Filter Technology Qld

DGKP INVESTMENTS PTY LTD T/A

Qld Dealer and Distributor Filter Technology Australia products

FILTRATION

Liebherr T282C Truck On Board Filtration

Digger Hydraulics Filtration With Pump And Motor

CAT On Board Diff And Final Drive Filtration

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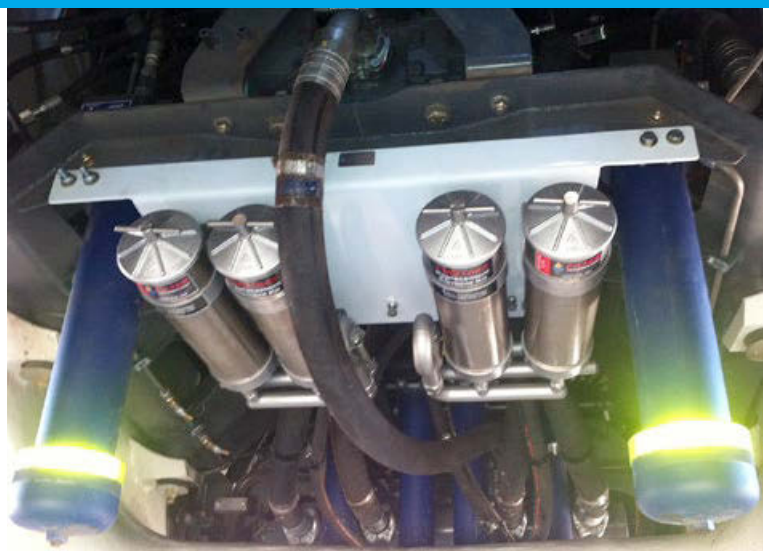
FILTER TECHNOLOGY
cleaner fluids mean better business

FIELD INSTALLATION

Filtration and Contamination Control Specialists



Liebherr T282C Wheel Motor Filtration

Hunter Valley New South Wales Coal Mining Operation

Filter Technology were requested by a large Hunter Valley coal mining company to assist with extending the life of fluids in electric final drive gear sets, through fluid cleaning.

The mine's challenge was to extend the fluid life from the current change cycles of 4250 hours to 18,000 hours, (half-life), but wanted to limit risk exposure.

Filter Technology designed a solution for the Liebherr T 282 C Ultra Class trucks providing an On Board Depth Filtration system to each wheel motor final drive. This design was developed to be a standard kit fitment system for all T 282 Ultra Class trucks.

Dirt levels identified in oil testing done from used fluids from the mine's Ultra Class trucks was as poor as ISO 4406 – 23/21/18 in August 2013. After fitment of a depth filtration system on a T 282 C truck, Filter Technology have successfully reduced the dirt levels down to levels of ISO 4406 – 16/15/12 which amounts to 30% less contaminants in the fluid.

To date this oil has achieved 11,924 hours of service and the oil still remains fit for ongoing use. This is a 280% improvement in service life of the fluid and has added to substantial reductions in contamination levels.

The benefit to the mine thus far amounts to an annualised saving of approx. **$14,868.00** for a set of final drives on one Ultra Class truck; in synthetic PAO 320 gear oil costs and labour savings on oil changes.

For the mine, the annualised savings on oil for their fleet of Ultra Class has been calculated to be approx. **$675,000.00**.

The oil remains in service and the aim is now to achieve 18,000 hours on the fluid which will increase savings even further.

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INSTALLATION MANUAL

FM40425-T282
Filtration System

For: Liebherr T282 C Class Truck

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Filter Technology Australia
FM40245-T282 Installation Details

Machine: LIEBHERR T282C Mining Truck
Application: Coal Mining
FTA System: FM40425-T282

1. Remove the two lower bolts on each high pressure filters see Fig 1.

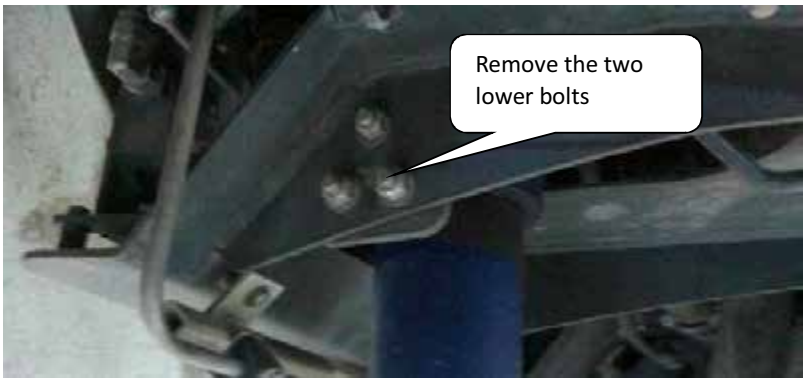

Figure 1

2. Hook the back of the filter systems bracket over the horse collar see Fig 2.

Figure 2

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3. Bolt the front of the filter system bracket with the supplied ½unc x 2" see Fig 3.

Figure 3

4. Install the three clapping bolts to the filter system bracket and tighten the locking nut see Fig 4.

Figure 4

5. Mount the two filtration systems onto the mounting bracket via the sixteen mounting bolts see Fig 5.

Figure 5

6. Install four Tee fitting for off driver side (ODS) and driver side (DS) supply and return to points see Fig 6.

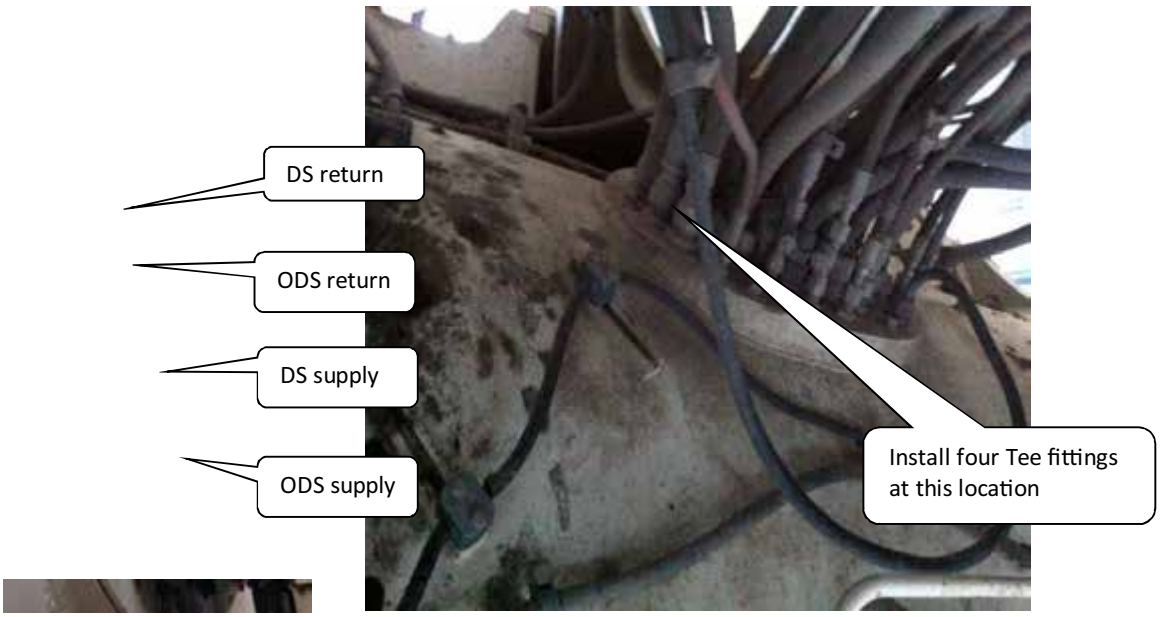

Figure 6

7. Install the Install four hoses marked off driver side (ODS) and driver side (DS) supply and return see Fig 7.

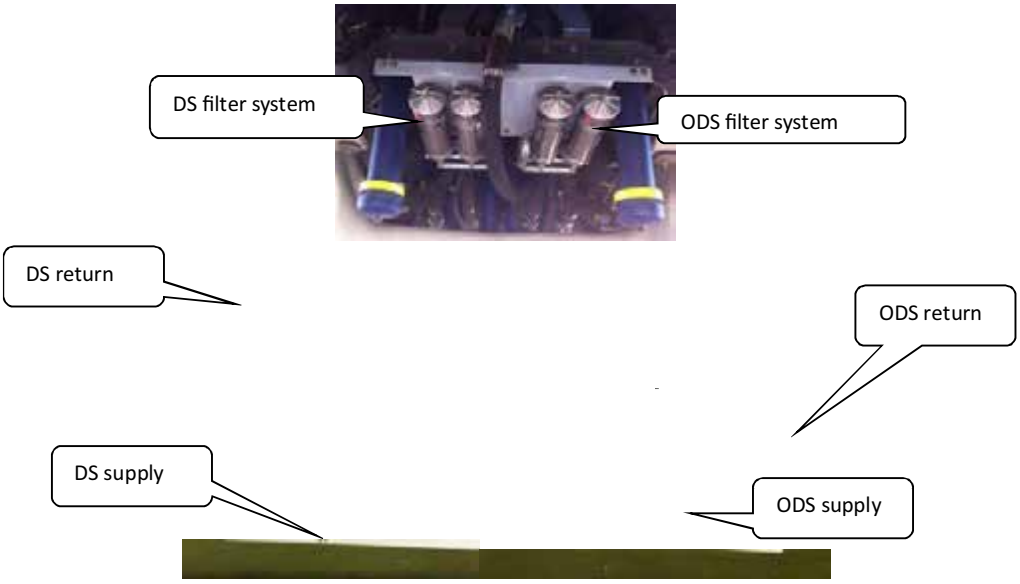

Figure 7

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QUICK CHANGE SERVICE KIT EXCHANGE SERVICE

Liebherr T282C Class Truck

FM40425-T282 Filtration System

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QUICK CHANGE SERVICE

FTQ highly recommend the use of our Quick Change Service Kit and Exchange Service of filters to make servicing easier, reduce change out time of service, no chance that the filter assembly will be reassembled incorrectly rendering the filtration inadequate, aids in eliminating spillage/contamination and is environmentally friendly.

QUICK CHANGE SERVICE KIT - Part No FM3944 Includes:

1 x Forkable Frame/Stand to suit
4 x DWV Heavy Duty 150mm PVC Tubes with End Cap, Threaded Collar and Screw on Cap.
4 x FM3502 (No 2) Quick Change Filter Assembly's complete

Each PVC tube holds a FM3502 Quick Change Assembly complete which provides the following:

- Provides clean dry storage of Quick Change Assembly
- When a service is due the Quick Change Filter Frame with assemblies in PVC tubes is located on the workshop floor ready for a change out of filters on the filtration unit/system.

EXCHANGE SERVICE: Part No QCE4X2

The Frame/Stand (complete) is returned to FTQ in Mackay.
The quick change assemblies are removed from PVC tubes and stripped of dirty filters and disposed of by FTQ.

PVC tubes and frame are pressure cleaned, quick change assembly parts are soaked and hot washed.

Quick Change Assembly's are then refurbished with new filters, seals and gaskets returned to clean PVC tube in frame and returned to site ready for next service.

This service is a cheaper option to striping and rebuilding filters on site and eliminates any human errors that the quick change will be reassembled incorrectly, rendering the filtration inadequate.

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QUICK CHANGE SERVICE KIT

Part No:	Description:
FM3944	4 x NO 2 PVC QUICK CHANGE SERVICE KIT

EXCHANGE SERVICE Mackay

Part No:	Description:
QCE4X2	Service 4 x No 2 Quick Change Filters

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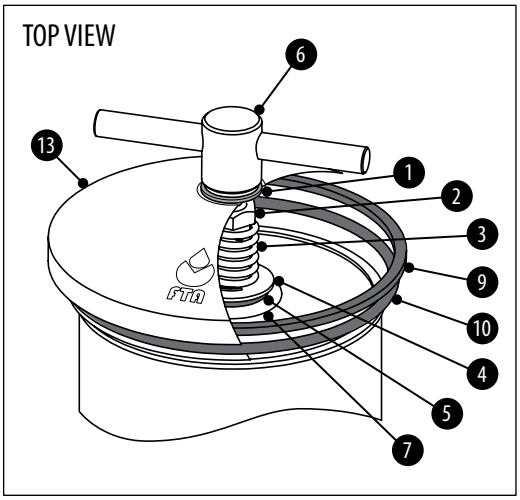
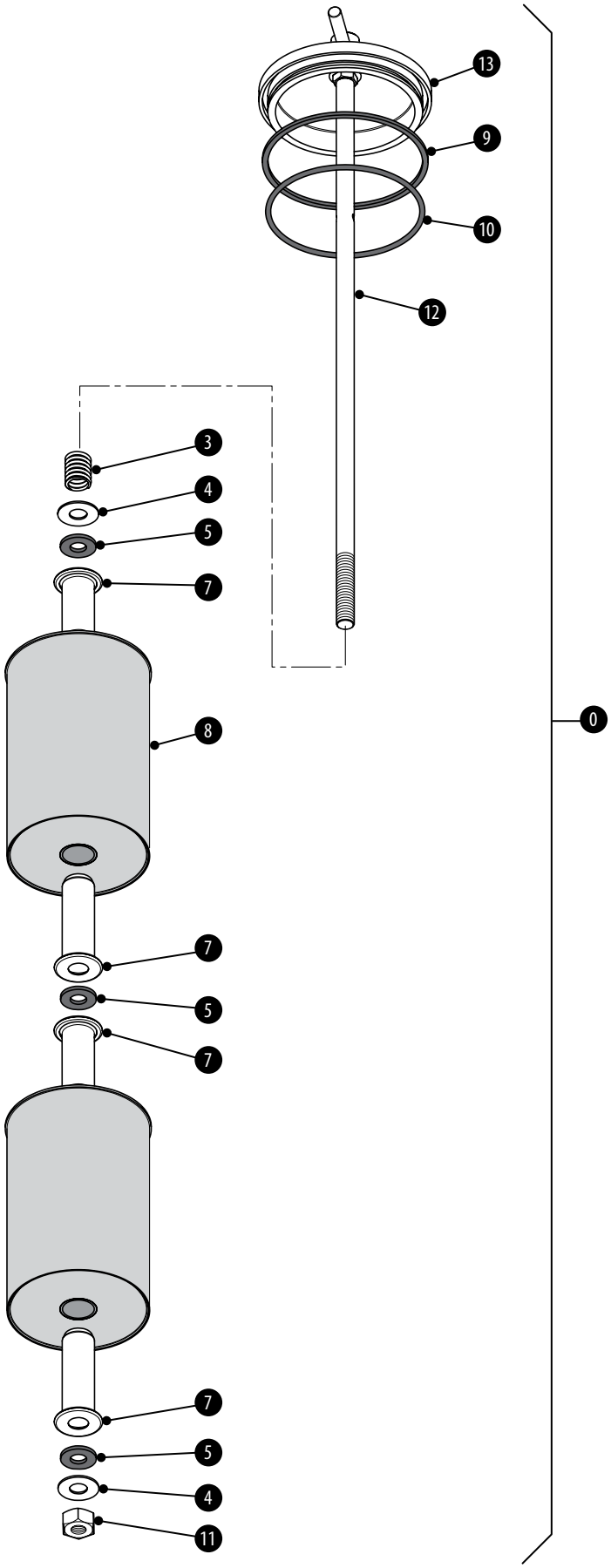
FM3502 Industrial Oil & Fuel Filter Quick Change Assembly : Parts List





Item No	Qty	Description	Part No
0	1	Engine fuel filter Quick Change assembly comprises items 1 – 13.	FM3502
1	1	Washer	FM0002
2	1	Lid lock nut	FM0005
3	1	Lid compression spring	FM0006
4	2	Return tube washer	FM0007
5	3	Post seal	FM0008
6	1	Tee handle with bleed screw	FM0010
7	4	Centre tube	FM0012
8	2	Element	FM2100
9	1	Gasket, lid	FM0004
10	1	O-Ring, lid	FM0025
11	1	Compression nut	FM0029
12	1	Return tube - No 2	FM0032
13	1	Lid	FM0003

Issue 001 – August 2010

ABN: 79 163 565 099

LIEBHERR 282T TRUCK ON BOARD FILTRATION

Quick Change Filter Service And Off Site Service Of Used/Dirty Filter Assembly

Removing the dirty/used filter assembly from the stainless filter housing

1. Isolate the filtration system.

2. Remove the element assembly from the filter housing by first unscrewing the the tee hadle counter-clockwise **(figure 1).**

3. Lift the dirty filter assembly clear from the housing and place it in a suitable container to minimize spillage and mess.

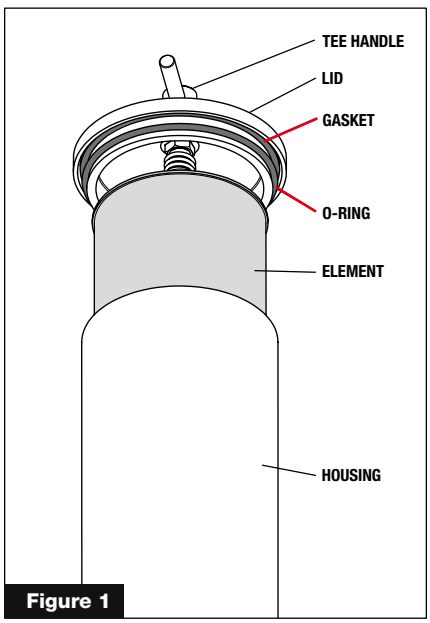


Figure 1

ABN: 79 163 565 099

Replacing the filter assembly into filter hosuing from PVC tube in holding frame

4. Insert the replacement element assembly into the housing, carefully locating the lid O-Ring into the housing tube.

Note: Take care not to dislodge the O-Ring when assembling.

5. Tighten the tee handle until the lid gasket seats against the end of the housing, then tighten a further 1/2 turn (180).

6. Repeat for other filter assemblies in the system.

7. De-isolate the filtration system, check for leaks and return to service.

Figure 2

Exchange Service Quick Change Filter Frame

8. Return dirty/used filter assembly into PVC tube and screw on lid.
Carefully replace PVC tube into holding frame. **DO NOT DROP or TORPEDO** the PVC tube into frame as this will cause the bottom of PVC to break/crack and the PVC tube will then need to be replaced.

9. WORKSHOP SUPERVISOR TO ACTION IMMEDIATELY THE RETURN OF THE FRAME WITH PVC TUBES TO THE WAREHOUSE.

For Servicing Return to LUBE TECHNOLOGY PTY LTD

SHED D - 10 PROSPECT STREET
MACKAY QLD 4740
m: 0409 061 950 p: (07) 4937 1271

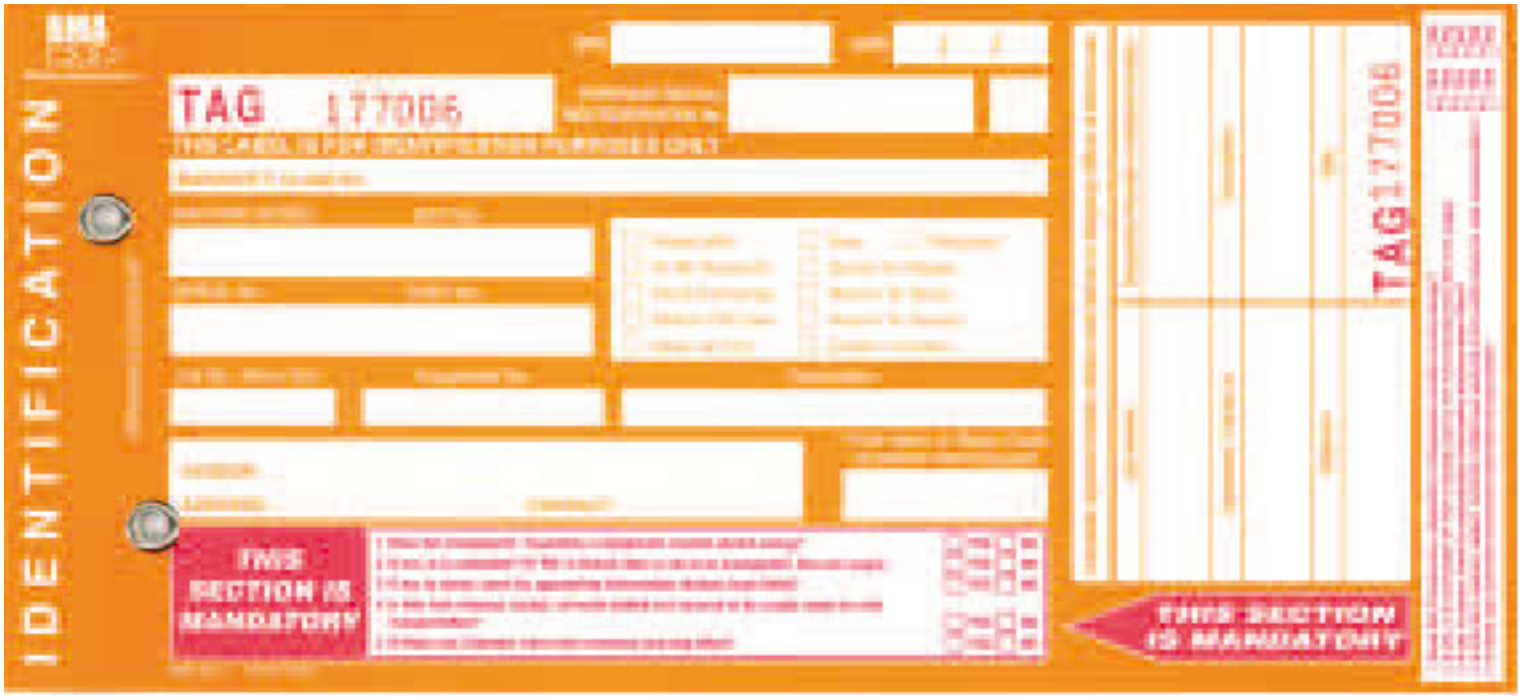
BMA Vendor: 30011004
BMA Material No: 11028058 - REFURBISH QCE 4X2

Return Filter Frame with used filters enclosed for disposal and rebuilding

Please take care when placing used filters into PVC tubing to avoid damage

Filtration and Contimation Control Specialists

PLEASE COMPLETE AND ATTACH ORANGE IDENTIFICATION TAG TO FRAME AND RETURN TO STORE IN TRANSPORT CONDITION.



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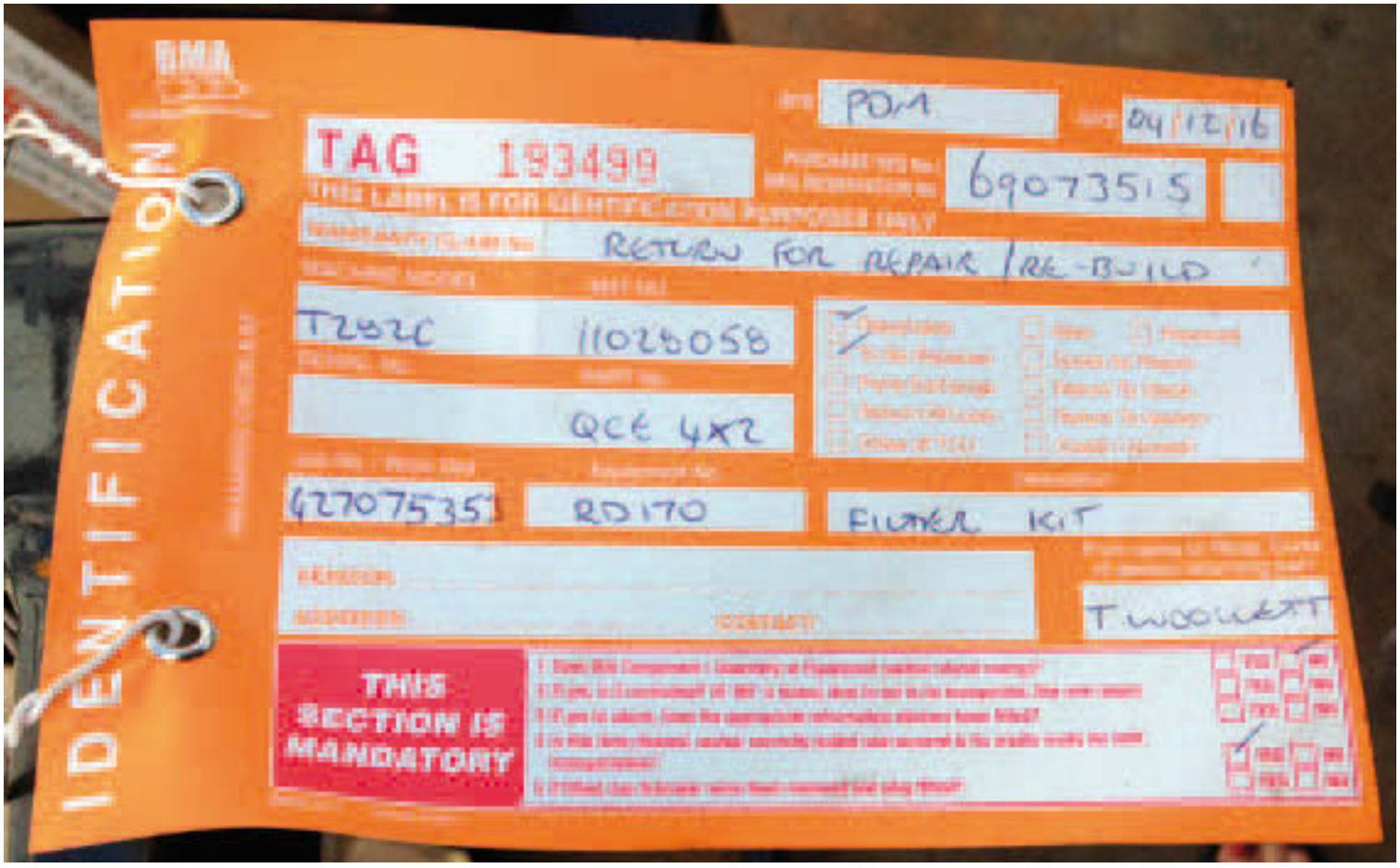
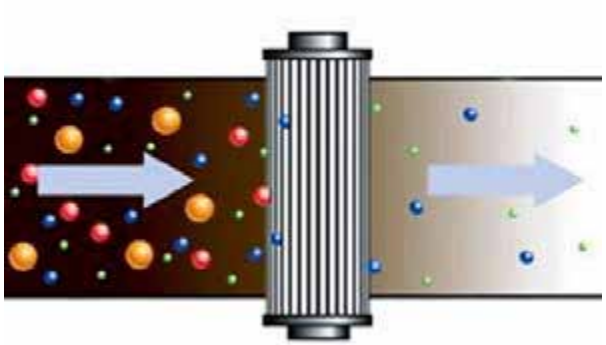


Can Fine Filtration Extend Oil Life?

Noria Corporation

Tags: oil filters, contamination control



"There's a company that claims to extend oil life by filtering contaminants down to 1 micron. Is there any risk of additive depletion by using such fine filtration systems? Is this type of filtration relevant to slow down the process of base number depletion/nitration in the case of gas engines?"

The claim of extending oil and machine life by utilizing fine filtration (less than 5 microns) is based on real-world experience and case studies. A good additive package should be fully blended and dissolved in the base oil. Therefore, fine filtration should not be able to strip out any additives.

However, many additives are polar in nature and have the ability to cling to particles. Many do so to fulfill their protective roles within lubricants. Examples for combustion engines include detergent and dispersant additives. These are polar and designed to cling to particles and water in the oil to hinder them from merging into larger particles or water droplets that could cause major issues. By doing their job, these additives will deplete over time by filtration/separation or simply fall to the bottom of the oil reservoir. Once they attach to the particle and the particle is removed by filtration, the filter does remove the additives, but it was just doing its job. The additives would have been depleted anyway.

Anti-foam additives can be separated as well. These larger insoluble molecules typically are larger than the 5-micron threshold for fine filtration. They are also polar and may cling to any filter fiber through which they are passed. The good news is that it would take extremely fine filtration to remove these insolubles, which would also eliminate the main cause of a foaming issue in the first place.

Base number depletion can be attributed to several things in a combustion engine. The two most prevalent are acid formation from combustion byproducts and oxidation. While having a cleaner lubricant can’t ward off an impending attack from old, worn rings and liners introducing combustion byproducts to the lubricant via blow-by, it can help prolong the onset rate of oxidation. Without exception, the cleaner, cooler and drier a lubricant is, the longer it will last in terms of oxidation.

Remember, fine filtration is always better than no filtration or poor filtration, since the additives will be depleted with or without filters. Plus, your machine and oil life will improve vastly with fine filtration.

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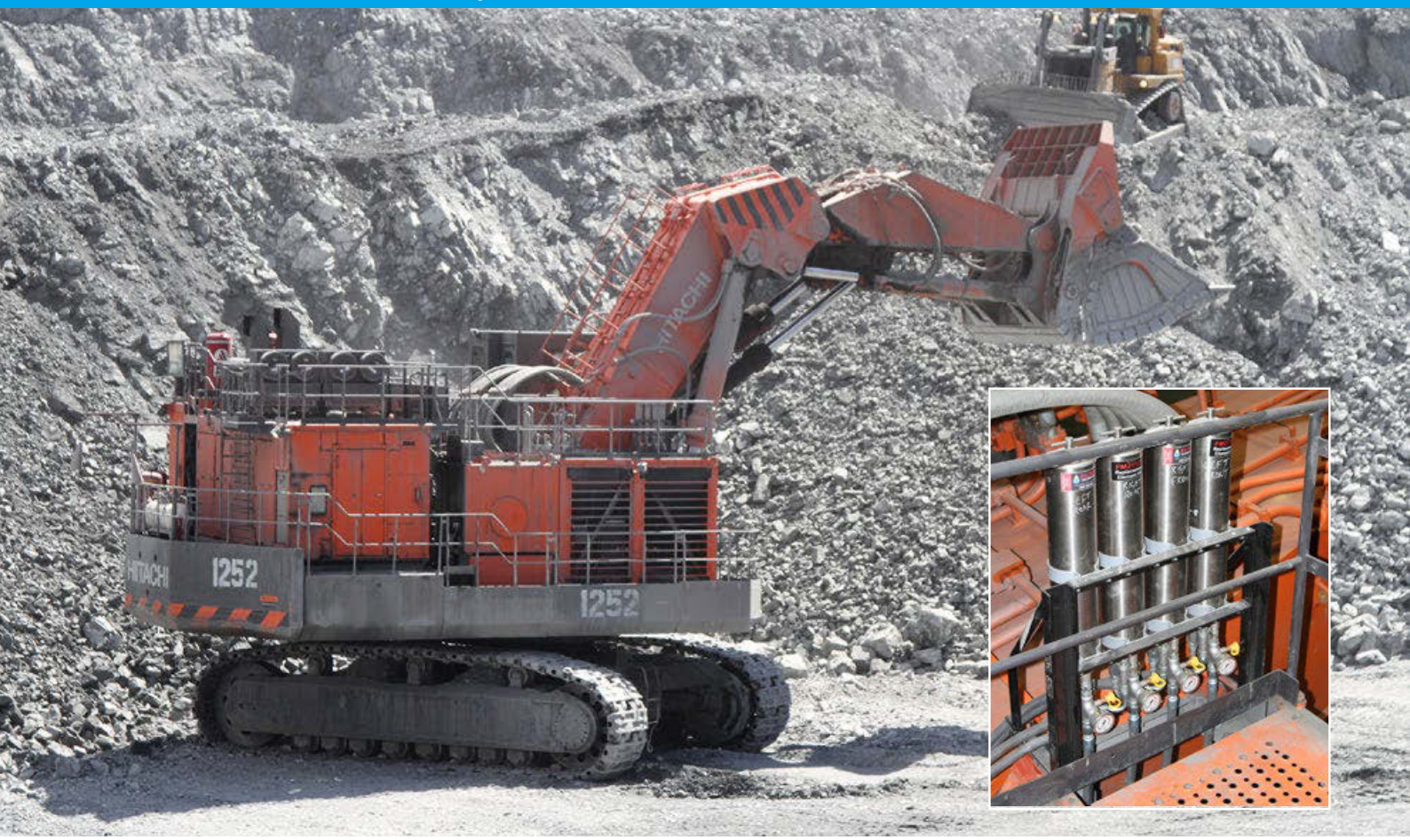
FIELD INSTALLATION

Filtration and Contamination Control Specialists



Swing Box Filtration System

Centerra Gold – Kumtor Mine Kyrgyzstan Central Asia

Kumtor Mine contacted Equipment Placement to assist their efforts in reducing contamination in the swing box systems of their mixed shovel fleet. With the results that have been achieved on the same shovels with the hydraulic filtration units previously installed, the addition of the swing box filtration was an easy progression in the management of contamination control.

Equipment Placement provided a solution with the use of Filter Technology Australia on-board depth filtration units. Kumtor fitted the FTA units to the swing box assemblies on their Liebherr R9350 and Hitachi EX3600 shovel fleet. Live oil samples were taken before the filtration was added and then over a period of 48 hours.

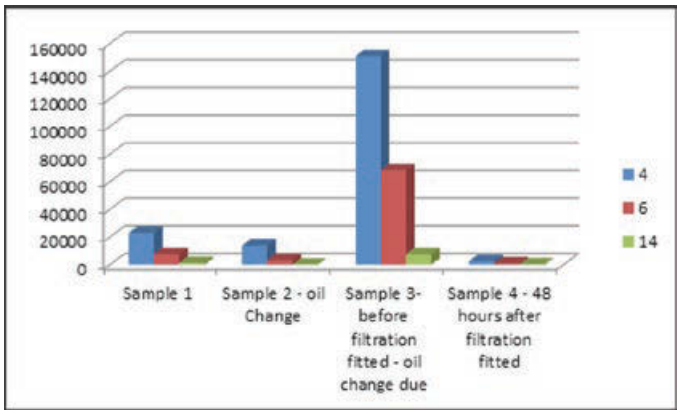
The results have proven the effectiveness of the filtration units to a point that reduction in contamination levels have returned the oil back to cleanliness better than the new oil kept in bulk storage. The oil analysis shows that there has been a reduction of 99.9% in the 4 µm range, 99.9% reduction in the 6 µm range and a 99.9% reduction in the 14 µm range.

The photographs show how easy the installation is to accomplish with minimal area required and with the added benefits of reduced contamination in the oil.

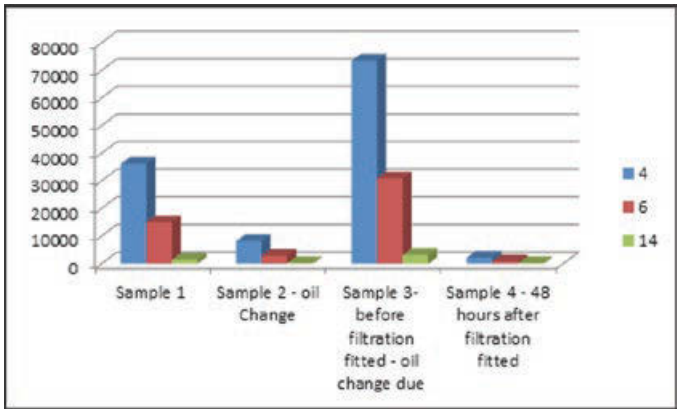
The life cycle of the swing box units should be increased. By using the industry accepted table supplied by the BHRA, the increased cleanliness of the oil indicates that if the standard is maintained then the swing boxes should gain at least fifty percent as many hours of operation than if the filtration had not been fitted. If the filtration is fitted when the swing boxes are fitted as new or refurbished, the life extension can be as much as double the usual service hours.

As the installation of the filtration draws from the bottom or service refill area of the swing box and then returns filtered oil back to the top of the box this gives a flushing motion and helps clean the contamination out of the box and also supply clean cooled oil to the upper areas of the box which is usually a high contaminate area.

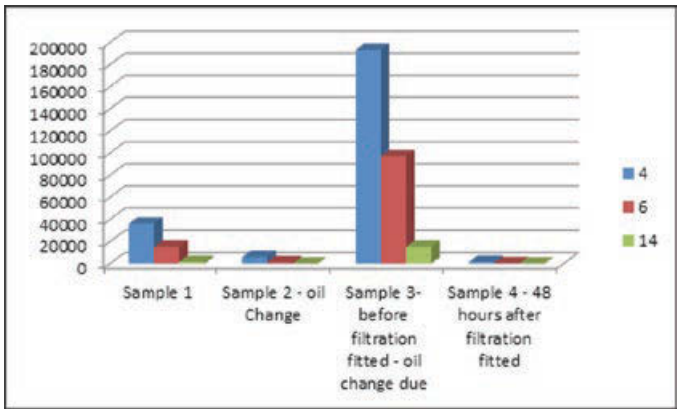
This result will allow Kumtor to extend oil change intervals, which will have a direct impact on operational costs, with savings in oil, waste oil streams, reduced downtime, and maintenance costs and have a huge reduction in the mines environmental impact.



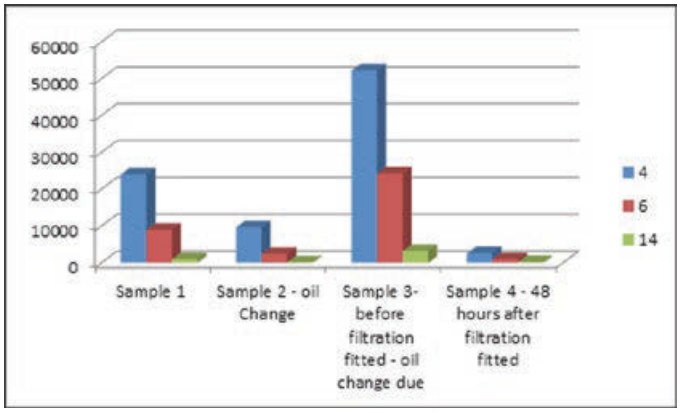
Left Rear Swing Box



Right Front Swing Box



Left Front Swing Box



Right Rear Swing Box

Fluid analysis showing marked reduction in contamination.

