WDA No 000 BFMA

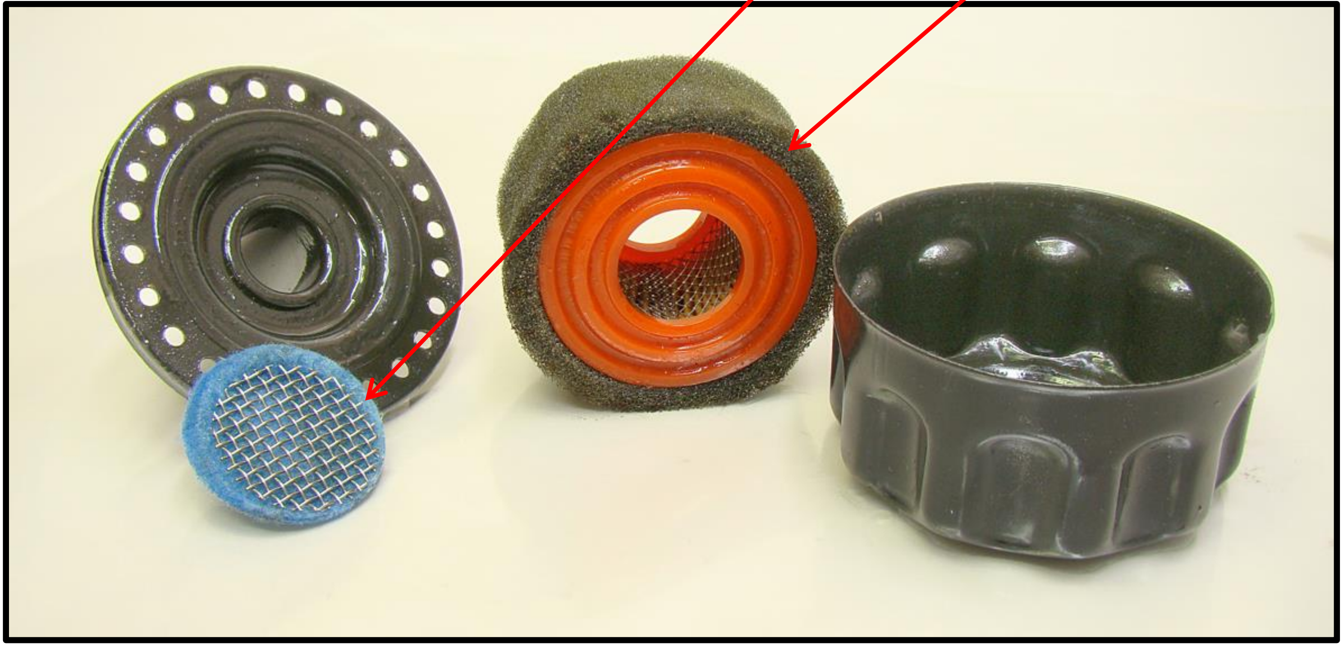
Objective. Crankcase Breather Filter Media Analysis Sample from 15/12/2014.

Method. Sample preparation in accordance with R&T's Procedure No. 28.
Breather Filter Sample was opened and media retrieved,
One sample processed of wear debris trapped in a 75 mm X 75 mm section of the oil filter element. This sample is filtered @ 0.3 µm.
The amount seen in the video pictures is not relatable to the debris concentration per ml of oil.

The left hand image indicates the condition of the exterior of the filter upon receipt.

