OilDry, Voith's innovative compressed air system

Innovative compressed air barrier system from Voith proactively prevents water intrusion, protecting bearings and extending the service life of lubrication oil.

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INTRODUCTION:

OilDry, Voith's innovative compressed air system, prevents water contamination in the lubrication system of the dryer section and wet end. Within hours of implementation on a production line for packaging paper in Europe, water content in the lubrication oil dropped significantly.

A modern paper machine is a complex and tightly integrated industrial system. Throughout, numerous bearings rely on tens of thousands of liters of lubrication oil to work smoothly under extreme loads and high temperatures.

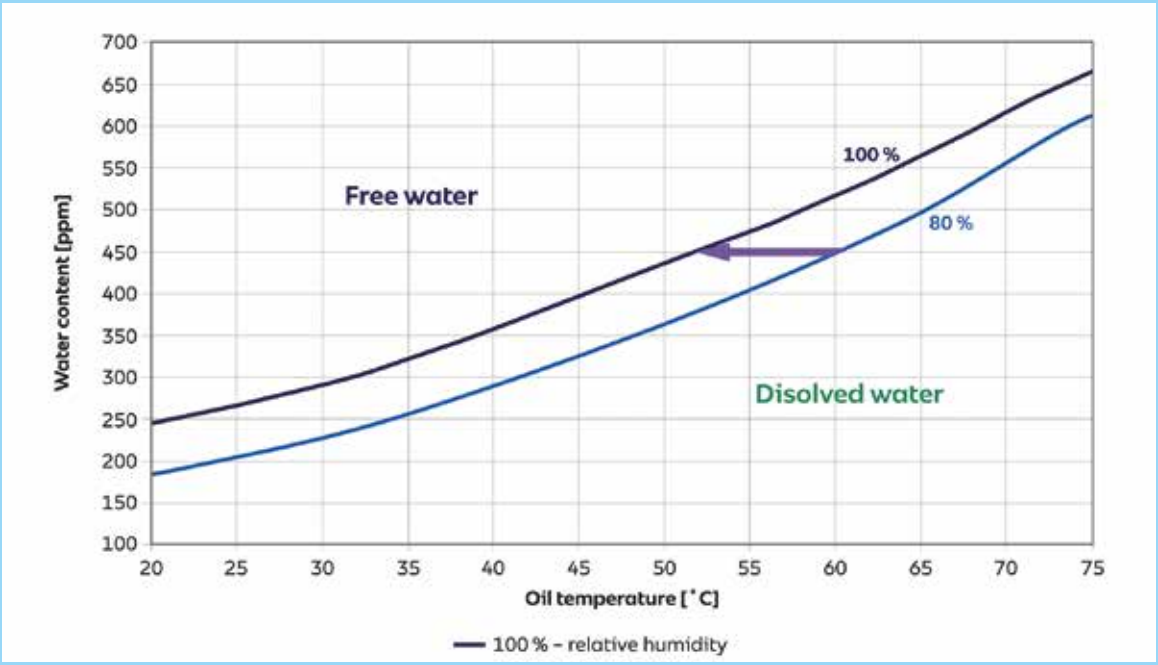
Lubrication oil can hold water in a dissolved state. The amount it can retain depends directly on its temperature. At a typical operating temperature of 62°C and a consistent relative humidity of 80 percent, oil contains around 450 parts per million of water. In this constellation, the water is bound and is therefore harmless. Problems occur, however, when the operating temperature goes down.

During a shutdown, paper breaks, or changes in production cycles, the operating temperature invariably drops. Lubrication oil cools down, and the oil-water mixture is disrupted. Once the temperature falls below 52°C, relative humidity in the oil rises to 100 percent. Any further drops in temperature will cause the oil to release excess water, which separates as free water.

