

TMR™-N2

Total Moisture Removal Systems

HIGHLY EFFECTIVE, LOW COST WATER REMOVAL SYSTEMS FOR ATMOSPHERIC-BREATHING LUBRICANT RESERVOIRS.

Total Moisture Removal-Nitrogen systems (TMR™-N2) cost effectively remove all 3 forms of water from lubricants and hydraulic fluids through mass transfer which is a highly effective, non-mechanical process. Using TMR™-N2 exploits the principle of chemical equilibrium to remove all types of water in a much more gentle, and energy efficient methodology. Most water removal systems use heat, vacuum, and pumps, which are all expensive to operate and maintain, to force the separation of the water from the lubricant. What is not understood is that in many applications, the primary mode of water ingress is atmosphere itself. Atmosphere provides an unlimited source of water whenever the moisture content in atmosphere is higher than the moisture content in the lubricant. Atmospheric water ingress rates are typically low and constant which lends itself perfectly to the TMR™-N2 system. Using mechanical separation systems in this scenario, would simply dehydrate the lubricant to an unsaturated state so that it can absorb more water from atmosphere. This creates an energy intensive cycle that fails to address the primary cause of water ingress.

TMR™-N2 systems produce ≥97% nitrogen gas that is extremely dry (-67.8°C/-90°F dew point and <0.01% relative humidity) using a small amount of standard compressed air at ambient conditions (75°F/ 24°C). The Nitrogen gas is introduced into the reservoir headspace at a point above the lubricant surface. As the clean, dry nitrogen sweeps across the reservoir, it will absorb water vapor which is forced out of lubricant as it moves towards moisture equilibrium with the Nitrogen on top of it.

TMR™ N2 systems reverse the normal reservoir breathing cycle (see illustrations on page 2) so that reservoirs are always discharging a small amount of high purity N2. In this configuration, reservoirs will be continually insulated with a free-flowing nitrogen blanket which eliminates the ingress of atmospheric water, particulate, and metal ions. Lubricant and hydraulic reservoirs operating in sea water environments, heavy industrial or agricultural regions can accumulate soluble metal ions, which are catalysts that accelerate lubricant breakdown.

MOVING BEYOND WATER REMOVAL AND MANAGING OXIDATION LEVELS

TMR™-N2 offers the additional benefit of removing the lubricants contact with oxygen. Oxygen along with water and metals, are the 3 primary catalysts of oxidation. TMR™-N2 offer users the ability to move beyond reactionary maintenance and actually manage the factors that accelerate oxidation. By continually managing water and oxygen levels, and by eliminating metal ion ingress from atmosphere, users can reduce the rate of lubricant breakdown, reducing maintenance requirements and extending lubricant life.

LONG-LIFE, LOW-COST, WITH ALMOST NO MAINTENANCE

TMR™-N2 systems have very low maintenance requirements. Two, inlet air filters are required to be replaced every 6 months to remove residual oil from the compressed air source which would otherwise reduce system life. With proper maintenance TMR™-N2 systems should last 8 years or more at which time only the generation unit would have to be replaced. The total cost of ownership of a TMR™-N2 system over 8 years is estimated to be \$5,500-\$8,000 in total (depending on size) which in many cases is \$50,000 lower than mechanical systems frequently used in these applications. That is a return on Investment (ROI) of \$44,500 or 809%. When you consider that 1 TMR™-N2 system can be shared between 2 reservoirs that are close in proximity, the ROI increases even more dramatically.



