# Introduction to OEI Magnetic Filtration

SOLVING TOMORROW'S CHALLENGES, TODAY.

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# THE LEGEND OF ONE EYE

## THE NAME ‘ONE EYE’ COMES FROM A LEGENDARY STORY OF COURAGE AND DETERMINATION

The company name is based on the story of a one-eyed grizzly bear who lived in the heart of the Canadian Rockies.

The story goes something like this: One dark night, a large, voracious grizzly broke into a hunter’s camper. The startled hunter fired at the snarling grizzly as it was charging through the door of his camper. In self-defense, the terrified hunter shot the grizzly’s eye out leaving it behind while the bear escaped into the forest.

Afterwards, famous hunters and intrepid game wardens desperately searched every nook and cranny to find this dangerous, wounded bear.

He was never caught.

He anticipated every trap. He outsmarted his competition. He became the cunning phantom grizzly named One Eye. As time passed, the legend of One Eye grew just as the grizzly grew larger, more powerful and more menacing every year. So potent is this legendary bear that in the end, even all his offspring were powerful, menacing and one-eyed!

One Eye’s intelligence, grit and ability to beat the odds is the perfect signature for our company and our brand.

# ONE EYE INDUSTRIES

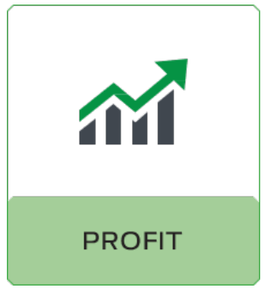
## OUR MISSION

To be the trusted partner for
industrial machinery operators around the world.

## WHY OUR CUSTOMERS CHOOSE US

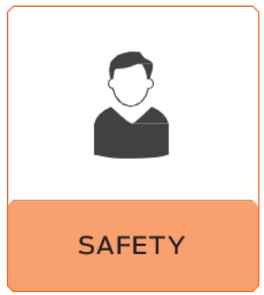
OEI Magnetic Filtration is the simplest way to achieve rapid payback with the lowest risk by extending the life of rotating equipment. As a result, safety is improved while substantially reducing costs and environmental impact of operations.

# WHY OEI




## RELIABLE EQUIPMENT MEANS INCREASED PROFITABILITY

OEI designs and manufactures reusable magnetic filtration systems as the sustainable alternative to conventional filters, each filter is optimized for its application and exceeds fluid-cleanliness standards. This helps to prevent failure, reduce unplanned maintenance, and minimize downtime.  The initial cost of an OEI product is quickly realized in the continued savings the product brings to any reliability program.




## REDUCE UNPLANNED MAINTENANCE AND INCREASE THE SAFETY OF YOUR TEAM

Optimal fluid cleanliness extends life of critical systems preventing component, system and ultimately equipment failure and replacement. Preventing unplanned maintenance and extending service intervals results in reduced travel to and from sites, exposure to elements, treatment of toxic materials and the opportunity for injury. This allows for extended service intervals and a reduction in labour intensive maintenance.


## CLEAN INSTEAD OF DISPOSE AND PROTECT OUR ENVIRONMENT

With a product life of 18+ years, OEI technology helps to reduce your environmental footprint. Each filter is cleanable, requires minimal consumables and operates without the use of utilities. Reusable components reduce the costs associated with the disposal and replacement of conventional filters, fluids and components.

# PROVEN AROUND THE WORLD

## GLOBAL SUCCESSFUL ACROSS DIVERSE INDUSTRIES

OEI magnetic filtration is employed internationally by leaders in the oil and gas, mining, commercial and residential building, manufacturing, transportation, food, pharmaceutical, defense, petrochemical and marine industries.  OEI magnetic filtration systems apply to engines, gearboxes, hydraulics and pneumatics, processed products, cooling systems and water systems. Each filter employs a magnetic filter element with a patented radial field configuration for high holding strength. These systems operate with minimal flow restriction and are proven to capture both ferrous and non-ferrous contamination in rotating equipment applications. The first OEI filtration system was installed in 2001 and has been proven successful in over 40 countries.