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Shovel Hydraulic Systems

Centerra Gold (Kumtor Mine, Kyrgyzstan, Central Asia)

Recd	**05/19/13**	05/18/13	06/17/13	01/21/13
Sample	05/18/13	05/17/13	05/16/13	04/18/13
Lab ID	1305190049	1305180035	1305170046	130420013
Lube T/D	48 hr	24 hr	0 hr	0 hr
Comp T/D	0 hr	0 hr	0 hr	47477 hr
Lube/Fit	N/N	N/N	N/N	N/N
PC > 4 ...	302.0	5379.0	37955.0	3293.0
PC > 6 ...	78.0	1880.0	5066.0	1299.0
PC > 14 ...	1.0	200.0	60.0	87.0
PC > 21 ...	0.0	80.0	10.0	30.0
PC > 38 ...	0.0	13.0	3.0	0.0
PC > 70 ...	0.0	0.0	0.0	0.0
ISO Code	15/13/7	20/18/15	22/20/13	19/17/14
UNF Fat ...	0.00	55.35	16.67	6.67

Particle count table reflecting higher oil cleanliness level than manufacturer's recommendation (Hitachi EX3600)

Recd	**05/19/13**	05/18/13	06/14/13	01/31/13
Sample	05/18/13	05/17/13	05/09/13	00/00/00
Lab ID	1305190050	1305180036	1305140014	1301310025
Lube T/D	24 hr	0 hr	0 hr	0 hr
Comp T/D	0 hr	0 hr	5502 hr	3274 hr
Lube/Fit	N/N	N/N	N/N	N/N
PC > 4 ...	1236.0	1801.0	209563.0	37226.0
PC > 6 ...	305.0	690.0	568135.0	15904.0
PC > 14 ...	35.0	67.0	4859.0	2026.0
PC > 21 ...	8.0	23.0	1391.0	751.0
PC > 38 ...	3.0	3.0	141.0	110.0
PC > 70 ...	0.0	0.0	0.0	3.0
ISO Code	17/15/12	18/17/13	25/23/19	22/21/18
UNF Fat ...	8.14	11.57	1551.44	367.16

Particle count table reflecting higher oil cleanliness level than manufacturer's recommendation (Liebherr R9350)

Kumtor Mine contacted Equipment Placement in regard to aiding their efforts to reduce contamination in the hydraulic systems of their mixed shovel fleet.

Equipment Placement provided a solution with the use of Filter Technology Australia on-board depth filtration units. Kumtor fitted the FTA units to their Liebherr R9350 and Hitachi EX3600 shovel fleet on the hydraulic reservoirs. Live oil samples were taken before the filtration was added and then over a period of 48 hours. The results have proven the effectiveness of the filtration units to a point that reduction in contamination levels have returned the oil back to a better than industry standards.

The oil analysis shows that there has been a reduction of 99.5% in the 4 µm range, 99.5% reduction in the 6 µm range and a 99.2% reduction in the 14 µm range. To give a real world understanding of this level of reduction in contamination these figures in the tables provided are as follows: the shovel with 4µm – 209653 PPM of contamination has 783 kg of contaminates in its system after the filtration unit was added this has reduce to 1236 PPM of contamination which equals 4.62 kg of contaminates.

As this shovel has four main pumps and pumps oil at full operation at 754 Lpm per pump that means that there is 138 kg of contamination passing through all pumps every minute, after the reduction in contamination this has reduce to 0.82 kg per minute.

This result will allow Kumtor to extend oil change intervals, which will have a direct impact on operational costs, with savings in oil, waste oil streams, reduced downtime, and maintenance costs and have a huge reduction in the mines environmental impact. The cleanliness of the oil will increase componentry life and machine reliability.

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FILTER TECHNOLOGY

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PRODUCTS FOR Mining

On-board filtration systems for industrial oil extend fluid and component life dramatically

Mining companies have a diverse range of equipment: earth-moving, drilling, conveying, coal washing and loading facilities to light vehicle fleets.

Maintaining and operating the equipment are typically the highest costs outside of the original purchase price.

Costly loss of production due to machine component failure are critical to a mine's bottom line.

Mining is often carried out in difficult and remote environments, with highly abrasive dust a fact of life. Filter Technology products are designed specifically to cope with these conditions.

Filtration plays an important part in the machine's longevity. Whether it be air, oil, fuel or a breather, preventing ingress of foreign particles into a machine will increase machine life. Contamination accelerates oil degeneration. The cleaner your oil and fuel systems, the longer your components will last.

Filter Technology products used in mining environments include:

- **Fuel filtration units**
- **Engine oil filtration units**
- **Industrial oil and fuel filtration units**

Customers' experience has proven that installing Filter Technology Australia's filter systems can significantly lower your company's operating costs.

APPLICATIONS

- **On-board oil and fuel filtration for excavators, draglines, haul trucks, mine utility vehicles etc.**
- **Kidney loop filtration units for cleaning industrial oil in gearboxes, final drives, diffs etc.**
- **Bowser fuel filtration units.**
- **Bulk filtration systems for industrial fuel and oil.**

Bulk fuel filtration systems prevent contaminants from entering vehicles' fuel systems, improving reliability and performance, as well as reducing wear and breakdowns.

Kidney loop filtration on final drive unit using mobile filtration buggy

Oil before and after filtration

Product Range for Mining Applications

Filtration Units

Type	Model	Filter Arr.
Engine Oil	FM3001	No 1 housing
	FM3002	No 2 housing
	FM3003	No 3 housing
	FM3004	No 4 housing
Engine Fuel	FM3101	No 1 housing
	FM3102	No 2 housing
	FM3103	No 3 housing
	FM3104	No 4 housing
Industrial Oil & Fuel	FM3201	No 1 housing
	FM3202	No 2 housing
	FM3203	No 3 housing
	FM3204	No 4 housing

Fixed Filtration Systems

Type	Model	Filter Arr.
Industrial Oil	FM40245	FM3204
	FM40345	FM3204
	FM40445	FM3204
	FM40645	FM3204

Fuel Bowser Systems

Type	Model	Filter Arr.
Fuel	FM40243	2 x FM3204
	FM40343	3 x FM3204
	FM40443	4 x FM3204

Mobile Filtration Systems - FM5 Series Filtration Buggies

Type	Model	Filter Arr. and Options
FM502 Series 2-wheel Filtration Buggy. *Available in* ***Lightweight*** *or* ***Heavy Duty***	FM50212 FM50222 FM50232 FM50242 FM50252 FM50262 FM50270	2 x FM3204 Options include heater, 24 V DC control, variable drive or air driven. Option: Underground Compliant available
FM504 Series 2-wheel Filtration Buggy ***Heavy Duty***	FM50412 FM50422 FM50432 FM50442 FM50452 FM50462 FM50470	4 x FM3204 Options include heater, 24 V DC control, variable drive or air driven. Option: Underground Compliant available

Note: 3 phase options available for all 5 Series products except FM50270 and FM50470.

Mobile Filtration Systems - FM6 Series Filtration Buggies

Type	Model	Filter Arr. and Options
FM6 Series 3-wheel Heavy Duty Filtration Buggy	FM60432 FM60632 FM60832	4/6/8/10 x FM3204 Options include heater, variable drive
	FM60442 FM60642 FM60842	
	FM60452 FM60652 FM60852	
	FM60462 FM60662 FM60862	
	FM60470 FM60670 FM60870	4/6/8/10 x FM3204 Air driven. For hyd. apps.

Note: 3 phase options available for all 6 Series products except FM60470, FM60670, FM60870.

Mobile Filtration Systems - FM7 Series Filtration Buggies

Type	Model	Options
FM7 Series 4-wheel Filtration Buggy ***Extra Heavy Duty***	FM71012	3 hose reels. 32 LPM pressure driven variable drive. For mech. drive trucks.
	FM71022	3 hose reels. 32 LPM pressure driven variable drive. Bulk compartment for flushing diff housing. For mech. drive trucks.
	FM71042	Built to filter 680 synthetic oil in electric drive haul truck final drive. 3 step system process. Heater with automatic temp. control.

Note:

Filter Technology Australia also designs and builds filtration units to cater for customers' specific requirements.

Please note that due to our policy of constant improvement, product specifications and descriptions are subject to change without notice.

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FILTER TECHNOLOGY

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PRODUCTS FOR Shovels/Backhoes

Filter Technology Australia hydraulic filtration packages are design to meet the harshest conditions on the mining and construction stage.

The proven patented technology of FTA depth filtration will not only enhance current OEM filter packages but also extend the life of componentry and consumables throughout the hardest working machines in the world.

The cost effectiveness of Filter Technology Filtration Systems will see the bottom line of operations enhanced from the smallest construction companies to the world's largest miners.

The benefits of after market depth filtration include:

- **No adverse changes to the OEM manufacturers systems or filtration package**
- **Ease of service with dealer-backed servicing agreements**

- **Price effectiveness compared to other aftermarket filtration equipment**
- **Proven depth media technology with results well within ISO cleanliness requirements**
- **Oil life extended to 10,000 plus operating hours with a regular service schedule**
- **Enhanced operation up time**
- **Major maintenance issues due to poor quality oils reduced extensively.**

Filter Technology Hydraulic Filtration Systems will increase profitability and keep machines working when all others fail.

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Filter Technology Qld

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Qld Dealer and Distributor Filter Technology Australia products.

FM40446 Fixed Filtration with Pump & Motor 4 x No 4 Filter Housings INLINE

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FILTER TECHNOLOGY

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PRODUCTS FOR
Excavators & Shovels

FM40246 On-board Filtration Unit

Designed to suit on-board hydraulic oil filtration for 100 T – 250 T Excavators/Shovels

FM40246 on-board filtration unit

Dimensions		
	Metric	US
Height	1250 mm	49″
Length	800 mm	31″
Width	400 mm	15″
Weight	110 kg	242 lb

Standard features:

- FM3204 x 2 filter housings
- Remove contamination down to 2 micron
- Fitted with pressure relief valve
- Suction strainer
- Pressure gauge
- Operation manual
- Optional extras
- Hour run meter
- Capable of being adapted for most recycling needs.

Optional features:

- D.O.L. isolation switch
- 24 VDC or 3 phase power
- 24 VDC or AC motor pump unit for independent oil circulation
- 24 VDC electrical installation packages available to assist installation.

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PRODUCTS FOR
Excavators & Shovels

FM40346 On-board Filtration Unit

Designed to suit on-board hydraulic oil filtration for 250 T – 400 T Excavators/Shovels

FM40346 on-board filtration unit

Dimensions		
	Metric	**US**
Height	1250 mm	49″
Length	950 mm	37″
Width	400 mm	15″
Weight	115 kg	253 lb

Standard features:

- FM3204 x 3 filter housings
- Remove contamination down to 2 micron
- Fitted with pressure relief valve
- Suction strainer
- Pressure gauge
- Operation manual
- Optional extras
- Hour run meter
- Capable of being adapted for most recycling needs.

Optional features:

- D.O.L. isolation switch
- 24 VDC or 3 phase power
- 24 VDC or AC motor pump unit for independent oil circulation
- 24 VDC electrical installation packages available to assist installation.

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FILTER TECHNOLOGY

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PRODUCTS FOR
Excavators & Shovels

FM40446 On-board Filtration Unit

Designed to suit on-board hydraulic oil filtration for 400 T – 550 T Excavators/Shovels

FM40446 on-board filtration unit

Standard features:

- FM3204 x 4 filter housings
- Remove contamination down to 2 micron
- Fitted with pressure relief valve
- Suction strainer
- Pressure gauge
- Operation manual
- Optional extras
- Hour run meter
- Capable of being adapted for most recycling needs.

Optional features:

- D.O.L. isolation switch
- 24 VDC or 3 phase power
- 24 VDC or AC motor pump unit for independent oil circulation
- 24 VDC electrical installation packages available to assist installation.

Dimensions		
	Metric	**US**
Height	1250 mm	49″
Length	1100 mm	43″
Width	400 mm	15″
Weight	120 kg	264 lb

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FILTER TECHNOLOGY

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PRODUCTS FOR
Excavators & Shovels

FM40646 On-board Filtration Unit

Designed to suit on-board hydraulic oil filtration for 550 T – 800 T Excavators/Shovels

FM40646 on-board filtration unit

Dimensions		
	Metric	US
Height	1250 mm	49″
Length	950 mm	37″
Width	750 mm	29″
Weight	140 kg	308 lb

Standard features:

- FM3204 x 6 filter housings
- Remove contamination down to 2 micron
- Fitted with pressure relief valve
- Suction strainer
- Pressure gauge
- Operation manual
- Optional extras
- Hour run meter
- Capable of being adapted for most recycling needs.

Optional features:

- D.O.L. isolation switch
- 24 VDC or 3 phase power
- 24 VDC or AC motor pump unit for independent oil circulation
- 24 VDC electrical installation packages available to assist installation.

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FILTER TECHNOLOGY

INSTALLATION AND OPERATION MANUAL

FM4 Series

Filtration Systems

By-Pass Filtration Systems
For Fixed Plant and Mobile Equipment

Issue 8: July 2015

Table of Contents

1.0 Introduction

The FM4 range of By-Pass Oil and Fuel Filtration Systems are designed to be permanently installed in position for both fixed plant and mobile equipment applications.

As the Filter Technology filter housings can be adapted to a very wide range of applications and fluids, this manual addresses hydraulic oil applications only.

While the various configurations can be very similar in many ways, please consult Filter Technology or our local representative for specific information relating to the following applications :

- Engine Oil Filtration
- Engine Fuel Filtration
- Bulk Fuel Filtration
- Industrial Gear Oils

There a many system configurations available however, primarily pressure to supply fluid to the filter system is supplied by one of the following means:-

- External system pressure (pressure and flow provided by the fluid system)
- On-board pump and motor (part of FTA filtration system)

All systems are based on the Filter Technology Australia designed and patented FM2100 Industrial Oil and Fuel Element. This element removes particulate contamination down to 2 micron in size.

In order to provide effective filtration, all systems are sized to provide a filtration flow rate of a minimum 20% of the system volume per hour. It is critical to ensure the required turn-over of oil through the filters to remove and maintain contamination levels within the target range.

2.0 Scope

This document is not intended to provide specific product data on any one particular system in the product range. It is designed specifically as an installation guide only.

For specifications or other information relating specifically to of any one filtration system, please contact Filter Technology Australia quoting the serial number found on the unit.

Contact details are provided at the end of the document.

3.0 General System Specifications

External System Pressure	
Supply Pressure	210 bar (3,000 psi) Max.
Safe Working Pressure	10 bar (145 psi) Max.
Filter Housing Pressure - Maximum	5.0 bar (72 psi) ΔP across relief valve + Return Line Pressure. See Section 6.1
Filter Housing Pressure – Normal Operation	1.5 bar (22 psi) to 3 bar (45 psi)
Return Line Pressure	1.5 bar (22 psi) Max.
Pressure Drop Across Filters (ΔP) (New Elements)	3.0 bar + 0.5 bar - 0.0 bar (45 psi + 7.0 psi - 0.0 psi)
Element Change Pressure	Normal Filter Housing Operating Pressure + 1.5 bar (22 psi).
Return Line Check Valve Cracking Pressure	0.5 bar (7.25 psi)
Dirt holding Capacity	0.9 kg (2 lb) per element
Mounting System	See Table 3 - *page 5*

Table 1

4.0 FM4 Series Part Numbering System

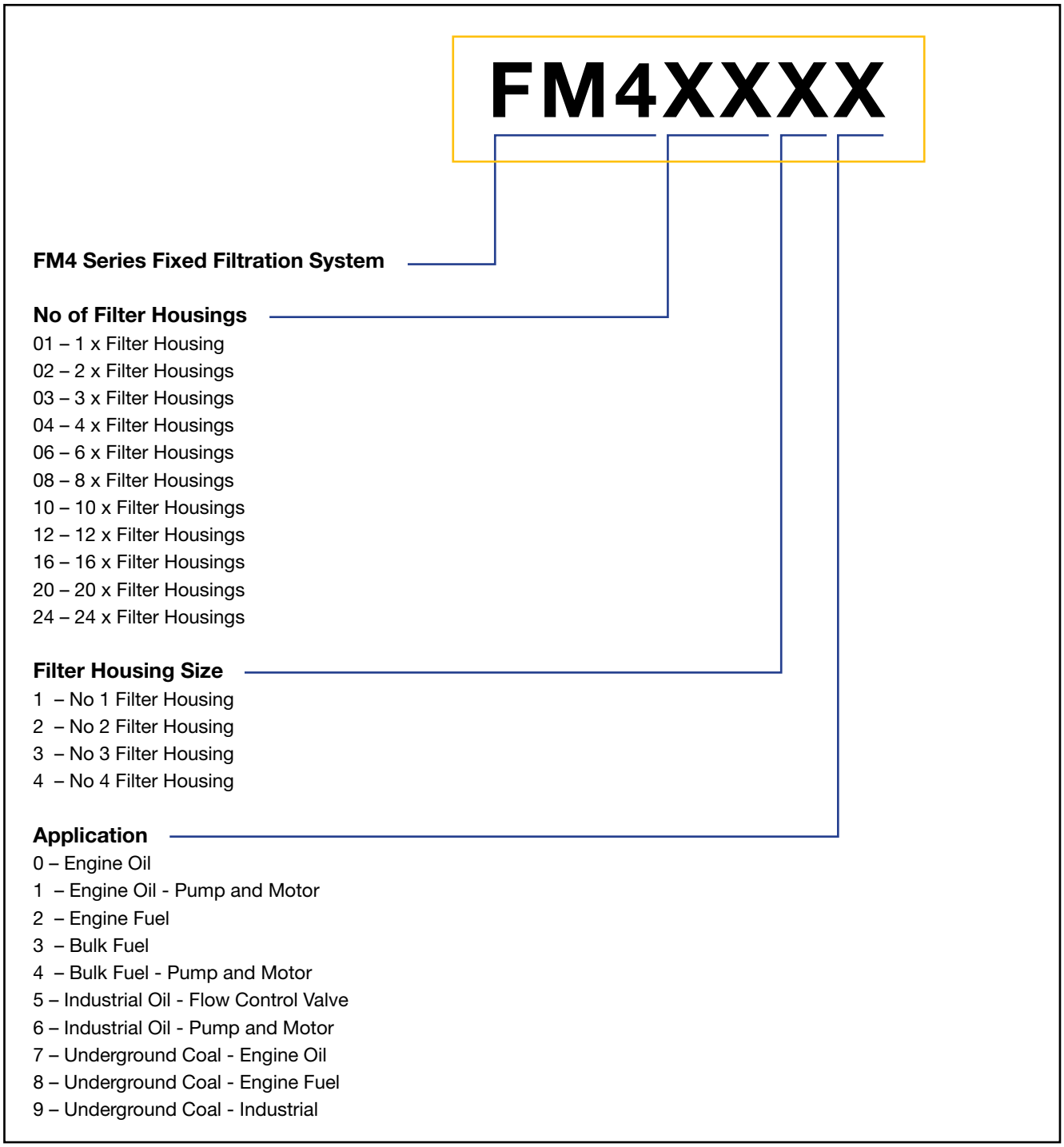


Table 2

Notes

1. The above numbering system is designed to broadly identify the configuration of the filter system and its intended application.

2. Specific filter system performance details are not included in this numbering system and are determined specific to each application.

5.0 Individual System Specifications

System Capacity (L)	FTA System	No of Elements	Flow L/min	Flow (gal/min)	% of System Filtered per Hour	Element Kit P/No
100	FM4011X	1	1.4	0.37	83	FM21010
200					41	
300					28	
400	FM4012X	2	2.8	0.74	41	FM21020
500					33	
600					28	
700					24	
800	FM4013X	3	4.1	1.08	31	FM21030
900					28	
1000					25	
1500	FM4014X	4	5.5	1.45	22	FM21040
2000	FM4024X	8	11.0	2.90	33	FM21080
2500					26	
3000					22	
3500	FM4034X	12	16.5	4.36	28	FM21120
4000					25	
4500					22	
5000	FM4044X	16	22.0	5.81	26	FM21160
5500					24	
6000					22	
6500					20	
7000	FM4064X	24	33.0	8.72	28	FM21240
7500					26	
8000					25	
8500					23	
9000					22	
9500					21	
10000					20	

Table 3

Notes : Above information based on following:

1. Oil at 40°C
2. Measured with clean elements
3. ISO 68 oil
4. X denotes application - see Table 2 - *page 4*

Note: Exact location of components may vary depending on the configuration of individual systems.

6.0 Main System Components

Typical System (FM40145 shown)

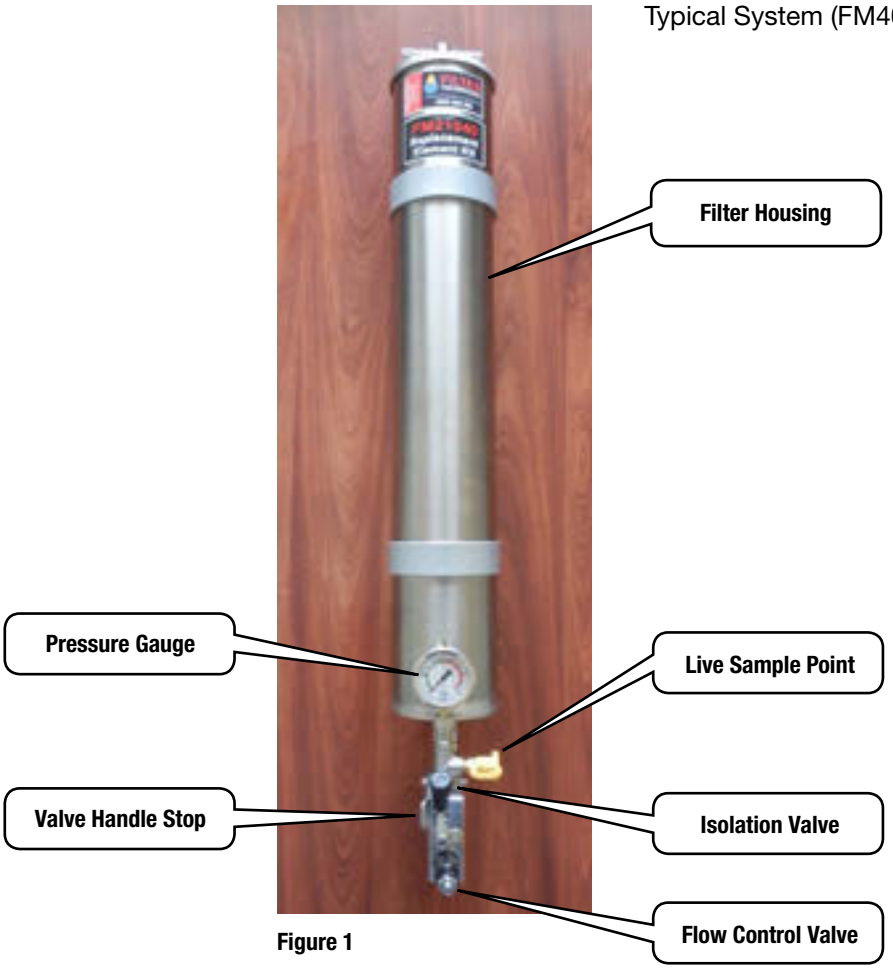


Figure 1

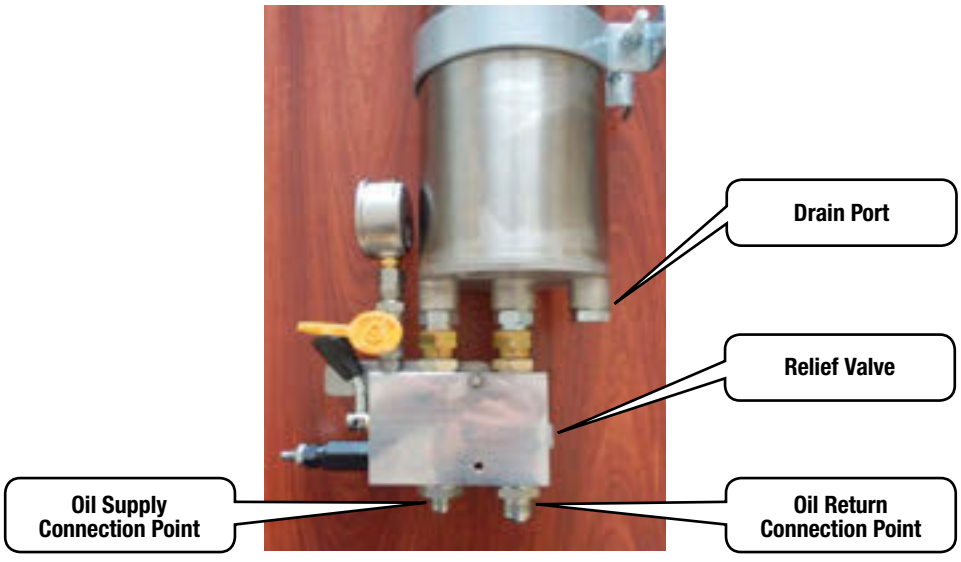
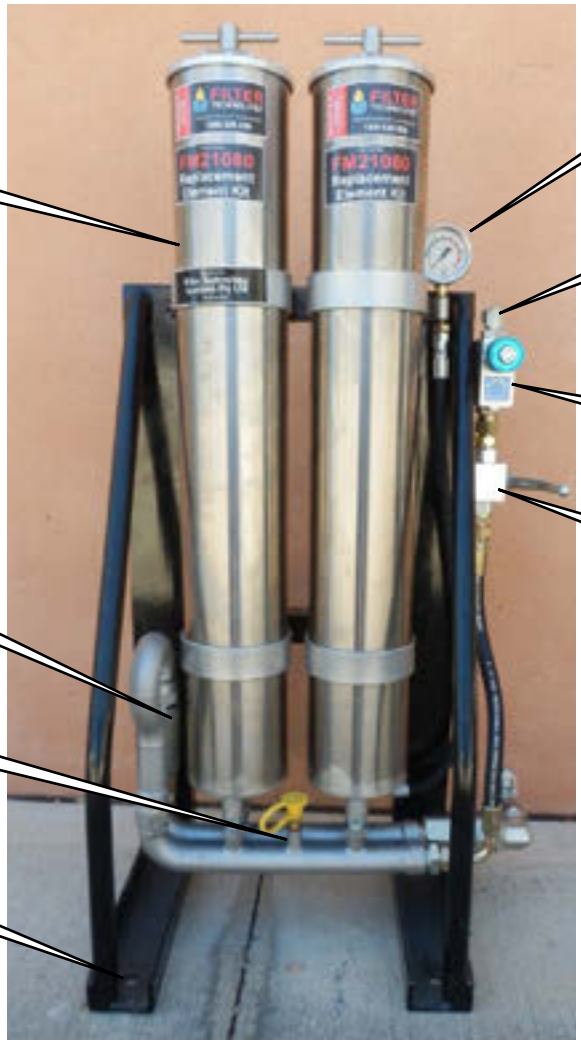


Figure 2

Note: Exact location of components may vary depending on the configuration of individual systems.

6.0 Main System Components



Typical system mounted on **Heavy Duty Frame** (FM40245 shown).

Figure 3

Figure 4

Note: Exact location of components may vary depending on the configuration of individual systems.

6.0 Main System Components

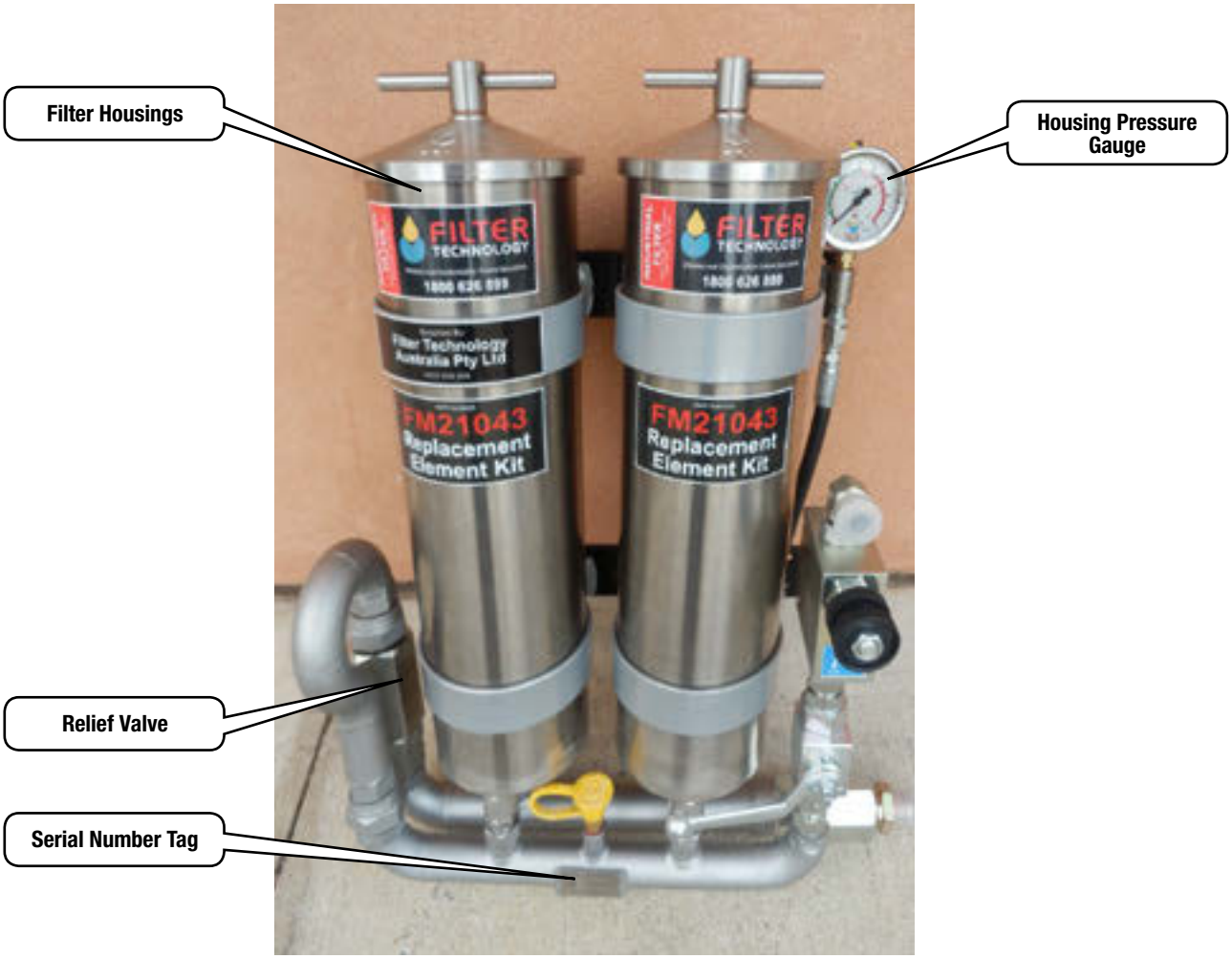


Figure 5

Typical system mounted on **Flat Bars** ready for installation to custom brackets (FM40225 shown).

Note: Exact location of components may vary depending on the configuration of individual systems.

6.0 Main System Components

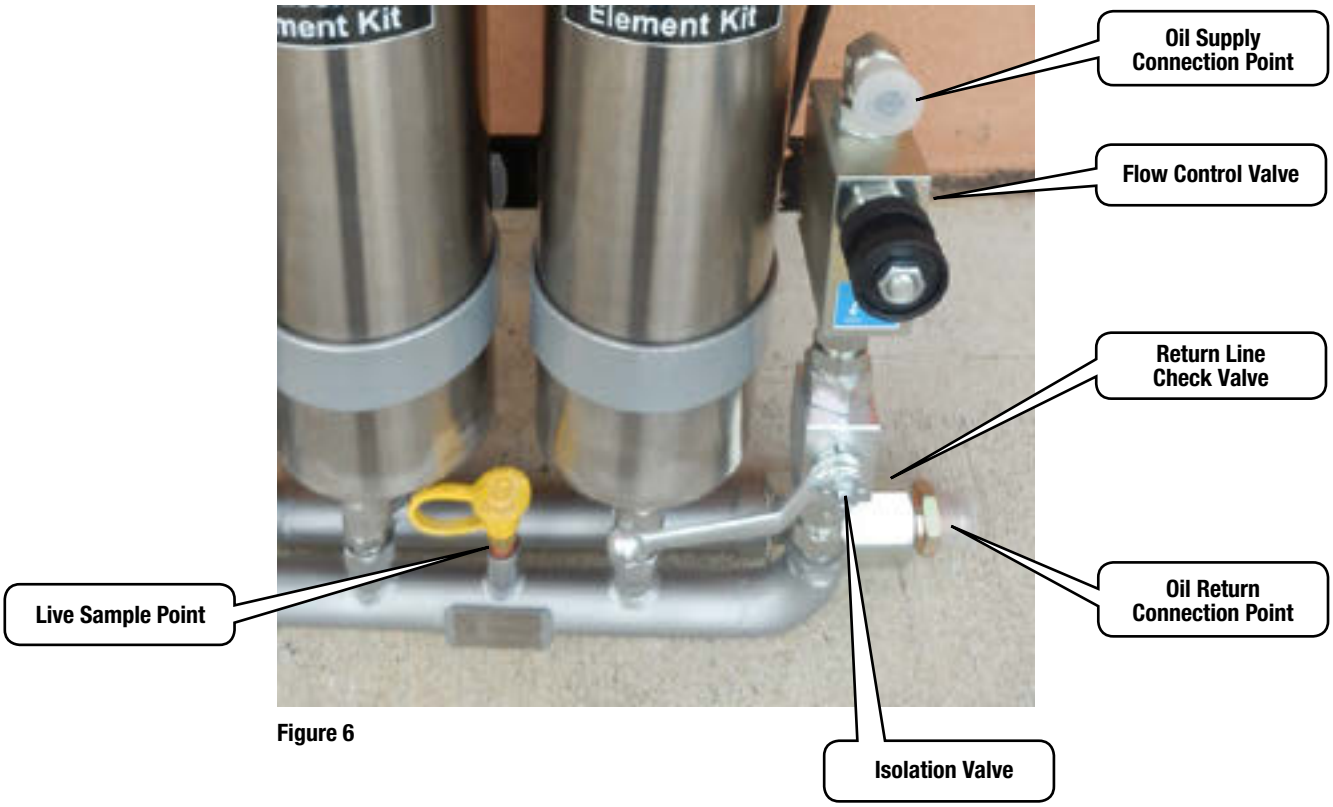


Figure 6

Figure 7

7.0 Installation Details

Record installation and commissioning details on check sheet at rear of this manual, see Section 16.0.

7.1 Mounting Information

Mounting System – See Table 4 - *page 12* to identify the system used. Also, see the following photos showing typical systems:-

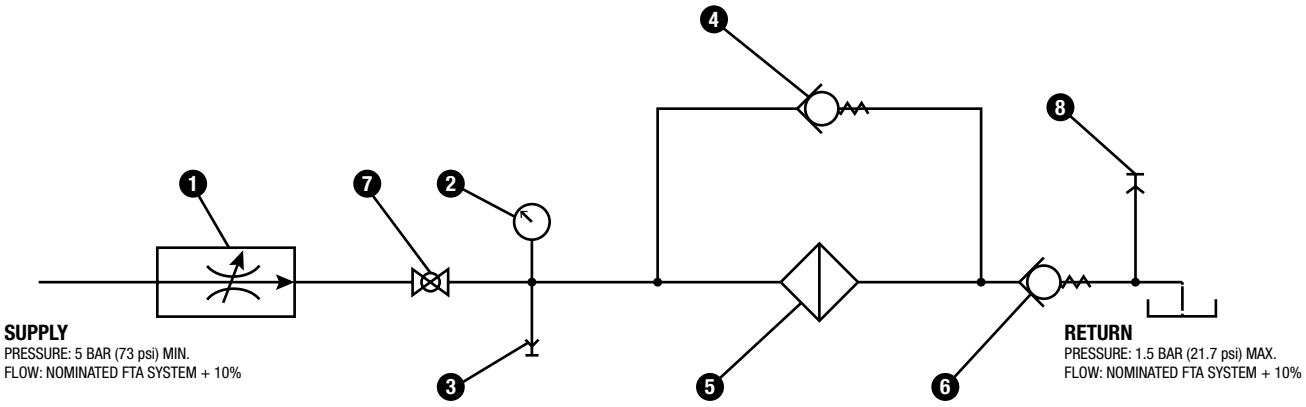
- Fig. 3 – Heavy Duty Frame
- Fig. 5 – Flat Bars

In selecting a location to mount the unit, the following issues should be considered:-

- Ease of access to service
- Congestion of established access paths
- Minimise Supply and Return Hose lengths
- Power Supply where required
- Check for adequate structural support under/behind the mounting location to resist vibration and/or cracking.

NOTE: Do not mount the system directly above the engine bay of mobile equipment or in such a location that any potential oil leak could come in contact with hot engine or exhaust system surfaces.

7.2 Filtration Schematic – External System Pressure



Item	Description
1	Flow Control Valve
2	Pressure Gauge
3	Live Sample Point
4	Pressure Relief Valve – 5 bar (73 psi
5	Nominated Filter System
6	Return Line Check Valve – 0.5 bar (7.3 psi)
7	Isolation Ball Valve
8	Return Line Pressure Test Point

7.3 Hose Details

As a minimum, all hosing shall be of industrial quality hydraulic hose complying with AS 3791 – Hydraulic Hose and also site and statutory requirements.