TMR™ is a trademark of EPT



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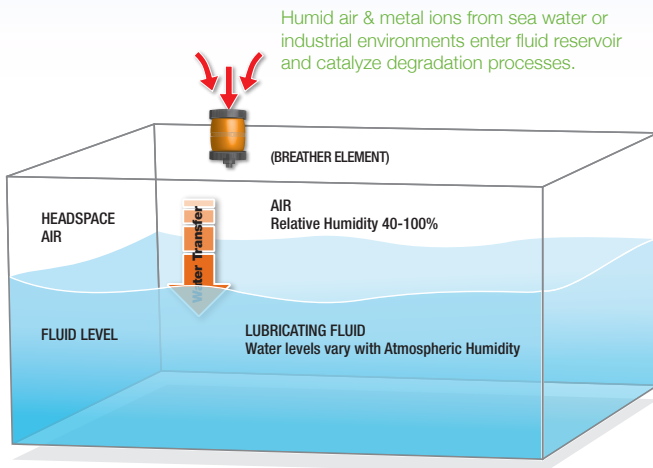
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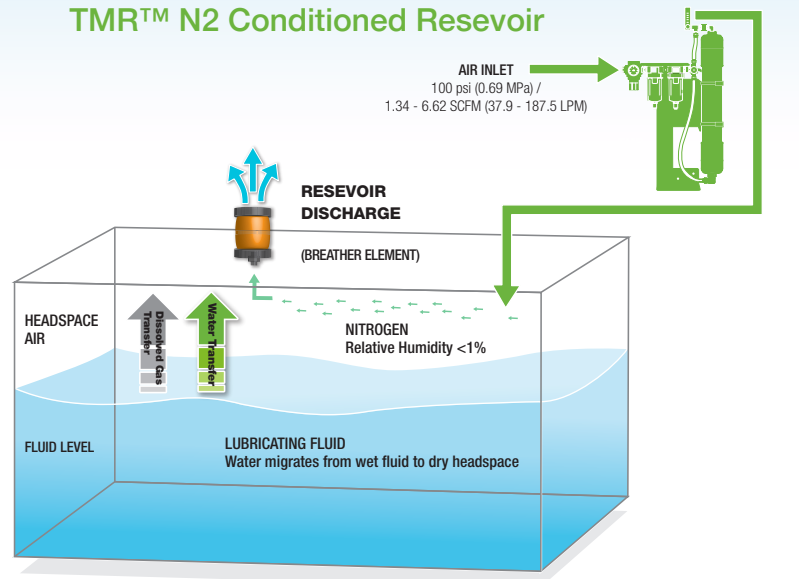
CONTAMINATION SOURCES



Atmospheric Breathing Lubricant Reservoirs



TMR™ N2 Conditioned Reservoir



KEY ISSUES WITH ATMOSPHERIC BREATHING LUBRICANT RESERVOIRS

- The Lubricant has unlimited access to water when atmospheric moisture levels are greater than lubricant moisture levels.
- Breather elements cannot reduce water levels in existing oil systems.
- Breather elements which are designed to reduce condensation have limited capacity and cannot prevent water ingress as the mode of ingress is typically mass transfer and not condensation.
- Sea water and industrial environments will also contribute metal ions which increases the rate of lubricant break-down.

KEY BENEFITS WITH TMR™ N2 FREE FLOWING NITROGEN BLANKETING SYSTEMS

- High purity N2 (98%) is generated at source providing unlimited capacity to reduce existing moisture.
- Will maintain water at very low levels (<50ppm total or <350ppm for EHC fluids) reducing the rate of lubricant break-down.
- Free flowing N2 is exhausted out the breather element or building exhaust reversing the typical flow configuration and eliminating one of the key ingress points for water and particulate contamination.
- Eliminates lubricant contact with oxygen, reducing oxidation, and promotes the removal of H, CO, C₂H₄, and other harmful breakdown gases.
- Normally eliminates the need for expensive vacuum dehydration equipment or disposable filter elements when water ingress rates are low or solely from atmosphere.
- Very low maintenance requirements (30 minutes per year).
- Quick Return on Investment (ROI).