## CANADIAN MANUFACTURING

OEI corporate headquarters and manufacturing facility is located in Calgary, AB, Canada. Global OEI authorized distributors are trained to aid in determining the most effective filtration solution for their application.

One Eye Industries Inc.
4344 12th Street SE
Calgary, AB
T2G 3H9

# SERVING INDUSTRIES AROUND THE WORLD

OIL & GAS
WELL STIMULATION

OIL & GAS
FACILITY

POWER
GENERATION

DEFENCE

MINING

TRANSPORTATION

PULP & PAPER

FOOD
PROCESSING

BUILDING
OPERATIONS

MANUFACTURING

RENEWABLE ENERGY

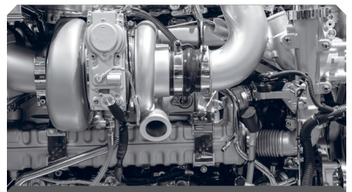
MUNICIPALITY

# APPLICATIONS

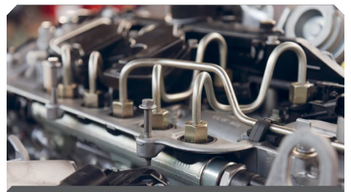
HYDRAULICS

PNEUMATICS

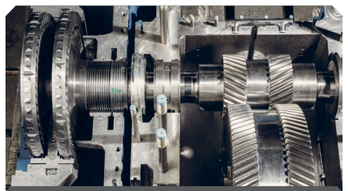
PUMPS



ENGINES



FUEL SYSTEMS



GEARBOXES

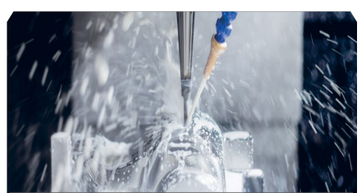
COMPRESSORS

TOTAL PROTECTION KITS

PROCESS & UTILITY WATER SYSTEMS

PRODUCT LINES

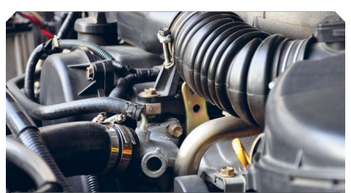
PARTS WASHERS



MILLING MACHINES

SUMPS & RESERVOIRS

HEAT EXCHANGERS



COOLANT LINES

The most damaging contaminants in any system are wear particles under 4 microns.

## The primary sources of fluid  contamination:

- The formations where the oil was produced
- The machining and manufacturing  processes of system components
- Air intake and
- Initial break-in of equipment.