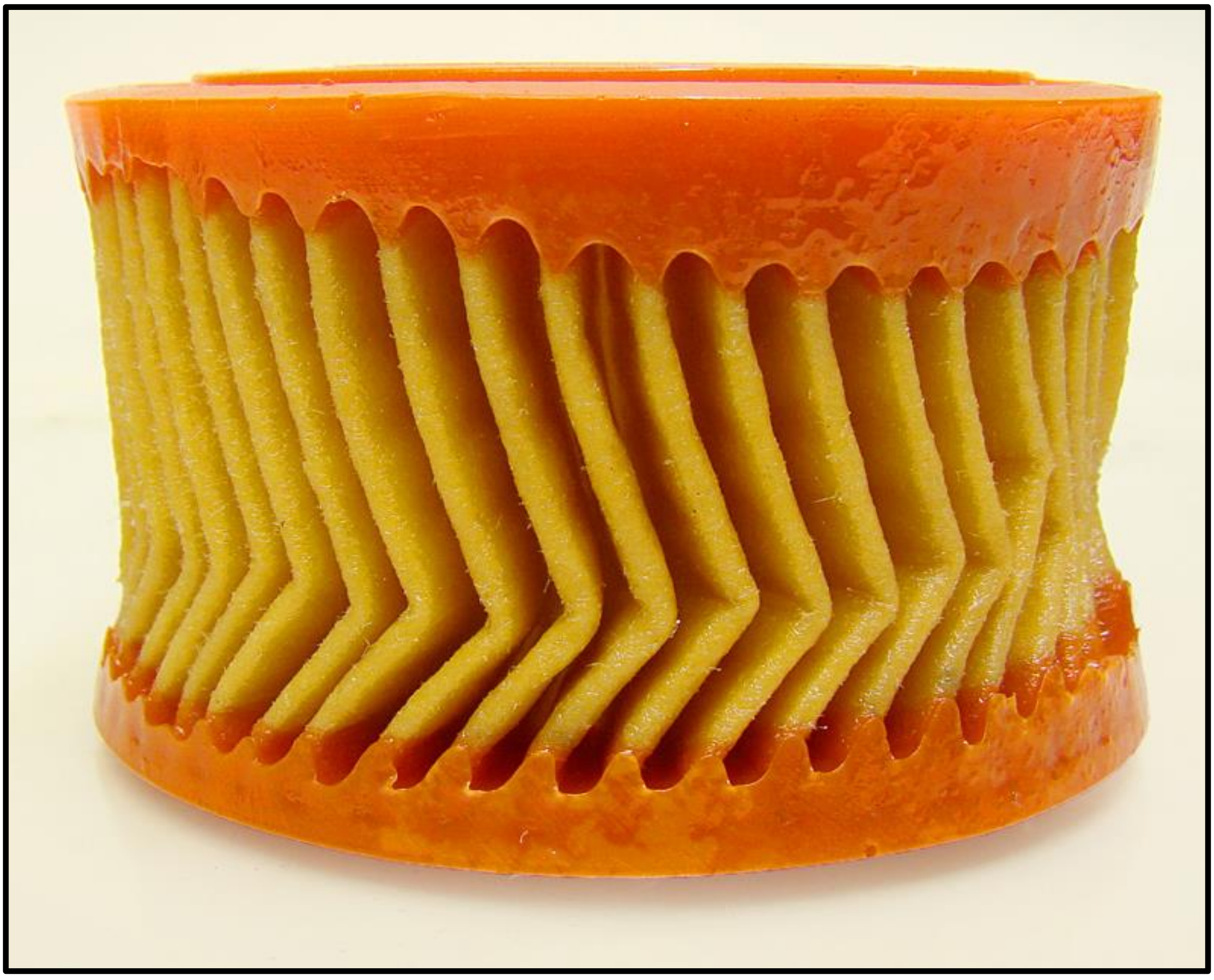
The Filter has been opened previous to receipt at the lab and was easily disassembled as the image below shows,

The dessicant pad and the media were both heavily oil soaked.

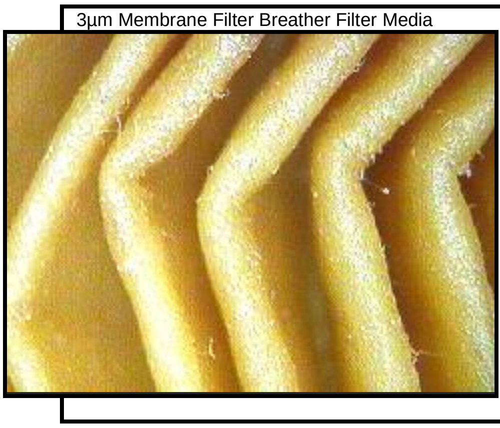


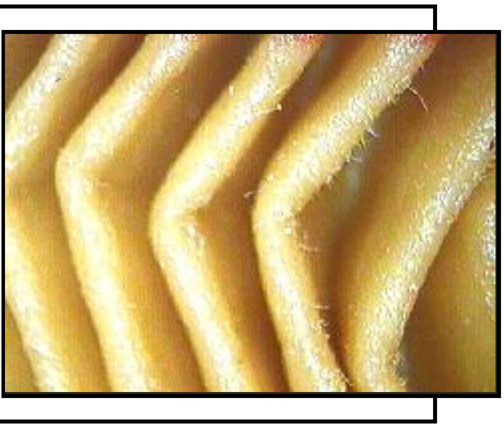
The Outer Foam Pre Filter and the pleated particulate filter were both heavily saturated with lubricant

The 3 µm Pleated Particulate Filter Media Cartridge was visible distorted, we are unsure if this occurred during the initial disassembly of the filter for analysis or the breather filter media was compressed in this manner after being clogged with compressor lubricant.

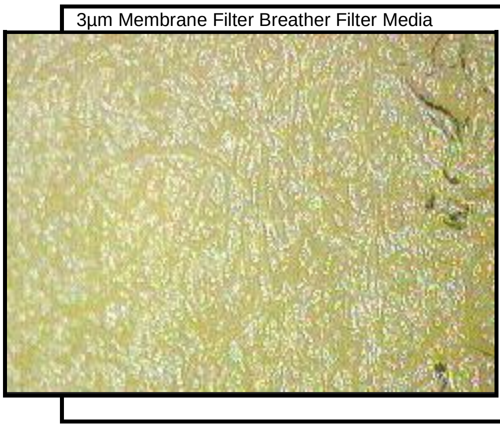


3µm Membrane Filter Breather Filter Media





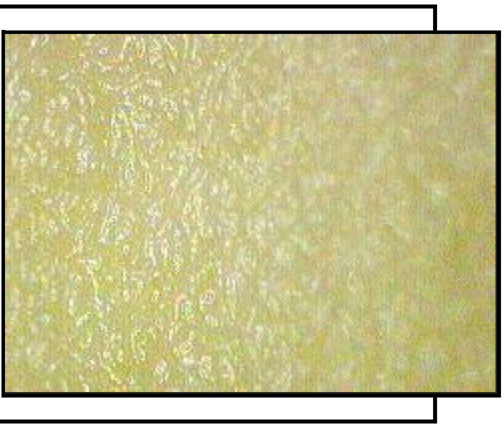
3µm Membrane Filter Breather Filter Media



