WATER REMOVAL

FILTER ELEMENT

IMPROVING SYSTEM RELIABILITY AND EFFICIENCY

PASSION TO PERFORM

MPFILTRI®

HOW MANY FILTER ELEMENTS

WILL BE NEEDED TO REDUCE WATER NORMAL SATURATION LEVEL?

To estimate the number of filters of a particular system or plant, first it's necessary to estimate the amount of water in your system using equation (1) : where V_{H_2O} is the estimate of the volume of water in litres/gallons, V_{oil} is the volume of oil in your system in litres/gallons, and ppm is the concentration of water in your system measured using Karl Fisher method (available also with our oil analysis report).

$$V_{H_2O} = V_{oil} \frac{ppm}{1{,}000{,}000} \quad (1)$$

Then you can calculate the required number of filters using equation (2)

METRIC UNITS

$$N = \frac{V_{H_2O}}{C_{ml}} \times 1000$$

US UNITS

$$N = \frac{V_{H_2O}}{C_{fl.oz.}} \times 128$$

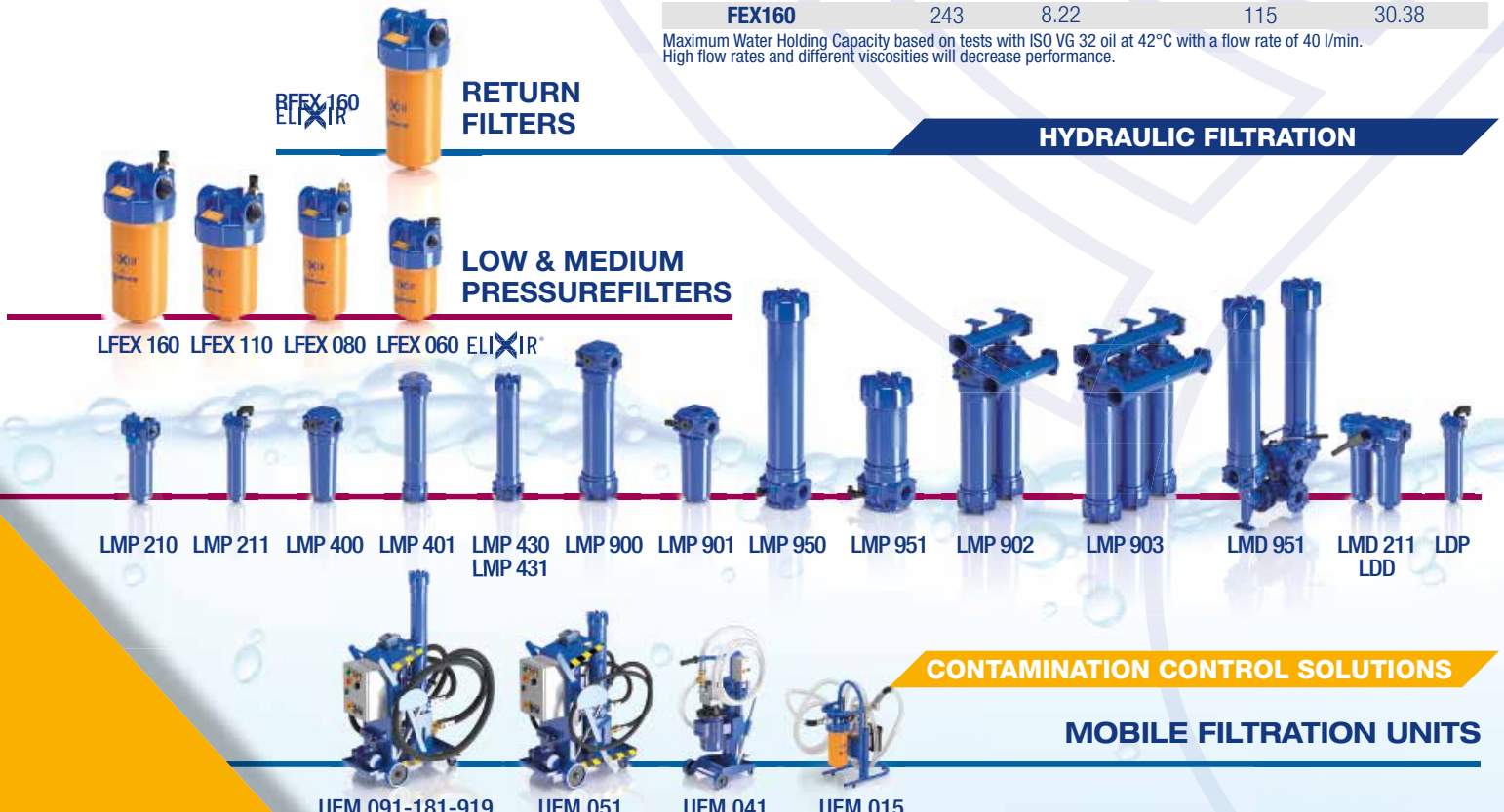
where:

- **N** is the number of filters required
- **C** is the maximum expected capacity of the filter selected for the same application from the table

Make sure to use correct units as identified in the formula and in the table.

