Water Removal
Filter Element

PASSION TO PERFORM

MPFILTRI®

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

Industry Segments

Power generation
Agriculture and Forestry
Construction
Material handling
Wind energy
Oil and gas

Applications

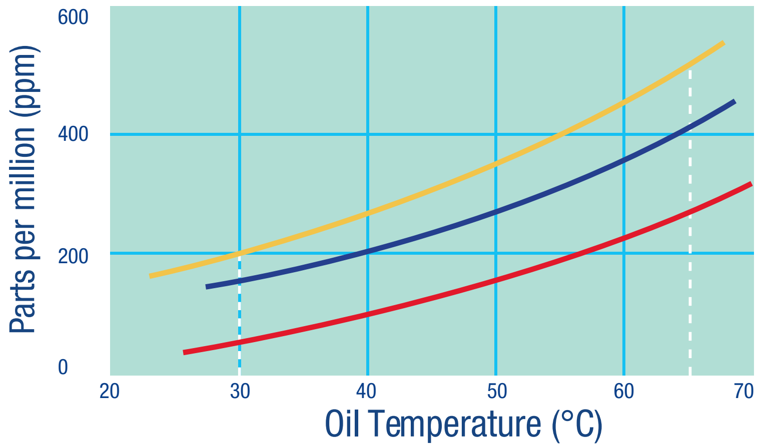
Compressors
Gearboxes
Power units
Lubrication modules, including tanks
Mobile hydraulics
Factory equipment
Fluid transfer unit

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.

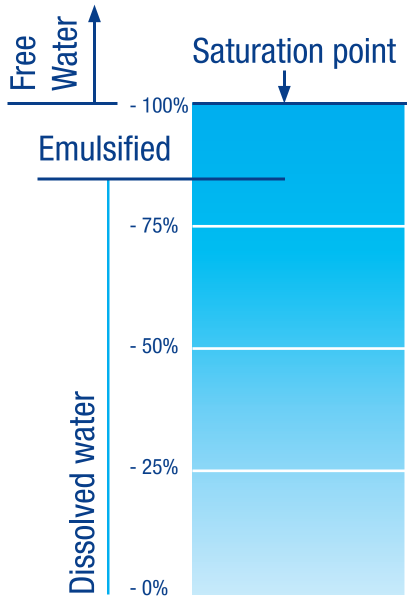


GRAPH REPRESENTATION OF 3 TYPES OF OIL

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.



TYPICAL WATER SATURATION LEVELS FOR MINERAL OILS

EXAMPLE

- 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.

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

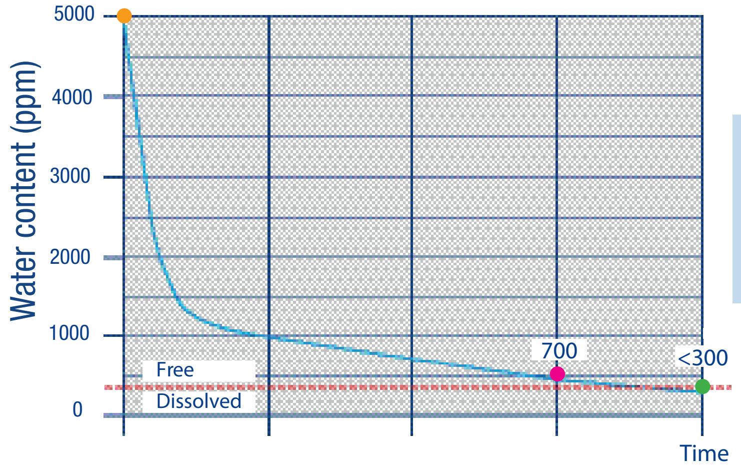
DECAY OF LUBRICANT PERFORMANCE
Cause of rust and sludge formation, metal corrosion and increased solid contamination

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

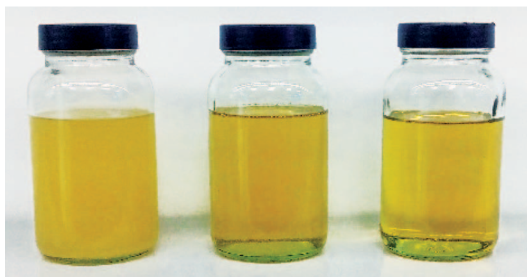
WATER CONTENT - KARL FISCHER METHOD



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.

A (5000 ppm)

B (700 ppm)



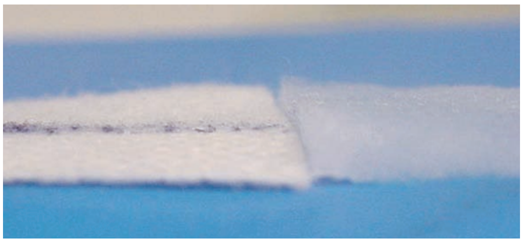
5000 ppm • 700 ppm • <300 ppm

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.