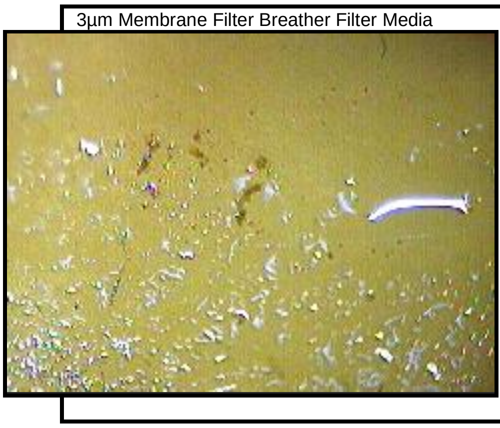
Breather Filter
3 µm Media Close Up
@ 50X

Note how the breather filter media is heavily saturated with lubricant.

200 µm



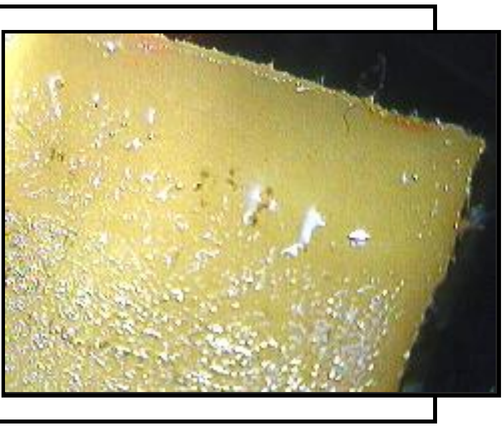
3µm Membrane Filter Breather Filter Media



Breather Filter
3 µm Outer Media Close Up
@ 50X/20X

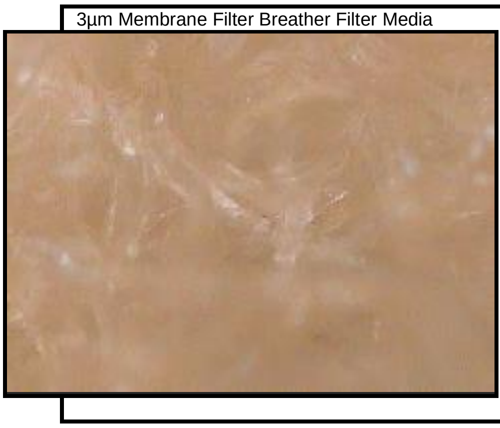
The breather filter media was heavily saturated with lubricant.