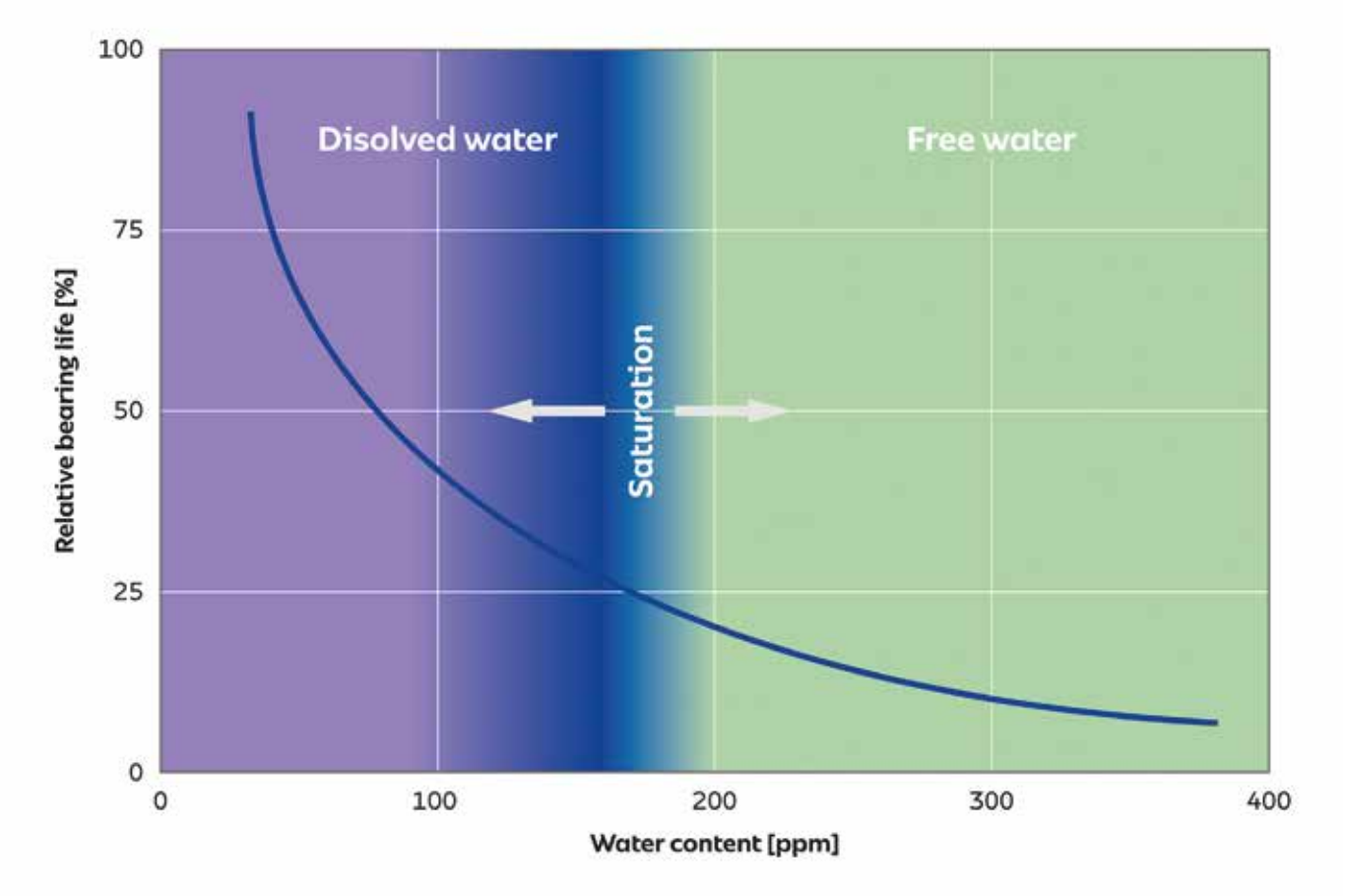
Why free water is costly for papermakers

When free water occurs, it can cause serious damage. Water contamination changes the oil's properties and performance, shortens its service life, and reduces the thickness of the lubrication film. "Free water is poison for the bearings," says Andreas Poinsitt, Product Manager Lubrication at Voith Paper. "When free water enters roller bearings, it causes corrosion within a short time. This leads to premature bearing damage and unplanned downtimes, often involving significant repair work and costs."

The graphic below shows the temperature dependency of the water saturation limit in oil, indicating that the capacity to absorb dissolved water increases almost linearly with rising operating temperature. A critical effect is highlighted by the blue arrow: when the oil cools down, the saturation threshold decreases, causing previously dissolved water to shift into the harmful free-water state (condensation), even though the absolute water content in ppm remains unchanged.



The diagram below illustrates the decrease in relative bearing service life as the water content in the lubricant increases, showing that even small amounts of dissolved water significantly shorten operating life. The transition to the free-water range after exceeding the saturation limit is particularly critical, as lubricant film formation fails and wear increases exponentially.



A special case: the dryer section with higher dew points

Increasingly, Poinsitt notes, paper mills operate in conditions of higher humidity. Modern dryer hoods run at higher dew points, for instance, which is good for energy-efficiency, but the higher humidity in the air is an issue for oil and for bearings. Higher dew points carry a greater risk of oil absorbing moisture and releasing free water, which puts bearings at risk.

Mills work hard to keep water out of the lubrication systems. Most common solutions require vacuum systems to remove the dissolved water in oil to prevent free water occurring. They evaporate water out of the oil and then vent the moist air.

"These kinds of systems only treat the symptoms, however, not the cause," adds Poinsitt. "We therefore decided to completely shift away from current practice and focused instead on designing a solution that would prevent water from entering the system in the first place."

A unique approach with strikingly dry results

By moving the spotlight to prevention rather than treatment, Voith designed a streamlined solution that is also easy to retrofit to existing dryers. "Instead of trying to remove water with a vacuum system, we decided to use compressed air to keep water out," explains Poinsitt.