Correct sizing of hosing is specific to each application however, typically, shall be of suitable diameter to provide unrestricted flow of oil with regard to the oil viscosity and length of hose used. Typically, it is recommended to use one hose size larger on the return line than the supply line to ensure no possibility of excessive return line back pressure exists.

See Table 4 - *page 12* for recommended hose size and connection point details.

Ensure hosing is thoroughly cleaned after manufacture and prior to installation.

Hosing shall be secured at regular intervals in such a manner as to ensure no risk of failure through mechanical, heat, abrasion or other damage, all in accordance with site and statutory requirements.

Consult authorised Filter Technology Australia dealer for advice specific to each application.

Figure 8

Typical examples of hydraulic hosing securely mounted in clamps

Figure 9

System Capacity (L)	FTA System	Mounting System		Hose Diameter		Connection Point JIC	
		Flat Bars	Heavy Duty Frame	Supply	Return		
100	FM4011X	X		1/4”	3/8”	9/16”	3/4”
200		X					
300		X					
400	FM4012X	X					
500		X					
600		X					
700		X					
800	FM4013X	X		3/8”	1/2”	3/4”	7/8”
900		X					
1000		X					
1500	FM4014X	X					
2000	FM4024X	X	X				
2500			X				
3000			X				
3500	FM4034X		X	1/2”	3/4”	7/8”	1 1/16”
4000			X				
4500			X				
5000	FM4044X		X				
5500			X				
6000			X				
6500			X				
7000	FM4064X		X	3/4”	1”	1 1/16”	1 5/16”
7500			X				
8000			X				
8500			X				
9000			X				
9500			X				
10000			X				

Table 4

Notes :

1. Above information based on a typical installation using hosing of up to 6.0m in length. Longer distances may require an increase in hose and connection point diameters to avoid restrictions in oil flow.

2. Mounting systems can be varied on request.

7.4 Oil Supply to Filter System

Oil supply is taken from a constantly pressurized source and connected to the Oil Supply Connection Point. This source of oil should have adequate pressure and flow capacity to accommodate the additional demand of oil supply to the filter system without having any negative effect on the operation or functionality of the circuit from which it is taken.

Where any concern exists, always conduct pressure checks on the supply circuit before and after installation of the filter system to ensure no problem has been introduced.

See Table 4 - *page 12* for recommended hose size and connection point details.

7.5 Oil Return To Compartment

Oil is returned to the compartment via a hose connecting the filter system Oil Return Connection Point to a location on the system compartment, usually an existing port of adequate size.

It is critical to ensure there is minimal return line back-pressure in the oil return hose in order to maintain the required minimum pressure drop across the filters, see specifications. For this reason it is strongly recommended to ***return filtered oil directly in to the compartment and use a hose one size larger than the supply hose to the filter system.***

NOTE: Where ever possible, do not tee into an existing return line which may already have back-pressure present, particularly where such existing return line runs into to OEM return line strainers or other form of restriction returning to tank.

See Table 4 - *page 12* for recommended hose size and connection point details.

At commissioning, the Return Line pressure should be checked at the outlet of the filter housing to ensure return line back pressure is minimal and therefore adequate pressure drop across the filters is present.

See **Section 8.0 Commissioning - External System Pressure** for further details.

8.0 Commissioning – External System Pressure

Optimum filtration system performance relies on the correct setting of the oil flow at commissioning.

Because most installations are unique in some manner, flows must be set at installation to suit the particular system.

8.1 Establishing the Correct Oil Flow

The setting of the oil flow requires the use of an inline flow meter with a range to suit the relevant required flow. The flow meter should be installed on the return to tank side of the filtration system (low pressure).

Contact your FTA supplier to obtain the correct flow for your machine.

Note: The basic rule of thumb used by FTA is 20% of the system capacity per hour.

Record installation and commissioning details on check sheet at rear of this manual.

8.2 Commissioning Process

Commission the system as follows :-

1. Ensure Isolation Valve is closed.
2. Ensure Flow Control Valve is screwed in clockwise 100% to closed position.
3. Install Flow Meter into Return Line.
4. Bring the oil system to normal operating temperature and pressures.
5. Open the Isolation Valve.
6. While observing the Housing Pressure Gauge, slowly open the Flow Control Valve to establish oil flow into the filter housing(s), adjust to specified flow.
7. Allow oil to flow through system for a short while, say 5 – 10 minutes to remove any air trapped in the filter housing(s). Pressure may fluctuate during this period.
8. Re-adjust Flow, previously set in step 6 above.
9. Inspect installation for any leaks and rectify as required if any.
10. Allow system to operate for 2 – 3 hours and check/reset flow rate to values determined above.

Figure 10

At this point the filter housing pressure should be recorded. This will help to establish some parameters for monitoring element condition.

Note: Pressure should be within the 20-45 psi range.

9.0 Assessing Element Condition

Typical element change interval is 500 hours, designed to align with typical OEM service intervals.

Under normal conditions, the unit will run at the specified pressure set at commissioning on clean elements.

Over time the level of contamination loading increases on the elements. This causes a restriction to the flow of oil through the elements. With increasing contamination the level of restriction increases also. Increasing levels of restriction result in increasing pressure in the filter element housing which is seen on the pressure gauge.

When housing pressure reaches the nominated value the elements are considered to be fully loaded with contamination and the elements should be changed.

NOTE: When housing pressure approaches maximum Filter Housing Pressure (see Table 1 - *page 3*) relief valves starts to “crack” open. At maximum Filter Housing Pressure the relief valve is fully open directing most of the oil flow back to the compartment unfiltered. At this stage very little oil is being filtered and the system must be serviced ASAP.

See the section “**10.0 Servicing Procedure**” for further information.

10.0 Servicing Procedure

Perform the element change procedure as follows:-

1. **Isolation of System**
   a. Implement machine isolation procedures as required.
2. **Removal of Filter Element Assembly**
   a. Using a clean rag or paper towel, clean away any dirt etc from around the lid of the filter housing.
   b. Rotate the Tee handle at the top of the filter housing in an anti-clockwise direction to unscrew it and disengage the thread in the base of the housing, see Fig. 11.
   c. Lift the filter element assembly out of the housing and place in a suitable drip tray.
   d. Place a suitable cover over the top of the housing to prevent contamination entry while the element assembly is removed.
3. **Change Filter Elements**
   a. Replace filter elements see "**11.0 Element Change Procedure**".
4. **Install Filter Element Assembly**
   a. Insert filter element assembly into element housing.
   b. Locate threaded end of return tube into the "lead" into the base of housing, see Fig. 12.
   c. Rotate Tee handle in a clockwise direction to engage thread and screw in.
   d. Ensure lid seals engage housing correctly to avoid pinching and possible damage.
   e. Continue to screw Tee handle down until lid seats firmly against housing.
   f. Rotate Tee handle a further 180° to apply final tension.
   g. Wipe down any oil residue.
5. **Return System to Service**
   a. Start system and bring to operating temperature.
   b. Observe housing pressure. After a short while, as air bleeds from the housing(s), it should settle at the specified Filter Housing Pressure.
   c. Check system for any leaks, particularly around the lid seal area. Rectify as required.
   d. System now ready for return to service.

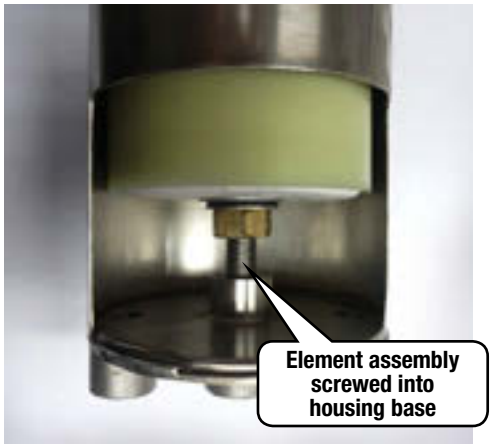


Figure 11

Figure 12

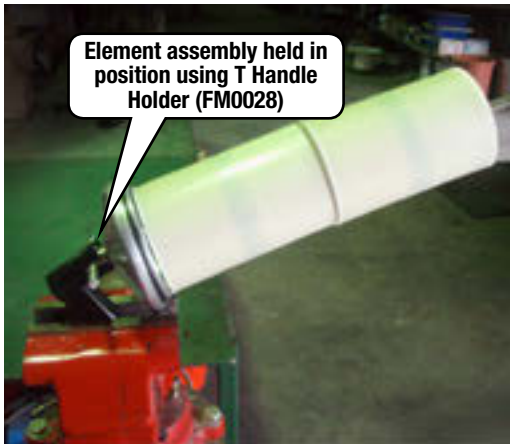


Figure 13

11.0 Element Change Procedure

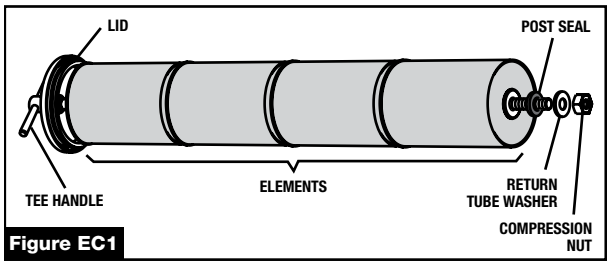


Figure EC1

Removing the Element Assembly

(Please consult the Operation and Maintenance Manual for your specific product.)

1 Remove the element assembly from the filter housing by unscrewing the tee handle counter-clockwise.

Stripping the Element Assembly

2 Holding the tee handle, remove the compression nut and return tube washer and retain (**figure EC1**).

3 Remove post seal.

4 Slide off all elements and post seals from return tube.

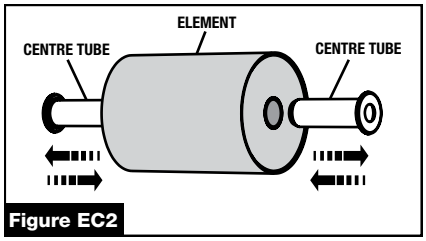


Figure EC2

5 Remove the centre tubes from each end of the old elements and retain (**figure EC2**).

6 Remove the top post seal and return tube washer, retaining the washer. (**figure EC3**).

7 Remove lid O-ring and lid gasket (**figure EC3**).

8 Dispose of old elements, post seals, lid O-ring and lid gasket.

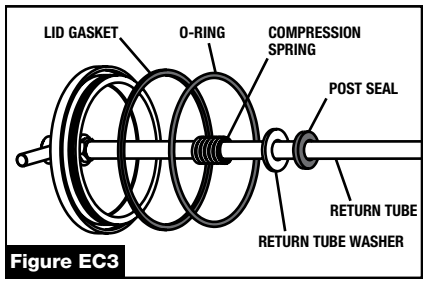


Figure EC3

Reassembly of Filter Assembly

9 Carefully install the O-ring and lid gasket into lid (**figure EC3**).

10 Slide the top return tube washer, then the post seal on to the return tube (**figure EC3**).

11 Insert the centre tubes into the new elements. Ensure they are fully inserted (**figure EC2**).

12 Load all the elements onto the return tube making sure there is a post seal between each element (**figure EC4**).

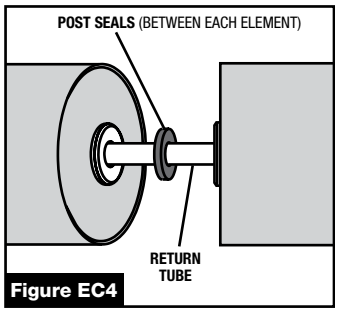


Figure EC4

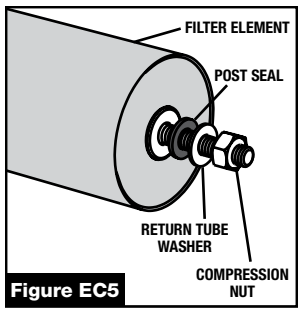


Figure EC5

13 Replace the bottom post seal, return tube washer and compression nut (**figure EC5**).

14 After loading all the elements and post seals on to the return tube, push down on the elements to seat them against the compression spring. This makes it easier to tension the compression nut correctly.

Tensioning the Compression Nut

15 Screw the compression nut firmly against the element assembly (**figure EC6**), using the correct spanner (Part No FM 0027).

16 Continue tightening the compression nut until the correct length of thread is exposed. Check by using the notch on the handle of the spanner (**figure EC7**).
Note: *This is essential for the correct installation of the assembly into the housing, the subsequent sealing and the filter unit's performance.*

Replacing the Element Assembly

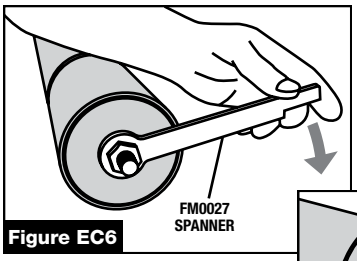


Figure EC6

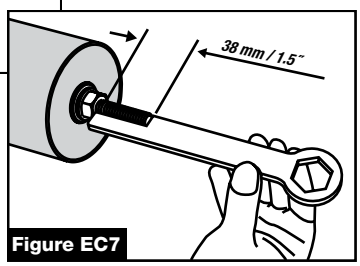


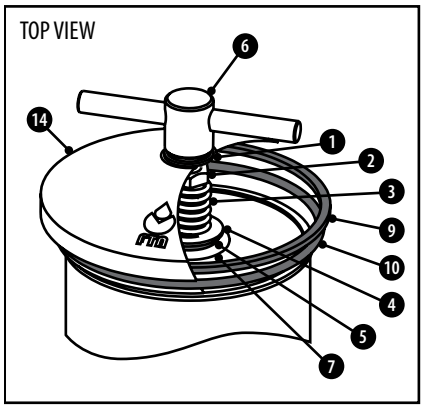
Figure EC7

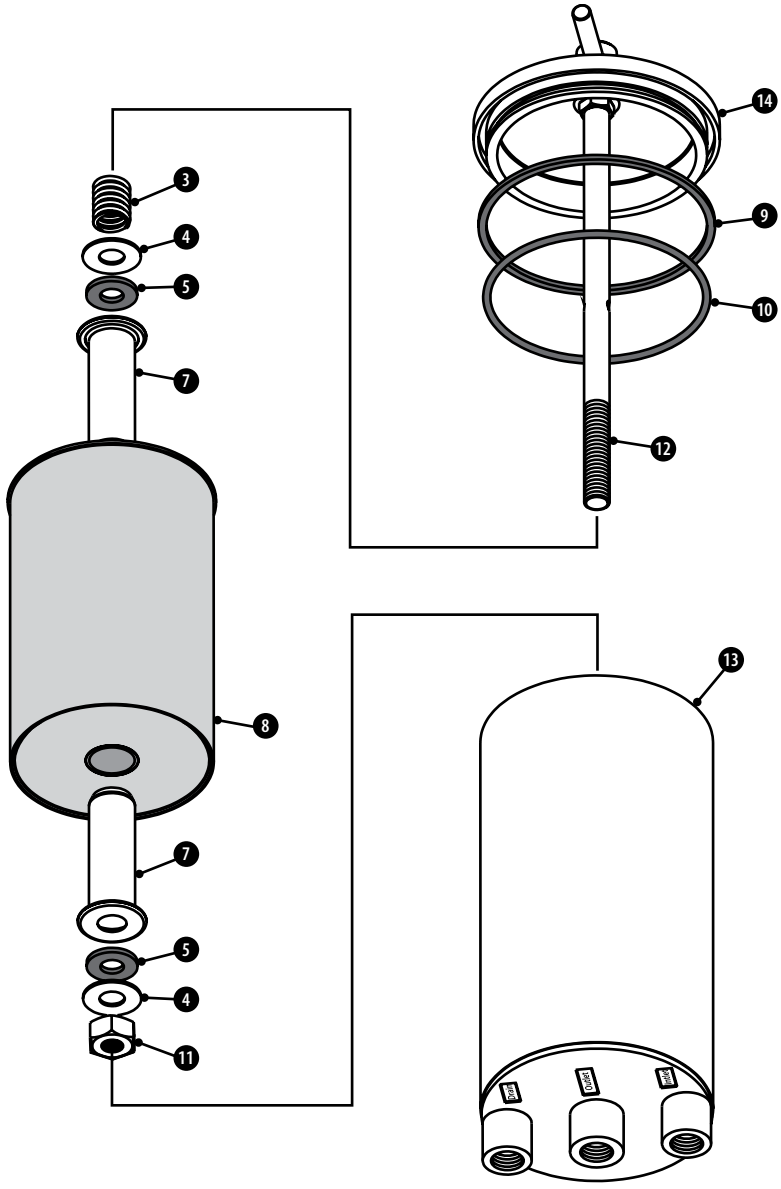
17 Insert the element assembly into the housing, carefully locating the lid O-ring into the housing tube.
Note: *Take care not to dislodge the O-ring when assembling.*

18 Tighten the tee handle until the lid gasket seats against the end of the housing, then tighten a further ½ turn (180°).

Parts List, Element Replacement Parts and Required Tools

Note: FM3201 Filter Assembly shown





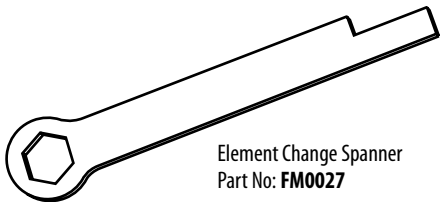
Item No	Qty	Description	Part No
1	1	Washer	FM0002
2	1	Lid lock nut	FM0005
3	1	Lid compression spring	FM0006
4	2	Return tube washer	FM0007
5	2	Post seal	FM0008
6	1	Tee handle	FM0001
7	2	Centre tube	FM0012
8	1	Element	FM2100
9	1	Gasket, lid	FM0004
10	1	O-Ring, lid	FM0025
11	1	Compression nut	FM0029
12	1	Return tube - No 1	FM0031
13	1	Housing - No 1	FM0051
14	1	Lid	FM0003

Element Replacement Parts List

Item No	Description	Part No	Quantity Required			
			FM3201	FM3202	FM3203	FM3204
5	Post seal	FM0008	2	3	4	5
8	Element	FM2100	1	2	3	4
9	Gasket, lid	FM0004	1	1	1	1
10	O-Ring, lid	FM0025	1	1	1	1

Note - Industrial oil, fuel and engine oil filters
ALL seals to be replaced EVERY element change.

Required Tools



Element Change Spanner
Part No: **FM0027**

12.0 General Maintenance

General maintenance tasks as follows:-

1. Structural

a. Check all installation bolts are firm and correctly tensioned.

b. Check for any cracks in mounting system or supporting structures.

2. Filtration System

a. Pressure gauge functional and in good condition.

b. Check all hydraulic hoses for:-

i. Leaks

ii. Signs of rubbing

iii. Securely clamped

c. Check housing mounting clamps all correctly tensioned

d. Check dust caps fitted to:-

i. Live Sample Valve

ii. Return Line Pressure Test Point

13.0 Tooling

The following tooling is available to support installation and maintenance of Filter Technology Australia filtration systems.

Return Line Pressure Gauge

Description		Part No
Pressure Gauge	0 – 10 bar (0 – 145 psi)	FM0063
Test Hose	0.5 m (1.6 ft)	FMH9250
Test Hose	1.0 m (3.3 ft)	FMH9251
Test Hose	2.0 m (6.6 ft)	FMH9252
Test Hose	4.0 m (13.1 ft)	FMH9253
Test Hose	6.0 m (19.7 ft)	FMH9254
Test Hose	8.0 m (26.2 ft)	FMH9255
Test Hose	10.0 m (32.8 ft)	FMH9256

Element Change Spanner

Part No: FM0027

T Handle Holder

Part No: FM0028

14.0 Distributor Contact Details

Distributor

Queensland
Filter Technology Queensland
Shed D 10 Prospect Street Mackay QLD 4740

Postal
PO Box 547 Mackay Qld 4740

Phone
07 4837 1271
24/7: 1800 623 719

Web
www.filtertechnologyqld.com.au

Sales And Support

Dave Pullen
Tel: 0429 462 863
Email: sales@filtertechnologyqld.com.au

15.0 Notes

16.0 FM4 System Installation Check Sheet

Machine Details		FTA Filter System Details	
Make / Model:		Model:	
Unit No:		Serial No:	

Installed by

Name :	
Company :	
Date :	

Installation Checks

1.0 System securely mounted in position, all bolts tight etc. Yes / No

2.0 Oil Supply taken from:

Hose diameter and length =

3.0 Oil Return connected into:

Hose diameter and length =

4.0 All hoses securely mounted at regular intervals to prevent damage and/or rubbing. Yes / No

5.0 Commissioning

5.1 Following commissioning process as per section 8.0 or 9.0 of this manual.

5.2 Check and record RLP in table below and calculate FHP and record.

Pressure	Description	bar	psi
RLP	Return Line Pressure	+	+
ΔP	Pressure Drop Across Filters	3.0	43.5
FHP	Pressure to Set Filter Housings at =		

6.0 Calculate Element Change Pressure

	bar	psi
6.1 Element Change Pressure = FHP + 1.5 bar (22 psi) =		

Filter Technology Qld

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Qld Dealer and Distributor Filter Technology Australia products.

Shed D, 10 Prospect Street, Mackay QLD 4740 • Postal: PO Box 547 Mackay QLD 4740
Ph: (07) 4837 1271 • Mob: 0409 061 950
Email: workshop@filtertechnologyqld.com.au
Web: www.filtertechnologyqld.com.au

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Filter Technology Qld

DGKP INVESTMENTS PTY LTD T/A

Filtration & Contamination Control Specialists

CAT D11 – FILTRATION OPTIONS

FM40125
Transmission -
16/15/11*

FM40120
Engine Fuel –
16/15/12*

FM40125
Hydraulics –
16/15/11*

FM40230
Engine oil

Live Sample Box

Shed D, 10 Prospect Street, Mackay QLD 4740 • Postal: PO Box 547 Mackay QLD 4740
Ph: (07) 4837 1271 • Mob: 0409 061 950
Email: workshop@filtertechnologyqld.com.au
Web: www.filtertechnologyqld.com.au

FILTER TECHNOLOGY

cleaner fluids mean better business

FIELD INSTALLATION

Filtration and Contamination Control Specialists

Suspension Oil Savings

		Before	After
	Limit	PPM	PPM
Lead	20	21	14
Iron	60	13	6
Aluminium	20	29	2
Copper	60	115	8
Chromium	15	17	1
Tin	15	0	0
Nickel	15	2	3
Silver	15	0	0
Titanium	15	0	0
	Limit	PPM	PPM
Silicon	20	4823	5418
Sodium	20	2	320
Vanadium		0	1
Particle count in 1ml		0	0
ISO-4406 6um\14um		-\21\17	-\15\12
PQ90 FE -mg\Ltr		73	3

Reduce your suspension oil usage with Filter Technology's filtration equipment.

Modern day suspensions require the specialised oils and these type of oils are expensive. By using off-line filtration these expenses can be dramatically reduced.

Filter Technology can provide a system that can recycle used suspension oil to a state of cleanliness that is cleaner than most new oil.

In the process of servicing equipment, oil is collected and then can be filtered using Filter Technology's patented depth filtration filters thus providing the results here.

The results have huge cost savings in the purchase of new oil and then can also extend oil life by up to 300%.

Filter Technology Qld
DGKP INVESTMENTS PTY LTD T/A

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FILTER TECHNOLOGY
cleaner fluids mean better business

Operations Manual for

830E WHEEL MOTOR ONBOARD FILTRATION SYSTEM

Table of Contents

INTRODUCTION

The FM40226 is an "on-board" oil filtration system designed specifically to suit the inboard oil reservoir electric wheel motor drive system.

It comprises of the following components:-

- FM3202 filter housing x 2 off
- 24V Electric motor x 2 off
- 1.37cc gear pump x 2 off
- Pressure switch x 2 off
- Electrical Enclosure

This unit services both wheel motors concurrently. It utilizes one electric motor and pump to filter each side. Being separate systems, there is no possibility of cross contamination between compartments.

The filter element media will remove particulate contamination down to 2 micron in size while removing moisture in levels of up to 2% by volume.

DEPTH MEDIA FILTRATION

Filter Technology Australia manufacture our own design patented depth media filtration oil and fuel elements in-house at Thornton, NSW, Australia.

The FM40226 employs 2 x FM2100 elements in each of the housings per system. Oil enters each end of the element and travels through a 70mm thick, or deep, section of filter media (hence the term "depth media") to meet in the centre section of the element where the oil then returns to tank.

This form of filtration is very effective in removing ultra-fine contamination, down to 2 micron in size, but does incur a considerable pressure drop across the filter(s) media.

Correct operating pressure is critical to ensure efficient element life. If excessive oil supply pressure were applied to the element, the filter media would "pack down" or compress and effectively block flow altogether.

For this reason the system is fitted with a 5 bar relief valve to limit housing pressure. Accordingly, flow rates are quite low compared to full full-flow filtration systems and this is why this form of filtration is usually only applied in a "bypass" or "off-line" application.

OIL TEMPERATURE

The above flow and pressure considerations are even more critical when considering high viscosity oils such as ISO 150 grade or higher. The heavy nature of these lubricants and their resistance to flow at ambient temperatures requires the use of heat to bring the oil viscosity down to a level where a reasonable flow rate can be achieved through such dense filter media material.

Where required, FTA systems incorporate a heating system which helps heat the oil to a temperature of at least 60° C. Heating to this temperature has no detrimental effect on the quality of the oil being filtered.

ADDITIVE REMOVAL

A common misconception made in regard to depth media filtration is the assumption that it will remove critical additives from the oil.

FTA has written assurance to confirm that additives will not be filtered out of the oil mainly due to the sub-micron size of the additive materials. Extensive field results over many years confirm the same.

ASSESSING OIL SAMPLE RESULTS

Another common concern is the question:-

"Doesn't this filtration remove all the wear debris from the oil and therefore our oil analysis becomes ineffective?"

The answer is that while depth media filtration is very effective in reducing particulate contamination, it does not remove it all. It is very effective in removing the great majority of particles greater than 4 micron in size. To a lesser extent it also removes particles greater than 2 micron however this is not so critical in most gearing applications where component clearances and oil film thicknesses can accommodate foreign material at sizes of 4 micron and less.

The net result of this is that the condition monitoring technician will still observe wear debris trends but at lower ppm counts than that recorded prior to installation of filtration.

It is this restriction in particle size that provides the opportunity to extend component life. If the size of the contamination particles can be kept to less than around 2 - 4 micron, they generally will not cause any additional wear because the oil film thickness is greater than the contaminant particle size and therefore the particles can pass between the operating surfaces, i.e. gear teeth, bearing roller paths etc, without actually causing any damage.

- **Do not rely solely on the ppm count to determine that the component is generating acceptable levels of wear debris.**

- **Always monitor the historical trend of wear generation rates.**
  (Ppm ÷ hrs on oil since last sample).

- **Have your lab provide ISO particle counts to identify the size range that the wear debris falls into. Also, the optical patch test method will be provide a more representative indication of the contamination present rather than the laser particle counting process which is commonly used unless specified otherwise.**

OPERATION

24V x 25A power is supplied via a relay which closes to provide power only when the engine is running. This ensures the batteries are not discharged while the truck is parked.

A green LED light on the front of the electrical enclosure illuminates to indicate that power is available.

Initially, while the oil in the filter housings is cold, the heated oil will flow through the filter housings, bypassing the actual elements and returning to tank via the 5 Bar relief. The heaters fitted to the units will help warm the oil.

After a short period the temperature of the housings, and cold oil contained within, will reach operating temperature (due to warming effect of the bypassing oil) and oil viscosity will drop to a level where it will flow through the filter elements back to tank rather than across the relief.

Normal system operating parameters are approximately 3.0 - 3.5 bar at 1.1 litre per minute at 50 °C using ISO 680 oil.

TESTING SYSTEM OPERATION

A Test switch is provided to allow the maintainer to bypass the relevant relays and run the system while the truck engine is not running.

In accordance with local site mobile equipment isolation procedures, perform system operation test as follows:-

1. Ensure power is available to the system
2. Depress and hold the Test/Prime button.
3. Observe the pressure gauge to note system pressure;-
    a. At < 50°C oil temperature, pressure will climb to approximately 4.5 bar at which point the relief starts to open and oil starts bypassing back to tank. Pressure may continue to increase up to around 5 – 6 bar but will reduce as the temperature increases.
    b. At > 50°C oil temperature, pressure will run at approximately 3.0 – 3.5 bar with new elements. As the dirt load in the elements increases, pressure will increase to approximately 4.5 bar at which point the relief starts to open and oil starts bypassing back to tank.

ELEMENT LIFE

As the elements “load up” with contamination, so to will the pressure required forcing oil through the elements increase (i.e. pressure is caused by resistance to flow).

Initial expectations are that elements will last for at least 500 hours, thus aligning with existing service intervals. Certainly, the elements should be changed if system pressure is at or above 4.5 bar with the oil at normal operating temperature.

Initially, after system installation and depending on pre-existing contamination levels, elements may “load up” with contamination possibly even before the 500 hour period is achieved as they clean up the compartment.

However after the first few element changes, it is expected that pre-existing contamination levels in the compartment will be reduced to a point where even 1000 hours may be achievable.

Ultimately, element life governed by:-

1. The level of external contamination ingress (ie dirt, dust and moisture).
2. Wear debris generation.
3. Contamination introduced during oil changes and top-ups.
4. Contamination existing in new oil stock.

ASSESING ELEMENT CONDITION

Element condition can be assessed by observing the pressure gauge whilst the system is running.

With the truck parked up and all local isolation regulations in place, perform the following steps:-

1. Ensure that the truck is generally at operating temperature and has only recently left service.
2. Depress the green “Prime” button to cause the filter system to run. (Note: The “Prime” function bypasses the need for the engine to be running or the oil to be above 50°C before the pump will start. As such, **if the system is not at operating temperature, an abnormally high pressure will be observed** due to the increased viscosity of the oil at temperatures less than 50°C.)
3. Allow the system to run briefly until system pressure appears to be steady.
4. Because the 5 bar relief actually starts to “crack” open at approximately 4.5 bar, elements should be changed if pressure is between 4.0 – 4.5 bar.

   NOTE: If pressure is allowed to continue at > 4.5 bar, the oil will bypass the filters and return to the reservoir unfiltered.

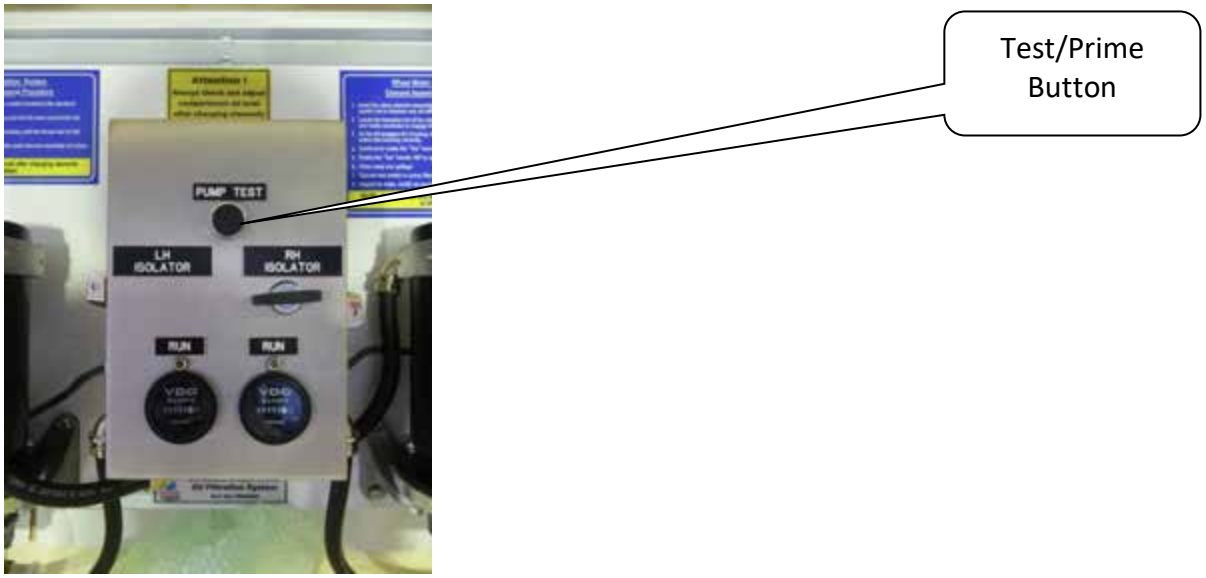
   This will result in wear debris and general contamination levels returning to levels typically seen without filtration.

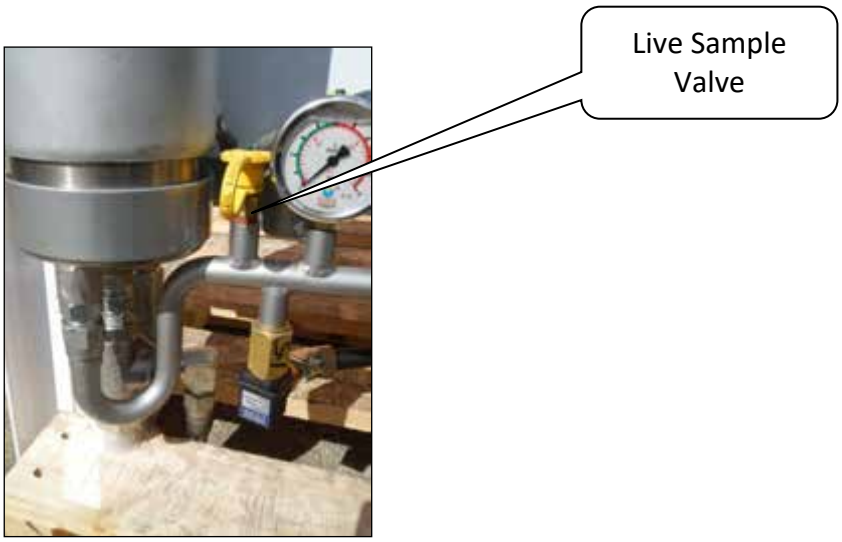
TAKING AN OIL SAMPLE

A live sample valve is located before the filters on each system, see item 5 on page 18.

Take a live oil sample as follows:-

1. Remove dust cap and wipe sample valve clean.
2. Connect sample tube and bottle to valve as shown.
3. Depress the Test/Prime button to generate oil pressure.
4. Fill sample bottle as required.
5. Remove sample tube and refit dust cap.
6. Fit lid to sample bottle and identify accordingly.



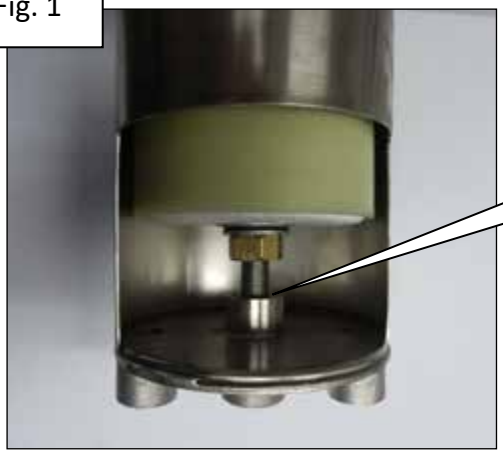


ELEMENT REMOVAL & REFITTING PROCEDURE AT SERVICE

With the truck parked up and all local isolation regulations in place, perform the following steps:-

1. Isolate power to the system via the isolation switch located at the electrical enclosure then test to confirm isolation.
2. Using a clean rag or paper towel, clean away any dirt etc from around the lids of the filter housings.
3. Rotate the housing lid “Tee” handle anti-clockwise until the thread can be felt to have disengaged in the housing, see Fig 1.
4. Lift the filter assembly only slightly and reposition so that the centre tube is not engaged in the housing, see Fig. 2. **Do not remove element assembly from housing at this stage.**
5. Repeat steps 3 to 5 at remaining housings so that the oil can start to drain.
6. Allow a short time for some of the oil in the housings to drain back to the reservoir. This will be more effective if the oil is warmer but is worth doing in any case.
7. With a spill container in position, withdraw the used element assembly and place it in the spill container.
8. Insert the clean element assembly into the housing slowly, being careful not to displace any oil still in the housing causing spillage.
9. Locate the threaded end of the Return tube into the base of the element housing and rotate clockwise to pull the lid into position. Note that there is a “lead” into the base to make it easier to align and engage the thread, see Fig 3.
10. As the lid engages the housing, take care to ensure the lid seal aligns and enters the housing correctly.
11. Continue to rotate the “Tee” handle until the lid has pulled up firm on the housing.
12. Rotate the “Tee” handle 180° to apply final tension to the lid seals.
13. Clean away any spillage.
14. Repeat process on other housings.

Fig. 1



Element assembly screwed into housing base.

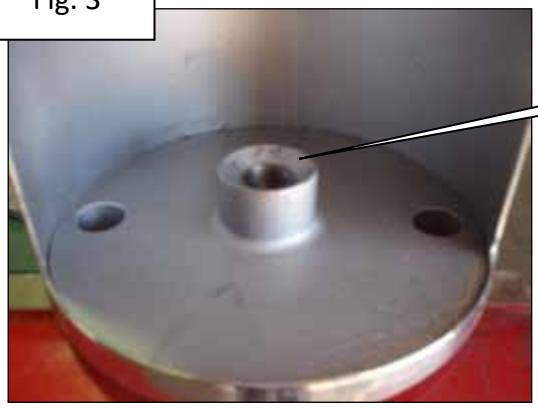
Cut-away views of base of element housing.