100/50 µm



3µm Membrane Filter Breather Filter Media

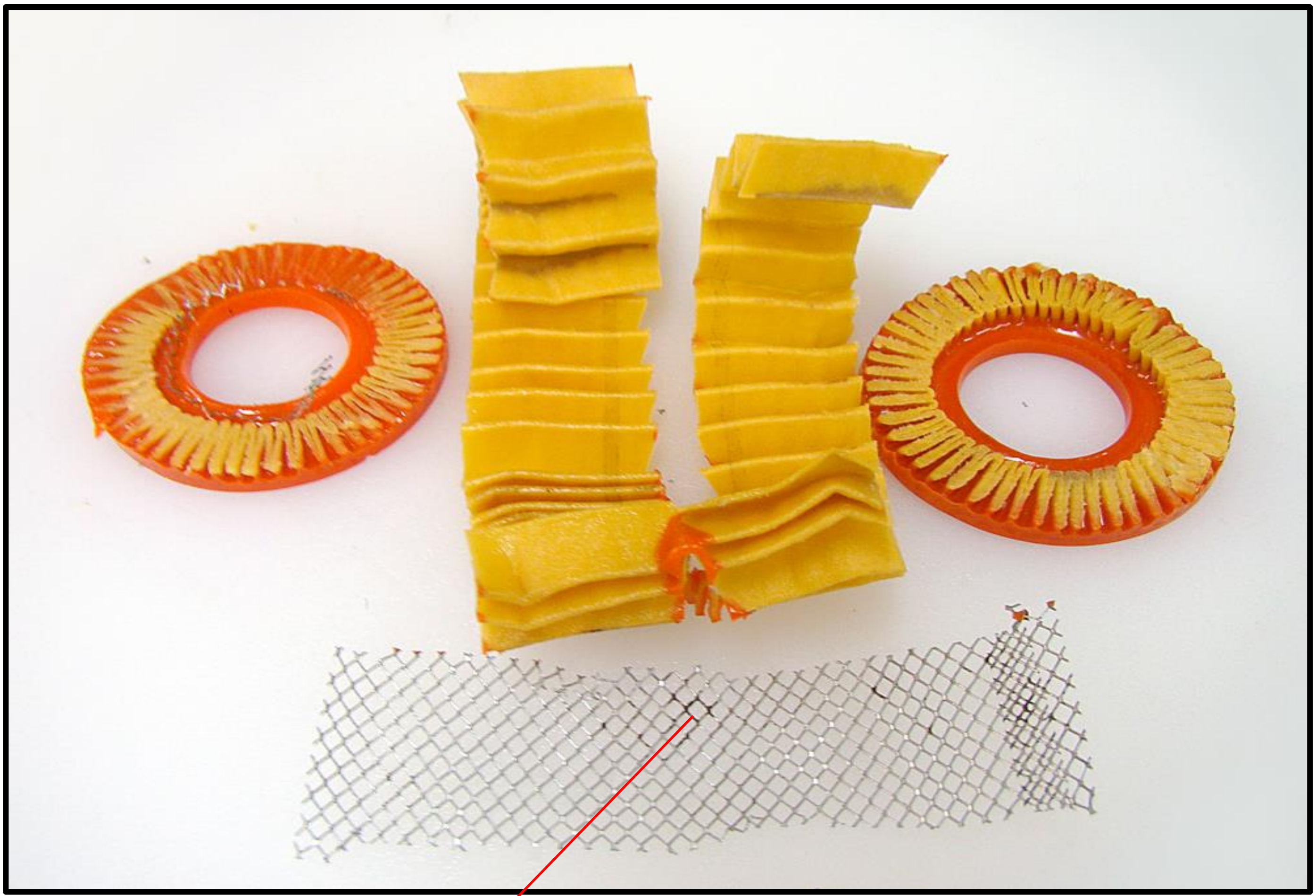
Solvent



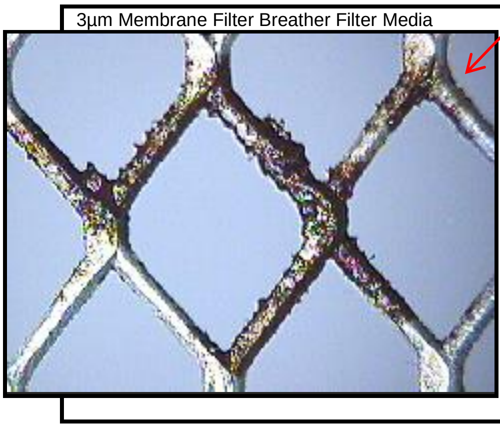
Breather Filter
3 µm Inner Media Close Up
@ 100X/200X

The breather filter media was heavily saturated with lubricant.

100/50 µm

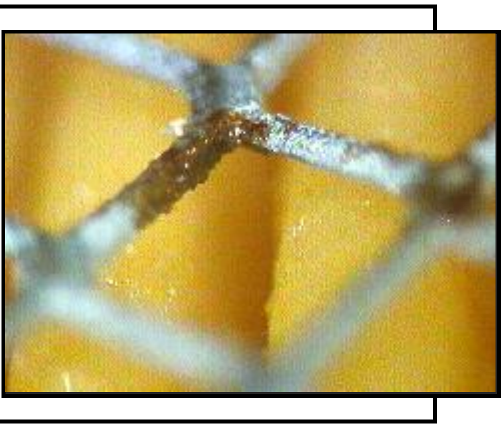


3µm Membrane Filter Breather Filter Media

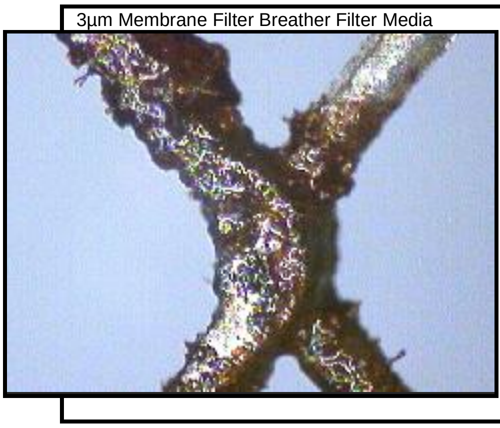


Breather Filter Media
Support Aluminium Mesh
@ 20X/45X

It was noted there were a few areas on the Breather Filter Media plated with heat damaged gelled Lubricant.



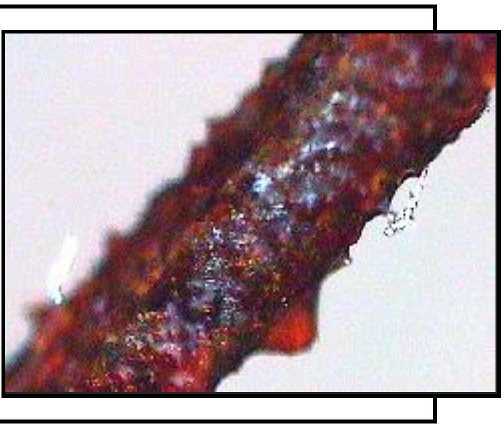
3µm Membrane Filter Breather Filter Media



