



# TMR™ AIR TOTAL MOISTURE REMOVAL SYSTEM

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

## Overview

Water is the most common and damaging contaminant found in hydraulic and lubricating systems. Water can exist in 3 forms: free, dissolved and emulsified. EPT's Total Moisture Removal (TMR™) Air systems cost effectively remove all 3 forms of water from lubricants and hydraulic fluids through mass transfer which is a highly effective, non-mechanical process. Most water removal systems use heat, vacuum and pumps, which are all expensive to operate and maintain, to force the separation of water from the lubricant. The TMR™ Air system exploits the principle of chemical equilibrium to remove all types of water in a much more gentle, and energy efficient methodology.

In many applications, the primary mode of water ingress is atmosphere, which provides an unlimited source of water whenever the moisture content in the atmosphere is higher than in the lubricant. Atmospheric water ingress rates are typically low and constant, which lends itself perfectly to the TMR™ Air 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.

## Free Flowing Dry Gas Blankets

TMR™ Air systems produce dry gas (-40°C/-40°F dew point and <1% relative humidity) using a small amount of standard compressed air at ambient conditions (24°C/75°F). The dry gas is introduced into the reservoir headspace at a point above the lubricant surface. As the clean, dry air sweeps across the reservoir, it will absorb water vapor which is forced out of lubricant as it moves towards moisture equilibrium with the dry gas.

TMR™ Air systems reverse the normal reservoir breathing cycle (see illustration) so that reservoirs are always discharging a small amount of dry air. In this configuration, the ingress of atmospheric water, particulate and metal ions is eliminated. 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.

## Long-life, Low-cost, with Minimal Maintenance

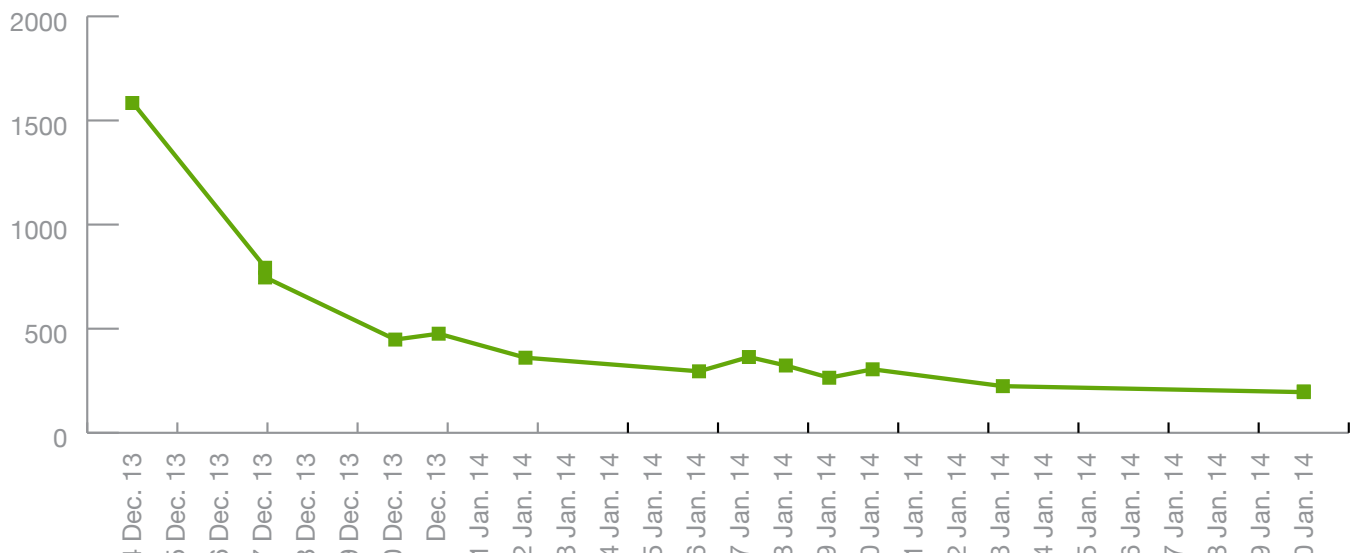
TMR™ Air systems have very low maintenance requirements. Two inlet air filters need to be replaced every 6 months to remove residual oil from the compressed air source, which would otherwise reduce system life. With proper maintenance, TMR™ Air systems should last 5 years or more at which time only the generation unit would need to be replaced. The total cost of ownership of a TMR™ Air system over 5 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 one TMR™ Air system can be shared between two reservoirs that are close in proximity, the ROI is even more dramatic.