GRAIN OF SALT
~ 100µ

HAIR FOLLICLE
~ 80µ

WEAR PARTICLE
< 4µ

MOST HARMFUL
< 1µ

**82%**

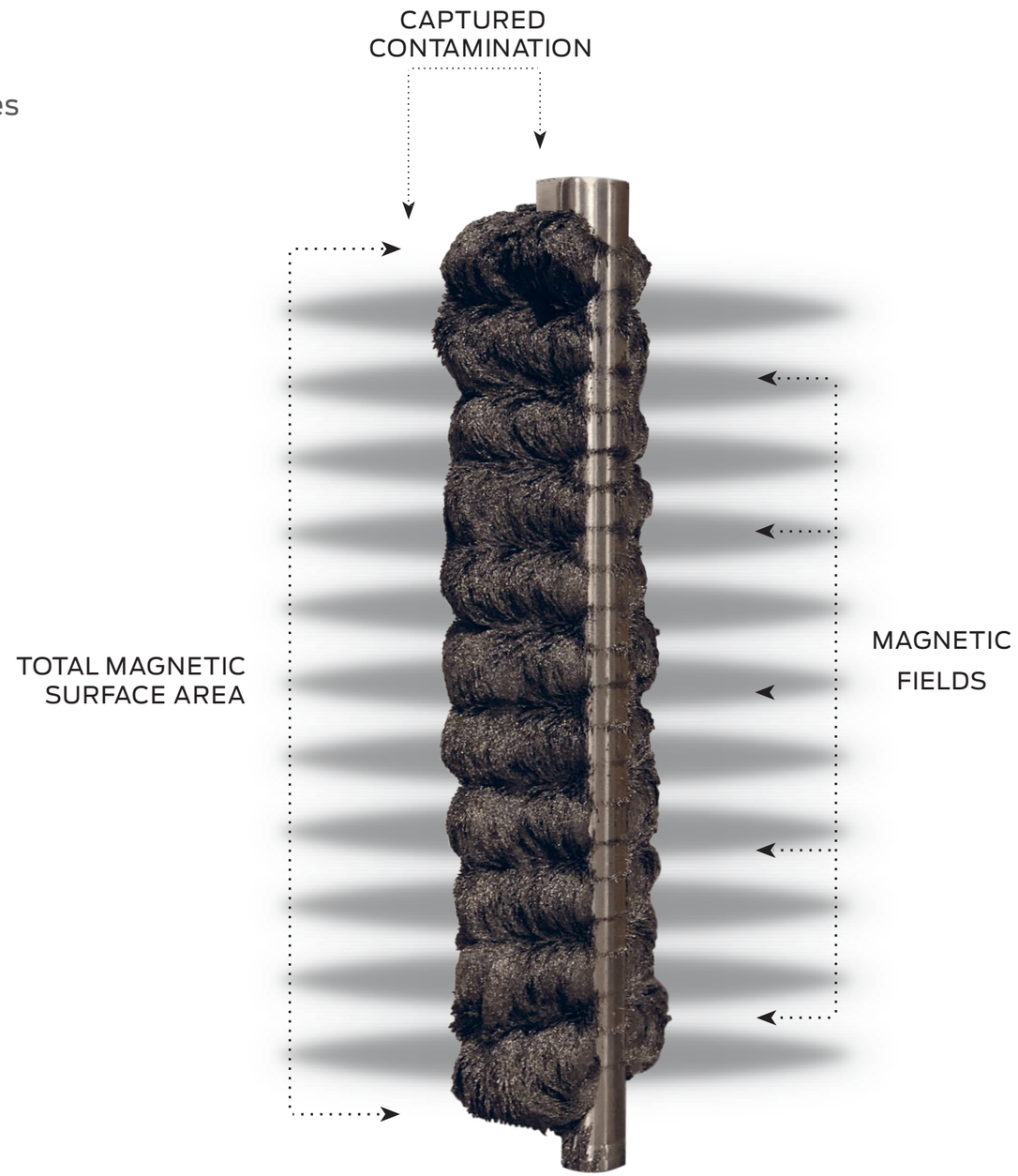
Of mechanical wear
is due to wear contamination

ISOCLEAN™ CERTIFIED LUBRICANTS

# CORE TECHNOLOGY

The patented, magnetic filter element attract 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*.

- Clean And Reuse
- Minimal Flow Restriction
- Continuous Filtration in Bypass
- Predictive Maintenance
- No Installation Restrictions
- Captures Non-ferrous Contamination
- Prevents Oxidization & Varnish
- No Worm Holing & Channeling



# OEI PRODUCTS

## SCRUBBER SERIES

Magnetic Filter Scrubbers employ a magnetic filter element in a specialty housing that ensures maximum dwell time for high efficiency filtration.

## ADD-VANTAGE 9000 SERIES

The ADD-Vantage 9000 magnetic filtration system employs a magnetic filter element and a stainless-steel cloth element in its design for high efficiency filtration and replaces conventional spin-on cartridge filters.

## Y-STRAINER SERIES

Magnetic Y-Strainers employ a magnetic filter element as a replacement of conventional y-strainers. Designs with and without a screen are available.

## KIDNEY LOOP SYSTEMS

OEI Kidney Loop Systems are self-contained filtration units with multiple magnetic filters for off-line filtration, fluid transfer of mobile or stationary equipment, and flushing of storage reservoirs..

# EXTENDING MAINTENANCE INTERVALS

## EQUIPMENT

New-Build Well Stimulation Pumper (A)

## APPLICATIONS

- 3152C CAT Engine
- TH55-E70 CAT Transmission
- FMC WQ2700 Quintuplex Pump

## CHALLENGE

Prevent the wear contamination that is inherent in new fluids, and produced during parts manufacturing and break-in operation from causing premature component failure and unscheduled downtime.