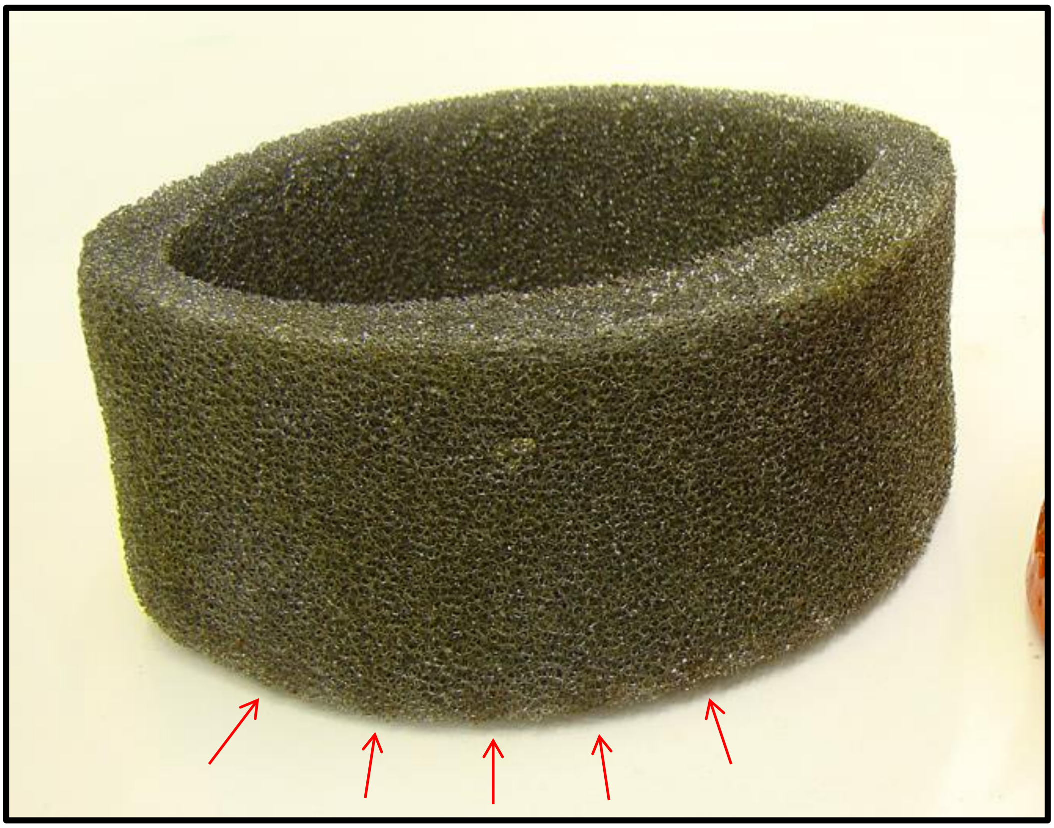
Breather Filter Media
Support Aluminium Mesh
@ 100X/200X

It was noted there were a few areas on the Breather Filter Media plated with heat damaged gelled Lubricant.

100/50 µm

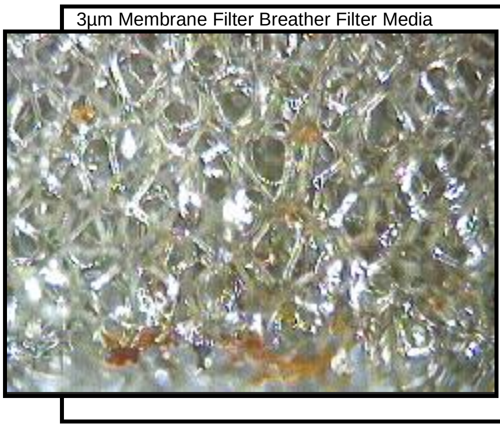


Breather Filter Outer Foam Pre Filter Media Analysis



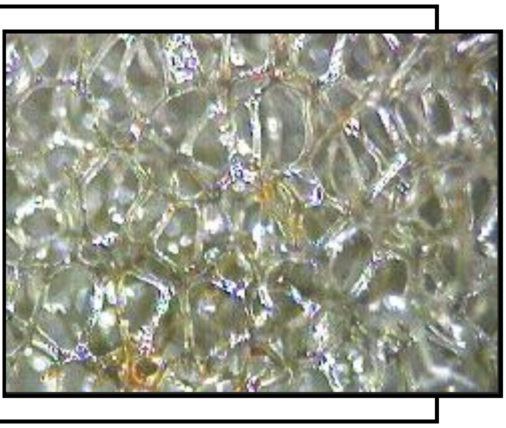
Note the repetative shading along base of the foam prefilter, these marks align with the vent holes in the under side of the breather filter cannister, the marks appear to be a combination of dirt and red iron oxides

3µm Membrane Filter Breather Filter Media

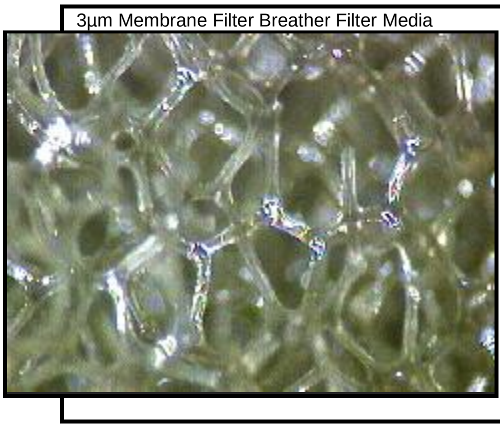


Breather Filter
3 µm Outer Foam Pre-Media
@ 45X

There was a mixture a gelled lubricant and red iron oxides adhering the prefilter.