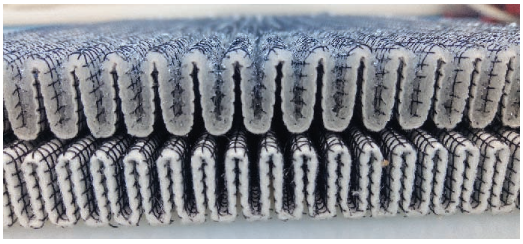
Water is present everywhere, during storage, handling and servicing

Filter Media



Fabric that absorbs water

Absorber media layer



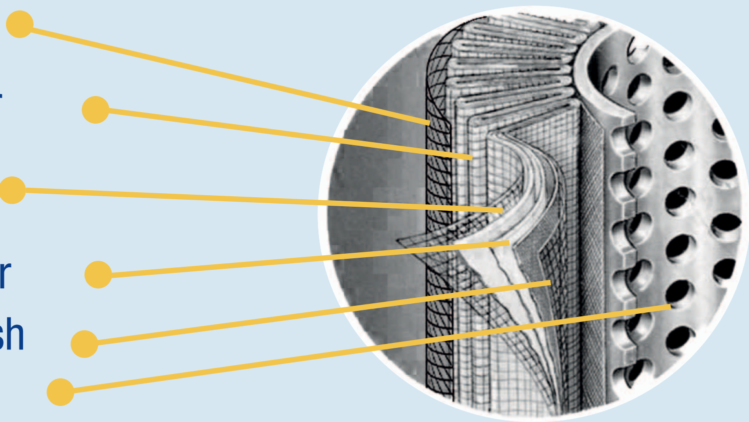
The Filter Media has absorbed water

MP Filtri filter elements feature an absorbent media which protects hydraulic systems from both particulate and water contamination.

MP Filtri's filter element technology is available with inorganic microfiber media with a filtration rating 25 μm (therefore identified with media designation WA025), providing absolute filtration of solid particles to $\beta_{x(c)} = 1000$.

Absorbent media is made by water absorbent fibres which increase in size during the absorption process. Free water is thus bonded to the filter media and completely removed from the system (it can not even be squeezed out).

FILTER MEDIA



The presence of water damages the components of the system

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

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, V_{oil} is the volume of oil in your system in litres, and ppm is the concentration of water in your system measured using Karl Fisher method (available also with our oil analysis report).

$$V_{H_2O} = V_{oil} \frac{ppm}{1{,}000{,}000} \quad (1) \qquad N = \frac{V_{H_2O}}{C} \quad (2)$$

Then you can calculate the required number of filters using equation (2): where N is the number of filters required and C is the maximum expected capacity of the filter selected for the same application from the table below. Make sure to use correct units as identified in the formula and in the table.

Element	Max Water holding capacity		Flow rate				Product type
	(ml)	(fl. oz.)	Min (l/min)	Max (l/min)	Min (gpm)	Max (gpm)	
CU2101WA025	158	5.34	20	101	5.28	26.68	LMP 210, LMP 211
CU2102WA025	247	8.35	32	159	8.45	42.00	LMP 210, LMP 211
CU2103WA025	343	11.60	44	220	11.62	58.11	LMP 210, LMP 211
CU4002WA025	211	7.13	27	135	7.13	35.66	LMP 400, LMP 401
CU4003WA025	307	10.38	39	197	10.30	52.04	LMP 400, LMP 401
CU4004WA025	403	13.63	52	258	13.74	68.16	LMP 400, LMP 401
CU4005WA025	619	20.93	79	395	20.87	104.35	LMP 400, LMP 401, LMP 430, LMP 431, UFM 051
CU4006WA025	933	31.55	120	600	31.70	158.50	LMP 400, LMP 401, LMP 430, LMP 431 UFM 051, UFM 091, UFM 181, UFM 919
CU9001WA025	763	25.80	98	489	25.89	129.18	LMP 900, LMP 901, LMP 902, LMP 903
CU9502WA025	611	20.66	78	391	20.61	103.29	LMP 950, LMP 951
CU9503WA025	698	23.60	90	448	23.78	118.35	LMP 950, LMP 951
MR2504WA025	413	13.96	40	265	10.57	70.00	UFM 041

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.

EXAMPLE

Suppose we want to remove water from very contaminated oil stored in a 1,000 litres tank in a hydraulic circuit with 30 bar working pressure. For this application, we already selected LMP 400 4. After a preliminary analysis using Karl Fischer method, the tank is found to have 1000 ppm of water (very contaminated).