## SOLUTIONS

Outfit all fluid applications with OEI Magnetic Filtration.

## RESULTS

The photos show the contamination collected from multiple applications after 300 hours of operation.

Planned maintenance intervals were extended from 250 hours to 600 hours.

| | MAGNETIC FILTER | PHOTO RESULT |
|---|---|---|
| ENGINE OIL | ADD-Vantage 9000 | B |
| SUMP PUMP LUBE OIL | Mounted Magnetic Element | C |
| QUINTUPLEX PUMP LUBE OIL | Magnetic Scrubber | D |
| COOLANT | Magnetic Y-Strainer | E |
| FUEL | ADD-Vantage 9000 | F |

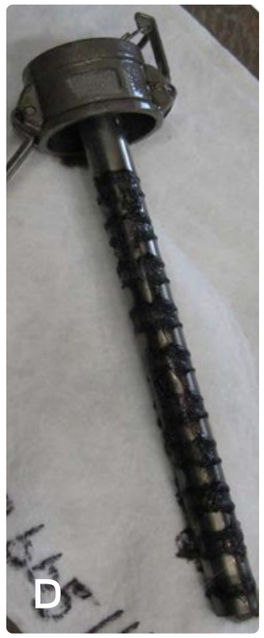
## ROI

PROFIT

PM Periods Extended

300 Hours To 600 Hours








## EQUIPMENT

Twin Pumper

## APPLICATIONS

Gearbox

## CHALLENGE

Determine the value of gearbox preventative maintenance.

## SOLUTIONS

Operate 2 Twin Pumpers for 6 years,

one with a gearbox reliability package employing OEI technology capable of filtering wear contamination < 1 µ,

and one without; compare the operating costs.

## RESULTS

| GEARBOX OPERATING COSTS OVER 6 YEARS | | | |
|---|---|---|---|
| | COST/HOUR | COST/YEAR | TOTAL COST |
| STAND-ALONE | $5.87 | $8,722.25 | $52,333.53 |
| RELIABILITY PACKAGE | $2.03 | $3,125.00 | **$18,750.00** |
| RELIABILITY PACKAGE SAVINGS: $33,583.53 | | | |

## ROI

PROFIT

GEARBOX

PREVENTATIVE MAINTENANCE

6 YEARS: $33,583.53

# EXTENDING HYDRAULIC PUMP OPERATING LIFE

## EQUIPMENT

Drill Rig

## APPLICATIONS

Closed Loop Hydraulic System on 35 Top Drives

## CHALLENGE

Design a bi-directional, high-pressure filtration system capable of handling
300 gpm to prevent pump damage from wear contamination produced by the motor.

The Parker P14/P16 pumps were failing due to wear contamination every 2-3 months at a cost of $35,000/set ($168,000 annually).

## SOLUTIONS

Deploy 2 OEI High-Pressure Magnetic Scrubbers on each Drill Rig.

## RESULTS

After installing OEI filtration, the Parker pump change-out intervals extended from every 2-3 months to every 3 years equating to $504,000 in savings.

These savings do not account for reduced downtime, production and labour requirements.

## ROI

PROFIT

HIGH-PRESSURE PUMP PROTECTION

$504,000 in 2.5 Months

| DESIGN PARAMETERS | |
|---|---|
| • >1 µ FILTRATION | • SUCTION FILTRATION |
| • BI-DIRECTIONAL FLOW | • CLOSED-LOOP SYSTEM |
| • HIGH PRESSURE | • NO HORSEPOWER REQUIREMENTS |

# CAPTURING NON-FERROUS CONTAMINATION

## EQUIPMENT

Frac Truck

## APPLICATIONS

Turbo Coolant System

## CHALLENGE

Improve the quality of coolant oil in order to prevent premature wear of seals and pumps, and improve its ability to cool and lubricate the turbo charger.

## SOLUTIONS

Install a magnetic y-strainer in the coolant circuit.

## RESULTS

The top photo shows contamination captured after 11 hours of operation.

Because of static adhesion and entrapped ferrous material, high quantities of non-ferrous and water particles were captured on the magnetic element.