Fig. 2

Element assembly unscrewed and repositioned as shown.

Oil in housing can now drain back to reservoir.

Fig. 3



"Lead" into thread

GENERAL SERVICING & MAINTENANCE

General maintenance tasks as follows:-

Structural

1. Check all installation bolts are firm and correctly tensioned.
2. Check for any cracks in frame work.

Electrical

3. Check all electrical harnesses for:-
    a. Signs of rubbing
    b. Securely clamped
    c. Correctly fitted into glands
4. Check electrical enclosure for:-
    a. Securely mounted
    b. Door closed and sealed
    c. Indicator lights and Test/Prime button functional and good condition.
5. Isolation switch functional and in good condition.
6. Check motor mounting bolts correctly tensioned

Filtration System

7. Pressure gauges functional and in good condition.
8. Check that sample valve dust caps are fitted.
9. Check all hydraulic hoses for:-
    a. Leaks
    b. Signs of rubbing
    c. Securely clamped
10. Check housing mounting clamps all correctly tensioned
11. Check pump mounting bolts correctly tensioned.
12. Check bell housing bolts correctly tensioned

Wheel Motor Reservoir

13. Oil level correct
14. Reservoir cap in place and sealed
15. Breather hosing and pipe-work intact and sealed
16. Isolation valve open
17. Evacuation coupling in good order
18. Solenoid valve in good order
19. Temperature probe in good order
20. No oil leaks

COMPONENT CHANGE-OUT SCHEDULE

Item	Component	Qty	Service Life
1	Filtration element	4	500 hrs
2	Electric motor	2	On condition
3	Hydraulic hoses	4	On condition
4	Hydraulic pump	2	On condition
5	All other components		On condition

CHECKING OIL LEVEL AFTER AN ELEMENT CHANGE OUT

When the elements are changed, some oil will be displaced from the housings by the removal of the used elements which will take some oil with them.

When the clean elements are installed, some air will be trapped in the housing around the clean elements.

In order to ensure the correct oil level in the oil tank of the wheel motor, the housings must be “primed” to ensure oil has displaced any trapped air in the housings before checking the oil level.

To “Prime” the element housings, perform the following procedure:-

1. Remove isolation of power at the electrical enclosure.
2. Depress and hold the Test/Prime button until housing pressure settles at 5 bar in both housings. This indicates that any trapped air has been “pushed” through the elements and the housings are now full of oil.
3. While the housings are still at 5 bar, check for any oil leaks around the housing lid seals or elsewhere. Correct as required.

Note: Very little oil will drain back to the reservoir if the system is isolated and the housing lids have not been opened.

After “Priming”, check oil level in wheel motor reservoir using OEM dipstick.

ELEMENT CHANGE PROCEDURE

FILTER TECHNOLOGY

Element Replacement Procedure
Industrial Oil and Fuel Filters

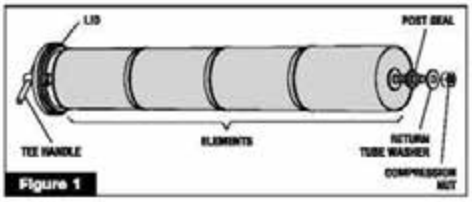


Figure 1

Removing the Element Assembly

(Please consult the Operation and Maintenance Manual for your specific product.)

1 Remove the element assembly from the filter housing by unscrewing the tee handle counter-clockwise.

Stripping the Element Assembly

2 Holding the tee handle, remove the compression nut and return tube washer and retain (**figure 1**).

3 Remove post seal.

4 Slide off all elements and post seals from return tube.

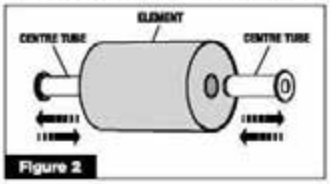


Figure 2

5 Remove the centre tubes from each end of the old elements and retain (**figure 2**).

6 Remove the top post seal and return tube washer, retaining the washer. (**figure 3**).

7 Remove lid O-ring and lid gasket (**figure 3**).

8 Dispose of old elements, post seals, lid O-ring and lid gasket.

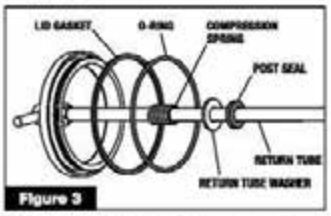


Figure 3

Reassembly of Filter Assembly

9 Carefully install the O-ring and lid gasket into lid (**figure 3**).

10 Slide the top return tube washer, then the post seal on to the return tube (**figure 3**).

11 Insert the centre tubes into the new elements. Ensure they are fully inserted (**figure 2**).

12 Load all the elements onto the return tube making sure there is a post seal between each element (**figure 4**).

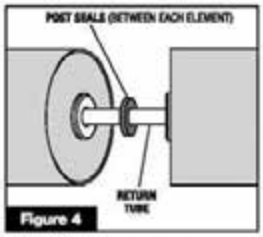


Figure 4

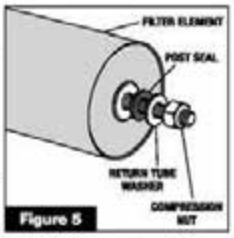


Figure 5

13 Replace the bottom post seal, return tube washer and compression nut (**figure 5**).

14 After loading all the elements and post seals on to the return tube, push down on the elements to seat them against the compression spring. This makes it easier to tension the compression nut correctly.

Tensioning the Compression Nut

15 Screw the compression nut firmly against the element assembly (**figure 6**), using the correct spanner (Part No FM 0027).

16 Continue tightening the compression nut until the correct length of thread is exposed. Check by using the notch on the handle of the spanner (**figure 7**).

Note: *This is essential for the correct installation of the assembly into the housing, the subsequent sealing and the filter unit's performance.*

Replacing the Element Assembly

(Please consult the Operation and Maintenance Manual for your specific product.)

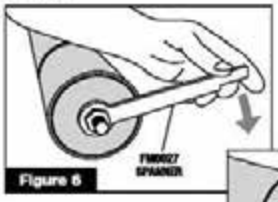


Figure 6

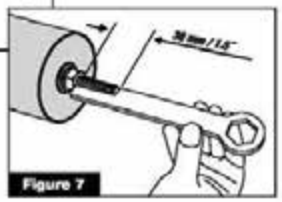


Figure 7

17 Insert the element assembly into the housing, carefully locating the lid O-ring into the housing tube.

Note: *Take care not to dislodge the O-ring when assembling.*

18 Tighten the tee handle until the lid gasket seats against the end of the housing, then tighten a further ½ turn (180°).

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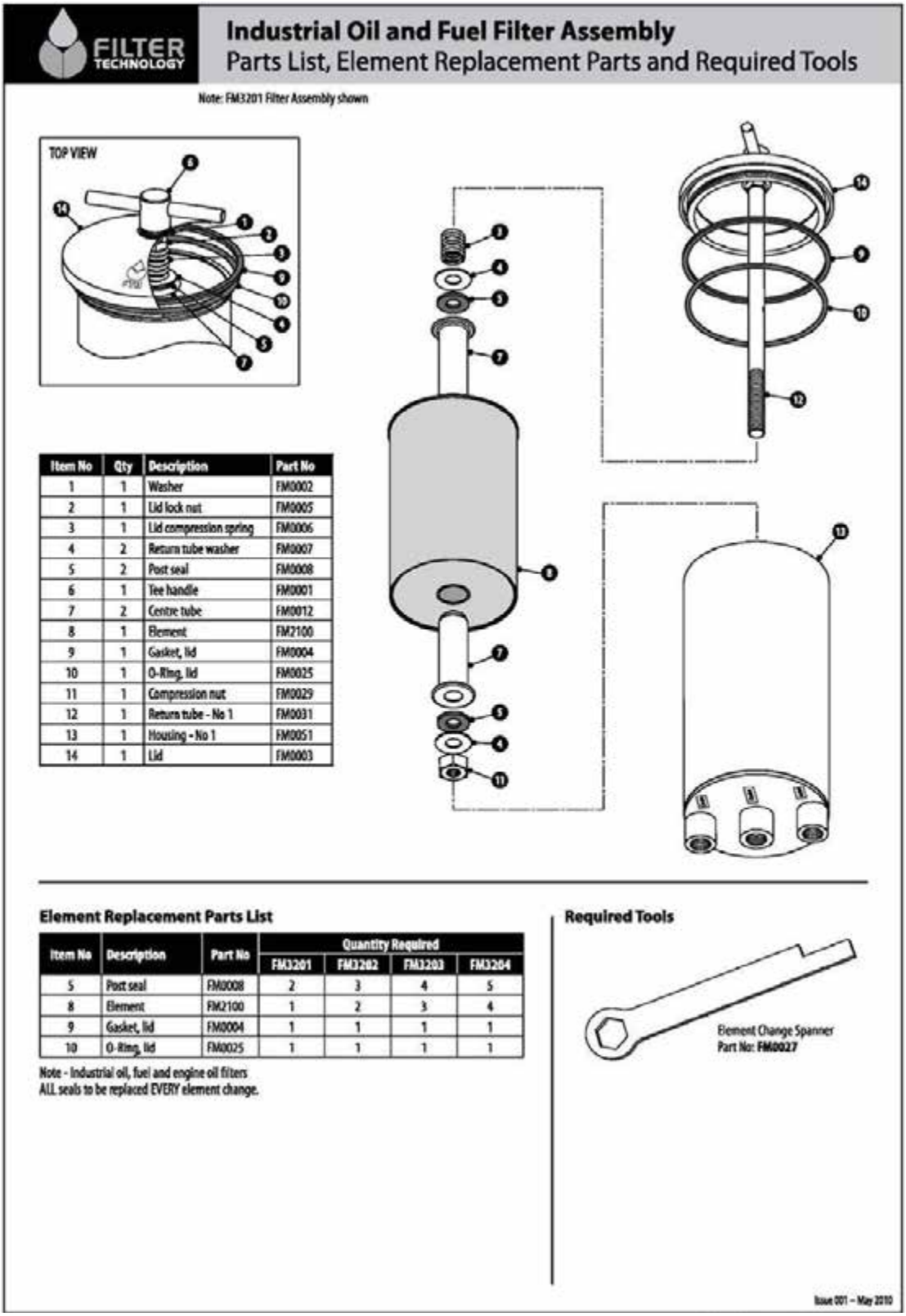

FILTER TECHNOLOGY

Industrial Oil and Fuel Filter Assembly
Parts List, Element Replacement Parts and Required Tools

Note: FM3201 Filter Assembly shown

Item No	Qty	Description	Part No
1	1	Washer	FM0002
2	1	Lid lock nut	FM0005
3	1	Lid compression spring	FM0006
4	2	Return tube washer	FM0007
5	2	Post seal	FM0008
6	1	Tee handle	FM0001
7	2	Centre tube	FM0012
8	1	Element	FM2100
9	1	Gasket, lid	FM0004
10	1	O-Ring, lid	FM0025
11	1	Compression nut	FM0029
12	1	Return tube - No 1	FM0031
13	1	Housing - No 1	FM0051
14	1	Lid	FM0003

Element Replacement Parts List

Item No	Description	Part No	Quantity Required			
			FM3201	FM3202	FM3203	FM3204
5	Post seal	FM0008	2	3	4	5
8	Element	FM2100	1	2	3	4
9	Gasket, lid	FM0004	1	1	1	1
10	O-Ring, lid	FM0025	1	1	1	1

Note - Industrial oil, fuel and engine oil filters
ALL seals to be replaced EVERY element change.

Required Tools

Element Change Spanner
Part No: **FM0027**

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TROUBLE SHOOTING

Refer to “Operation”, page 5, for explanation of how system operates.

	Symptom	Action
1.	No power supply to system	Ensure isolation switch at enclosure is closed.
		Investigate power supply to isolation switch.
2.	No pressure on gauge.	Ensure engine is running
		Ensure oil temperature is > 50°C.
		Ensure temperature probe is functional
		Ensure solenoid valve is functional.
		Ensure correct oil level in reservoir.
		Ensure gauge is functional.
		Ensure all hoses are in intact and no leaks.
		Ensure power supply to system.
		Debris jammed in seat of relief valve allowing oil to by-pass elements and return to reservoir.
3.	Oil leak at housing lid	Ensure compression nut is correctly tensioned, see element change procedure.
		Ensure lid seals are in good condition and correctly mounted as lid is tensioned.
		Ensure T Handle on lid is correctly tensioned
4.	Excessive housing pressure	Ensure oil temperature is > 50°C.
		Check elements for excess contamination.
5.	Oil sample results indicate no improvement in oil cleanliness.	Ensure housing pressure within spec.
		Check that elements are not blocked with contamination.
		Debris jammed in seat of relief valve allowing oil to by-pass elements and return to reservoir.
6.	System does operate under Test/Prime mode	Ensure power supply is available.
		Ensure red LED light is functional

For further information see contact details at rear of this manual.

SPECIFICATIONS

Model	FM40226
Power Supply	24V x 30Amp
Flow Rate @ 680cst	1.1 LPM @ 50 Deg.C.
Pressure Control	5 Bar relief valve
Filter Housing	FM3202 x 1 per side
Blocked Filter Indication	Yes – pressure gauge
Filter Element	P/N FM2100 x 4 off
Filter Element Replacement Kit	FM21043
Particulate Removal	> 2 micron
Moisture Removal	Up to 2%
Efficiency @ 4 micron	90%
Efficiency @ 6 micron	94%
Dirt Holding Capacity	900g per element
Live Sample Valve	Yes–after pump, prior to filters

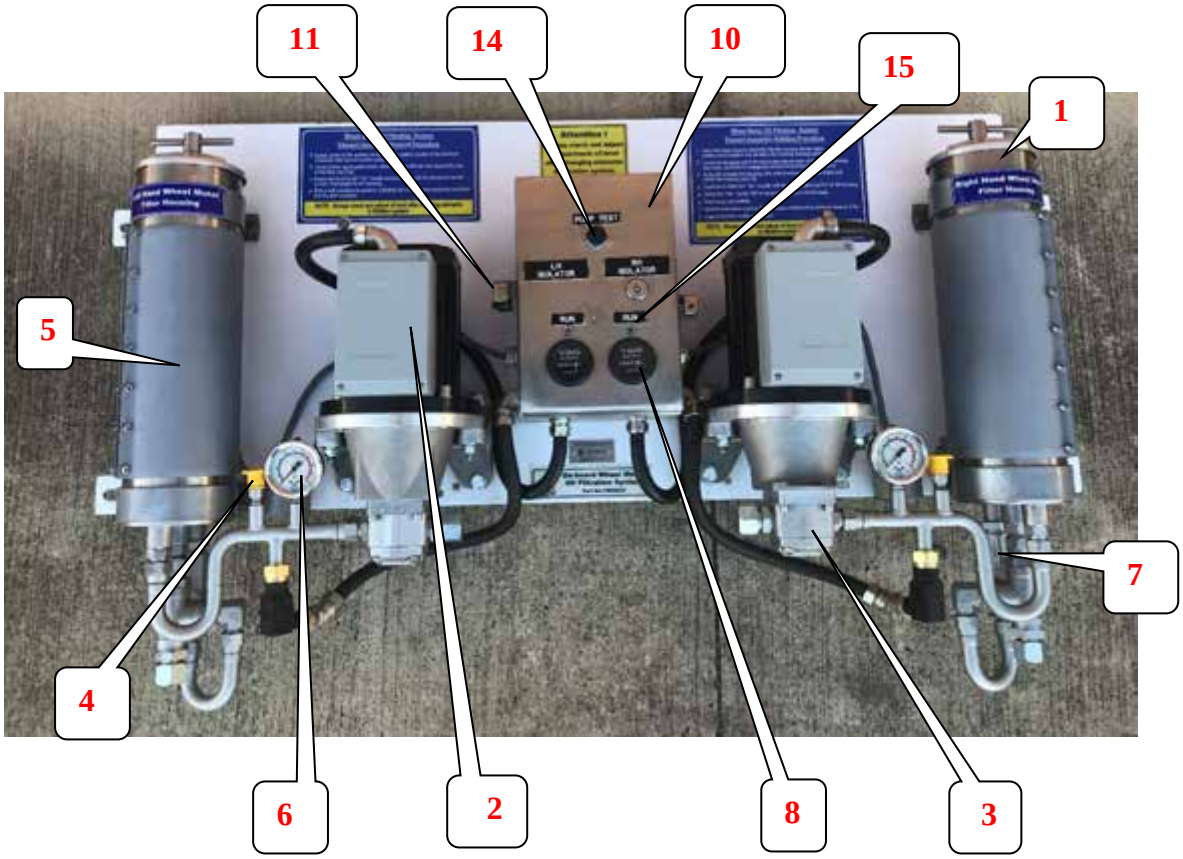
SYSTEM COMPONENTS

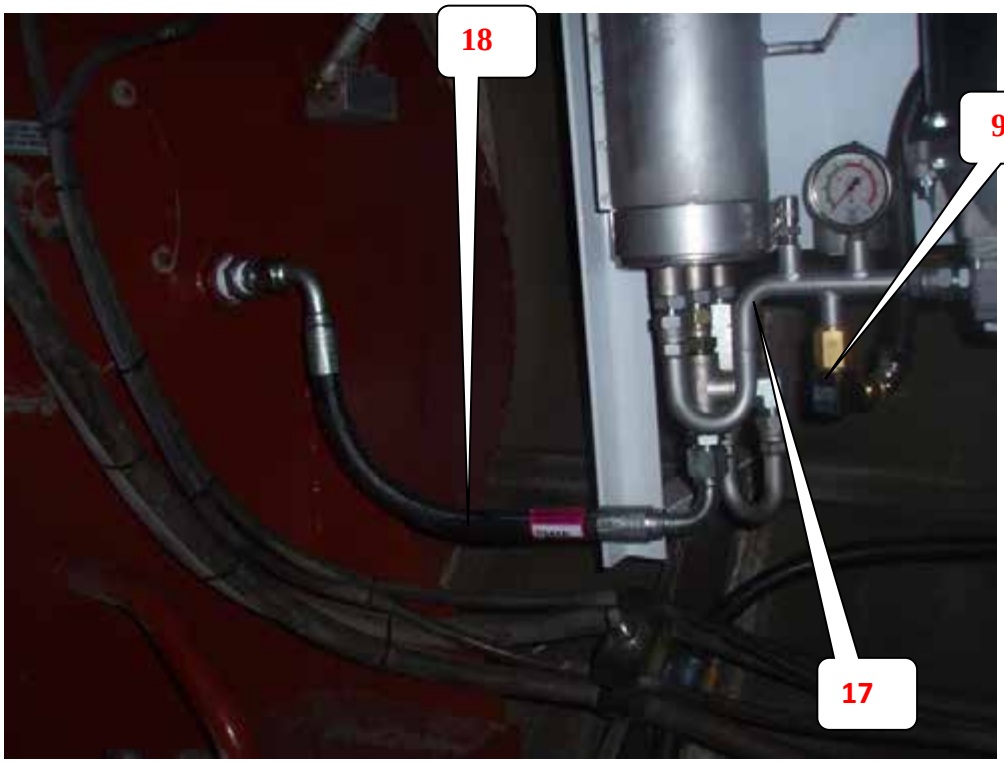
Item	FTA Part Number	Technical Description	Quantity
1	FM3202	Filter Housing No 2 - Industrial	2
2	FME1097	24V DC Electric Motor x 1200 RPM	2
3	FMP1101	Pump	2
4	FMP3010	Live Sample Point	2
5	FME2046	Heater Bands 24VDC	2
6	FM0063	Pressure Gauge	2
7	FMP3054	Relief Valve - 5 Bar x 3/4"	2
8	FME6250	Hour Meter	2
9	FME4008	Pressure Switch	2
10	FME6278	Electrical Enclosure	1
11	FME5078	Isolation Switch	2
12		Wheel Motor Tank Isolation Valve 1” *	2
13		Wheel Motor Tank Oil Evacuation Point *	2
14	FME6362	Test/Prime button	2
15	FME6322	“System Running” indicator	2
16		Suction hose to pump **	2
17	FM0636	Delivery Pipe to filters	2
18		Return hose to tank**	2
19	FMP3057	Non Return Valve	2

* Found on a typical installation, may vary depending on individual truck set up

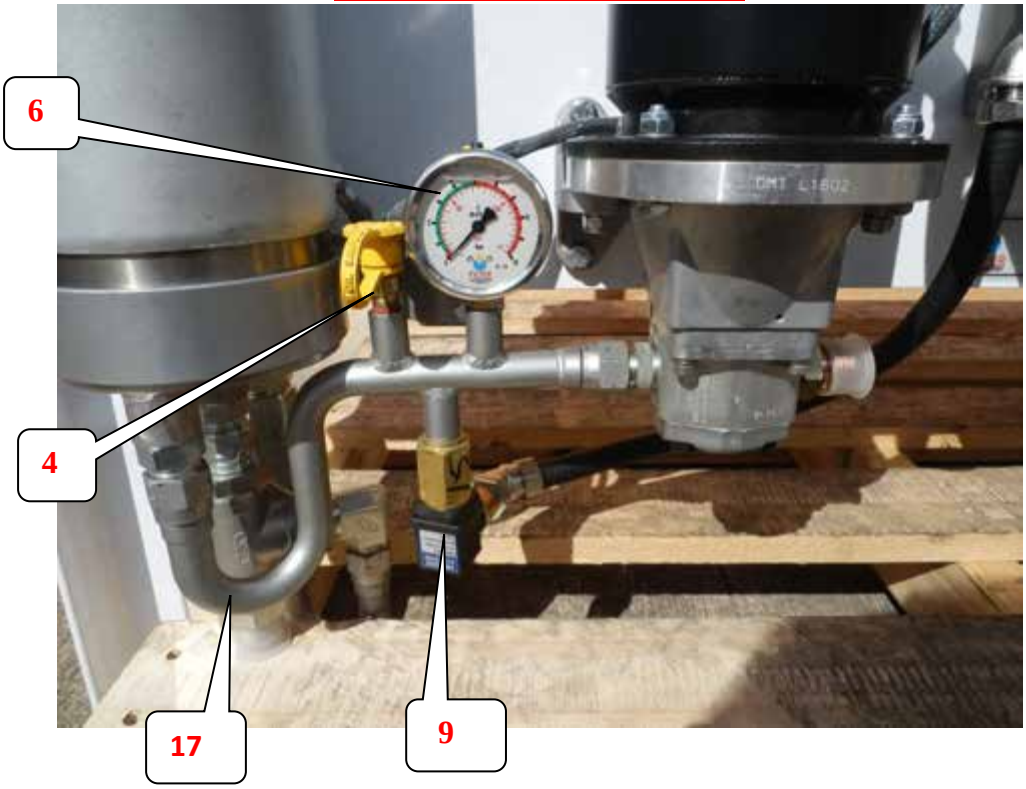
** Hoses supplied for a typical installation, alterations may be required depending on the setup of your truck

SYSTEM COMPONENTS

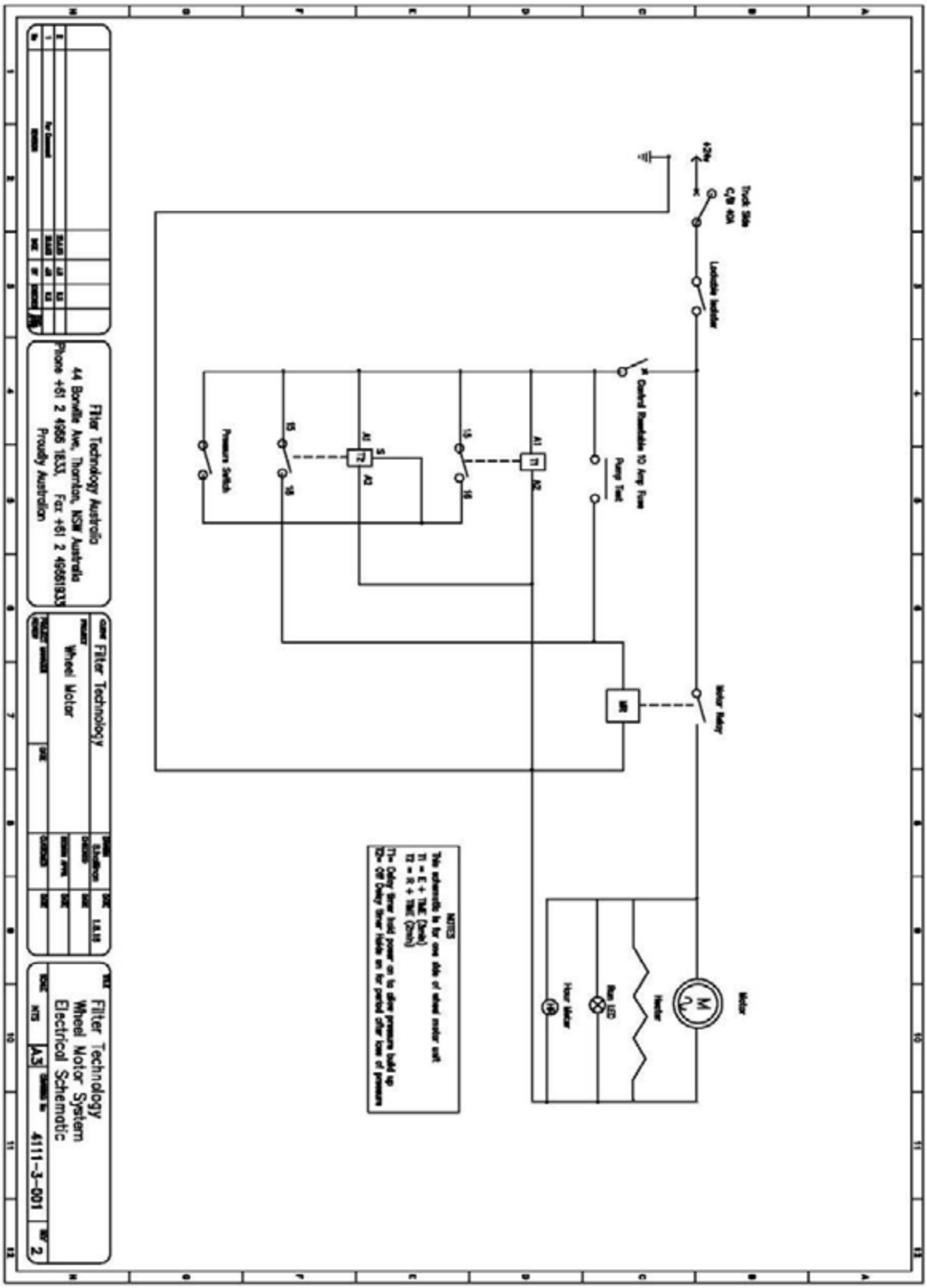




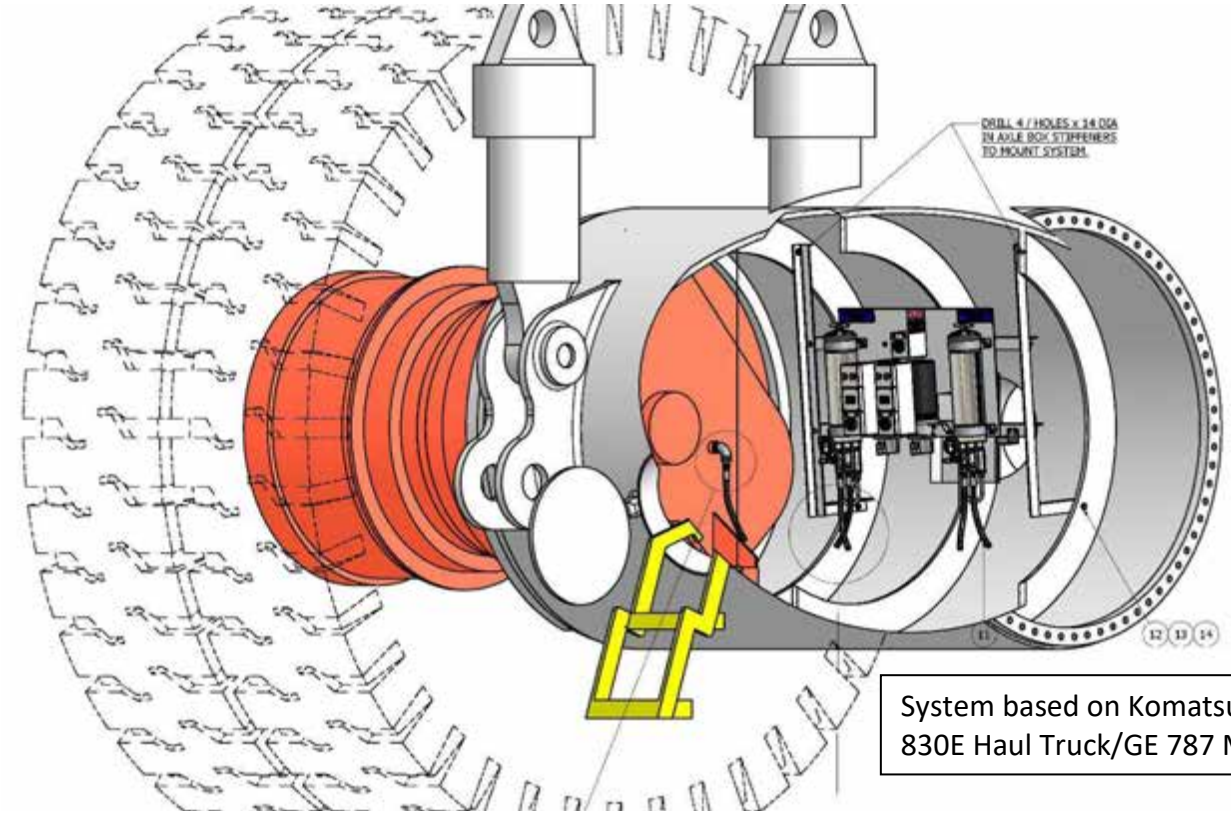
SYSTEM COMPONENTS



ELECTRICAL SCHEMATIC

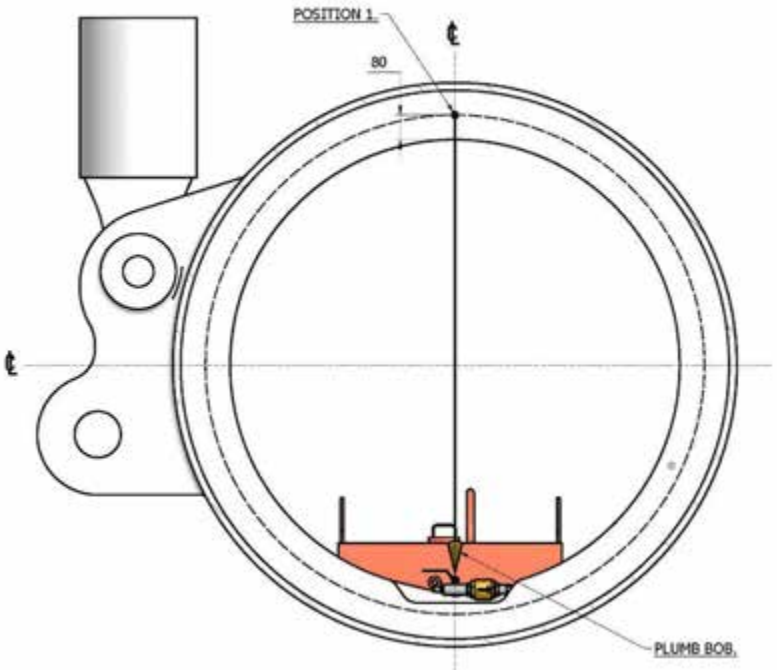


TYPICAL INSTALLATION



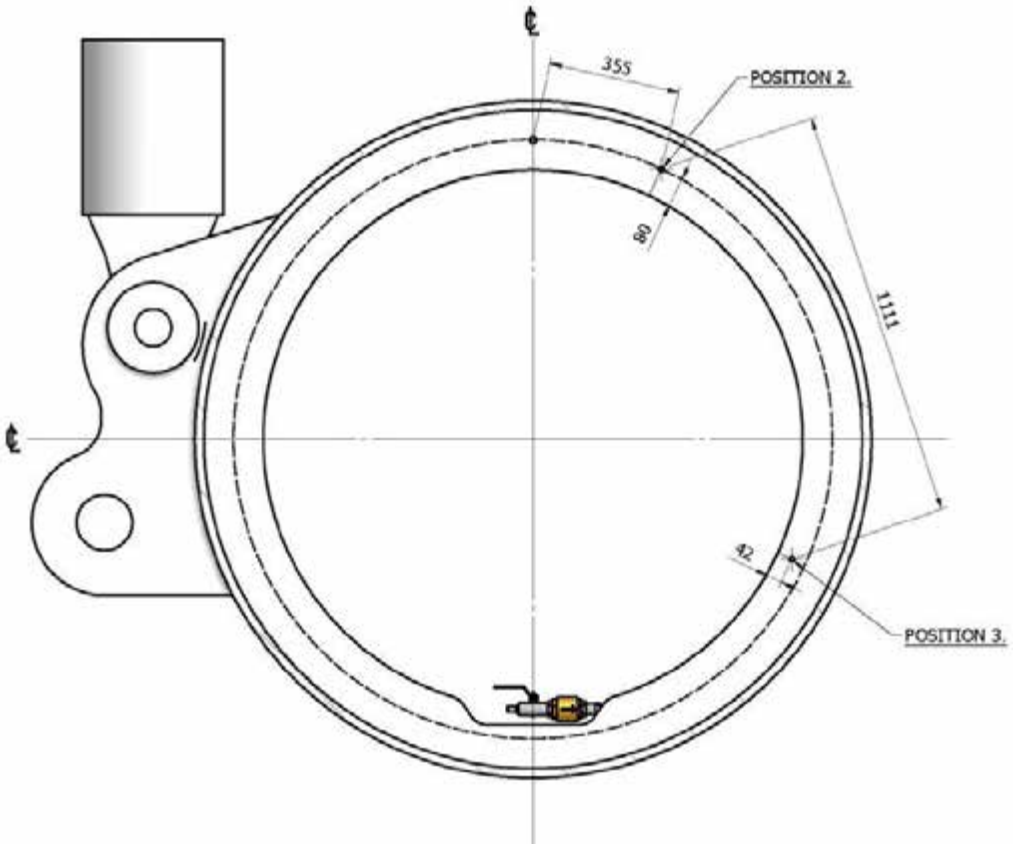
System based on Komatsu
830E Haul Truck/GE 787 Motor

STEP 1



Step 1 - Locate Position 1.
At centre, top of axle housing

STEP 2

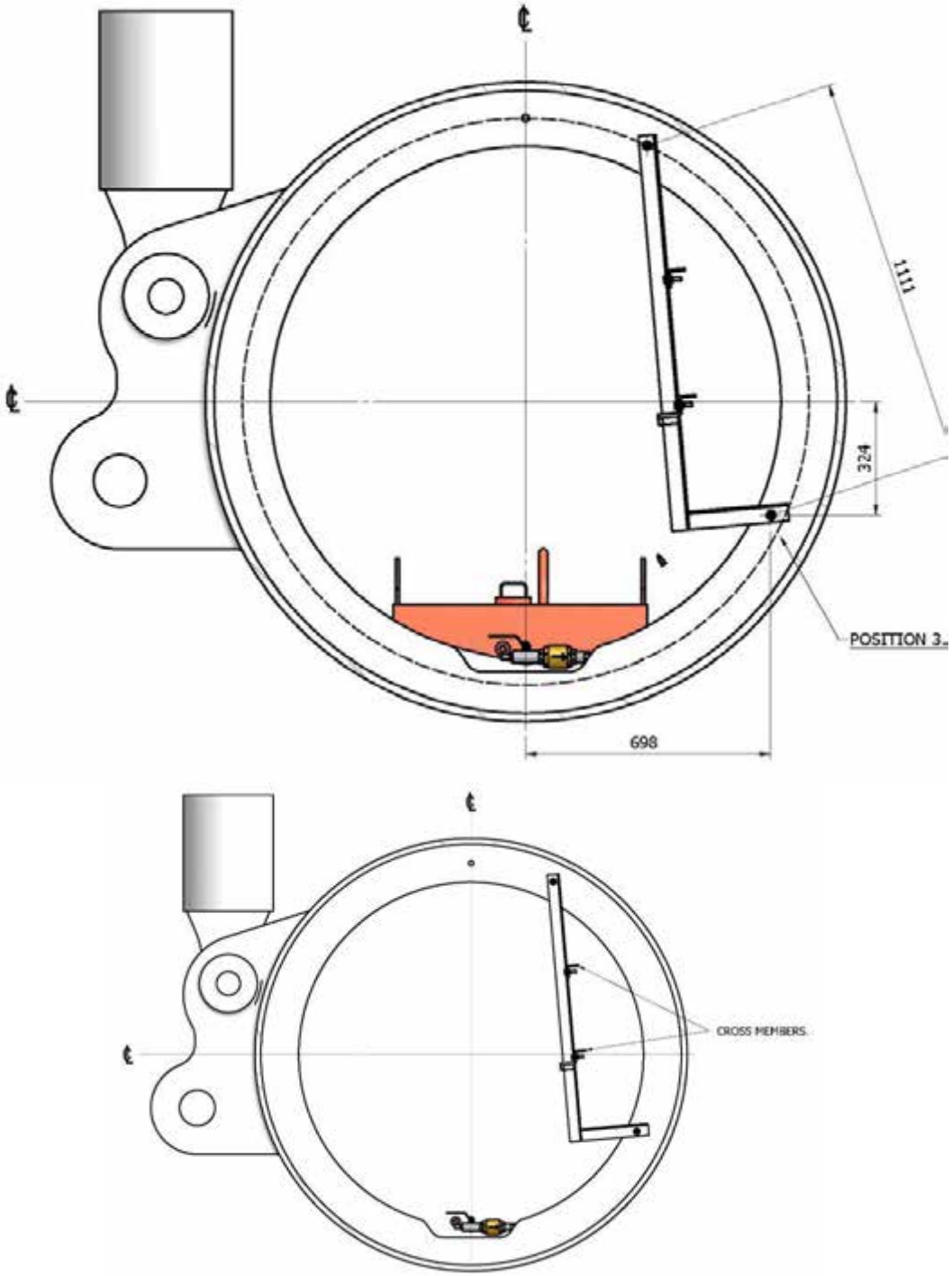


Step 2 – Locate Position 2 & 3
(Use tremmals to mark out hole centres as shown)

Step 3 – Check positions 2 & 3 align with support bracket
(Adjust position 3 if required)

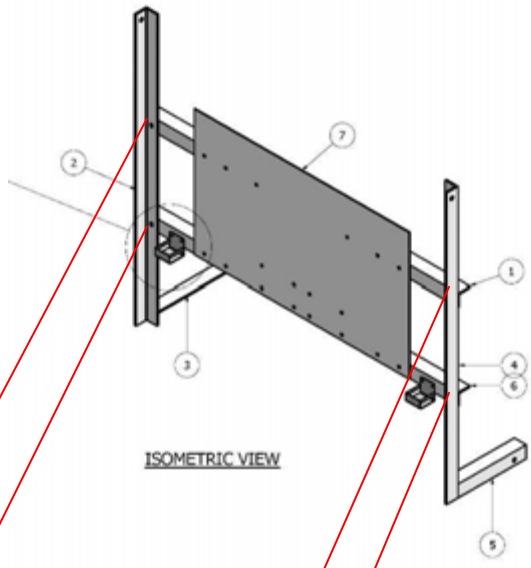
Step 4 – Drill holes at positions 2 & 3 x 14 Dia

STEP 5



Step 5 – Install vertical mounting brackets, & secure firm.