Therefore: $V_{H_2O} = V_{oil}$ ppm / 10^6 = 1000 x 1000 / 10^6 = 1 litre

$N = V_{H_2O} / C_{LMP\ 400\ 4} = 1 / 0{,}403 = 2{,}5$

To remove free water, and reduce water content in the system below the level of saturation, three (3) LMP4004WA025 filters are required.

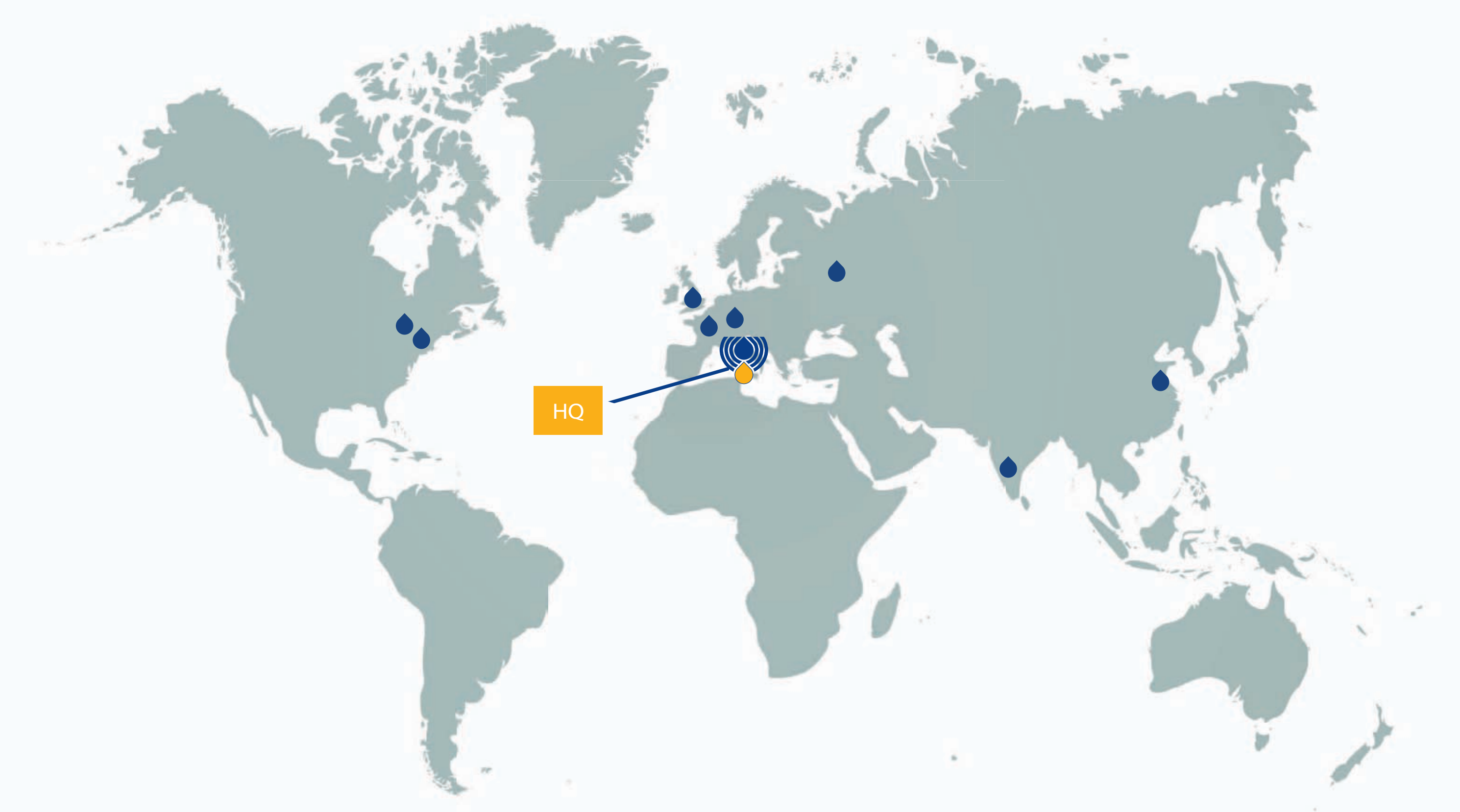
LOW & MEDIUM PRESSURE FILTERS - LMP Series
Together with our differential pressure indicator (ΔP = 2 bar - 0.2 MPa)

- LMP 210
- LMP 211
- LMP 400
- LMP 401
- LMP 430
- LMP 431
- LMP 900
- LMP 901
- LMP 902
- LMP 903
- LMP 950
- LMP 951

MOBILE FILTRATION UNITS FOR OFF-LINE FILTRATION
UFM Series

- UFM 041
- UFM 051
- UFM 091
- UFM 181
- UFM 919

WORLDWIDE NETWORK



HEADQUARTERS

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PASSION TO PERFORM

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