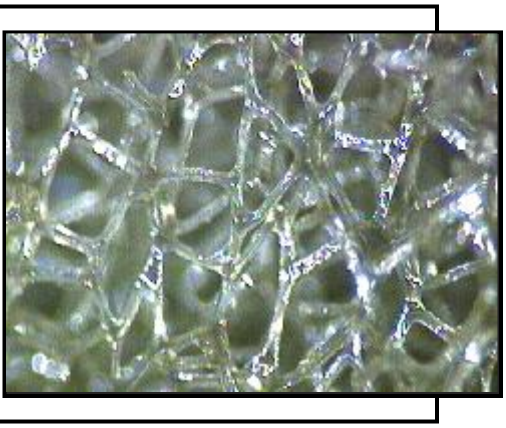
3µm Membrane Filter Breather Filter Media



Breather Filter
3 µm Inner Media Close Up
@ 100X

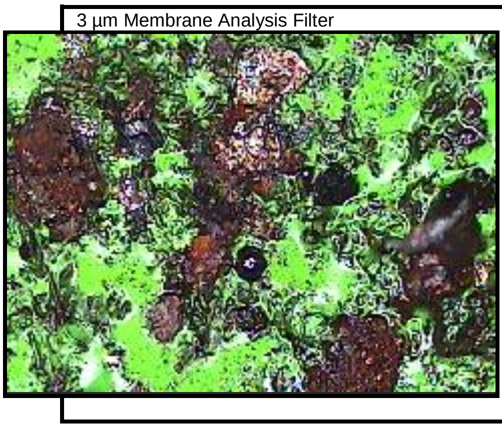
The breather filter media is wet with lubricant.

100 µm



Breather Filter Outer Foam Pre Filter Media was next washed in prefiltered solvent and the washing fluid was filtered at 3 µm to extract the contaminates below.

3 µm Membrane Analysis Filter



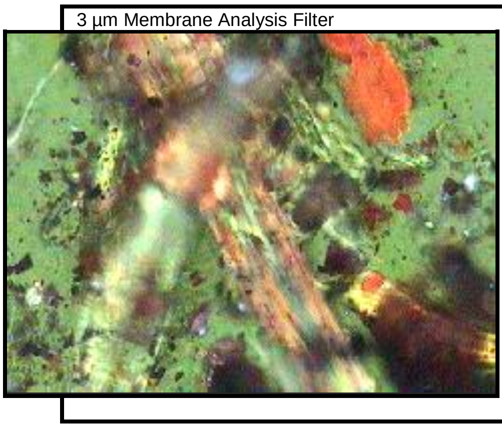
Outer Foam Pre Filter

Trackside Two Body Ferrous Wear Debris and Carbonised Lubricant @ 500X Sized 0.5-120 µm

There was a moderate amount of this fine hard particle catalysed abrasive wear debris present.

20 µm

3 µm Membrane Analysis Filter



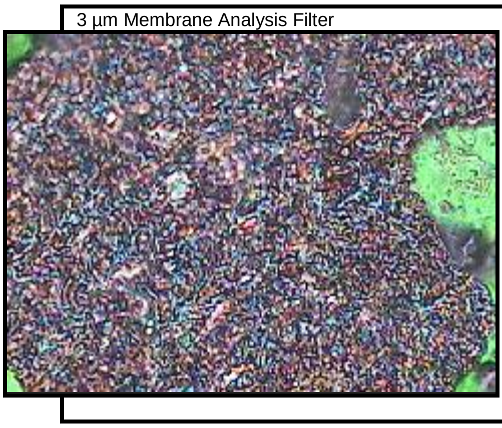
Outer Foam Pre Filter

Trackside Organic Debris and Carbonised Lubricant @ 500X Sized 0.5-120 µm

There was a light to moderate amount of these organic fibres present

20 µm

3 µm Membrane Analysis Filter



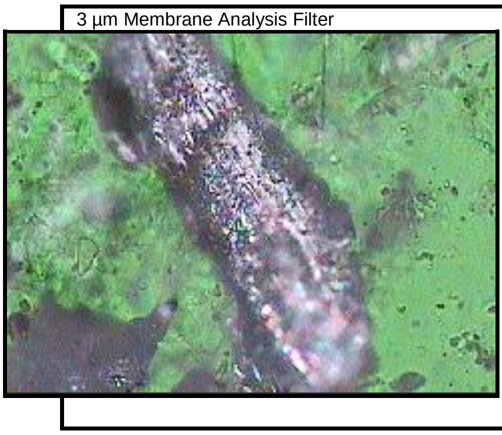
Outer Foam Pre Filter

Trackside Two Body Ferrous Wear Debris and Carbonised Lubricant @ 500X Sized 0.5-120 µm

There was a moderate amount of this fine hard particle catalysed abrasive wear debris present.