During a pilot phase in Europe on a paper machine for packaging paper, with a machine speed of 1,350 m/min, a rudimentary test rig was set up. The compressed-air system was installed along the oil return system in the dryer section.

"We installed our solution at strategic places along the oil return system," explains Poinsitt. "The theory was, this approach would create overpressure, which would prevent water from entering the system and being absorbed by the oil."

Instant proof of concept: a radical drop in water content

Before the Voith system was installed, the water content in the oil fluctuated between 25 and 30 percent – and that was only because an additional oil removal system was running continuously in the background. Without the oil removal system, at times the water content had hit 80-85 percent.

"As soon as we turned on our system, the water content fell sharply. The results were striking. Within just a few hours, it had dropped significantly," notes Poinsitt. "It's the fastest I've seen an innovation prove itself on a full-scale production line."

Impressively, even when the additional oil removal system was turned off, the water content stayed at the same low level. Today, the system continues to run on the paper machine and has consistently kept the water content at a considerably lower level since installation.

The trend illustrates how the water content in the central lubrication system was significantly reduced within just a few hours after the OilDry was put into operation and has since been consistently maintained at this low level.

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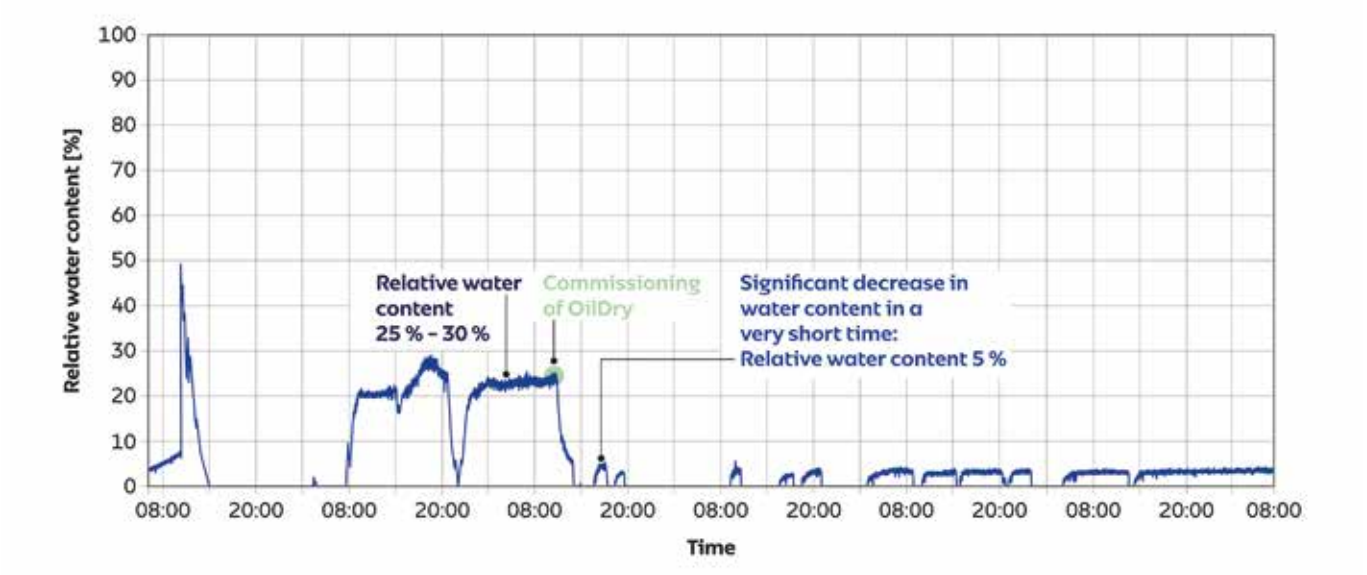

The innovation to proactively prevent water intrusion

OilDry is the apt name of this innovative system, which has been patented, as it prevents oil from absorbing water rather than removing water content retroactively. It essentially works by using compressed air to form a barrier around the labyrinth seals, which prevents moist air from passing through the seals and entering the bearings, where it would otherwise condense and be absorbed by the oil.

What's more, OilDry is a quick fix for all types of paper machines, including from third parties. The compressed air connections can be installed around the labyrinth seals during a short, scheduled shutdown. The remaining piping and control panel installation work can be carried out during production.

OilDry: proactively preventing water contamination

Currently, OilDry is installed in the dryer section of a number of production lines in Europe, but Andreas Poinsitt and his team are already working with papermakers on solutions that will work in the wet end of the paper machine, specifically in the forming and press section.

Although water intrusion in lubrication oil has long been accepted as a result of the humid conditions in a paper mill, OilDry proves that it does not have to be. By using compressed air to create reliable barriers around labyrinth seals, the water content in lubrication oil remains low, securing a longer, smoother service life for bearings.

The message is clear: proactively working against high water content protects bearings, extends the service life of lubrication oil, and can lead to a smoother production line.

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Product Manager Lubrication at Voith Paper

Image 1: OilDry, Voith's innovative compressed air system