STEP 6

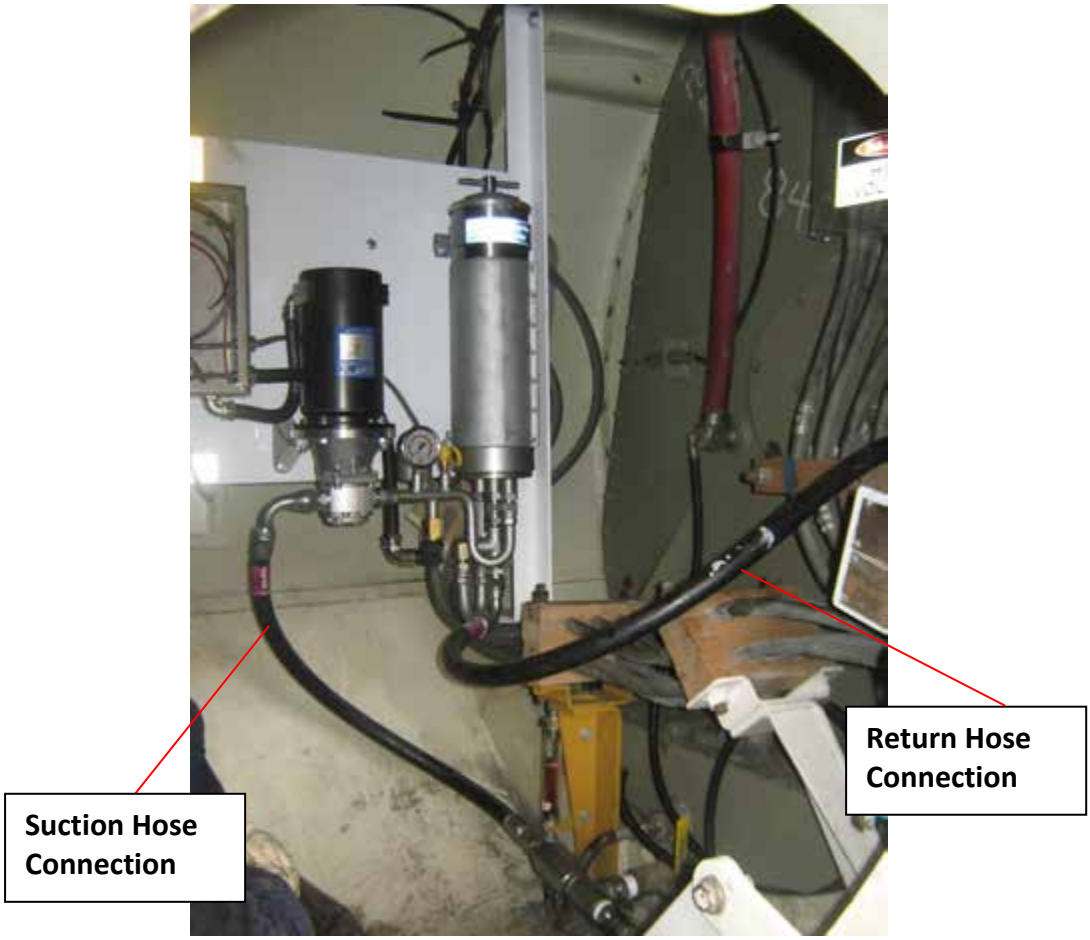


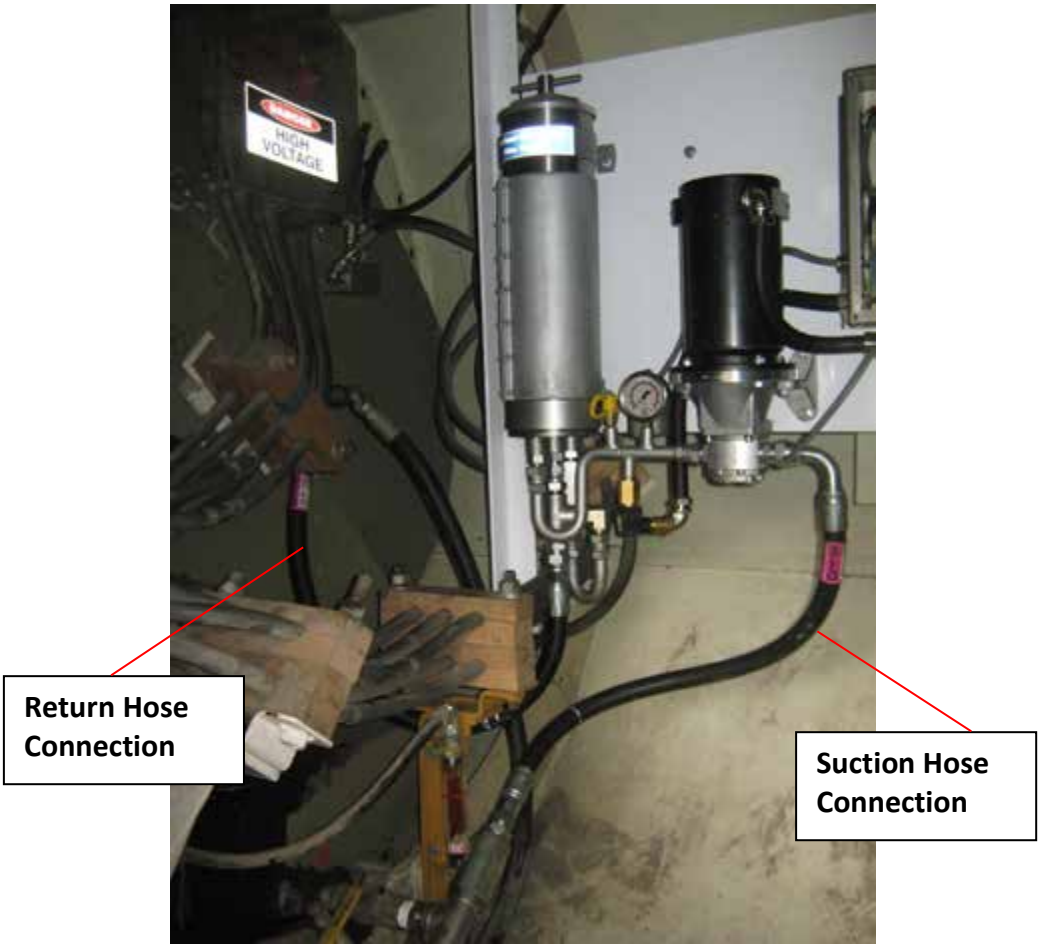
Step 6 – Install Filtration Panel to the Vertical Mounting Brackets using 4 bolts

Step 7 – Connect Hoses
See below for typical hose install

Suction Hose Connection


Return Hose Connection


Suction Hose Connection
Return Hose Connection



Step 8 – Have a suitably qualified electrician to connect the electrical wiring. See Electrical Schematic for Wiring details.

DESIGNED & MANUFACTURED FOR:

FILTER TECHNOLOGY QUEENSLAND

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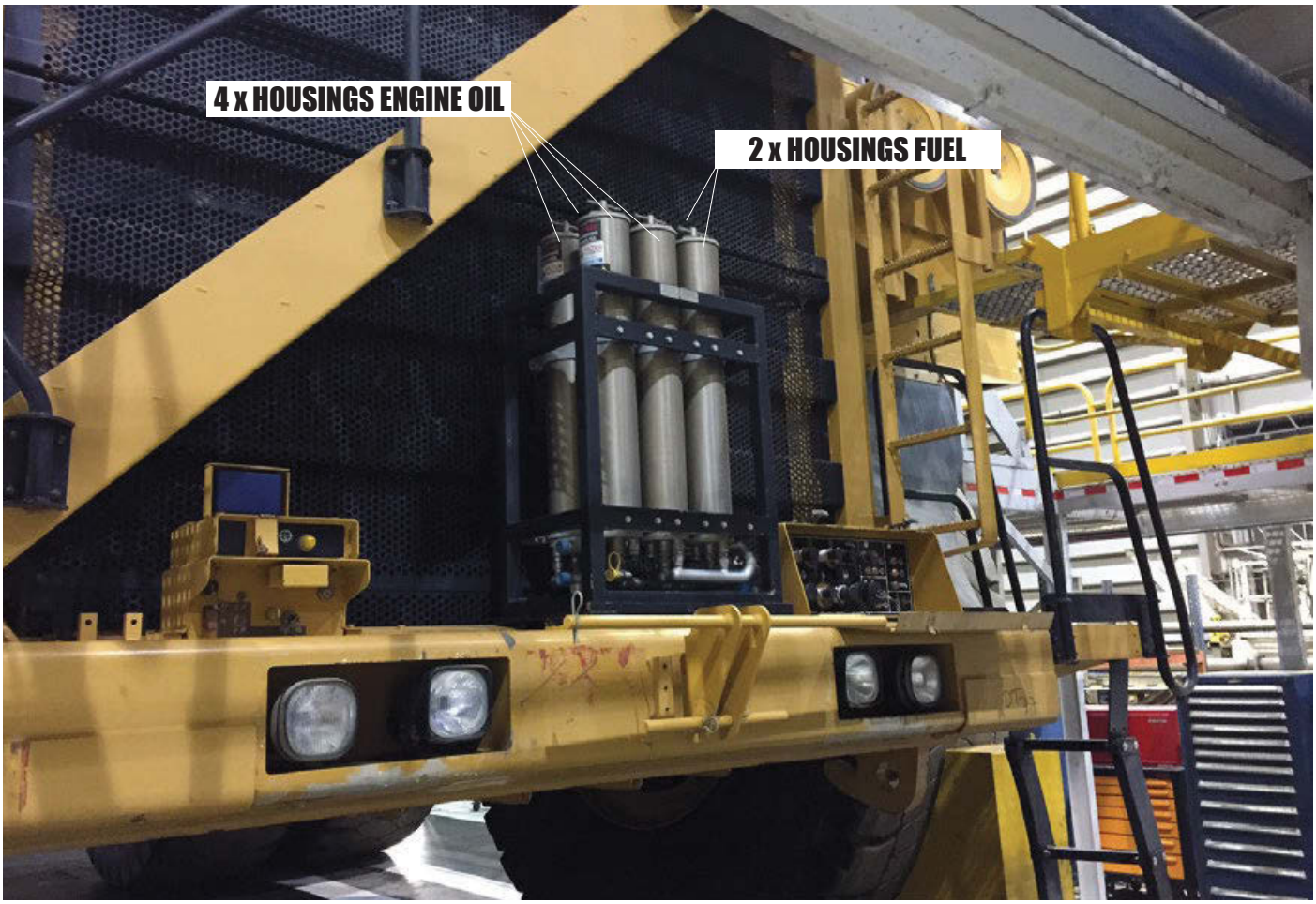
FILTER TECHNOLOGY
cleaner fluids mean better business

FIELD INSTALLATION

Filtration and Contamination Control Specialists

Engine Oil Filtration – Cat C175 / 3516 Engine



A solution has been provided to a customer having engine oil issues with the use of Filter Technology engine oil filtration units. The customer has fitted the on-board oil filtration units to their Caterpillar 793 and 789 series trucks.

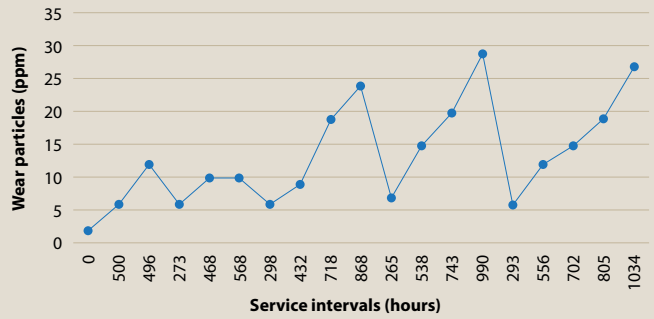
The engines have been monitored over a 3000 hour period with oil analysis samples taken at 250 hour periods. This provided an extended history of the oil's cleanliness, additive package and wear rates.

It shows that over this period, the filtration unit has kept the oil to an OEM acceptable cleanliness level for a longer time than the previous standard service periods. It has also reduced contamination and wear particles over the service periods from the installation of the filtration units, which can be seen in the data of the oil analysis.

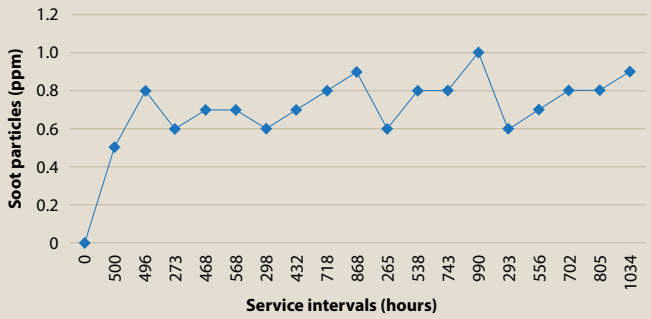
In graph 1, the iron wear rate can be seen to be reduced over the same period as the engine oil is filtered through the service life of the oil. This reduction will increase the service life of the engine due to decreased wear rates and contamination particulates in the oil.

In graph 2, the soot levels can be seen to follow the trend of the iron particles over the same period as the engine oil is filtered through the service life of the oil. This reduction will slow the formation of acid and stabilise the oil viscosity.

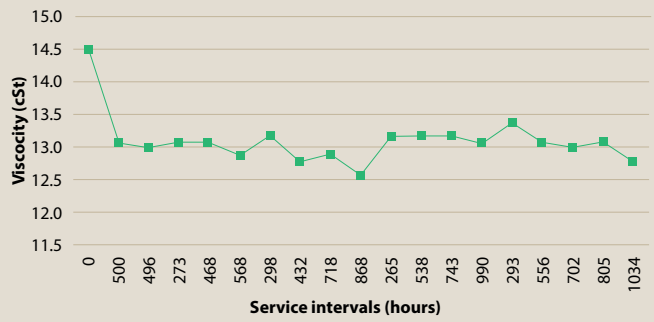
Graph 1: Iron wear rate



Graph 2: Soot levels



Graph 3: Viscocity



Graph 3 shows that the oil viscosity (V100) has remained stable over the period after installation of the filtration unit, even with extended oil life the engine has reduced wear particles and soot in the lubrication system. The additive package is not being depleted as would normally happen in standard service periods, which aids in increased life cycle potential for the engine oil.

As a resultof the extension of oil life cycles, there is are cost savings as follows:

Service costs BEFORE installation:

1 x 500 hr engine oil service (oil + OEM filter replacement) = $1909.00 each

14 services a year x $1909.00 =$26,726.00 per year

Service costs AFTER installation:

1 x 1000 hr engine oil service (oil + OEM filter replacement + FTA filter replacement) = $2443.00 each

1 x 500 hr (FTA filter replacement only) = $534.00 each

7 x $2443.00 + 7 x $534.00 =$20,839.00 per year

This equates to service savings on engine oil and elements to a yearly average of:

$26,726.00 – $20,839.00 = **$5,887.00 per year**

This reduction in contamination results in an expected 100% increase in service life extension of the engine oil and OEM elements, with reduced service requirements. This allows for improved productivity and increased reliability of the engines. Due to the reduced service requirements, engine lubrication systems can be serviced less frequently, which reduces risks associated with servicing.

As a result, the customer can extend engine oil change intervals which will have a direct impact on operational costs. These include savings in reduced downtime and maintenance costs, and result in a huge reduction in the mine's environmental impact. The cleanliness of the engine oil will increase componentry life and machine reliability.

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CAT
HSE

FILTER TECHNOLOGY

INSTALLATION AND OPERATION MANUAL

FM40335D
Filtration System

By-Pass Filtration System
To Suit CAT® 793F Differential and Final Drive Lube System

Issue 1: August 2015

Table of Contents

1.0 Introduction

The FM40335D By-Pass Filtration System is designed to be permanently installed in position on the truck for the filtration of the differential and final drive lube system.

The system is based on the Filter Technology Australia (FTA) designed and patented FM2100 Industrial Oil Element. This element removes particulate contamination down to 2 micron in size.

In order to provide effective filtration, the systems are sized to provide a filtration flow rate of a minimum 20% of the compartment volume per hour. It is critical to ensure the required turn-over of oil through the filters to remove and maintain contamination levels within the target range.

In the CAT 793F application, oil supply to the FTA filters is taken from the OEM supply to the existing Diff Lube Filtration System. Oil is returned from the FTA filters direct into the diff compartment via the existing cover plate location on top of the differential assembly housing.

2.0 General System Specifications

Supply Pressure	210 bar (3,000 psi) max.
Safe Working Pressure	10 bar (145 psi) max.
Filter Housing Pressure - Maximum	5.0 bar (72 psi) ΔP across relief valve + Return Line Pressure. See Section 5.1
Filter Housing Pressure – Normal Operation	See Section 5.1
Return Line Pressure	1.5 bar (14.5 psi) Max. See Section 5.1
Pressure Drop Across Filters (ΔP) (New Elements) 3.0 bar (45 psi)	3.0 bar $^{+0.5\ bar}_{-0.0\ bar}$ (45 psi $^{+7.0\ psi}_{-0.0\ psi}$)
Element Change Pressure	Filter Housing Operating Pressure + 1.5 bar (22 psi) See Section 5.1
Dirt holding Capacity	0.9 kg (2 lb) per element

Table 1

3.0 Main Components

3.1 Filter System

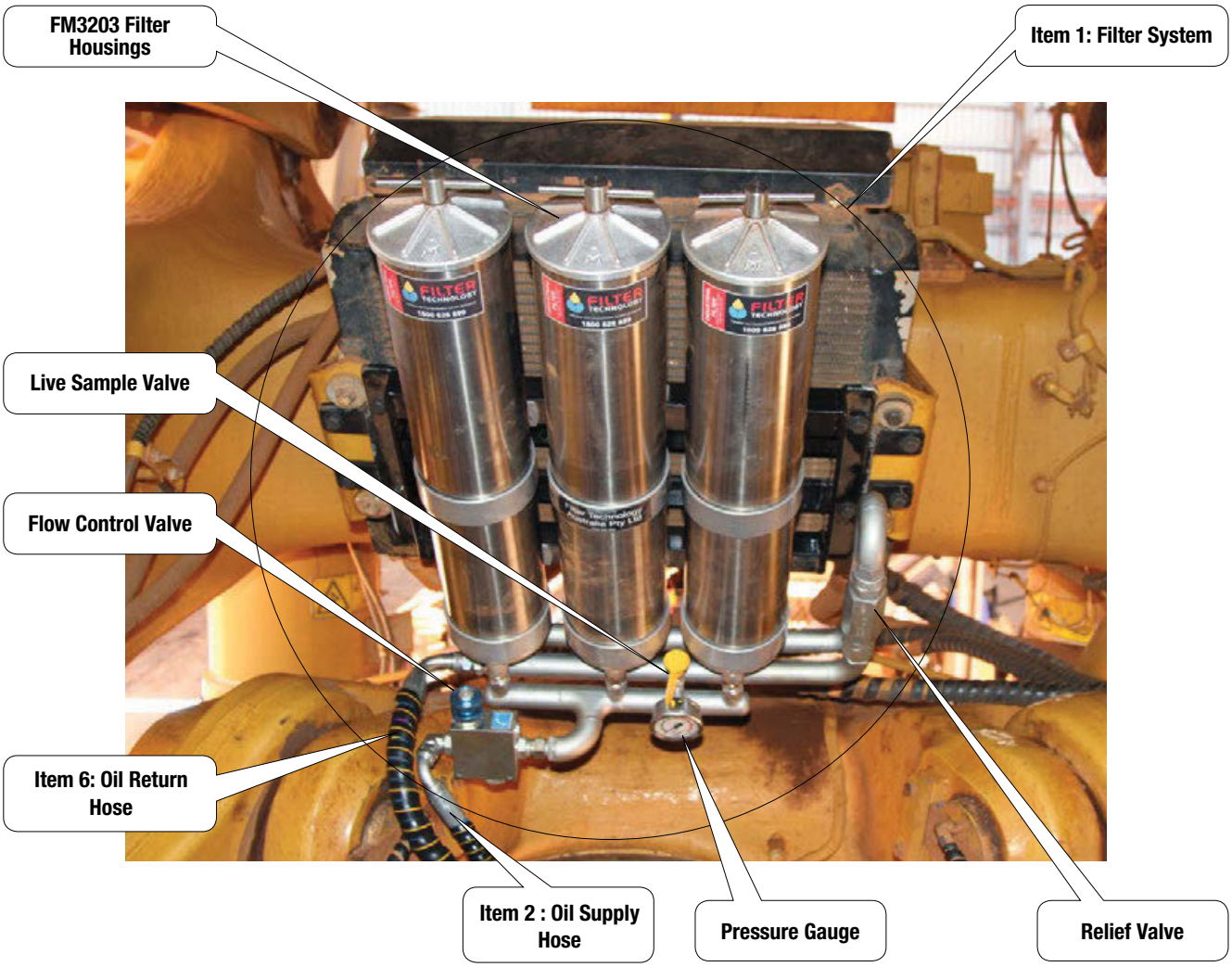


Photo 1

3.2 Supply Point

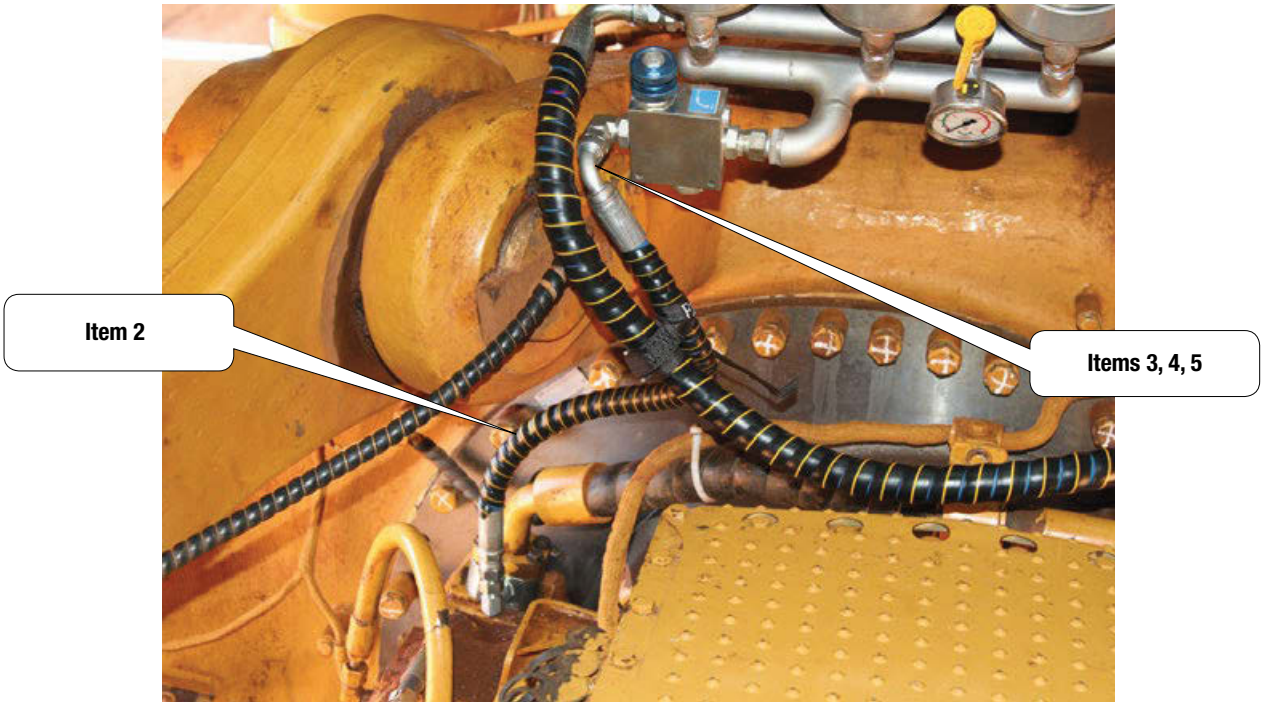


Photo 2 – Supply Point

3.3 Return Point

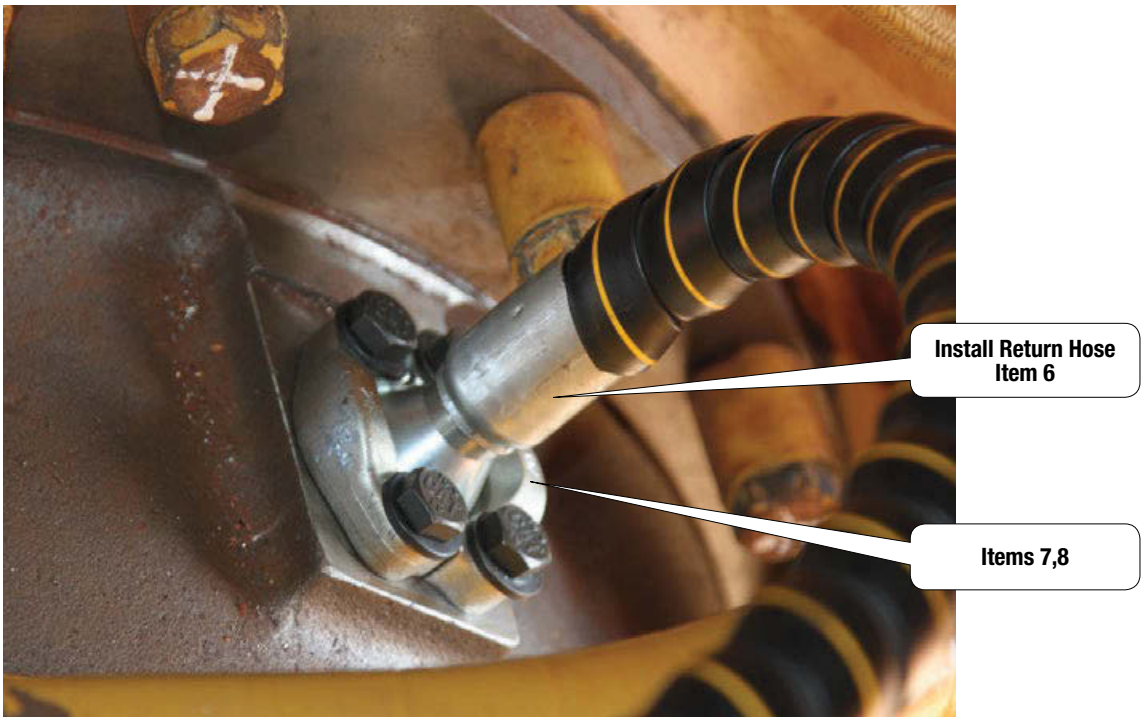


Photo 3 – Return Point

4.0 Installation Details

Record installation and commissioning details on check sheet at rear of this manual, *see* **Section 11.0 FM4 System Installation Check Sheet.**

4.1 System Installation Parts List

Item No.	Description	Part No	Qty
1	Filtration System	FM40335D	1
2	Hose Assembly (Supply)	FMH9060	1
3	Elbow	FMH2209	1
4	Face Seal O Ring	FMM4001	1
5	Sandwich Block	FM0478	1
6 - 8	Hose Assembly	FMH9061	1

Table 2

4.2 Hose Details

As a minimum, all hosing shall be of industrial quality hydraulic hose complying with AS 3791 – Hydraulic Hose and also site and statutory requirements.

Correct sizing of hosing is specific to each application however, typically, shall be of suitable diameter to provide unrestricted flow of oil with regard to the oil viscosity and length of hose used. Typically, it is recommended to use one hose size larger on the return line than the supply line to ensure no possibility of excessive return line back pressure exists.

Ensure hosing is thoroughly cleaned after manufacture and prior to installation. Hosing shall be secured at regular intervals in such a manner as to ensure no risk of failure through mechanical, heat, abrasion or other damage, all in accordance with site and statutory requirements.

Any changes or modifications made to OEM hose mounting arrangements must include alternative means of securing such hoses to a standard of no less than the original arrangement.

4.3 System Location

The system is mounted to the inside of the left hand chassis beam, see Figure 1.

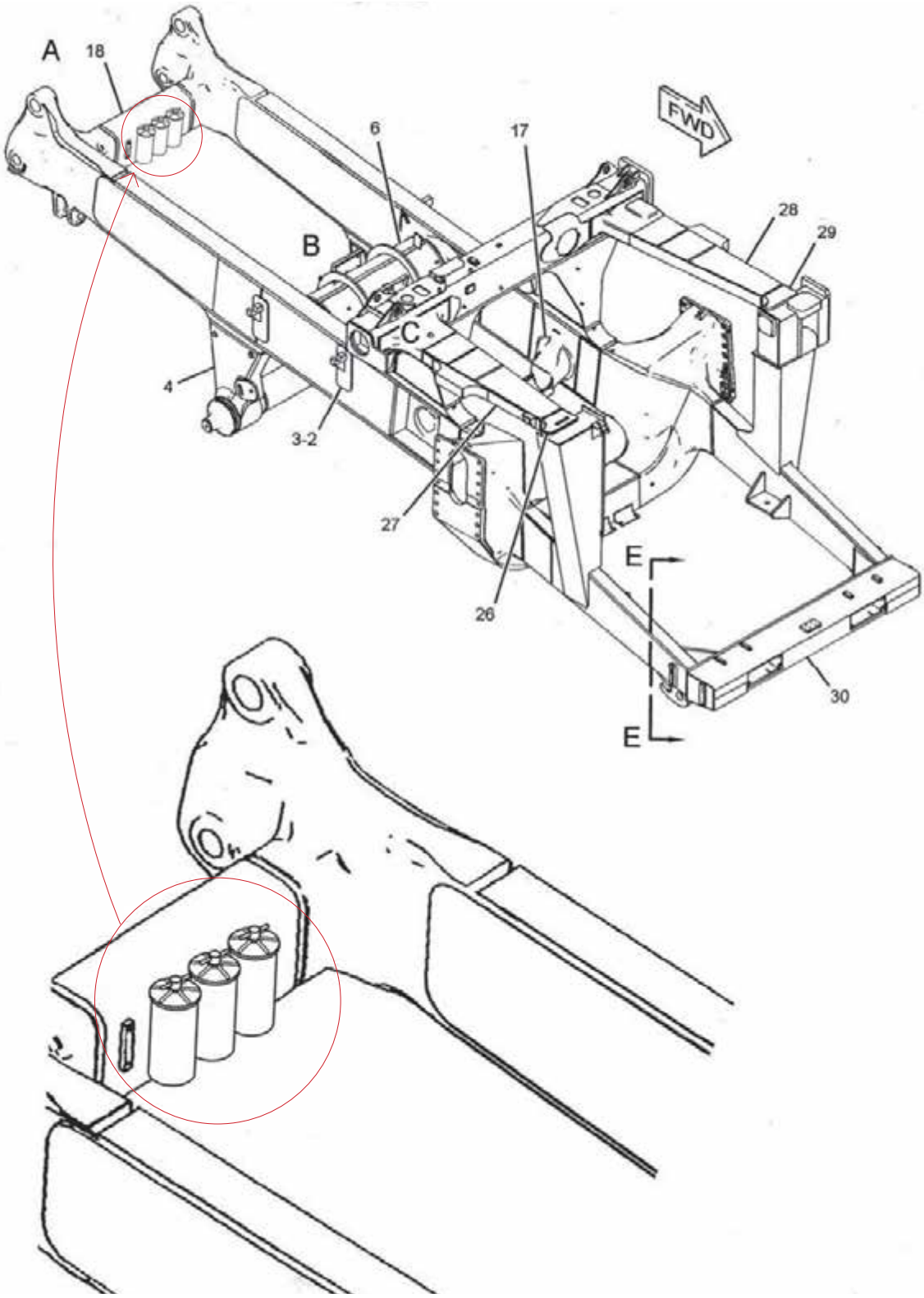


Figure 1

4.4 Oil Supply to Filter System *(see Photo 4)*

1. Locate hose assembly 246-5818.
2. Remove mounting clamp assembly.
3. Disconnect hose 246-5818 from pump assembly 148-8373.
4. Add sandwich block assembly to pump.
5. Connect hose 246-5818 to sandwich block, using bolts of the following specification: 100 mm x 12 mm x 1.75 pitch, grade10.9, hex head.
6. Install supply hose FMH9060 to elbow FMH2313.

