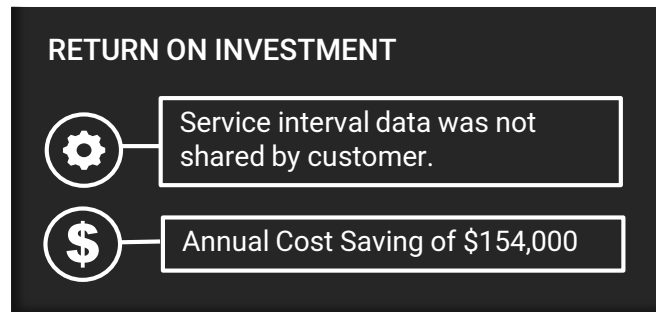


## CASE STUDY

Precision Drilling  
One Eye Industries

May 2012 – May 2015

Equipment: Super Single Top Drive  
Application: Closed Loop Hydraulic Line



### Problem

Closed loop hydraulic lines require filtration of the fluid flowing from the motor to the pump as well as the pump to the motor. The system components on these lines have tolerances <math><1\ \mu</math> - 10 microns.

The closed loop hydraulic line on this application flowed 300 GPM and required bi-directional filtration. High pressure filters require increased horsepower to meet the flow rate requirements which puts higher pressure on the pump.

The Parker P14/-16 Pumps on this unit cost Precision Drilling \$168,000/year because they were requiring replacement every 2.5 months from the wear contamination conventional filtration was unable to remove.

### Solution

Precision Drilling determined that installation of an OEI high pressure magnetic scrubber would protect the pump from contamination coming from the motor.

### Results

A substantial reduction in pump wear and failure has been realized since employment of the magnetic filter scrubber.

The Parker Pumps operational life was extended to 2.5 years with a cost savings of \$385,000 and a reduction in downtime costs and reduction in production loss penalties

Since installation, the magnetic filter has provided an annual savings of \$154,000 not including downtime, maintenance and loss of production costs.

**“The Magnetic Scrubber now allows us to filter in both directions filtering out the particles finer than the 10 micron size that our standard filters are rated for.”**

Brent Pavelich, Maintenance Manger  
Precision Drilling

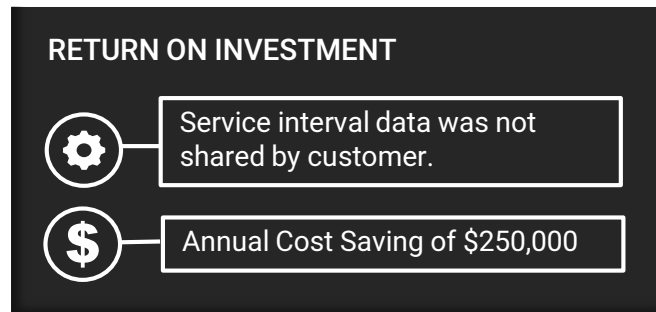


## CASE STUDY

Tesco Corporation  
One Eye Industries

January 2013 – June 2014

Equipment: NABU TBR Hydraulic Power Unit  
Application: Engine



### Problem

Engine components have wear contamination tolerances of  $<1\mu$  - 30 microns. The conventional filtration on this application was missing contamination under 10 microns which was causing premature wear of the engine components.

### Solution

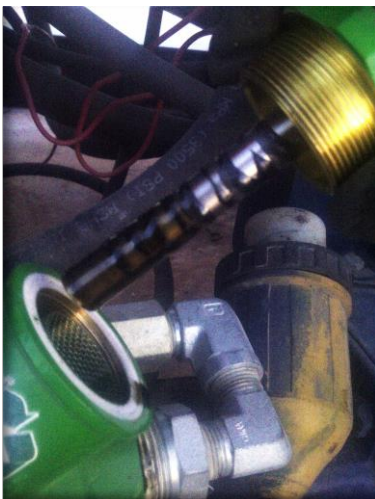
Stan Sterling, Maintenance Manger for Tesco Corporation installed an OEI magnetic filter y-strainer on the HPU engine to increase filtration efficiency.

### Results

Significant contamination was captured after 60 days of operation. The magnetic filter y-strainer protected the critical engine components such as it's valves and pistons.

**“Through the use of this oil filter in conjunction with OEI’s magnetic coolant, fuel and hydraulic filters, we had a potential cost savings of \$250,000 - \$300,000 annualized based on 25,000 operating days for this Tesco rental fleet.”**

Stan Sterling, Maintenance Manger  
Tesco Corporation



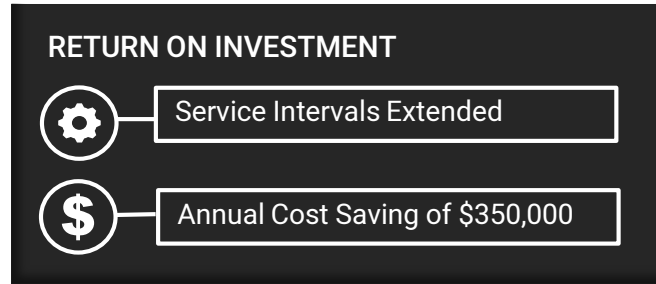


## CASE STUDY

BMA Blackwater Mine  
One Eye Industries

January 2008 - November 2008

Equipment: Kress Coal Haul Truck  
Application: CAT 3508 Engine



### Problem

The Kress Coal Haul Truck's 3508 CAT Engine was diagnosed to be rebuilt at 13,000 hours because an oil analysis showed high levels of contamination: particle quantifier (PQ) 12.

### Solution

Prior to rescheduling the engine rebuild, Tim Rantin, Maintenance Manger at BMA installed an OEI ADD-Vantage 9000 magnetic filter (200 Beta efficiency rating) alongside two conventional CAT filters (no efficiency rating).

### Results

The oil analysis on the next planned maintenance (PM) interval identified the PQ of <1.

With the new filtration, the haul truck stayed in service with the CAT 3508 engine lasting an additional 17,200 hours before a glycol leak contaminated the oil and the engine failed.

The maintenance intervals extended first to 350 hours, then to 500 hours realizing significant cost savings.

The cost savings of preventing the engine rebuild was \$350,000.



**2018 ONGOING OEI PROJECT**

**Cat-785D-Mining Truck**

**Gold Mine in Papa New Guinea**

**Problem**

Lost productivity due to engine failures

**Solution**

2 year trial - on 6 haul trucks - using 9ADV9 filtration on engine oil

**Result**

- I. Expanded trial from 6 haul trucks to 40 haul trucks after 1 year
- II. Saved Between \$1.3 – \$1.6 million by extending rebuild time and extending oil intervals
- III. A complete outfitting of the CAT-785D Fleet, for a total of 50 haul trucks this year