Element *WA025*	Max Water holding capacity		Fluid flow rate	
	C_{ml}	$C_{fl.oz.}$	Max (l/min)	Max (gpm)
CU2101	158	5.34	101	26.68
CU2102	247	8.35	159	42.00
CU2103	343	11.60	220	58.11
CU4002	211	7.13	135	35.66
CU4003	307	10.38	197	52.04
CU4004	403	13.63	258	68.16
CU4005	619	20.93	395	104.35
CU4006	933	31.55	600	158.50
CU9001	763	25.80	489	129.18
CU9502	611	20.66	391	103.29
CU9503	1397	47.85	895	236.43
DN016	103	3.48	64	16.90
DN025	165	5.58	102	26.95
DN040	269	9.09	172	45.44
MR2504	413	13.96	265	70.00
FEX060	88	2.98	35	9.25
FEX080	140	4.73	50	13.21
FEX110	186	6.29	83	21.93
FEX160	243	8.22	115	30.38

Maximum Water Holding Capacity based on tests with ISO VG 32 oil at 42°C with a flow rate of 40 l/min.
High flow rates and different viscosities will decrease performance.



BENEFITS

- Remove particulate and water contamination improving system reliability and efficiency
- Dramatically extends oil and hydraulic component life
- Reduces the chance of catastrophic failure
- Reduces replacement part costs, maintenance costs and associated downtime
- Lowers energy consumption
- Increases equipment performance and improves machine productivity
- Improves environmental impact with reduction in waste products

PREVENT KEY PROBLEMS

Liquid contamination mainly causes a decline in lubrication performance and reduces protection of fluid surfaces.

By removing water from your fluid power system, you can prevent such key problems as:

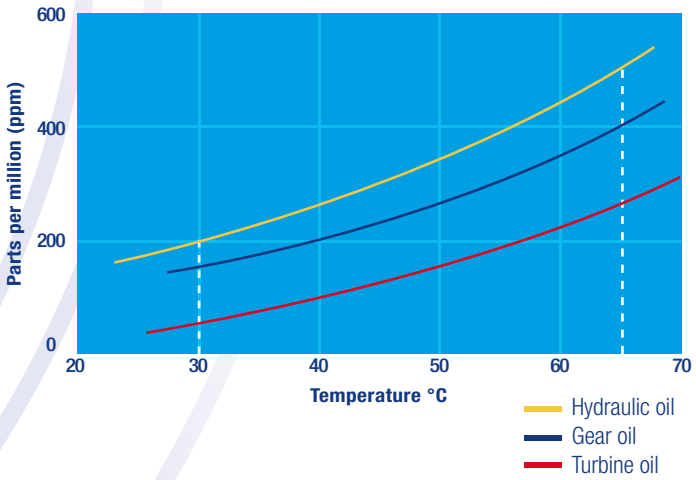
- **Corrosion (metal etching)**
- **Loss of lubricant power**
- **Accelerated abrasive wear in hydraulic components**
- **Valve-locking**
- **Bearing fatigue**
- **Viscosity variance (reduction in lubricating properties)**
- **Additive precipitation and oil oxidation**
- **Increase in acidity level**
- **Increased electrical conductivity (loss of dielectric strength)**
- **Slow/weak response of control systems**

WATER CONTENT

Water content is usually indicated as a percentage of saturation at a certain oil temperature in degrees centigrade

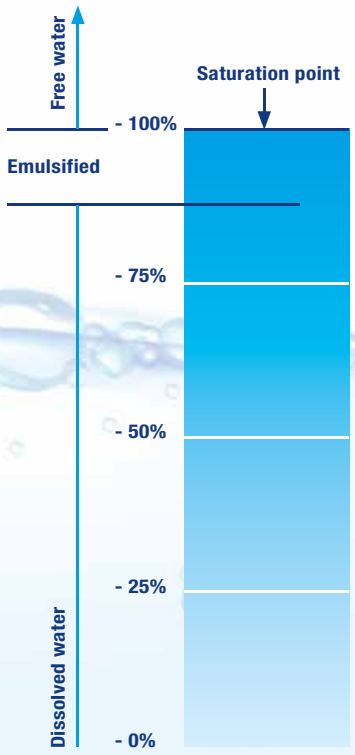
Different oils have different saturation levels therefore RH (relative humidity) % is the best and most practical measurement. 100% RH corresponds to the point at which free water can exist in the fluid, therefore the fluid is no longer able to hold the water in a dissolved solution. In mineral oils and non-aqueous resistant fluids, water is unsolicited. Mineral oil will usually have a water content in the range of 50-300 ppm (at about 30°C) which it can support without adverse consequences. Once the water content exceeds about 300 ppm the oil starts to appear hazy. Above this level, there is the risk that free water accumulates in the system in the low-flow rates areas. This can cause corrosion and early wear.