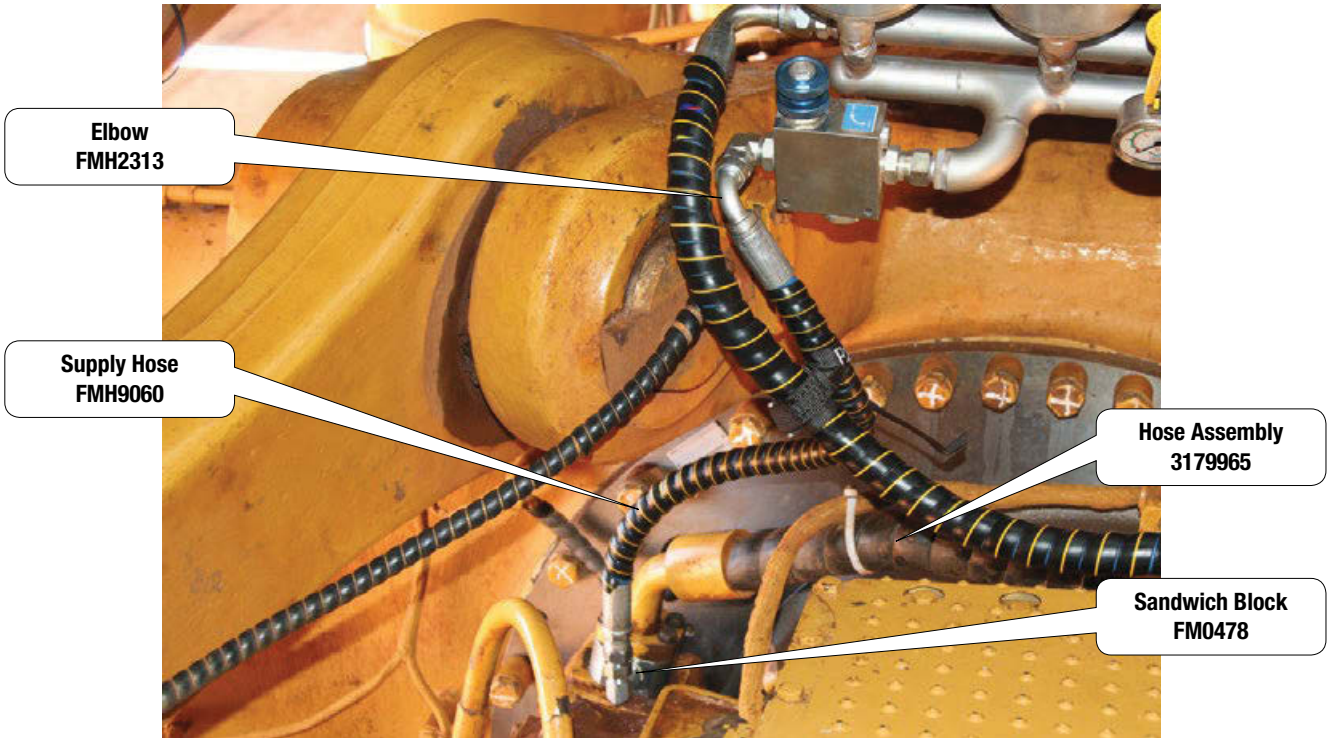


Photo 4

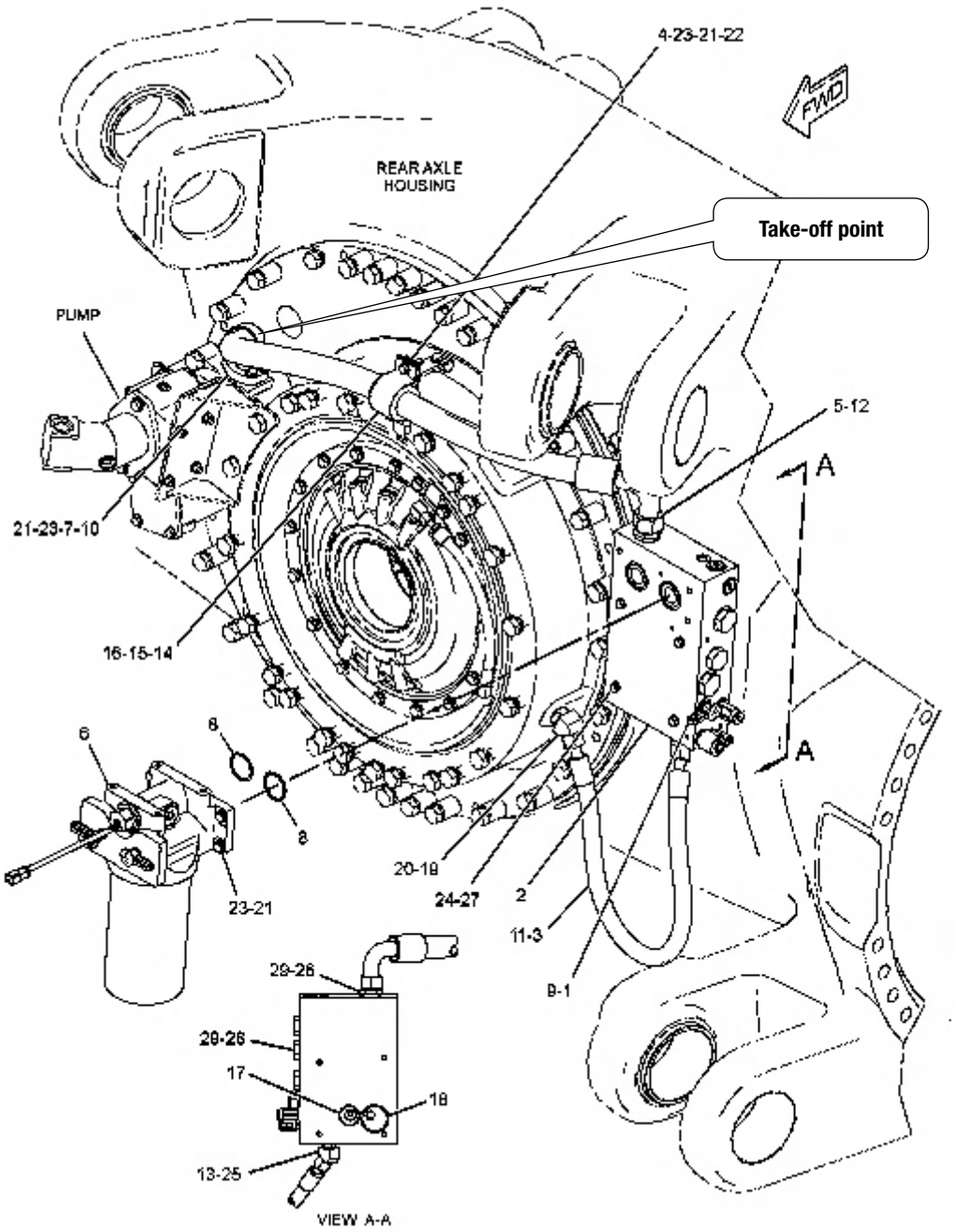

4-23-21-22
FWD
REAR AXLE HOUSING
Take-off point
PUMP
5-12
A
21-23-7-10
16-15-14
6
8
8
A
20-19
24-27
2
11-3
B-1
23-21
29-26
29-26
17
18
13-25
VIEW A-A

Figure 2

4.5 Oil Return To Compartment

1. Locate left side oil port cover #32 and remove, *see Figure 3*.
2. Install O-ring faced hose to return position, reusing #45. Ensure bolts are still suitable to use - if not, replace clamping bolts as shown, *see Figure 3*.
3. Once the return hose has been installed to the return point, the hose can be placed into position ready for installation onto the return point of the filtration unit.

4.6 Mounting of Filtration System

The filtration system has been designed to mount to the diff oil cooler mounting position. The mounting holes on the filtration unit have been spaced to directly mount to the diff oil cooler mount bosses on the chassis cross member.

If a diff oil cooler has been fitted to the truck there will be an extra mount frame supplied to add to the diff oil cooler bracket which then allows the filtration unit to be mounted.

This mounting system needs no modifications to the chassis. It only requires four extra holes to be drilled to the front of the diff oil cooler mounting brackets.

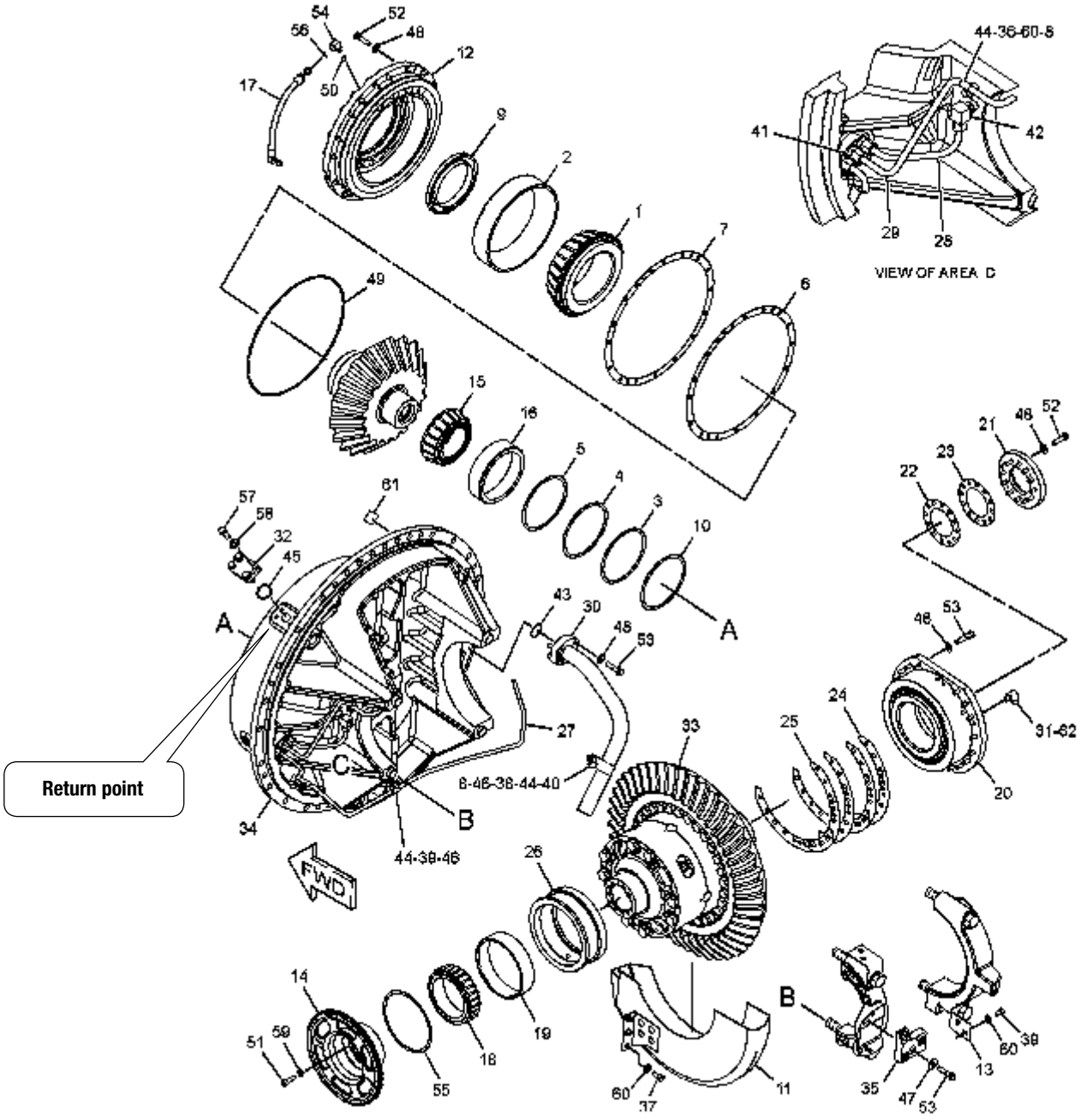

Return point
VIEW OF AREA D
FWD
44-36-60-8
8-46-38-44-40
44-38-46
31-62

Figure 3

Photo 5

5.0 Commissioning

Optimum filtration system performance relies on the correct setting of the housing pressure at commissioning.

Because most installations are unique in some manner, pressures must be set at installation to suit the particular system.

5.1 Establishing Correct Filter Housing Operating Pressure

To establish the optimum Filter Housing Pressure, perform the following calculation where:-

RLP = Return Line Pressure (Return Line Back Pressure + Return Line Check Valve Cracking Pressure - See Table 1)

FHP = Filter Housing Pressure

ΔP = Required Pressure Drop Across Filters

FHP = RLP + ΔP

Example 1

Pressure	bar	psi
RLP	1.2	17.4
ΔP	3.0	43.5
FHP	4.2	60.9

Element Change Pressure = 4.2 bar + 1.5 bar = 5.7 bar

Element Change Pressure = 60.9 psi + 22 psi = 82.9 psi

Example 2

Pressure	bar	psi
RLP	0.5	7.25
ΔP	3.0	43.5
FHP	3.5	50.75

Element Change Pressure = 3.5 bar + 1.5 bar = 5.0 bar

Element Change Pressure = 50.75 psi + 22 psi = 72.75 psi

Record installation and commissioning details on check sheet at rear of this manual.

5.2 Commissioning Process

Commission the system as follows :-

1. Ensure Flow Control Valve is screwed in clockwise 100% to closed position.
2. Bring the oil system to operating temperature and pressures.
3. While observing the pressure gauge, slowly open the flow control valve to establish oil flow into the filter housing(s), adjust to approximately 3.0 bar.
4. Allow oil to flow through system for a short while, say 5 – 10 minutes to remove any air trapped in the filter housing(s). Pressure may fluctuate during this period.
5. Inspect installation for any leaks and rectify as required.

NOTE: Setting and Adjustment of Housing Pressure

The commissioning procedure should only be conducted with clean elements installed.

Once set at commissioning, the housing pressure must not be adjusted during normal operation even though it will be noticed that housing pressure will increase as the elements “load up” with contamination.

See **Section 6 – Assessing Element Condition** for further information.

6.0 Assessing Element Condition

Typical element change interval is 500 hours, designed to align with typical OEM service intervals.

Under normal conditions, the unit will run at the specified pressure set at commissioning on clean elements.

Over time the level of contamination loading increases on the elements. This causes a restriction to the flow of oil through the elements. With increasing contamination the level of restriction increases also. Increasing levels of restriction result in increasing pressure in the filter element housing which is seen on the pressure gauge.

When housing pressure reaches the nominated value the elements are considered to be fully loaded with contamination and the elements should be changed.

NOTE: When housing pressure approaches maximum Filter Housing Pressure (see Table1) relief valves starts to “crack” open. At maximum Filter Housing Pressure the relief valve is fully open directing most of the oil flow back to the compartment unfiltered. At this stage very little oil is being filtered and the system must be serviced as soon as possible.

See **Section 7 – Servicing Procedure** for further information.

7.0 Servicing Procedure

Perform the element change procedure as follows:-

1. **Isolation of System**
   a. Implement machine isolation procedures as required.
2. **Removal of Filter Element Assembly**
   a. Using a clean rag or paper towel, clean away any dirt etc from around the lid of the filter housing.
   b. Rotate the Tee handle at the top of the filter housing in an anti-clockwise direction to unscrew it and disengage the thread in the base of the housing, *see Photo 6*.
   c. Lift the filter element assembly out of the housing and place in a suitable drip tray.
   d. Place a suitable cover over the top of the housing to prevent contamination entry while the element assembly is removed.
3. **Change Filter Elements**
   a. Replace filter elements see “Element Change Procedure”.
4. **Install Filter Element Assembly**
   a. Insert filter element assembly into element housing.
   b. Locate threaded end of return tube into the “lead” into the base of housing, *see Photo 7.*
   c. Rotate Tee handle in a clockwise direction to engage thread and screw in.
   d. Ensure lid seals engage housing correctly to avoid pinching and possible damage.
   e. Continue to screw Tee handle down until lid seats firmly against housing.
   f. Rotate Tee handle a further 180° to apply final tension.
   g. Wipe down any oil residue.
5. **Return System to Service**
   a. Start system and bring to operating temperature.
   b. Observe housing pressure. After a short while, as air bleeds from the housing(s), it should settle at the specified Filter Housing Pressure.
   c. Check system for any leaks, particularly around the lid seal area. Rectify as required.
   d. System now ready for return to service.

Photo 6

Photo 7

8.0 Element Change Procedure

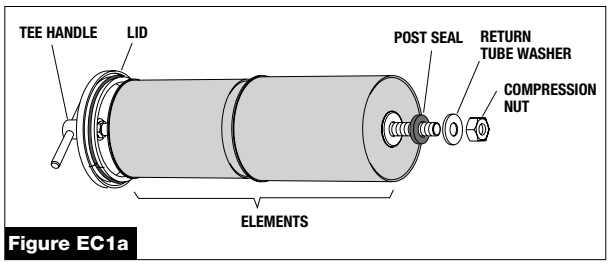


Figure EC1a

Removing the Element Assembly

(Please consult the Operation and Maintenance Manual for your specific product.)

1 Remove the element assembly from the filter housing by unscrewing the tee handle counter-clockwise.

Stripping the Element Assembly

2 Holding the tee handle, remove the compression nut and return tube washer and retain (**figure EC1a**).

3 Remove post seal.

4 Slide off all elements and post seals from return tube.

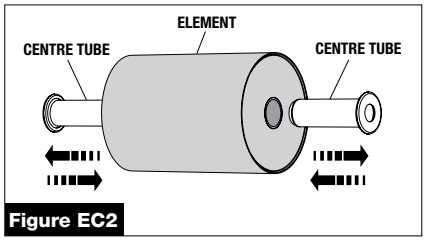


Figure EC2

5 Remove the centre tubes from each end of the old elements and retain (**figure EC2**).

6 Remove the top post seal and return tube washer, retaining the washer. (**figure EC3**).

7 Remove lid O-ring and lid gasket (**figure EC3**).

8 Dispose of old elements, post seals, lid O-ring and lid gasket.

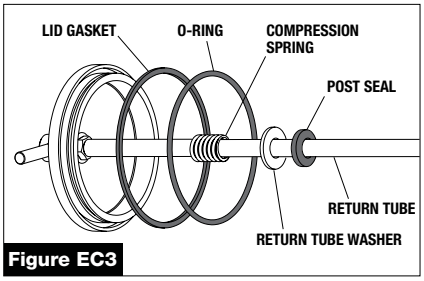


Figure EC3

Reassembly of Filter Assembly

9 Carefully install the O-ring and lid gasket into lid (**figure EC3**).

10 Slide the top return tube washer, then the post seal on to the return tube (**figure EC3**).

11 Insert the centre tubes into the new elements. Ensure they are fully inserted (**figure EC2**).

12 Load all the elements onto the return tube making sure there is a post seal between each element (**figure EC4**).

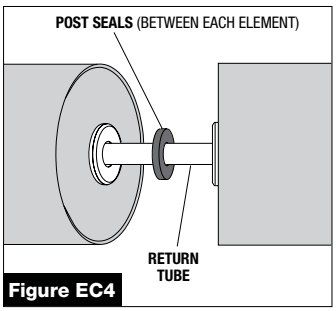


Figure EC4

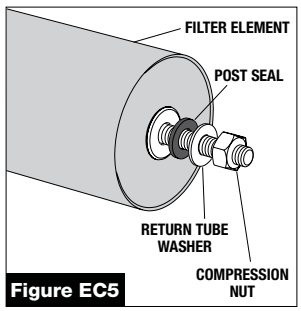


Figure EC5

13 Replace the bottom post seal, return tube washer and compression nut (**figure EC5**).

14 After loading all the elements and post seals on to the return tube, push down on the elements to seat them against the compression spring. This makes it easier to tension the compression nut correctly.

Tensioning the Compression Nut

15 Screw the compression nut firmly against the element assembly (**figure EC6**), using the correct spanner (Part No FM 0027).

16 Continue tightening the compression nut until the correct length of thread is exposed. Check by using the notch on the handle of the spanner (**figure EC7**).
Note: *This is essential for the correct installation of the assembly into the housing, the subsequent sealing and the filter unit's performance.*

Replacing the Element Assembly

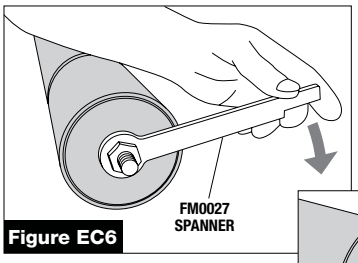


Figure EC6

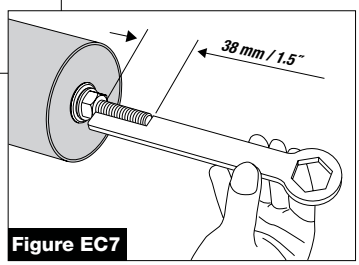


Figure EC7

17 Insert the element assembly into the housing, carefully locating the lid O-ring into the housing tube.
Note: *Take care not to dislodge the O-ring when assembling.*

18 Tighten the tee handle until the lid gasket seats against the end of the housing, then tighten a further ½ turn (180°).

9.0 General Maintenance

General maintenance tasks as follows:-

1. Structural

a. Check all installation bolts are firm and correctly tensioned.

b. Check for any cracks in mounting system or supporting structures.

2. Filtration System

a. Pressure gauge functional and in good condition.

b. Check all hydraulic hoses for:-

i. Leaks

ii. Signs of rubbing

iii. Securely clamped

c. Check housing mounting clamps all correctly tensioned

d. Check dust caps fitted to:-

i. Live Sample Valve

ii. Return Line Pressure Test Point

10.0 Contact Details

Distributor

Queensland
Filter Technology Queensland
Shed D 10 Prospect Street Mackay QLD 4740

Postal
PO Box 547 Mackay Qld 4740

Ph: 07 4955 2230 Fax: 07 4955 3673
Toll Free:1800 623 719 (24/7)

Sales And Support

Dave Pullen
Tel: 0429 462 863
Email: sales@filtertechnologyqld.com.au

Manufacturing Facility

Filter Technology Australia
44 Bonville Avenue, Thornton NSW 2322

Postal:
PO Box 101 Beresfield NSW 2322

Tel: +61 2 4966 1833
Fax: +61 2 4966 1933
Toll Free Australia: 1800 626 899
Email: info@filtertechnology.com.au

www.filtertechnology.com.au

11.0 System Installation Check Sheet

Machine Details

Make / Model:		Model:	
Unit No:		Serial No:	

FTA Filter System Details

Installed by

Name :	
Company :	
Date :	

Installation Checks

1.0 System securely mounted in position, all bolts tight etc. Yes / No

2.0 Oil Supply taken from:

Hose diameter and length =

3.0 Oil Return connected into:

Hose diameter and length =

4.0 All hoses securely mounted at regular intervals to prevent damage and/or rubbing. Yes / No

5.0 Commissioning

5.1 Following commissioning process as per section 8.0 or 9.0 of this manual.

5.2 Check and record RLP in table below and calculate FHP and record.

Pressure	Description	Bar	PSI
RLP	Return Line Pressure	+	+
ΔP	Pressure Drop Across Filters	3.0	43.5
FHP	Pressure to Set Filter Housings At =		

6.0 Calculate Element Change Pressure

	Bar	PSI
6.1 Element Change Pressure = FHP + 1.5 Bar (22 psi) =		

12.0 Notes

CAT 789 Onboard Filtration Unit Trial

May 2017

Summary

Recently we setup a trial filtration unit on the rear diff of CAT 789.

This unit consists of a stand-alone pump that draws oil from the diff housing, pumps the oil through the six filters, and deposits it back into the diff.

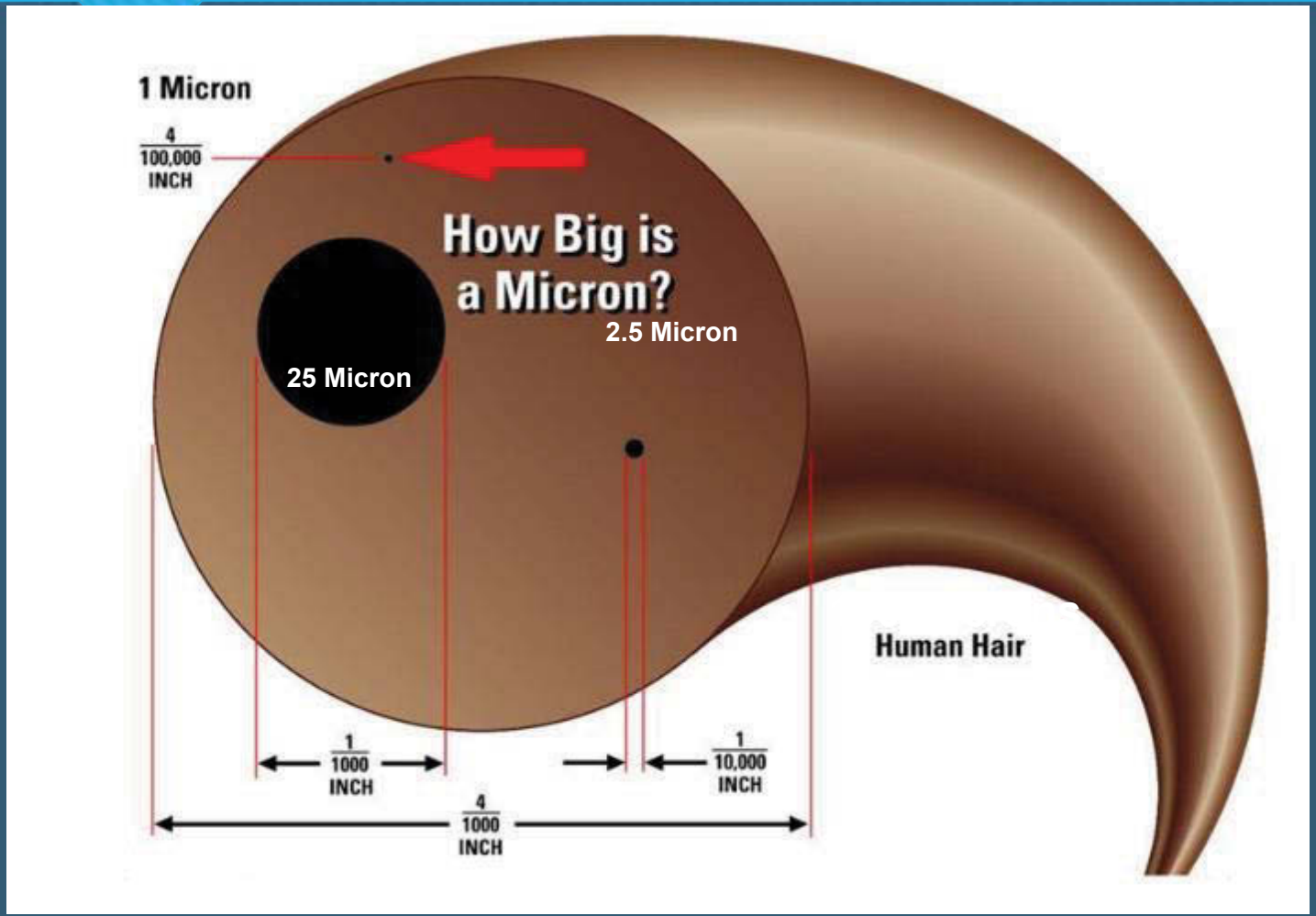
This pump continuously forces 4.5 litres per minute through the filters, so at a total compartment capacity of 417 litres, it is cycling the oil every 92 minutes.

In one continuous 12hr shift, it will cycle the diff oil over 7 times!

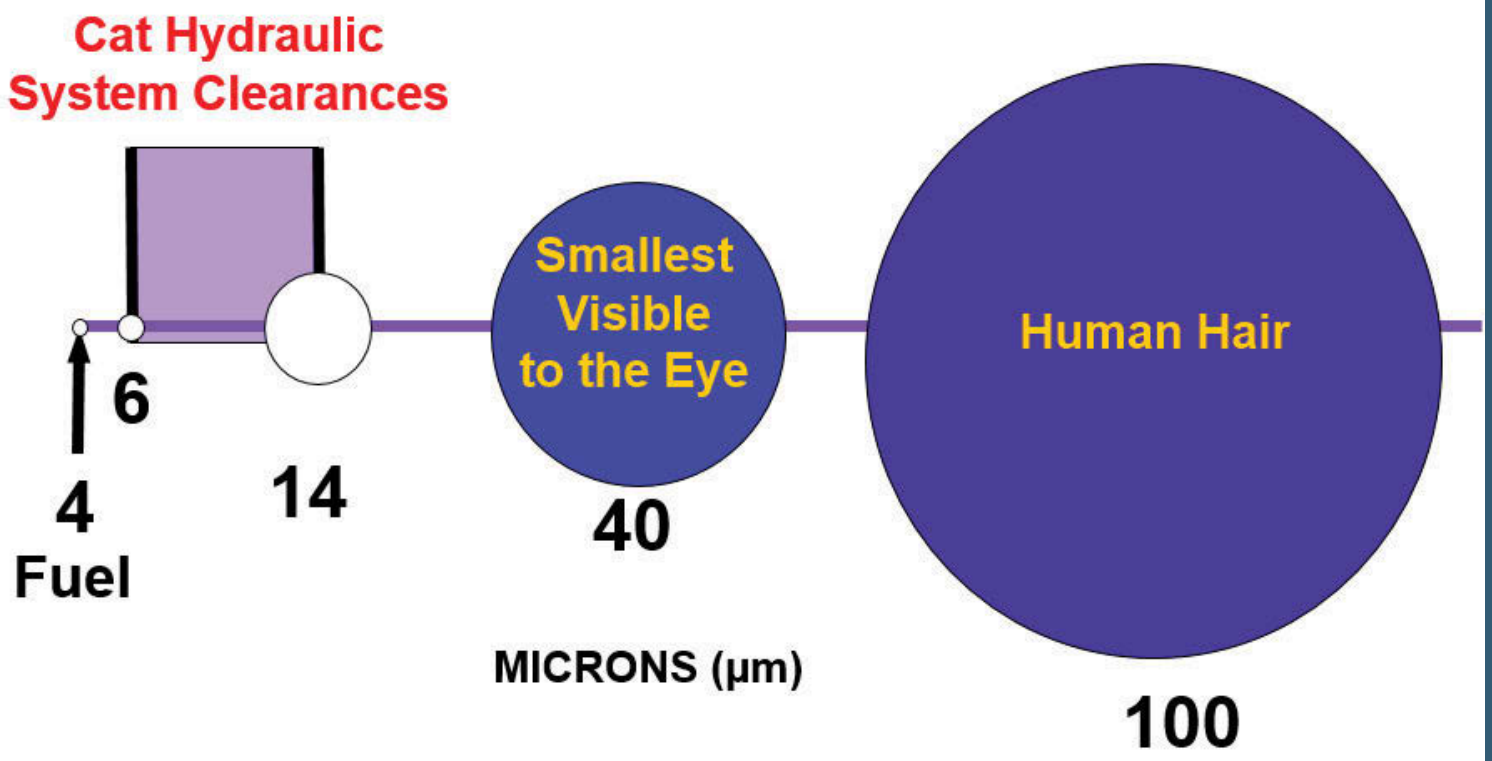
Since installing the filtration unit, the contaminant levels have dramatically decreased on the 4, 6, and 14 micron particles, as is shown below:

	4 Micron	6 Micron	14 Micron
30/03/2017	112521	55550	65
30/04/2017	1253	151	11
% Reduction	**98.89%**	**99.73%**	**83.08%**

Micron Size Explained



Small Particle Contamination



Particles You Can't See Are Harmful!

Contamination Example

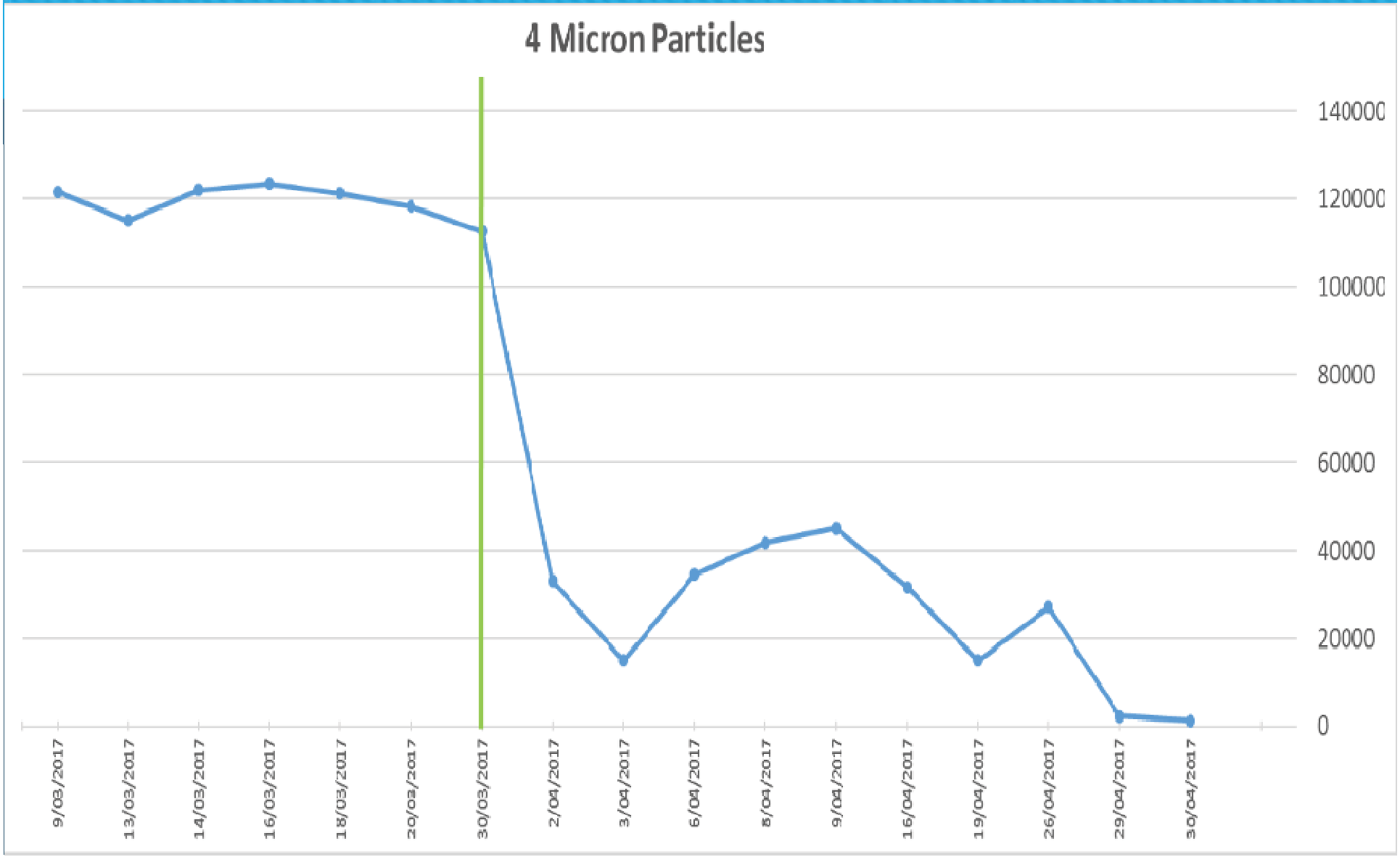
FILTER TECHNOLOGY

How much difference will cleaning oil from ISO 21/18 to 18/15 or 16/13 really make?

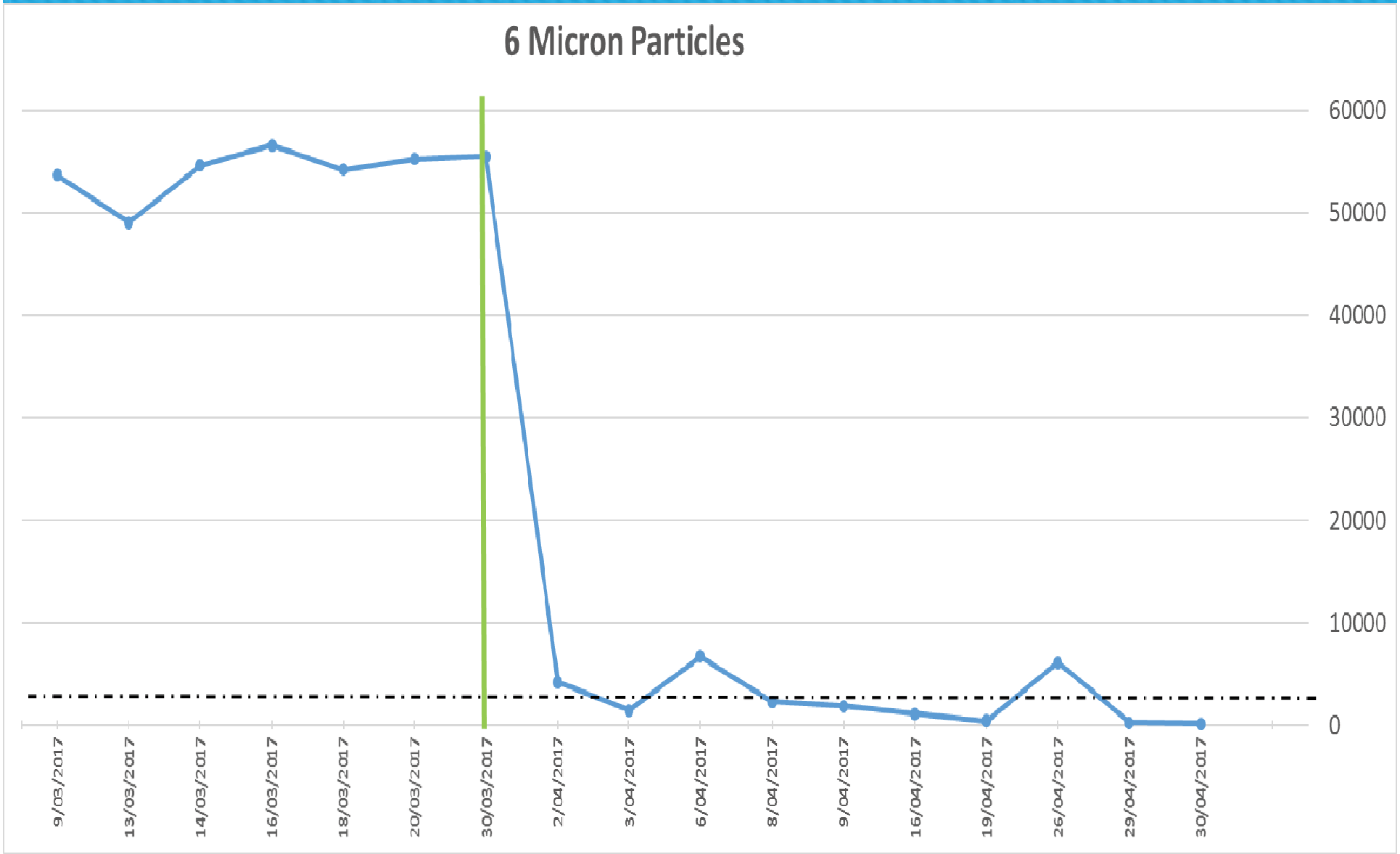
Example: 121 L/min pump working 8 hours/day for 200 days

Amount of "Dirt" in Oil	Amount of "Dirt" Flowing Through Pump in One Year
ISO 21/18	286 kg/yr
ISO 18/15	36 kg/yr
ISO 16/13	9 kg/yr