### Analysis

- 32% Silica
- 59% Ferrous Material

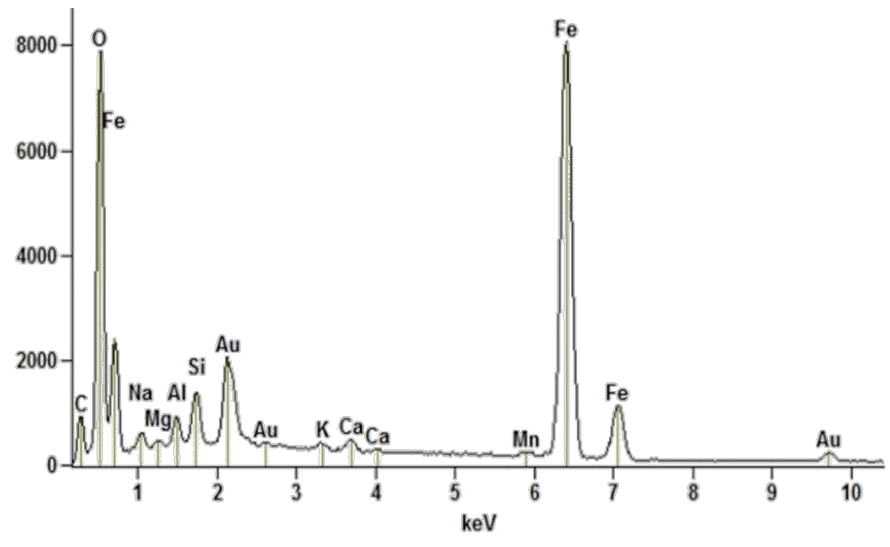
### Contamination Particle Sizes

< 1 - 40 µ

## ROI

PROFIT

TURBO-CHARGER
OPERATING LIFE EXTENDED
2 - 3 x



# PREVENTING COMPONENT FAILURE

EQUIPMENT

930E HAUL TRUCK

APPLICATIONS

Wheel Motor

CHALLENGE

Find a more effective predictive maintenance tool than OEM ceramic-magnetic plugs to monitor and identify premature wear of the haul truck wheel motors.

SOLUTIONS

Test the efficiency of OEI magnetic technology against OEM magnetic technology.

On one of the wheel motors, install 1 OEI Magnetic Filter Plug alongside 7 OEM plugs to evaluate and compare their capability of capturing wear contamination.

RESULTS

Before the test was completed, the wheel motor had a catastrophic failure.

When the magnetic plugs were removed at the rebuild shop, only the OEI Magnetic Filter Plug showed signs that a bolt had broken off causing severe damage and catastrophic failure.

If OEI Magnetic Filter Plugs had been in service and monitored as part of a predictive maintenance plan, this failure could have been prevented.

ROI

PROFIT

PM Periods Extended

300 Hours To 600 Hours

OEM MAGNETIC PLUG

OEI MAGNETIC FILTER PLUG

# 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.

## SOLUTIONS

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.

# 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.

## SOLUTIONS

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-M079 |
| Compartment | engine-primary |
| Oil Brand/Type | BP MINE MULTI 15W40 |
| Oil Changed | Y |

Lab Control Number 02925708
Current Evaluation A

**CURRENT** EVAL: A — 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.

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 |

**PREVIOUS #1** EVAL: A — 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.

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

**PREVIOUS #2** EVAL: B — 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.

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

**PREVIOUS #3** EVAL: A — 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.

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

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 | DEP | V100 | Mo |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210108 | 2 | 19 | <1 | 2 | 1 | 3 | <1 | <1 | 3 | 3 | 2486 | 8 | 1188 | 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 | 13 | 1 |
| 271107 | 9 | 46 | <1 | 5 | 7 | 15 | <1 | <1 | 4 | 2 | 2611 | 9 | 1233 | 1091 | 0.1 | <3.0 | 59 | 41 | 49 | 2 | 110 | OK | 15 | 2 |
| 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 | 90 | 2 | 4 | 8 | 19 | <1 | <1 | 5 | 2 | 2650 | 9 | 1155 | 1000 | 0.1 | <3.0 | 64 | | | 12 | 106 | OK | 14 | 3 |

ONE EYE INDUSTRIES

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