## High Performance with Predictable Results

### CASE STUDY

TMR™ system started on 24-Dec-13

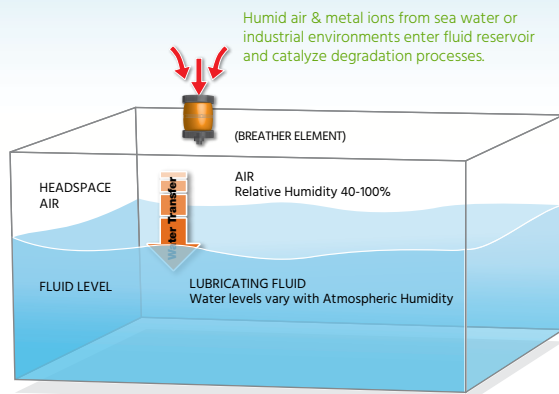
#### Water Content (ppm)



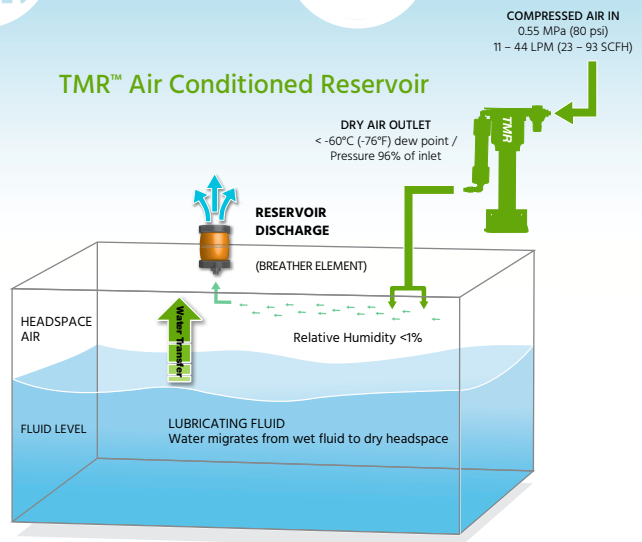
## CONTAMINATION SOURCES



### Atmospheric Breathing Lubricant Reservoirs



### TMR™ Air 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 existing water levels.
- Breather elements, which are designed to reduce condensation, have limited capacity and cannot prevent water ingress from atmosphere via mass transfer.

**Note:** extraction fans used to prevent condensation make this situation worse.

- Sea water and industrial environments will also contribute metal ions which increases the rate of lubricant breakdown.

## Key Benefits of TMR™ Air Systems

- Dry gas is generated at the source providing unlimited capacity to reduce existing moisture.
- Maintains water at very low levels (<50 ppm total or <350 ppm for EHC fluids) reducing the rate of lubricant breakdown.
- Free flowing dry gas is exhausted out the breather element, reversing the typical flow configuration and eliminating one of the key ingress points for water and particulate contamination.
- Normally eliminates the need for expensive vacuum dehydration equipment or disposable filter elements when water ingress rates are <200 ppm/day or solely from atmosphere.
- Very low maintenance requirements (30 minutes per year).
- Quick return on investment (ROI).

## TMR™ Air System Sizing

TMR™ Air systems are regulated, intrinsically safe and have a manually adjusted flow control valve with flow meter. These systems are ideally suited when oil reservoirs are in small rooms where you do not want to change atmospheric gas levels through the addition of nitrogen. They are designed to remove up to 100 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 without bearings and should be removed if technically and logistically feasible. TMR™ systems will not work while extraction fans are operating. Contact your authorized dealer for additional information.

SIZING AND TECHNICAL SPECIFICATIONS	
<b>PART NUMBER</b>	<b>600904</b>
Reservoir Volume (L/gal)	≤2000/7570
Daily Water Removal (ppm)	100
Connections: Inlet/Outlet FNPT (in.)	¼
Dimensions LxWxH (mm/in.)	354 x 127 x 607/ 14 x 5 x 24
Shipping Dimensions LxWxH (mm/in.)	508 x 250 x 734/ 20 x 10 x 29
Shipping Weight (kg/lb)	10/21
Output Flow Rate – Manual Control with Flow Meter (LPM/SCFH)	0-28/0-60
Pre-set Flow Rate (LPM/SCFH)	14/30
Air Consumption Max. at 0.69 MPa/100 psi (LPM/SCFH)	0-85/0-180

REPLACEMENT PARTS	
<b>PART NUMBER</b>	<b>600904</b>
Particulate Filter	601265
Oil Coalescer	601514
Pressure Gauge	601556
Replacement Membrane	601740

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

## Additional Resources

1. White Paper: Effectively Eliminating Water Contamination from Hydraulic and Lubricating Fluids
2. TMR™ N<sub>2</sub> System Product Information

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