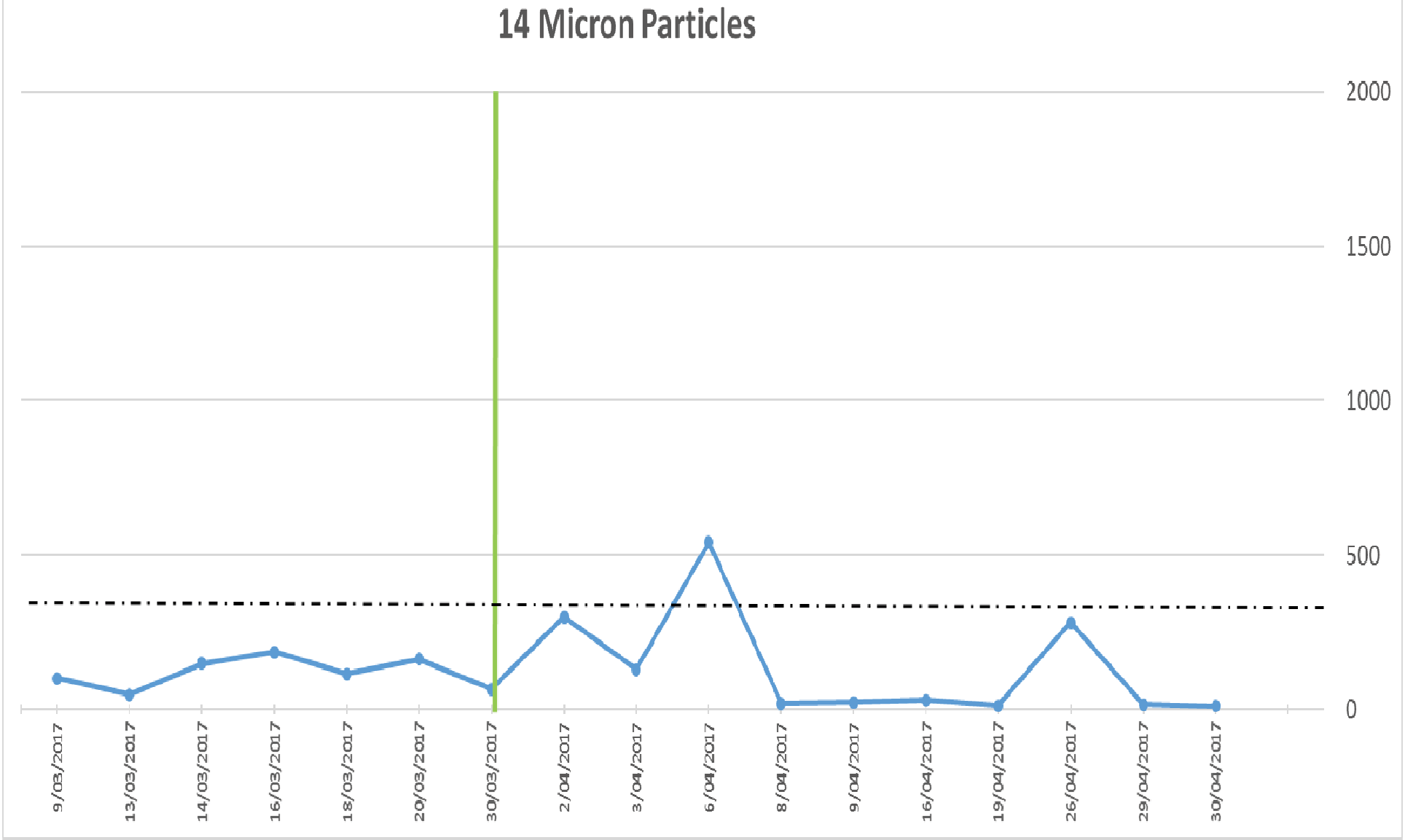
4 Micron (PPM)


4 Micron Particles
140000
120000
100000
80000
60000
40000
20000
0
9/03/2017
13/03/2017
14/03/2017
16/03/2017
18/03/2017
20/03/2017
30/03/2017
2/04/2017
3/04/2017
6/04/2017
8/04/2017
9/04/2017
16/04/2017
19/04/2017
26/04/2017
29/04/2017
30/04/2017

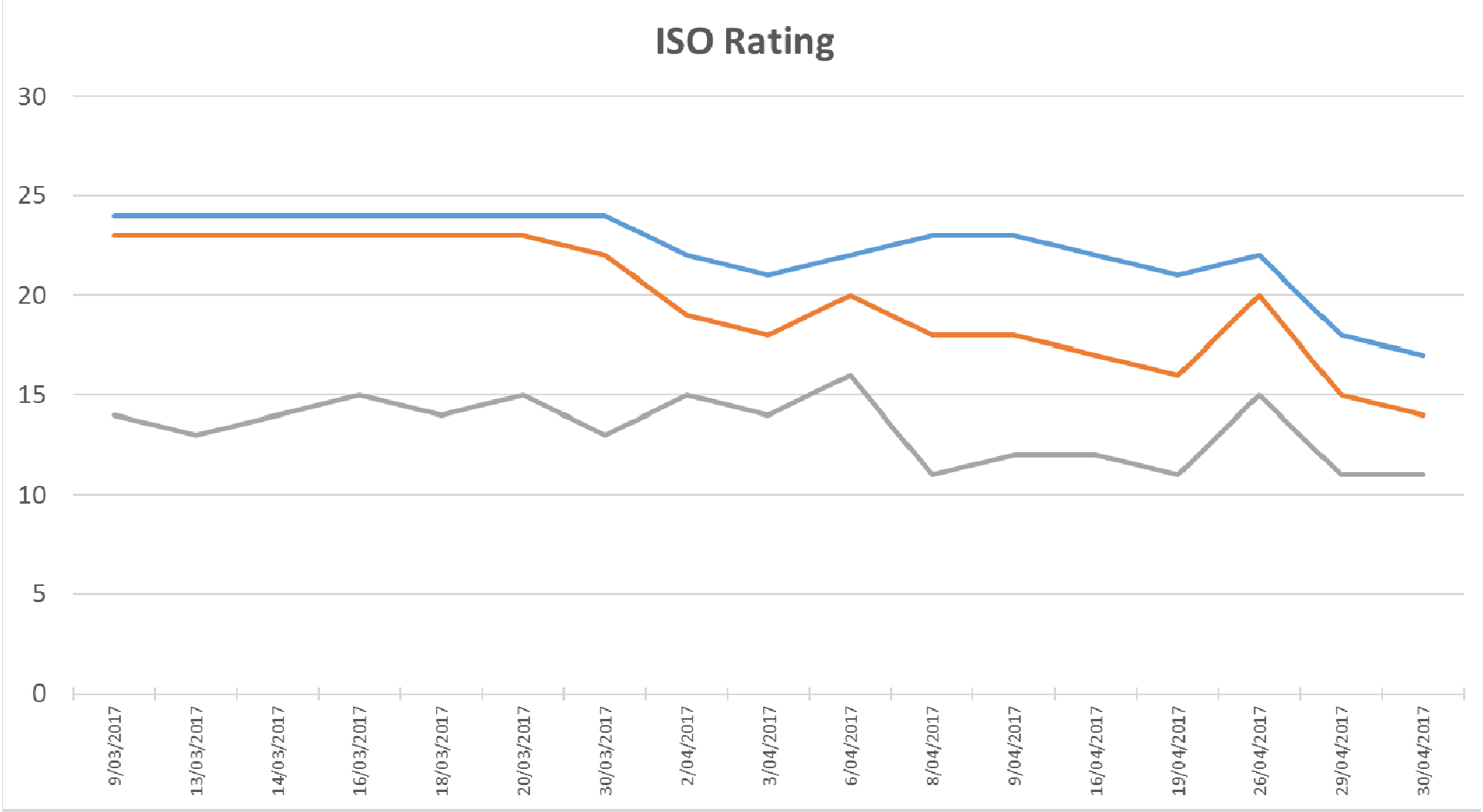
6 Micron (PPM)


6 Micron Particles
60000
50000
40000
30000
20000
10000
0
9/03/2017
13/03/2017
14/03/2017
16/03/2017
18/03/2017
20/03/2017
30/03/2017
2/04/2017
3/04/2017
6/04/2017
8/04/2017
9/04/2017
16/04/2017
19/04/2017
26/04/2017
29/04/2017
30/04/2017

14 Micron (PPM)

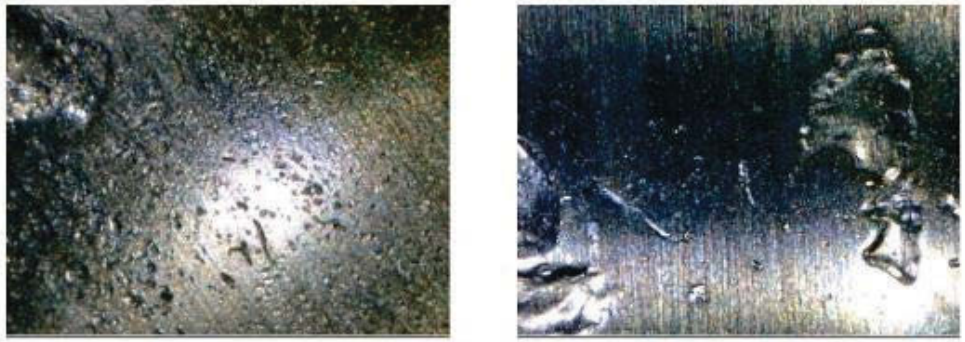


CAT 789 - ISO Rating Trend

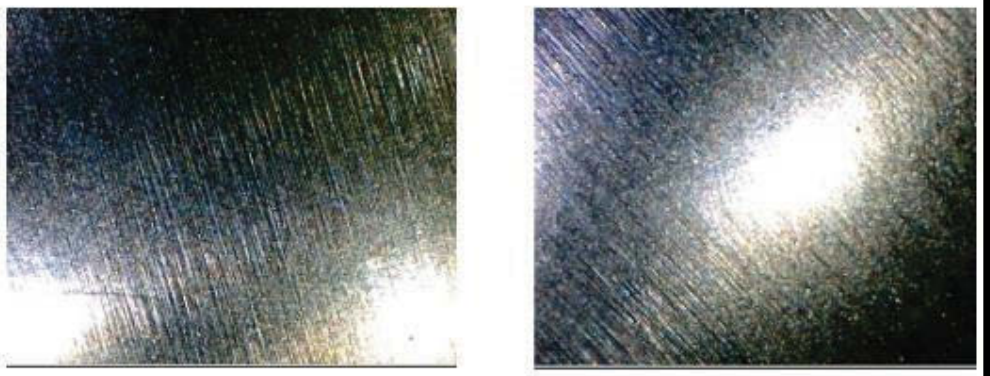


Bearing Damage – 793C Example

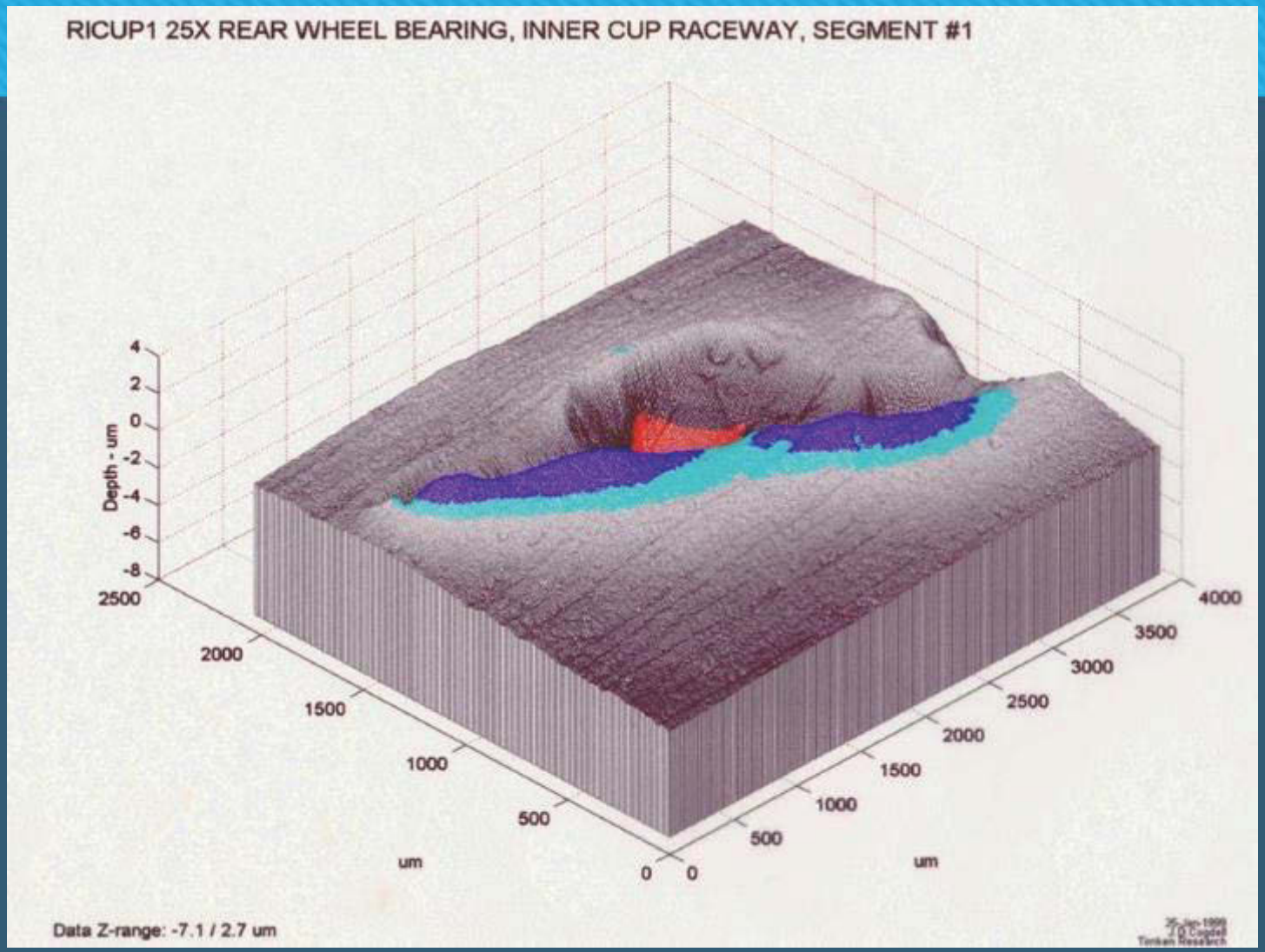
793C Final Drive Wheel Bearings @ 13,000 SMU
1200 Hour Oil Change Intervals "No Kidney Looping"



793C Final Drive Wheel Bearings @ 18,000 SMU
4000 Hour Oil Change Intervals "With Kidney Looping"



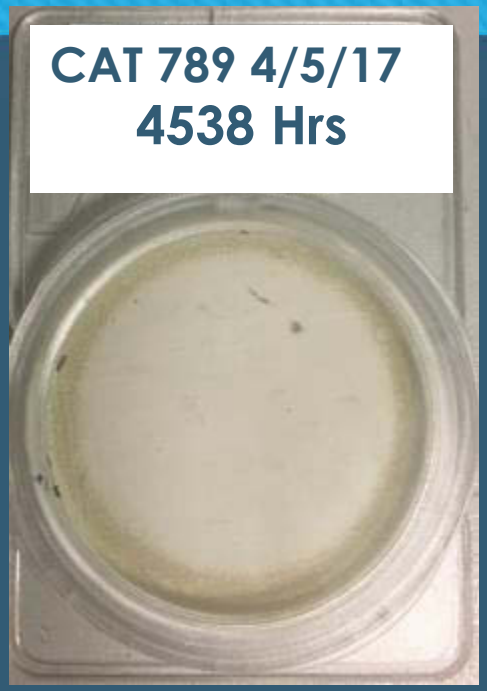
Bearing Damage – Timken Research

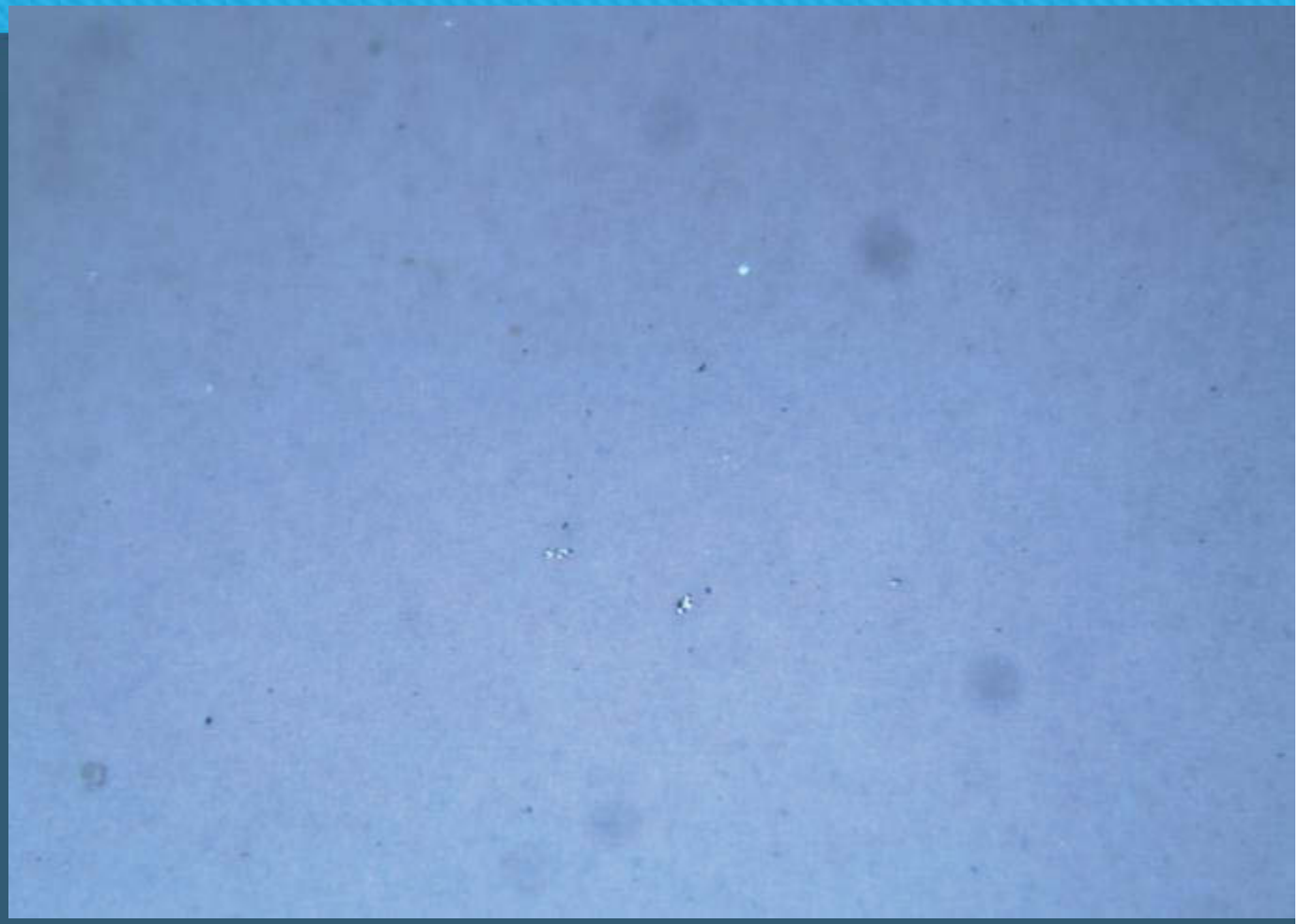


CAT 789 without FM40326 Patch Test – 4th May 2017

ISO – 24/18

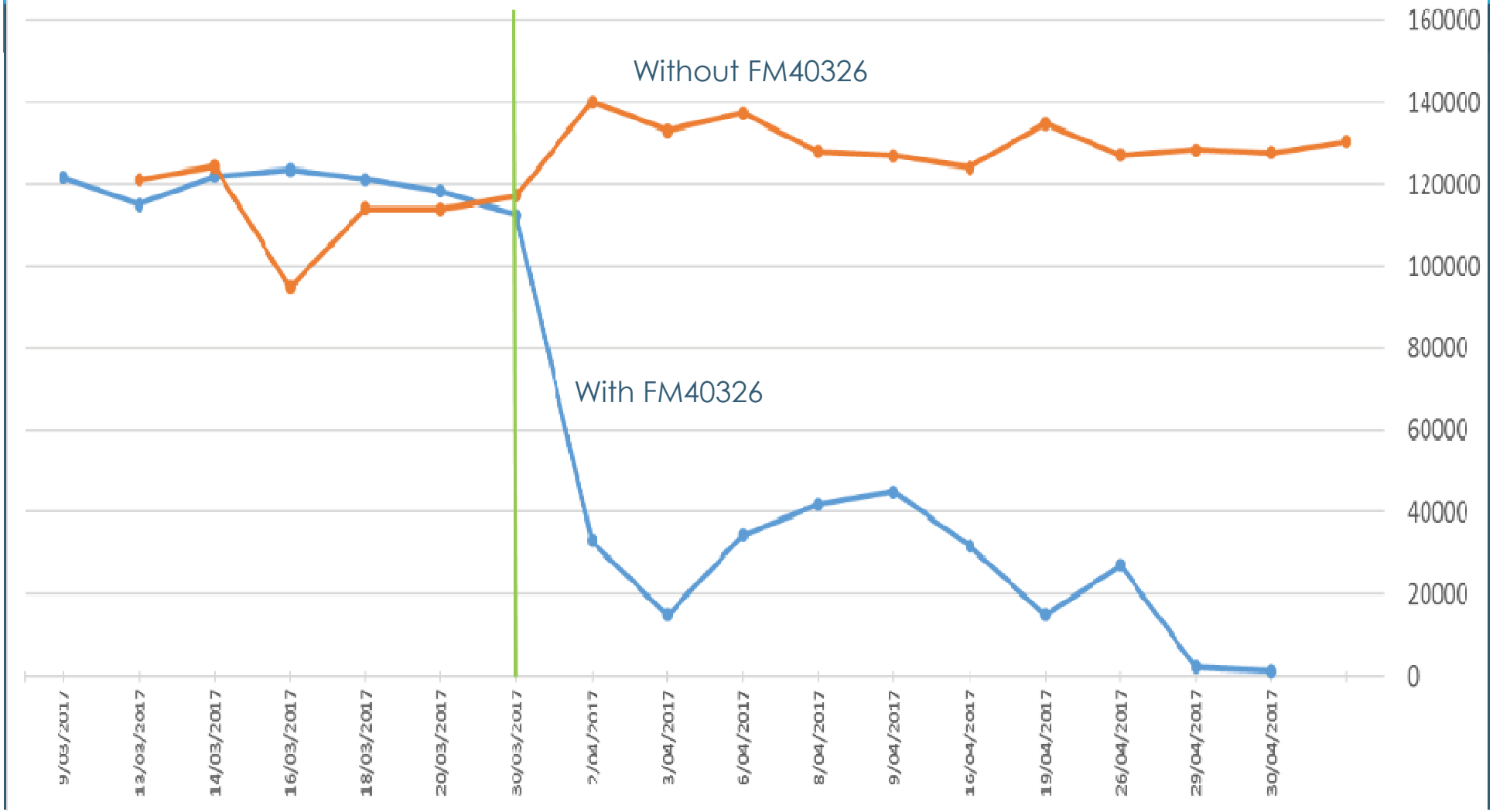
CAT 789 with FM40326 Patch Test – 4th May 2017



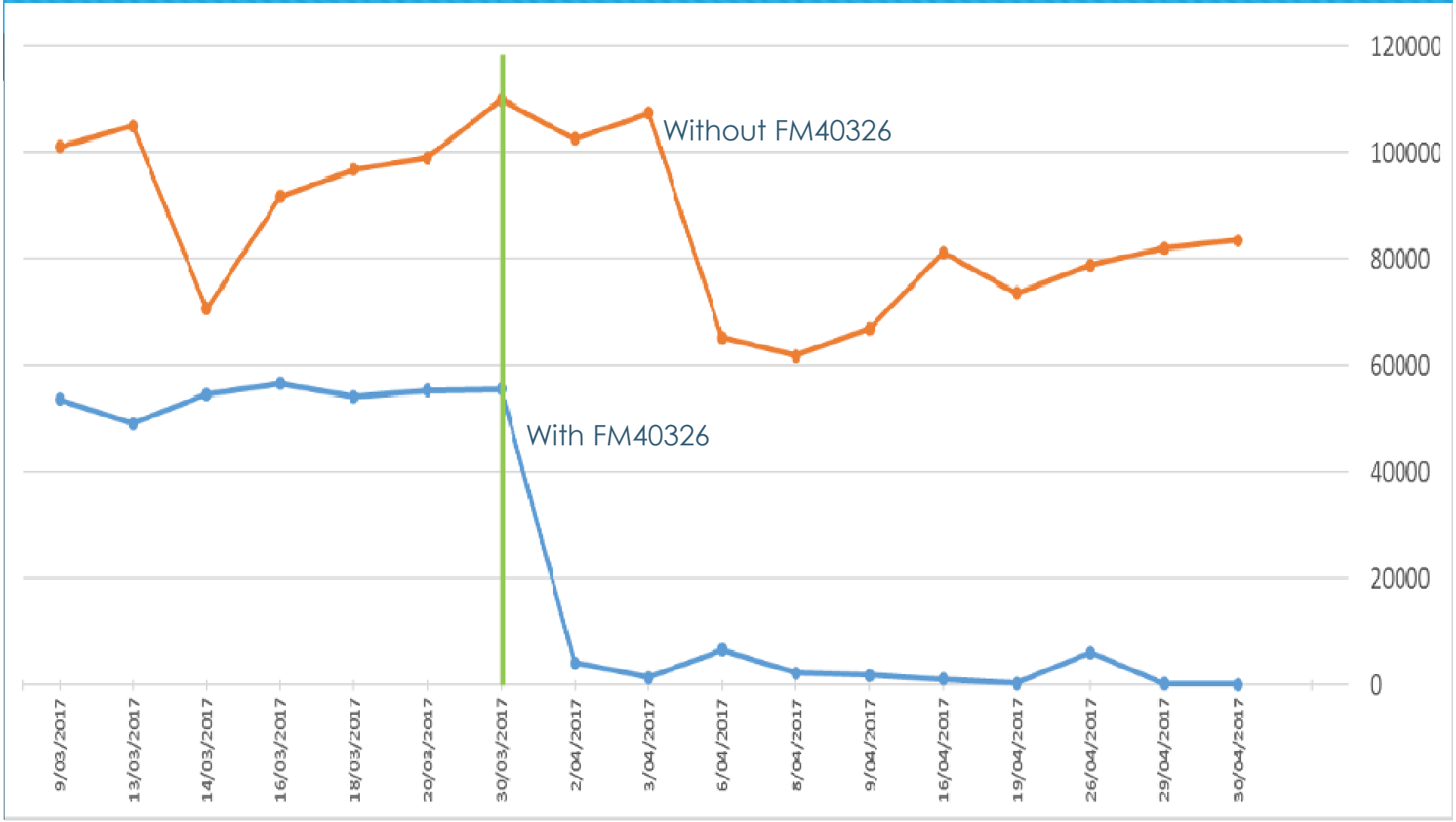


ISO – 14/11

CAT 789 fitted with FM40326 VS CAT 789 without FM40326– 4 Micron



CAT 789 fitted with FM40326 VS CAT 789 without FM40326– 6 Micron



Cleanliness is Vital

It takes very little to contaminate a sample:

- Leaving a lid facing up on the trolley whilst taking a sample
- Having the sample gun out of its bag when not in use
- Having the sample tubes out of their bag when not in use

FM5 Series Mobile Filtration Buggy

The FM5 Series of filtration units are designed to suit small to medium size compartments, up to approximately 1000L, across a wide range of fluids, from diesel and light hydraulic oils right up to high viscosity heavy gear oils at 1500 cst.

Designed to be well balanced and highly maneuverable for use in tight access, fixed plant and other applications, the FM5 series are easy to operate and maintain.

Custom built to suit the application, these units provide highly effective solutions to oil and fuel contamination problems. The introduction of improved oil cleanliness standards provides the opportunity to extend oil drain intervals, reduce maintenance tasks and generally reduce unit operating costs.

1000 cst oil in a rotary kiln trunnion drive in a cement manufacturing plant.
Oil cleanliness improved from ISO 22/21 to ISO 17/16, a 97% reduction in contaminants.

FM5 Series Mobile Filtration Buggy

FM50431

* 3 x Systems sold for filtration of conveyor drive gear boxes and hydraulics at a large coal export terminal.
* Configured to suit each application :-
* ISO 46 @ 14 L/min
* ISO 220 @ 6 L/min
* ISO 320 @ 6 L/min

Ease of handling to move the system in conjested environments.

FM50451

* 7 x systems sold for filtration of fixed plant gear boxes in two large CHPP's in a large coal mine.
* Variable drive motor control to manage housing pressure.
* Stainless chassis for corrosive environment
* ISO 150 x 1 off
* ISO 220 x 2 off
* ISO 320 x 2 off
* ISO 460 x 2 off

FM5 Series Mobile Filtration Buggy standard features:

* FM4 Filter Housings
* Remove contamination down to 2 Micron
* Fitted with pressure relief valve
* Suction strainer
* Pressure gauge
* Hour run meter
* Element change light
* Pressure differential switch
* 3.5m Suction and Return hoses
* Flat face, quick release couplings on hoses
* Capable of being adapted for most recycling needs
* Mobile and portable
* Easily maneuverable on a well balanced, heavy-duty trolley
* Silicon filled tyres, no puctures
* Operation manual

Optional features:

* Custom speced to suit application
* D.O.L. isolation switch
* 24V Control Electrical Package
* Single or three Phase Power
* Heater Package; 2500 Watt 15 A
* Variable Drive Pressure Control
* Particle Counter
* Air Drive
* Dust cover available

Shipping Crate Dimensions - Subject to Final Specification		
	Metric	**US**
Height	1600 mm	63 "
Length	780 mm	31 "
Width	850 mm	33.5 "
Weight	250Kg	551 lbs

Criteria to consider when specifying a Filter Technology Filtration System:

* Application - Fixed or Portable System
* Oil Type and Grade
* Compartment Capacity
* Temperature Of Oil At Time Of Filtration
* Timeframe Allowed For Filtration
* Access To Compartment

All of the above considerations are critical in determining the most cost effective solution to your filtration needs.

To find out more about the most effective Filter Technology system to meet your needs, contact your nearest dealer as listed on the back page.

Komatsu 630E wheel motor - kidney filter cart results

Kidney filter cart with heater designed to suit 680 grade oil for GE wheel motors

Manifold close to tub access door with suction line from bottom of wheel motor and return line back to top for ideal circulation

FILTER TECHNOLOGY
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Filtration and Contamination Control Specialists

FM50462-HD Heavy Duty Filtration Buggy

Pressure driven variable drive with heater

Features:

- Pressure driven variable drive
- Heated
- Fitted with pressure relief valve
- Pressure gauge.
- Hour run meter
- Element change light
- Pressure differential switch
- Emergency stop button
- Seven metres of hosing (3.5 m suction and 3.5 m return hoses)
- 3/4” quick release couplings
- Two wheeled, heavy duty trolley
- Mobile and portable
- Silicon filled tyres

Filters:

- 4 x FM3204 Industrial filter units
- Heated

Suitable for all:

- Gear oils
- Hydraulic oils

Option:

- On-board particle counter can be fitted on request.

FM50462 Dimensions		
	Metric	US
Height	1390 mm	54.7″
Width	750 mm	29.5″
Depth	670 mm	26.3″
Weight	174 kg	384lb
Max Pressure	5 bar	72 psi
Recommended operating pressure	3 bar	43 psi

Function

Oil Applications:

FTA Buggies are typically used for small hydraulic reservoirs on gearboxes, final drives, blow and injection moulder or wherever hydraulic oils are used. Their kidney loop system and quick release couplings allow easy movement between machines in industrial sites allowing machinery to be filtered while the machine is still in service. They can also be used to filter new oil from the drum into the machine.

Filter Technology Qld
DGKP INVESTMENTS PTY LTD T/A

Shed D, 10 Prospect Street, Mackay QLD 4740
Postal: PO Box 547, Mackay QLD 4740
Ph: (07) 4837 1271
Mob: 0409 061 950

Email: workshop@filtertechnologyqld.com.au
Web: www.filtertechnologyqld.com.au

FILTER TECHNOLOGY
cleaner fluids mean better business

Filtration and Contamination Control Specialists

The FM6 Series of filtration units are designed for filtration of small to medium size compartments, up to approximately 1000L, across a wide range of oils up to 1500 cst.

Largely based on the successful FM5 Series, these units also include the following features :-

* Hose reels to carry and safely store longer hoses
* Able to provide higher flow rates through provision of more filter element housings

FM60442 filtering wheel motor oil on a Komatsu 830E

Typical filtration connection points on a Komatsu 830E wheel motor oil reservoir

FM60842 filtering hydraulic oil on a Komatsu 830E

Lab results for the above pictured RH wheel motor samples indicated the following results :-

Contaminant	"Before" (ppm)	"After" (ppm)	Improve-ment
Iron	386	15	96%
Copper	20	8	60%
Silicon	128	12	42%
PQ	358	<10	97.2%

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Web: www.filtertechnologyqld.com.au

FILTER TECHNOLOGY
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Filtration and Contamination Control Specialists

FM604

* 4 x FM4 Filter Housings
* Specifically suited to GE 788 wheel motors or similar
* 6 L/min @ 40°C on ISO 680 oil
* 2500W heater
* Hose reels fitted with 8.0m hoses

FM606

* 6 x FM4 Filter Housings
* Speced to suit transmission oils
* 16L/min @ 40°C on SAE 50 oil
* 2500W heater
* Hose reels fitted with 8.0m hoses

FM608

* 8 x FM4 Filter Housings
* Speced to suit hydraulic system reservoirs
* 40L/min @ 40°C on ISO 68 oil
* 2500W heater
* Hose reels fitted with 8.0m hoses

Filter Technology Qld
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Web: www.filtertechnologyqld.com.au

FILTER TECHNOLOGY cleaner fluids mean better business

Filtration and Contamination Control Specialists

FM6 Series Mobile Filtration Buggy standard features:

* FM4 Filter Housings
* Remove contamination down to 2 Micron
* Fitted with pressure relief valve
* Suction strainer
* Pressure gauge
* Hour run meter
* Element change light
* Pressure differential switch
* Suction and Return hose reels
* 8.0m hoses on hose reels
* Flat face, quick release couplings on hoses
* Capable of being adapted for most recycling needs
* Mobile and easily maneuverable on a three wheeled, heavy-duty chassis, fitted with park brake
* Powder coat finish, toolbox to hold loose fittings
* Drip tray with drain plug
* Operation manual

Optional features:

* Custom speced to suit application
* D.O.L. isolation switch
* 24V Control Electrical Package
* Single or three Phase Power
* Heater Package; 2500 Watt 15 A
* Variable Drive Pressure Control
* Particle Counter
* Air Drive
* Dust cover available

Shipping Crate Dimensions - Subject to Final Specification		
	Metric	**US**
Height	1600 mm	63 "
Length	1850 mm	73 "
Width	900 mm	35.5 "
Weight	Kg	lbs

Criteria to consider when specifying a Filter Technology Filtration System:

* Application - Fixed or Mobile System
* Oil Type and Grade
* Compartment Capacity
* Temperature Of Oil At Time Of Filtration
* Timeframe Allowed For Filtration
* Access To Compartment

All of the above considerations are critical in determining the most cost effective solution to your filtration needs.

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616
JLG


616

MM 24.08.2015

FM60663

FILTER TECHNOLOGY
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Filtration and Contamination Control Specialists

FM7 Series Electrical Drive Filtration Units

FM71033 Wheel Motor Filtration Unit

General Description

Ever increasing payload capacity in off-highway haul trucks has lead to planetary gear reduction drive systems employing larger volumes of high viscosity oils. With the oil volume held in the gear compartment, as opposed to a separate tank or sump on earlier or smaller trucks, it is very difficult to circulate the oil at an effective flow rate.

The highly congested gear case restricts effective circulation of the oil and the large sections of gearing act as considerable “heat sinks” thereby all but cooling the oil faster than it can be heated during the filtering process.

As a result Filter Technology has found that it is critical to evacuate the oil into a holding tank where the oil can be heated and filtered at effective flow rates. This ensures that all of the oil passes through the elements rather than missing “dead zones” of oil at the back of the compartment.

System Process

3 step process initiated via operation of touch screen control panel as follows:-

Evacuation Mode – Compartment oils are evacuated into respective holding tanks in preparation for filtration

Recirculate Oil Mode – Filtration process is fully automated to filter first one tank and then the other tank.

Return Mode – Oils are then returned to respective compartments.

Shipping Dimensions		
	Metric	US
Height	1600 mm	63″
Length	2550 mm	101″
Width	1650 mm	65″
Weight	820 kg	1808 lb
Maximum Pressure	5 bar	75 psi
Rec. Operating Pressure	3 bar	45 psi
Rec. Maximum Flow (@ 60°C on ISO 680 oil)	20 L/min	5.3 gal/min

Filter Technology Qld
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Postal: PO Box 547, Mackay QLD 4740
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Mob: 0409 061 950

Email: workshop@filtertechnologyqld.com.au
Web: www.filtertechnologyqld.com.au

FILTER TECHNOLOGY
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Filtration and Contamination Control Specialists

FM7 Series Mechanical Drive Filtration Units

FM71042 Tote Bulk Oil Filtration Unit

General Description

- Built to filter various mineral and synthetic oils either as a kidney loop unit or to filter 1000L/250G oil pods and be a delivery unit.
- 400 volt pressure driven variable drive motor coupled to 5 gal/20 LPM pump.
- 5000 watt heater is built in underneath the filter pack with a temperature controller automatically controlling the temperature of the oil at 70°C/160°F while in use.
- 10 x FM3204 filter housings.
- Light to indicate the elements are blocked.
- Suction hose and return hose reels have 8 metres/ 24 feet of 1″ hose on them, both hoses have quick release couplings with matching couplings on the machine to keep them free of contaminates when not in use.
- An electronically controlled three way tap on the suction side on the pump and on the return of the filtration unit allows easy changeover from pod to hose reel and is controlled by a switch on the electrical box.
- Heavy duty frame with drip tray with solid rubber wheels which make moving easy.
- Fork tines are built into the frame.
- 24 volt control electrical control circuit.
- Lockable isolation switch and emergency stop built in.
- Service platform built into the bulk head for ease of access to the filtration pack.

Shipping Dimensions		
	Metric	US
Height	1600 mm	63″
Length	2550 mm	101″
Width	1650 mm	65″
Weight	820 kg	1808 lb
Maximum Pressure	5 bar	75 psi
Rec. Operating Pressure	3.9 bar	58 psi
Rec. Maximum Flow (@ 60°C on ISO 680 oil)	20 L/min	5.3 gal/min

Filter Technology Qld
DGKP INVESTMENTS PTY LTD T/A

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Email: workshop@filtertechnologyqld.com.au
Web: www.filtertechnologyqld.com.au

FILTER TECHNOLOGY
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Filtration and Contamination Control Specialists

FM7 Series Mechanical Drive Filtration Units

FM71012 Mechanical Drive Filtration Unit

General Description

Designed specifically for use on mechanical drive trucks, the FM71012 is equipped with three hose reels for connection to the compartments via quick-connect couplings.