20 µm

3 µm Membrane Analysis Filter

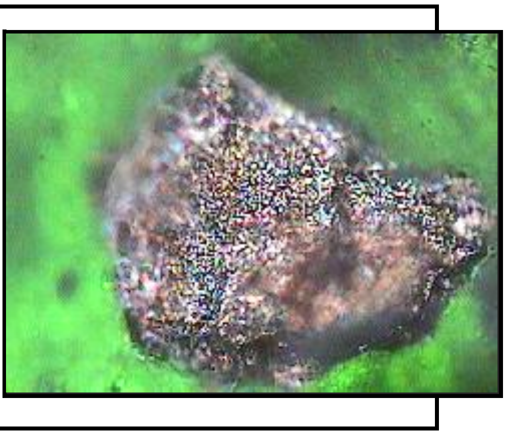


Outer Foam Pre Filter

Trackside Two Body Ferrous Wear Debris and Carbonised Lubricant @ 500X Sized 0.5-120 µm

There was a moderate amount of this fine hard particle catalysed abrasive wear debris present.

20 µm



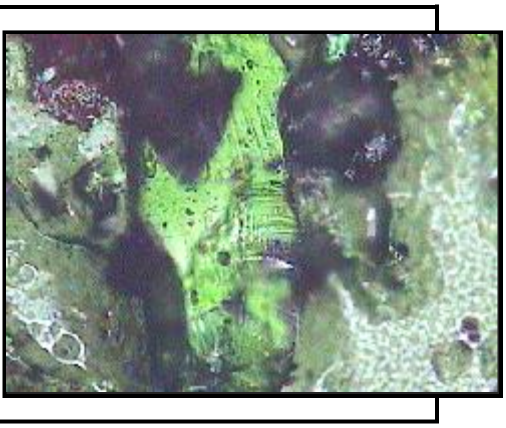
3 µm Membrane Analysis Filter

Outer Foam Pre Filter

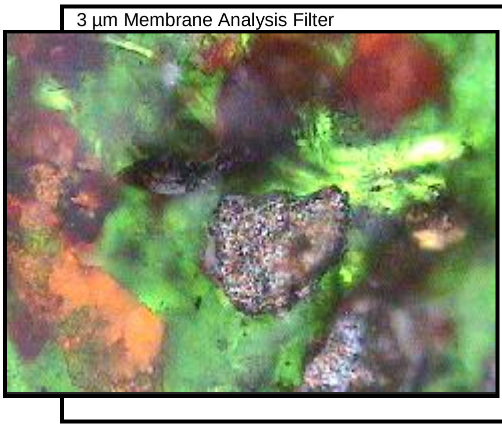
Trackside Two Body Ferrous Wear Debris and Carbonised Lubricant @ 500X Sized 0.5-120 µm

There was a moderate amount of this fine hard particle catalysed abrasive wear debris present.