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HIGH PERFORMANCE WITH PREDICTABLE RESULTS

CASE STUDY 1

TMR™ Started on 7-Feb-14

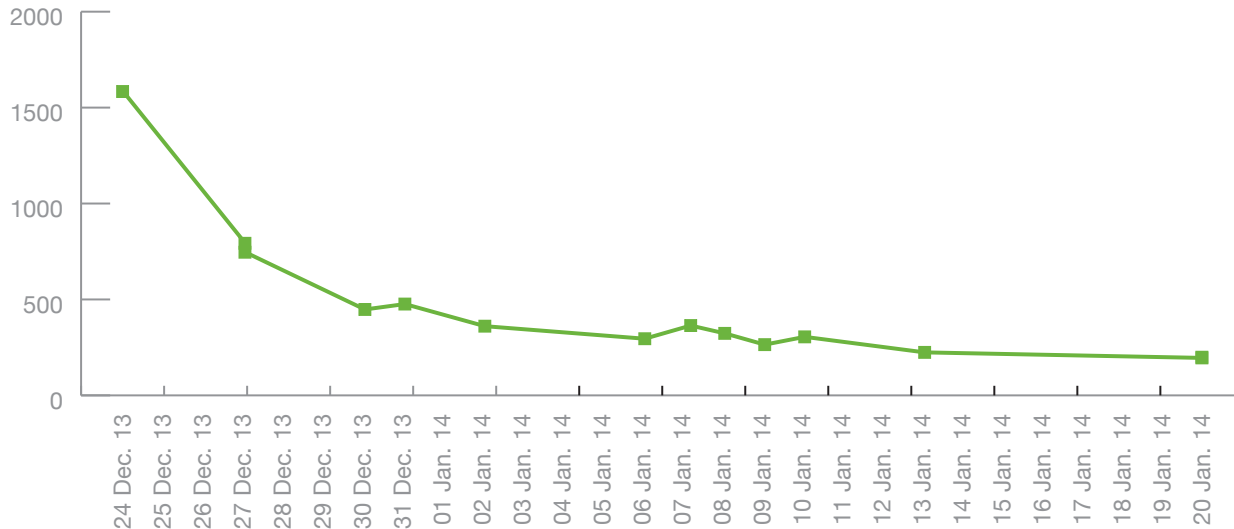
MOISTURE IN PPM



CASE STUDY 2

TMR™ Started on 24-Dec-13

WATER CONTENT (PPM)



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SIZING

TMR™-N2 systems are regulated, intrinsically safe, and have a manually adjusted flow control valve with flow meter. TMR™-N2 systems are designed to remove up to 100 – 300 ppm water per day and sized according to the headspace volume. Reservoirs need a breather element (or suitable exhaust) and excessive atmosphere access points should be sealed. Reservoir extraction fans are not ideal in applications with-out bearings and should be removed if technically and logistically feasible.

SIZING AND TECHNICAL SPECIFICATIONS				
PART NUMBER	601902	601903	601904	601905
Reservoir Size (gallons/litres)	≤ 400 / 1532	≤ 800 / 3028	≤ 2000 / 7570	≤ 3000 / 11356
Daily Water Removal (ppm)	100-300	100-300	100-300	100-300
Inlet/Outlet-NPT (inch)	¼	¼	¼	¼
Dimensions LxWxH mm (inch)	162 x 421 x 777 mm (6 ¾" x 16 ⅝" x 30 ⅝")	162 x 466 x 1254 mm (6 ¾" x 20 ⅝" x 48 ⅝")	168 x 499 x 1234 mm (6 ⅝" x 19 ⅝" x 48 ½")	168 x 499 x 1234 mm (6 ¾" x 19 ⅝" x 48 ⅝")
Shipping Dimensions LxWxH mm (inch)	254 x 508 x 864 mm (10" x 20" x 34")	280 x 534 x 1296 mm (11" x 21" x 51")	280 x 534 x 1296 mm (11" x 21" x 51")	PART 1 508 x 737 x 864 mm (10" x 20" x 29") PART 2 178 x 178 x 1677 mm (7" x 7" x 66")
Shipping Weight	10kg (21lbs)	20kg (44lbs)	22kg (48lbs)	PART 1 11 kg/23 lb PART 2 10 kg/20 lb
N2 Output - Manual Control with Flow Meter (SCFH/LPM)	0.5 / 14.2	0.75 / 21.2	1.25 / 35.4	2.5 / 70.8
Pre-set Flow Rate	30 SCFH/14 LPM	45 SCFH/ 21 LPM	75 SCFH/ 35 LPM	150 SCFH/ 70LPM
N2 % at Pre-set Flow @ 100psi/ 0.69 MPa/ Air Temp. of 70F/21C	97%	>97%	>97%	>97%
Air Consumption max @ 100psi / 0.69 MPa (SCFM/LPM)	1.34 / 37.9	2.05 / 58.1	3.63 / 102.8	6.62 / 187.5
FOR PART NUMBER	601902	601903	601904	601905
Particulate Filter	601265	601265	601265	601265
Oil Coalescer	601514	601514	601514	601514
Pressure Gauge	601556	601556	601556	601556
Replacement Membrane	601341	601551	601599	601609