Oil is drawn from the differential drain port via the suction hose reel and pumped the filter housings. The oil is then returned simultaneously through both return hose reels to the final drives.

Due to the high viscosity of lubricants typically used in these drive systems, it is essential to start the filtration process while the compartment is still quite warm after leaving service.

A heater is incorporated into the system to maintain the oil at the required temperature throughout the filtration process.

System Process

1. Connect the suction and return hoses to the relative ports.
2. Connect to power and commence filtration process.

Filtration Time - For a typical 240 ton class differential and final drive compartment off 900 – 1000 L, using SAE 60W oil held at approx. 60°C, allow 9.0 – 11.0 filtration time.

Shipping Crate Dimensions		
	Metric	US
Height	1600 mm	63˝
Length	1900 mm	75˝
Width	1450 mm	57˝
Weight	670 kg	1474 lb
Maximum Pressure	5 bar	75 psi
Rec. Operating Pressure	3 bar	45 psi
Rec. Maximum Flow (@ 60°C on SAE 60W oil)	32 L/min	8.5 gal/min

FM7 Series Mechanical Drive Filtration Units

FM71022 Mechanical Drive Filtration Unit

General Description

Designed specifically for use on mechanical drive trucks, the FM71022 is designed to provide ultimate flexibility and return on investment. The system is configured to provide a choice of four operation modes:-

1. **Kidney loop filtration of oil whilst still in compartment**. The compartment needs to still be warm to assist in keeping oil at the required temperature and viscosity during filtration.
2. **Evacuation and kidney loop filtration of oil in on-board holding tank**. Particularly useful where the compartment has been allowed to cool. Also provides assurance that 99% of all oil is removed and subject to filtration process.
3. **Evacuation, kidney loop filtration and recirculation**. This mode creates a flushing and cycling process, passing oil through the filter system, back to the compartments and returning back to the filters. This process assists in removing any residual contaminants which did not leave the compartment at the initial evacuation.
4. **Filtration of new oil stock prior to use**. Ensures new oil stock meets OEM cleanliness requirements prior to use.

Filtration time - For a typical 240 ton class diff and final drive compartment off 900 – 1000 L, using SAE 60W oil held at approx. 60°C, allow 9.0 – 11.0 filtration time. Can be manufactured to suit larger trucks.A heater is incorporated into the system to maintain the oil at the required temperature throughout the filtration process.

Shipping Crate Dimensions		
	Metric	US
Height	1600 mm	63˝
Length *(subject to final spec.)*	3400 mm	134˝
Width *(subject to final spec.)*	1450 mm	57˝
Weight *(subject to final spec.)*	1000 kg	2200 lb
Maximum Pressure	5 bar	75 psi
Rec. Operating Pressure	3 bar	45 psi
Rec. Maximum Flow (@ 60°C on SAE 60W oil)	32 L/min	8.5 gal/min

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ELEMENT SERVICE KIT

Includes:

- FM2100 Elements
- Seals to complete a full service
- Element Change Procedure
- Kit allows for 1 complete service

NB: Picture is only a representation of what is in an Element Service Kit.
Quantities of the contents and sizes vary according to the Filtration Unit that it suits.

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QUICK CHANGE EXCHANGE

Includes:

- This is a 'One Of Purchase' and the Quick Change Frame, PVC Tubes and Quick Change Assemblies remain the property of the purchaser.
- The Quick Change Exchange system ensures efficient servicing (user friendly), reduces change out time of service, assists in eliminating spillage/contamination and is environmentally friendly.
- The Service Exchange System is returned to Filter Technology Queensland by your nominated transport when you have completed a service of your filtration unit. This System is serviced by Filter Technology Queensland and then returned to site ready for your next service.
- Each Quick Change Service System is manufactured to suit your filtration system for 1 complete service.

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Filter Technology Qld

DGKP INVESTMENTS PTY LTD T/A

Qld Dealer and Distributor Filter Technology Australia products.

QUICK CHANGE SERVICE INFORMATION

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QUICK CHANGE SERVICE

Filter Technology Queensland highly recommend the use of our **Quick Change Service Kit** and **Quick Change Service Frame** to make servicing easier, reduce change out time of filters and aid in eliminating spillage and contamination and is environmentally friendly.

QUICK CHANGE SERVICE KIT

This is a one off purchase of the Quick Change Service Kit which has the correct number of filters complete with seals, o rings and post seals required to service:

The Quick Change Service Kit includes a steel mounting frame/stand which holds 10 x PVC tubes that are sealed at each end with either a screw/push PVC cap.

Each PVC tube holds a stem of 4 new filters complete and ready for the filter unit which acts in the following way:

- Provide clean dry storage for the Filter Stems.
- When a service is due the Quick Change Filter Frame, with new filters, is located with the filter unit to the machine.
- At the service, the dirty filter stems are removed from the Final Drive Filter Unit and replaced with new clean filter stems and the dirty filter stems that have been removed are returned back into the PVC tubes in the frame.

On completion of the service/change out of filters you now have a frame of dirty filter stems in the PVC tubes.

The frame with the PVC tubes should now be returned to store and logged for a service/refurbish of filters. **Quick Change Service Frame** - i.e., Clean/Service/Refurbish.

QUICK CHANGE SERVICE FRAME

The frame complete with PVC tubes and dirty filters is then returned to Filter Technology Queensland for service, cleaning and refurbished with new filters, seals, o rings, post seals.

Filter Technology Qld will return the Quick Change Service frame to site/store/warehouse ready for the next service with the filter unit.

PART NO:	DESCRIPTION	
FM3952	**No 4 Ind Quick Change Service Kit**	**(One Off Purchase)**

Quick Change Service Frame Mackay (Exchange Service)

PART NO:	DESCRIPTION
FMF4QC	**Service No 4 Ind QC Frame**

The Quick Change can be abbreviated to QC and use **Service Frame** in the description.

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Quick Change Frame/PVC Tubes

Quick Change Assembly

Filters Oil

Industrial


LP32
EQUIPMENT
LP34


LP34


LP34


LIGHT VEHICLE
FILTRATION
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WARNING
CATERPILLAR


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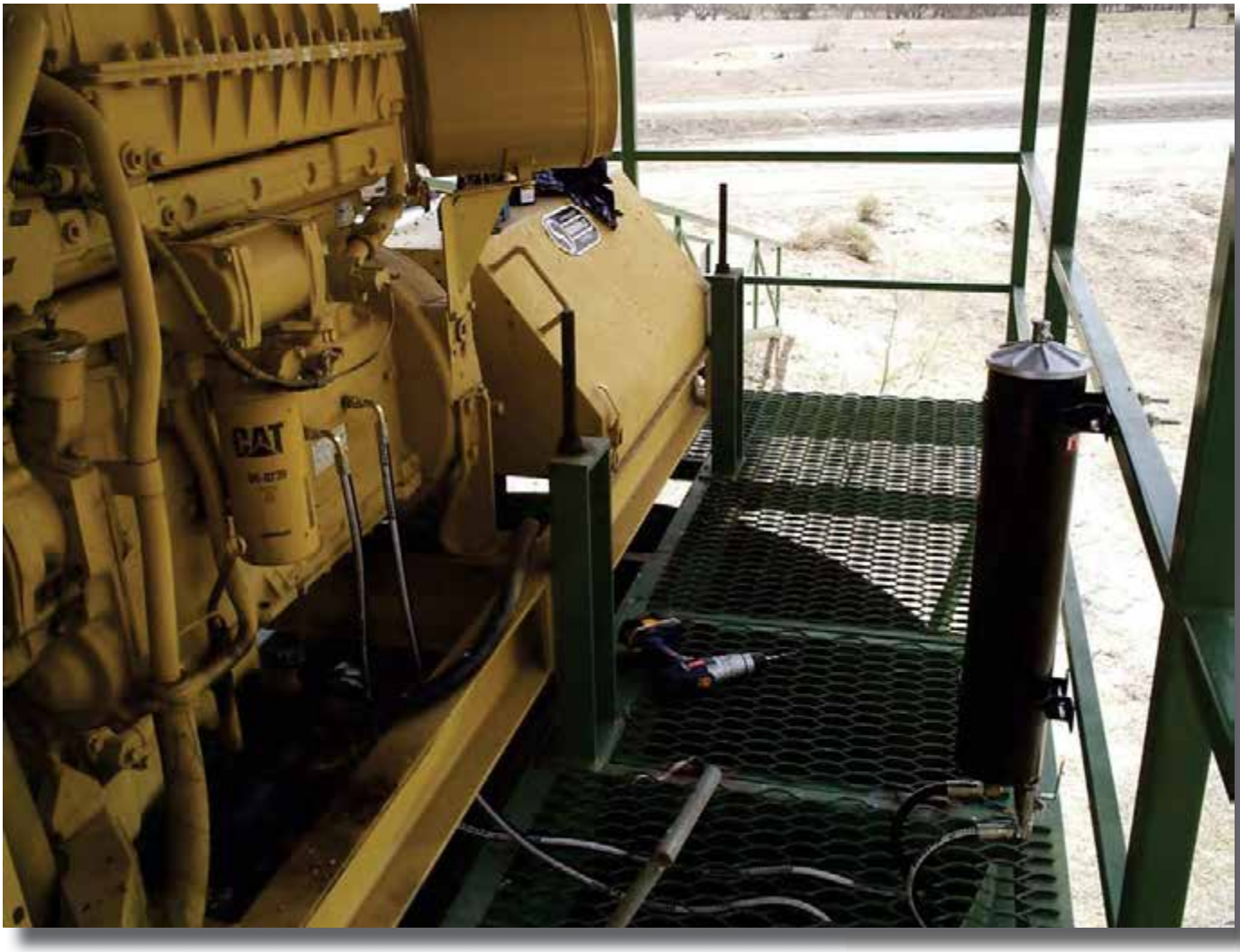
CAT


turbo II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HYD
VHP


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HOT
FINAL DRIVE
FILTRATION 830
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ENGINE OIL
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02/02/2008


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UNDER GROUND GRADER
29. 11. 2005


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EX12
HITACHI
HYD
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UNIT
EX5600
HITACHI EXCAVATOR


HYD
DR460
DRILL


FUEL
ENGINE OIL
CAT
29. 11. 2005


WA900


DANGER

FILTER TECHNOLOGY QUEENSLAND

Specialising in full flow and off-line filtration systems suitable for hydraulics, final drives, gear boxes, engines & fuel delivery systems.

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AGRICULTURE

TRANSPORT

MINING

QUARRY/EARTHMOVING

MARINE

AUTOMOTIVE

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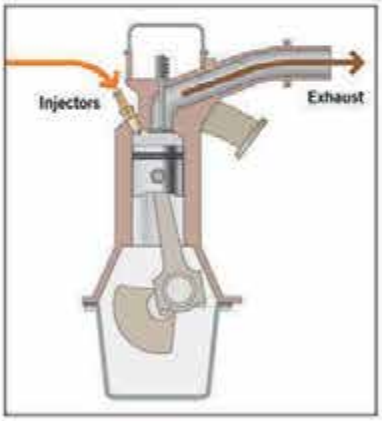
Filter Technology's range of unique fuel and oil filters are used in a wide variety of Industries such as mining, transport, agriculture, marine, construction and print media.

Diesel Engines



Diesel engines work in some of worlds' harshest environments, where oil and fuel cleanliness are critical to a machines' availability and longevity of engine components. The control of particulate contamination (soot) in engines is critical, because increased soot levels lead to higher oil temperature and viscosity.

For every ten degrees Celsius rise in the oil temperature above the recommended operating oil temperature, the oil life is halved. Normal filtration removes particle down to 10 microns.

Research has proven that to reduce engine wear to virtually zero, particles above 3 microns need to be removed. Filter Technology's bypass oil filters will remove most particles down to 2 microns. Removal of these Particles and Soot has seen oil life doubled, and engine life increased.

Fuel Injection Systems

Diesel injector systems of today have changed considerably in the past ten years. The new age of electronically controlled injectors deliver precise measured fuel at exactly the right time. In a life cycle of 10,000 hours, an injector will perform over half a billion cycles. Unless clean fuel is delivered to the injector, it will suffer accelerated wear.

Installing Filter Technology Australia fuel filters to your vehicle will remove most particulate contamination, maintain serviceability and reduce costly repairs to your injectors.

Emission Results - Diesel

Emission tests carried out at Parsons Australia Diesel testing facility in Sydney, Australia on an International Iveco Prime Mover powered by a Caterpillar C12 Euro 3 standard engine fitted with an FM3103 on fuel and an FM3003 on oil, returned a reduction of NOx (Nitric Oxide) by 15%, greenhouse gas CO_2 (Carbon Dioxide) by 4.9%, diesel particulates (PM) by 25.7% and CO (Carbon Monoxide) by 1.2%. Fuel economy increased by 4.9%.

Emission Result - Petrol

Tests conducted at Toyota Australia's testing facility at Altona, Melbourne on a petrol V6 Camry sedan fitted with an FM1000 filter on oil and fuel saw a reduction in CO (Carbon Monoxide) of 14.5% and NOx (Nitric Oxide) by 50.3%.

Automotive

The FM1000 range of automotive filters is suitable for all passenger cars and petrol 4WDs on oil and fuel. Research has proven clean oil and fuel can extend oil drain intervals, extend component life, improve fuel economy and lower emissions.

As diesel fuel quality affects the way in which our diesel light commercials and 4WDs perform, fitting our FM1000 fuel filters will give you the protection your injection system needs, improving performance, economy and emissions.

More Profit for your Bottom Line

Fuel Applications

Local Governments are conscious of the relationship of fuel quality and vehicle performance. Lake Macquarie Council installed two FM40443 fuel pump systems.

Fuel particulate contamination was reduced from 16/13 to 15/12, a 60% reduction. They have extended the life of their OEM filters from 3 to 12 months across their fleet and eliminated in-field breakdowns due to fuel related issues. They have also seen fuel economy increase by 2% across the fleet. The increased life of OEM fuel filters has seen a reduction of these entering landfill, all good news for the environment. Service life of the FM3104 elements is 4 months.

Lower Maintenance Costs

Hydraulic Applications

Injection moulding companies have found that dirty oil affects their machines' performance, availability and component life. They also have trouble restarting their machines once they had been stopped due to sticking servo valves. The ISO before installation was 19/15. A FM40345 bypass system, which filters 20% of the lube tank volume every hour, was installed. The ISO was reduced to 14/11, a 93% reduction. This has greatly increased the machines' availability. FTA elements are changed three times per year.

Reduce Waste Streams

Quarry/Construction Applications

Arguably one of the harshest environments for plant and machinery operation. Extreme pressures are placed on crusher lubrication systems. Hanson Wolfdene Qld operate seven crushers, all fitted with FM40345 systems.
Oil drains have been extended from 500 to 12,000 hours. FTA elements are changed on a three monthly basis. Oil analyses taken from site all indicate wear metals and silicon are at acceptable levels.

Reduce Emissions

Transport Applications

Frasers Coaches Dubbo were concerned with extending engine component and fuel injector life in their coaches. Fitting one FM3003 oil filter extended oil drains and OEM oil filter changes from 20,000km to 80,000km, with FTA oil elements being changed at 20,000km intervals.

Installing a FM40443 fuel system to the depots' fuel pump extended the OEM fuel filter life from 20,000km to 100,000km. FTA's fuel FM3104 elements are changed at six monthly intervals.

Increase Machine Availability

Mining Applications

Thiess at Mt Owen implemented a proactive approach to contamination control, including improved breathers on their bulk oil tanks and monitoring cleanliness of the oil being delivered to both the machine and the bulk storage facility on site. Thiess fitted all six of their diggers' hydraulic systems with FTA bypass systems.

As a result of the contamination control, all of the diggers hydraulics systems are running at ISO 16/13 or better, pump life has improved from 12,000 to 18,000 hours and cylinder ram life has gone from 5000 to 8000 hours, which relates to lower operating costs and improved availability of the machines.

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Key Benefits

6 Ways you'll benefit from using FTA Filtration Systems

1 Component Life

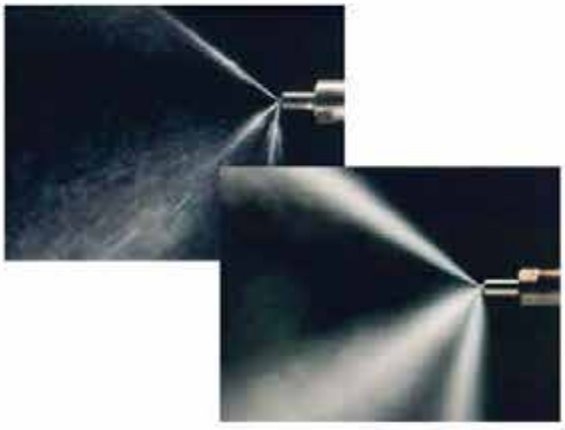
- Onboard filtration keeps oil consistently clean.
- Pre-filtering oil eliminates all contaminants being introduced to components at oil change
- Reduces accelerated wear through wear particle removal.
- Removal of particulates in diesel fuel down to 2 microns increases fuel pump and injector life.
- Engine, hydraulics and gear life extension with Filter Technology can be calculated using universally accepted "Component Life Extension Charts" such as those prepared by Noria Corporation.

2 Oil Life Extension

- With oil filtered continuously through our onboard filtration systems, oxidization by products and other sludge forming contaminants are captured and oil life is dramatically extended.
- Through our integrated fuel and oil filtration, moisture in fuel is reduced thereby reducing the creation of sulfuric acid and increasing oil life.
- With our bypass filtration collecting soot particles of 2 microns or greater, there is substantially reduced demand on the additives leading to extended additive life and oil life.
- By changing oils and fluids on condition as opposed to time, substantial savings can be made.

3 Fuel Injector Life

- Removing particles down to 2 microns, our filter systems ensure fuel delivered to the injection system exceeds cleanliness levels required by today's modern engines.
- From refinery to truck to final dispensing point, most fuels have been contaminated considerably to levels which reduce injector life, a problem easily remedied by incorporating Filter Technology's depth filtration.
- Our filtration systems trap water molecules, preventing them from damaging expensive injector components.
- Bacterial and algal contaminants are captured before they enter the injection system.

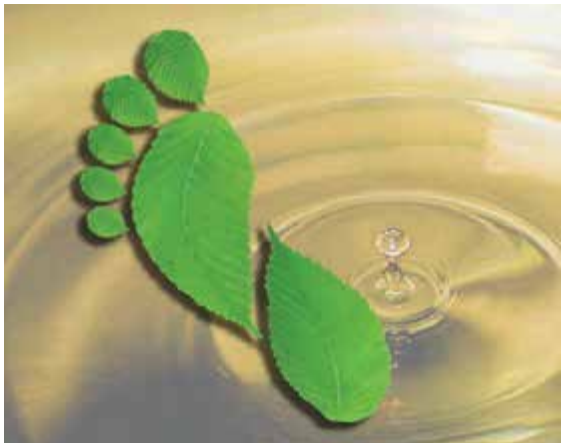


4 Lower Fuel Consumption

- Improved fuel burn, meaning less fuel and more power. Tests carried out on an Iveco truck at Parsons Test Facility NSW showed a 4.9% saving on fuel translating into an equivalent reduction of C02.
- Lake Macquarie City Council achieved 2% improvement in fuel economy after the installation of Filter Technology fuel filtration to their fuel bowsers.
- Linfox Transport achieved a 3% saving on fuel after the fitment of Filter Technology fuel filters to their truck fleet.
- WestBus Buses achieved a fuel saving of 3.2% after the installation of FTA fuel filtration systems at their facility.
- Comfort DelGro Group has the largest single bus fleet in NSW & use FTA fixed bowser filtration to protect their valued assets".

5 Reduce Environmental Impact

- Lower fuel consumption (average of 2 – 4% reduction) has a direct correlation to lower emissions of C02, CO and other harmful emissions.
- Our filtration system (when tested on an Iveco Truck through Parsons Aus. Testing Facility) reduced CO emissions by over 1.2%, NOX by 15% and diesel particulates by 25.7%
- Longer OEM filter life reduces landfill wastage.
- Increased oil life reduces amount of waste oil requiring disposal.



6 Proven Return on Investment and Short Payback Period

- FTA can identify in advance an accurate estimated return on investment on your capital purchase based on extensive data collated from performance history.
- A multiplier effect of ongoing and measurable cost savings results from extended oil life, reduced fuel consumption, extended service intervals, less downtime and increased component life.
- Payback period on our filtration systems generally range from 3 months – 2 years, giving you exceptional value and many years of cost saving for a one off investment.
- When our filtration systems are leased, immediate cash surplus is usually created as monthly cost savings will generally outweigh lease payments.

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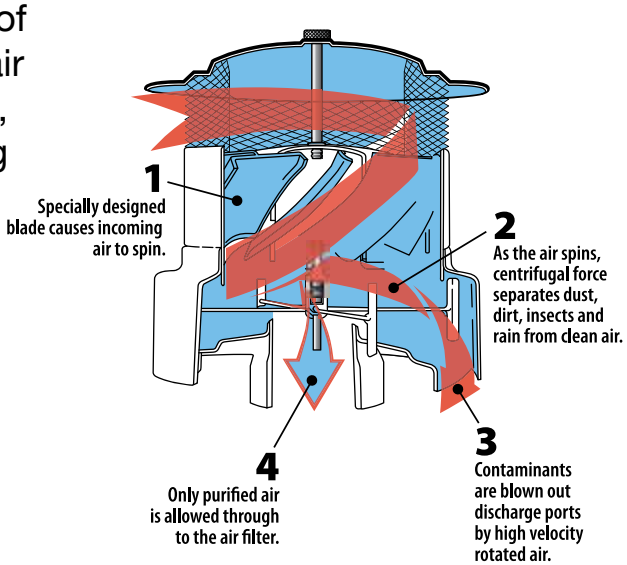
Cleaning the Air...

The recognized world wide leader in high performance after market Precleaners

Turbo Precleaners remove up to 98% of the dirt, dust, rain and snow before it reaches the air filter. Air filter life can be extended by 8 to 10 times, while saving fuel, maximising power, and extending engine life.



Turbo's "Custom Balance" Turbo

units remove 50% more of the dust that other precleaners allow through to the filter, while adding only half the air restriction. There is no other unit, O.E.M. supplied or other after-market, that compares with the "Balance" of Turbo's performance and engine protection.

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TURBO CLEANER WORKSHEET

Date: _____

Name: _____

Best Contact Number: _____

Email address: _____

Address: _____

_____

This worksheet is designed to help you specify the proper turbo® Precleaner model and size for your engine.

Engine Displacement ……..R.P.M. ……..

Engine Horsepower ……Engine Model ……..

Equipment Year, Make, Model #.....

……

Air Intake Diameter …… Turbo Charged (circle one) Yes / No

Type of turbo® Precleaner Preferred (circle one) Polymer / Steel

---

Please describe any additional conditions, accessories, or application requirements necessary for the optimal performance of this piece of equipment:

_____

_____

_____

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Filter Technology Qld

FM3001 Engine Oil Filtration Unit

FM3001 Engine Oil Filters are suitable for use on:

- small gearboxes
- lubrication systems up to 50 litres (11 gals)
- hydraulic systems up to 100 litre (22 gals) capacity
- small diesels, forklifts and stationary powerplants

Filter Technology engine oil filters are a by-pass unit. There are three basic considerations when installing Filter Technology engine oil filters:

- Mounting location.
- Oil pressure source.
- Oil return points.

FM3001 filters include 1 element and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 1 x 1.5 mm (1/16") hole in the 10 mm (3/8") return tube which controls flow in engines, or 1 x 6 mm (1/4") hole which controls flow in hydraulics.

Dimensions	Metric	US
Height	346 mm	13.5"
Diameter	127 mm	5.0"
Weight	3.0 kg	6.75 lb
Maximum Pressure	5.52 bar	80 psi
Rec. Operating Pressure	1.38-4.14 bar	20-60 psi

FM3001 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	0.20	2.5
2.07	30	0.27	3.5
2.76	40	0.36	4.75
3.45	50	0.46	6
4.14	60	0.53	7
4.83	70	0.60	8
5.52	80	0.63	8.5
6.21	90	0.67	9
6.89	100	0.71	9.5

FM3101 Engine Fuel Filtration Unit

FM3101 Engine Fuel Filters are suitable for use on:

- small diesel engines
- small gensets
- remote engine installations
- agricultural equipment

Filter Technology engine fuel filters are a full flow filter unit. There are three basic considerations when installing Filter Technology engine fuel filters:

- Mounting location.
- Bleed off point for the existing system to the filter.
- Return from the filter into the existing system.

FM3101 filters include 1 element and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 1 x 6 mm (1/4") hole in the 10 mm (3/8") return tube allows fuel to flow through unrestricted.

Dimensions	Metric	US
Height	346 mm	13.5"
Diameter	127 mm	5.0"
Weight	3.0 kg	6.75 lb
Maximum Pressure	4.83 bar	70 psi
Rec. Operating Pressure	2.76 bar	40 psi

FM3101 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	7.50	100
2.07	30	11.00	147
2.76	40	14.00	186
3.45	50	16.00	213
4.14	60	18.50	246
4.83	70	20.50	273
5.52	80	22.00	293
6.21	90	23.75	316
6.89	100	25.00	333

FM3002 Engine Oil Filtration Unit

FM3002 Engine Oil Filters are suitable for use on:

- lubrication systems 50–75 litres (11–17 gals)
- hydraulic systems 100–200 litres (22–44 gals)
- small diesels up to 20 litre (5 gals) sump capacity
- four wheel drives and light trucks
- stationary engines and small gearboxes

Filter Technology engine oil filters are a by-pass unit. There are three basic considerations when installing Filter Technology engine oil filters:

- Mounting location.
- Oil pressure source.
- Oil return points.

FM3002 filters include 2 elements and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 2 x 1.5 mm (1/16") holes in the 10 mm (3/8") return tube which controls flow in engines, or 2 x 6 mm (1/4") holes which controls flow in hydraulics.

Dimensions	Metric	US
Height	525 mm	20.5"
Diameter	127 mm	5.0"
Weight	5.0 kg	11.25 lb
Maximum Pressure	5.52 bar	80 psi
Rec. Operating Pressure	1.38-4.14 bar	20-60 psi

FM3002 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	0.76	10
2.07	30	1.20	16
2.76	40	1.80	24
3.45	50	2.30	30
4.14	60	3.00	40
4.83	70	3.50	46
5.52	80	4.00	53
6.21	90	4.60	61
6.89	100	5.00	66

FM3102 Engine Fuel Filtration Unit

FM3102 Engine Fuel Filters are suitable for use on:

- small to medium size trucks (4-8 tonnes)
- gensets (50-200 hp)
- remote engine installations
- agricultural equipment

Filter Technology engine fuel filters are a full flow filter unit. There are three basic considerations when installing Filter Technology engine fuel filters:

- Mounting location.
- Bleed off point for the existing system to the filter.
- Return from the filter into the existing system.

FM3102 filters include 2 elements and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 2 x 6 mm (1/4") holes in the 10 mm (3/8") return tube allow fuel to flow through unrestricted.

Dimensions	Metric	US
Height	525 mm	20.5"
Diameter	127 mm	5.0"
Weight	5.0 kg	11.25 lb
Maximum Pressure	4.83 bar	70 psi
Rec. Operating Pressure	2.76 bar	40 psi

FM3102 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	12.00	160
2.07	30	16.00	213
2.76	40	19.00	253
3.45	50	22.00	293
4.14	60	24.00	320
4.83	70	26.00	346
5.52	80	28.00	373
6.21	90	30.00	400
6.89	100	32.00	426

Filter Technology Qld
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Filter Technology Qld

FM3003 Engine Oil Filtration Unit

Dimensions	Metric	US
Height	700 mm	27.5"
Diameter	127 mm	5.0"
Weight	6.0 kg	13 lb
Maximum Pressure	5.52 bar	80 psi
Rec. Operating Pressure	1.38-4.14 bar	20-60 psi

FM3003 Engine Oil Filters are suitable for use on:

- lubrication systems 75–100 litres (17–22 gals)
- hydraulic systems 200–400 litres (44–88 gals)
- small diesels 20–35 litre (5–7 gals) sump capacity
- most trucks and gensets
- stationary engines and small gearboxes
- multiples used for engines above 500 hp

Filter Technology engine oil filters are a by-pass unit. There are three basic considerations when installing Filter Technology engine oil filters:

- Mounting location.
- Oil pressure source.
- Oil return points.

FM3003 filters include 3 elements and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 3 x 1.5 mm (1/16") holes in the 10 mm (3/8") return tube which controls flow in engines, or 3 x 6 mm (1/4") holes which controls flow in hydraulics.

FM3003 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	1.40	18
2.07	30	1.90	25
2.76	40	2.40	32
3.45	50	3.00	40
4.14	60	3.30	44
4.83	70	4.00	53
5.52	80	5.00	66
6.21	90	5.40	72
6.89	100	6.00	80

FM3103 Engine Fuel Filtration Unit

Dimensions	Metric	US
Height	700 mm	27.5"
Diameter	127 mm	5.0"
Weight	6.0 kg	13 lb
Maximum Pressure	4.83 bar	70 psi
Rec. Operating Pressure	2.76 bar	40 psi

FM3103 Engine Fuel Filters are suitable for use on:

- most trucks
- gensets (250-500 hp)
- stationary engines
- agricultural equipment

Filter Technology engine fuel filters are a full flow filter unit. There are three basic considerations when installing Filter Technology engine fuel filters:

- Mounting location.
- Bleed off point for the existing system to the filter.
- Return from the filter into the existing system.

FM3103 filters include 3 elements and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 3 x 6 mm (1/4") holes in the 10 mm (3/8") return tube allow fuel to flow through unrestricted.

FM3103 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	12.50	166
2.07	30	16.50	220
2.76	40	20.50	273
3.45	50	23.00	306
4.14	60	25.00	333
4.83	70	27.50	366
5.52	80	29.50	393
6.21	90	30.50	406
6.89	100	31.50	420

FM3004 Engine Oil Filtration Unit

Dimensions	Metric	US
Height	875 mm	35"
Diameter	127 mm	5.0"
Weight	8.5 kg	19 lb
Maximum Pressure	5.52 bar	80 psi
Rec. Operating Pressure	1.38-4.14 bar	20-60 psi

FM3004 Engine Oil Filters are suitable for use on:

- lubrication systems 100–200 litres (22–44 gals)
- hydraulic systems 400–800 litres (88–176 gals)
- used in multiples on larger hydraulic machines
- crusher lubrication tanks
- recycling buggies
- larger marine engines

Filter Technology engine oil filters are a by-pass unit. There are three basic considerations when installing Filter Technology engine oil filters:

- Mounting location.
- Oil pressure source.
- Oil return points.

FM3004 filters include 4 elements and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 4 x 1.5 mm (1/16") holes in the 10 mm (3/8") return tube which controls flow in engines, or 4 x 6 mm (1/4") holes which controls flow in hydraulics.

FM3004 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	3.50	46
2.07	30	5.00	66
2.76	40	6.60	88
3.45	50	7.50	100
4.14	60	8.50	113
4.83	70	10.00	133
5.52	80	12.00	166
6.21	90	13.00	173
6.89	100	15.00	200

FM3104 Engine Fuel Filtration Unit

Dimensions	Metric	US
Height	875 mm	35"
Diameter	127 mm	5.0"
Weight	8.5 kg	19 lb
Maximum Pressure	4.83 bar	70 psi
Rec. Operating Pressure	2.76 bar	40 psi

FM3104 Engine Fuel Filters are suitable for use on:

- used in multiples in large systems
- fuel pumps and bowsers
- large stationary engines
- agricultural equipment

Filter Technology engine fuel filters are a full flow filter unit. There are three basic considerations when installing Filter Technology engine fuel filters:

- Mounting location.
- Bleed off point for the existing system to the filter.
- Return from the filter into the existing system.

FM3104 filters include 4 elements and:

- 3 x 1/2" NPT female threads for inlet and outlet and pressure gauge or drain.
- 4 x 6 mm (1/4") holes in the 10 mm (3/8") return tube allow fuel to flow through unrestricted.

FM3104 Flow Rates

Line in pressure		Line out flow	
bar	psi	L/min	gals/hr
1.38	20	13.85	185
2.07	30	22.04	293
2.76	40	31.36	418
3.45	50	40.00	533
4.14	60	46.04	614
4.83	70	53.84	718
5.52	80	58.32	777
6.21	90	65.60	875
6.89	100	68.08	907

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LUBE TECHNOLOGY

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Sage OIL VAC

Sage Oil Vac Streamline Shop Series

is ideal for shop or factory settings. The Shop Series small size means that it can fit in almost any space and make fluid changes easier than ever. Shop models work on the same vacuum and pressure process as our larger lube systems and can be used for fluid recovery only or fluid removal and refilling.

Sage Oil Vac
Manufacturers of on-site maintenance equipment

STANDARD MODELS

30040V
- (1) 30 gallon ASME tank - Used Oil
- (1) 30 gallon ASME tank- Fresh Oil & Fluid
- Vacuum generator (requires additional air source)
- (2) ¾" x 15' Oil Hoses with manual hose wraps
- Integrated off-load hose
- Filter Stinger™
- Barrel Straw to vacuum new oil
- Used Filter Receptacle™
- (1) Digital Handheld Meter
- Width: 24 in / (61cm)
- Length: 51 in / (129.5cm)
- Empty weight: 285 lbs / (129.2 kg)
- Max Operating Weight: 723 lbs / (328 kg)

30070V
- (1) 60 gallon ASME tank - Used Oil Only
- Vacuum generator (requires additional air source)
- (1) 1" x 15' hose with manual hose wraps
- Integrated off-load hose
- Filter Stinger™
- 10 gallon drain pan
- Width: 24 in / (58.4cm)
- Length: 60 in / (152.4cm)
- Empty weight: 288 lbs / (130.6 kg)
- Max Operating Weight: 726 lbs / (329 kg)

30080
- (1) 30 gallon ASME tank - Used Oil Only
- Vacuum generator (requires additional air source)
- (1) ¾" x 15' hose with manual hose wrap
- Integrated off-load hose
- Filter Stinger™
- Width: 27" / (68.58cm)
- Length: 26 in / (66.04cm)
- Empty weight: 160 lbs / (72.6 kg)
- Max Operating Weight: 379 lbs / (171.9 kg)

30120V
- (1) 120 gallon ASME tank - Used Oil only
- Vacuum generator (requires additional air source)
- (1) 1" x 15' hose with manual hose wrap
- Filter Stinger™
- 17 gallon drain pan
- Width: 26 in / (66 cm)
- Length: 60 in / (152 cm)
- Empty weight: 480 lbs / (218 kg)
- Max Operating Weight: 1358 lbs / (615 kg)

STREAMLINE
SHOP SERIES

VERSATILE • DEPENDABLE • PRACTICAL

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STREAMLINE SHOP SERIES™

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This patented mobile, self-contained fluid exchange system allows you to perform scheduled maintenance twice as fast without the use of pumps that can occasionally break down. The Streamline Shop Series standard models can be used in a broad range of applications in which efficiency and convenience are valued. The Streamline Shop Series standard models come in 1- or 2-tank configurations that are hand-trucked or carted around the factory, shop or garage.

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A scheduled service of a vary large piece of equipment with many fitters, vehicles with trailers transporting bulk oil pods. There had to be a better way.

REMEMBER.... YOUR TIME IS MONEY.

- VIRTUALLY MAINTENANCE-FREE. NO PUMPS
- SIMPLE TO OPERATE
- THE EXCHANGE OF LUBE IS QUICK
- OILS CAN BE EXCHNAGED WHILIST AT OPERATING TEMPERATURES
- NO MESS. NO CONTAMINATION. NO WASTE. NO SPILLS
- ELIMINATE OIL SPILLS FROM THE FILTER REPLACEMENTS
- ALL TANKS ARE EXPOXY LINED. IDEAL FOR CAPTURING AND REPLENSING COOLANTS
- METERED DISPENSING
- A MODEL TO SUIT YOUR BUSINESS
- MAKES FIELD SERVICING AN ACTION NOT A TASK

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The right connections make a difference. We exclusively use FEMCO drain plugs and accessories with our mobile lube systems. FEMCO products allow you to perform hot oil changes in less than half the time compared to the traditional 'drop the plus process'. Outfit your equipment fleet with quick disconnect fitting allowing you to vacuum used oil directly from the engine crankcase into the used oil tank in 100% enclosed process. Reduce maintenance times and less chance of costly spills allow for a very quick return on investment.

FEMCO THE SOLUTION FOR CHANGING HOT OIL & FLUIDS, EFFICENT, CLEAN & SAFE

Click Drain Plug

The click drain plug consist of a plug and a clicker, simply connect the clicker to the oil drain plug to start the secure draining process. This drain plug is completely manufactured out of 100% brass to withstand hot temperatures.

Compact Drain Plug

The compact drain plug is perfect when space restrictions apply, this plug is 12mm from the sump / oil pan. This drain plug is completely manufactured out of 100% brass to withstand hot temperatures and features a dust cover for protection.

Standard Drain Plug

The standard drain plug is perfect for most vehicles and equipment as it is a significant upgrade from normal drain plugs. This drain plug is completely manufactured out of 100% brass to withstand hot temperatures and features a dust cover for protection.

Drain Plug accessories

We offer a wide range of FEMCO drain plug accessories to ensure operators have everything they need to be successful; these accessories enable you to carry out oil and fluid exchanges quickly and easily without spillage.