20 µm



3 µm Membrane Analysis Filter

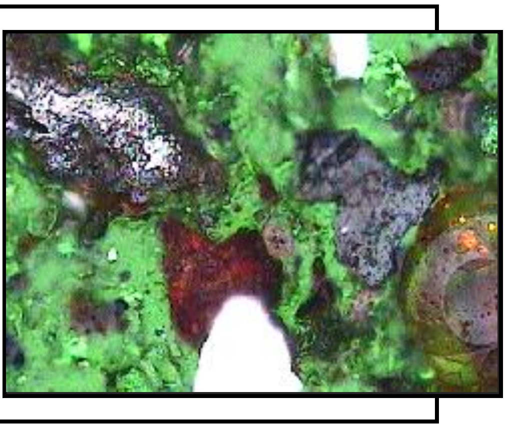


Outer Foam Pre Filter

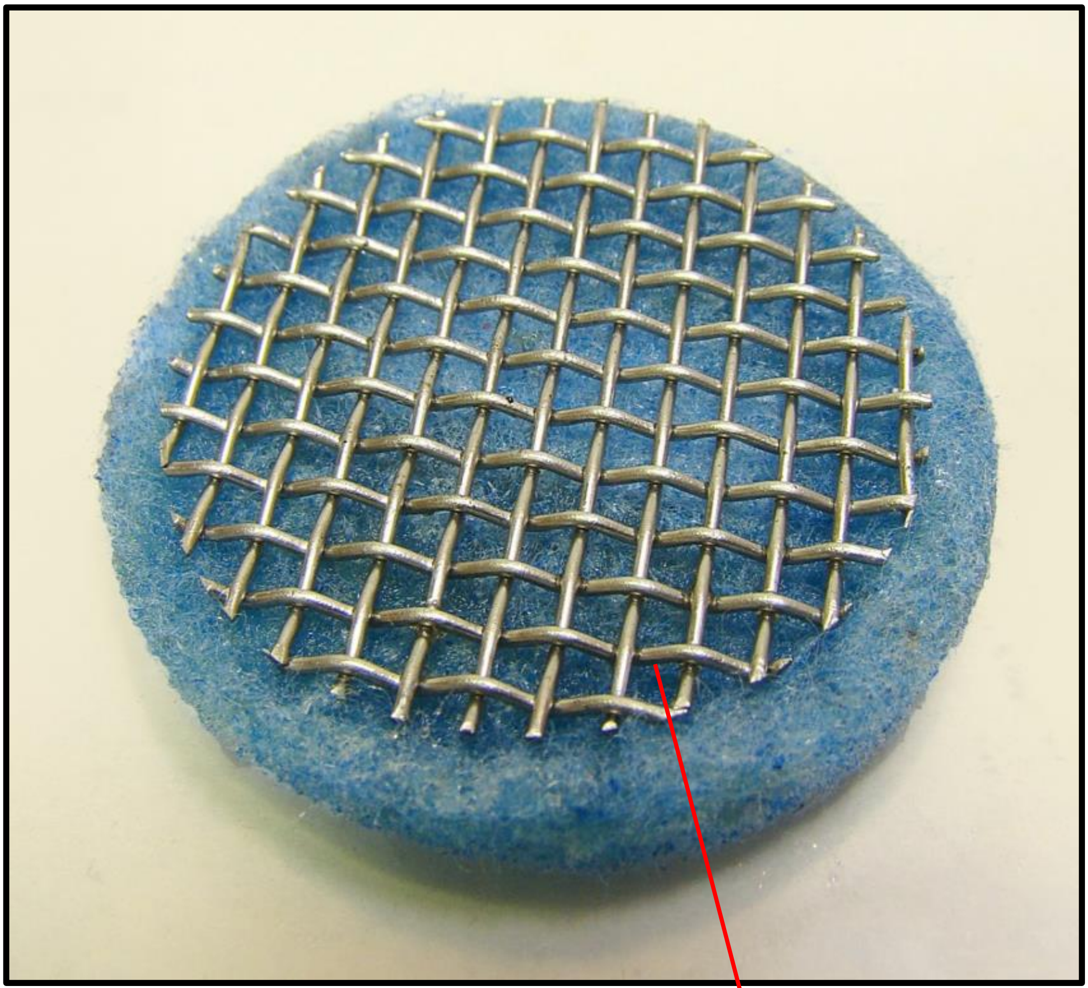
Trackside Two Body Ferrous Wear Debris and Carbonised Lubricant @ 500X Sized 0.5-120 µm

There was a moderate amount of this fine hard particle catalysed abrasive wear debris present.

50 µm



Breather Filter Desiccant Filter Pad

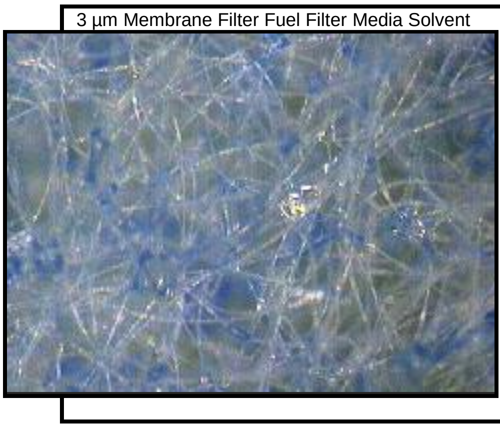


3µm Membrane Filter Breather Filter Media

Breather Filter
Desiccant Filter Pad
@ 45X

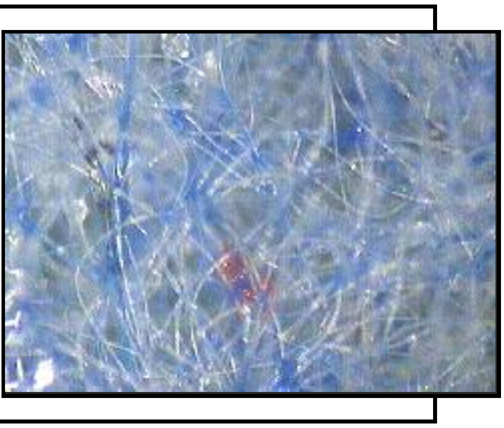
The closer view of the Desiccant Filter Pad showed the were heat damaged lubricant particles caught in the media.

3 µm Membrane Filter Fuel Filter Media Solvent



Breather Filter
Desiccant Filter Pad
@ 45X

The Desiccant Filter Pad is saturated with lubricant.



151214 Results Conclusions and Recommendations

The Crankcase Breather Filter Media Analysis sample indicated the breather filter was heavily saturated with compressor lubricant and the excess lubricant has obstructed the air flow in the tight 3µm media pressurising the compressors sump.

The heavy saturation of lubricant choked the media off and it appears the pressure has collapsed the media cartridge as noted on page 2.

The dirt and debris extracted on pages 6 & 7 is typical of trackside contamination with ferrous two body abrasive wear debris, wear spheres and copper, carbon & Graphite particles from the pantograph electrical contacts.

Most likely with mounting on the crankcase the elevated exposure to oil mists has prevented the breather filter from working correctly.

If the breather filter were to be shifted from the compressors crankcase onto the compressors sub frame using a metal pipe to assist with coalescing lubricant vapours that may prevent the heavy oil saturation found in the compressors crankcase breather filter.

Rob Simmonds

Rob Simmonds
Reliability Manager