The graph represents the water contamination of the oil inside the “Filter Media”.
The white vertical line at 65°C indicates the maximum value for parts per million (ppm), the typical limit of the filter element. In the new R&D laboratory of MP Filtri, with latest technology test equipment, methods are employed to control the chemistry of the fluid and consequently the water content.



SATURATION LEVELS

Oil becomes cloudy when it’s contaminated with water above its saturation level. The saturation level is the amount of water that can be dissolved in the oil’s molecular chemistry.
Since the effects of free (also emulsified) water is more harmful than those of dissolved water, water levels should remain well below the saturation point. However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. The concentration of water in the oil must be kept as far as possible below the saturation point, see the graphic.



Example:

TYPICAL WATER SATURATION LEVELS FOR MINERAL OILS

- Mineral hydraulic oil @ 30°C = 200 ppm (0.02%) = 100% saturation
- Mineral hydraulic oil @ 65°C = 500 ppm (0.05%) = 100% saturation

As a guideline, we recommend maintaining saturation levels below 50% in all equipment.

CONCENTRATION OF WATER INSIDE THE OIL

Liquid contamination mainly causes a decline in lubrication performance and reduces protection of fluid surfaces

DISSOLVED WATER
(below saturation point)

INCREASING FLUID ACIDITY
Cause of surface corrosion and premature fluid oxidation

GALVANIC COUPLE
AT HIGH TEMPERATURES
Cause of metal corrosion

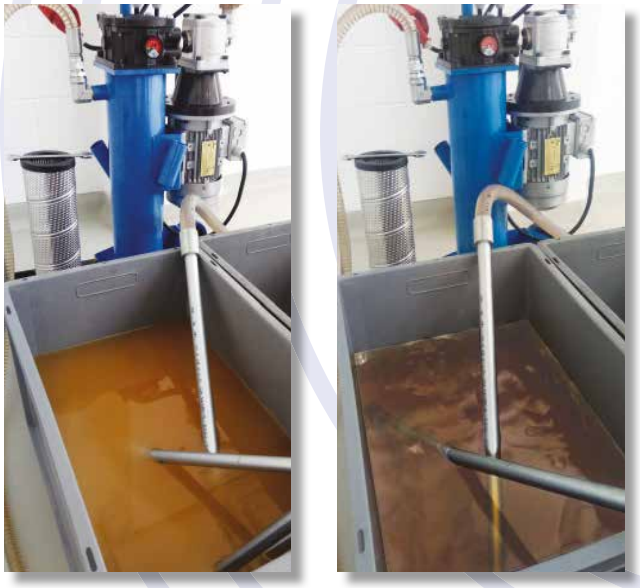
FREE WATER (emulsified or in droplets)
ADDITIONAL EFFECTS

DECAY OF LUBRICANT PERFORMANCE
Cause of rust and sludge formation, metal corrosion and increased solid contamination

BACTERIAL COLONIES CREATED
Cause of viscosity increase, annoying smell, discoloured fluid

ICE CREATION AT LOW TEMPERATURES
Causes damage to the surface

ADDITIVE REDUCTION
Free water retains polar additives

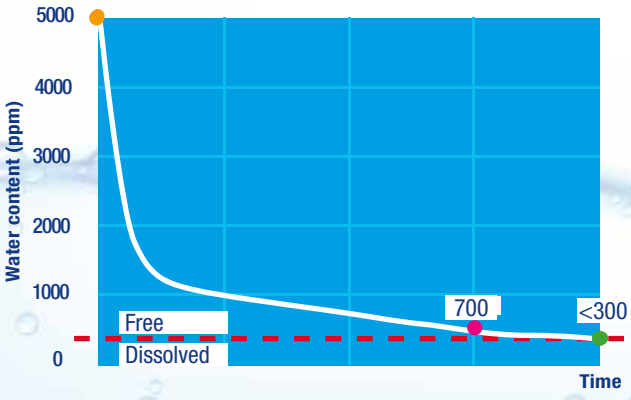


A (5000 ppm) ● **B** (700 ppm) ●

In the Photo **A** (5000 ppm):
the oil is hazy. This is because it has not passed through the water removal filter element of the UFM 041 (Offline Filtration Unit).

In the Photo **B** (700 ppm):
the oil is more transparent after passing through the water removal element of the UFM 041 (Offline Filtration Unit) which will absorb the free water.

WATER CONTENT - KARL FISCHER METHOD:



The graph represents the determination of water content according to the Karl Fischer titration method - DIN 51777. The curve represents the decrease in the concentration of water in oil, over time.

● 5000 ppm ● 700 ppm ● < 300 ppm

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