Notes: 1) Values produce ≥97% nitrogen-enriched gas at outlet
2) Temperature of membrane must stay ≥ 75 °F (24 °C) for optimal performance.
Nitrogen recovery will be hindered if temperature averages ≤ 24 °C

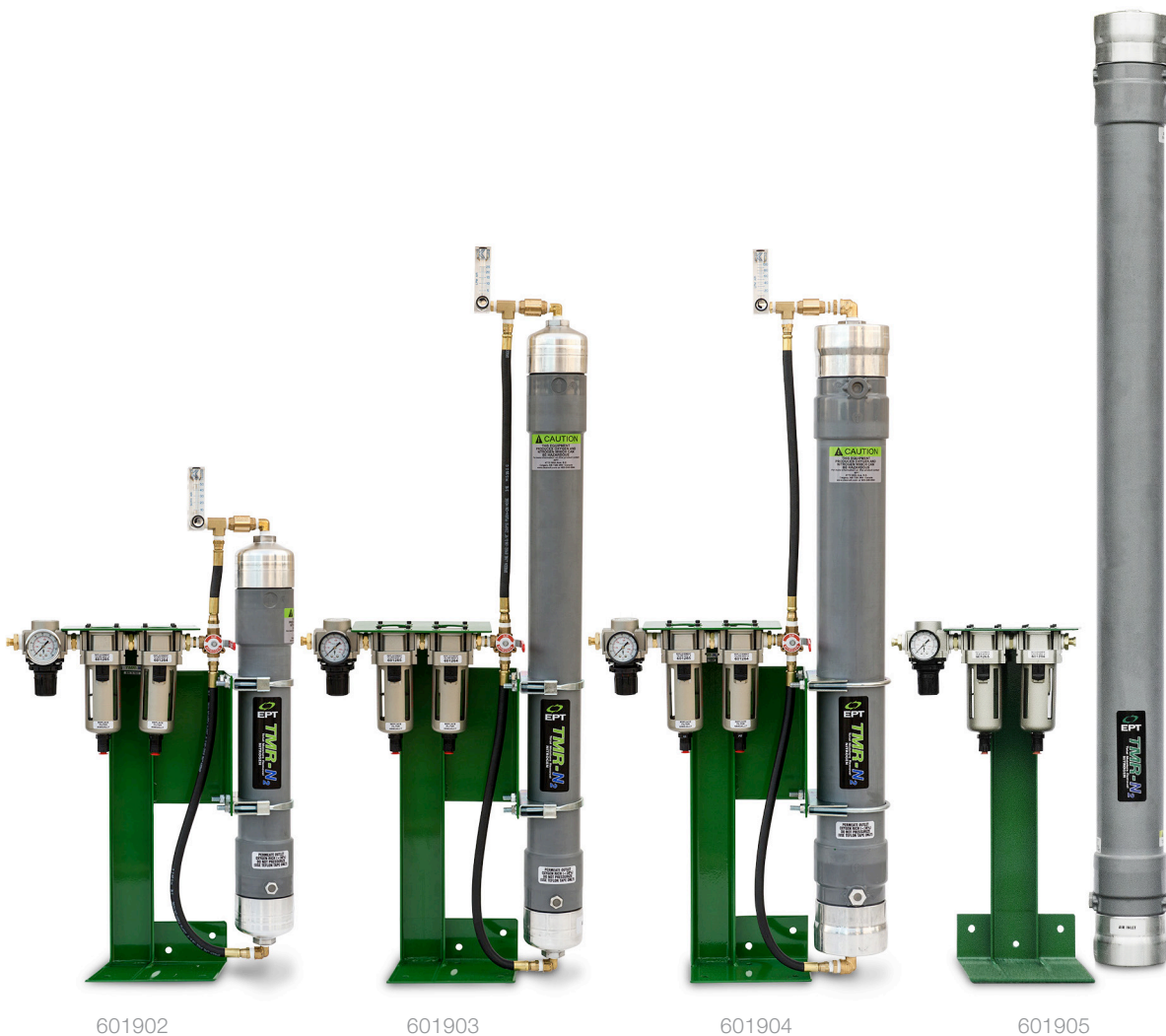


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601902

601903

601904

601905

AVAILABLE OPTIONS	DESCRIPTION
M1	Manifold to share 1 TMR™ with 2 reservoirs.

CONTACT INFORMATION

For additional information contact:
Sales@cleanoil.com



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