



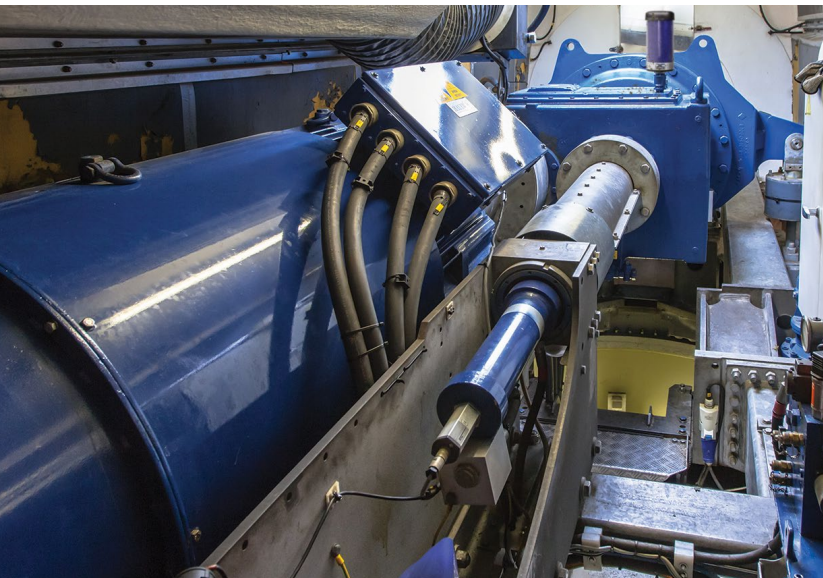
SOLUTIONS FOR THE  
**WIND ENERGY**  
MARKET

## THE PROBLEM

# Wind Turbine Gearboxes & Hydraulics Are Often Not Meeting Their 20-year Designed Life.

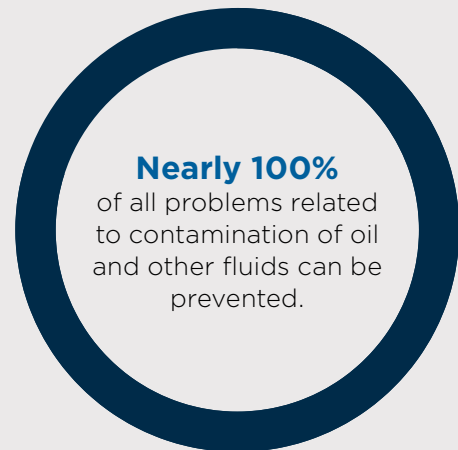
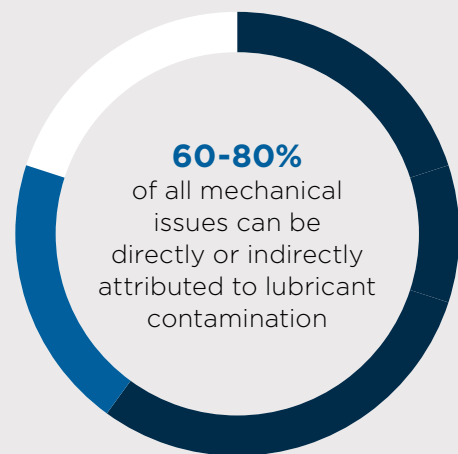
Premature failure of these components increases:

- Turbine Unplanned Downtime (Lost Revenue)
- Unplanned Maintenance
- Gearbox & Hydraulic Replacement and/or Rebuild
- Shortened Fluid Service Life
- Warranty Reserves
- Cost of Energy



## Quick Facts...

- Older wind turbine gearboxes do not have any form of filtration. When no filtration is present, contamination will be the number one cause of component failure.
- In newer generation wind turbines, filtration is often added to the gearbox. However, in order to maintain adequate flow rates through the cooler, many gearbox filters do not meet the efficiencies required for fluid cleanliness levels.
- In hydraulic systems, contamination has long been known to be the leading causing of component failure.



Some of the biggest names in the wind energy business including **5 of the top 8** wind turbine OEMs trust Des-Case solutions.





## Contamination Control: The Key to Wind Turbine Reliability

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The wind power sector has a unique and very demanding set of challenges, including extreme operating conditions, hard-to-access locations, and the need for continuous availability and efficiency. Machinery reliability in wind turbines is especially tasking as poor lubrication practices can cause failures in system gearboxes, hydraulic systems and bearings, which are costly to fix. To increase scheduled time between maintenance, reduce cost of lubrication replacement, and protect the system from failure, prevention and treatment of contamination is key.

### Particle Contamination Is the Leading Cause of Hydraulic and Gearbox Failures.

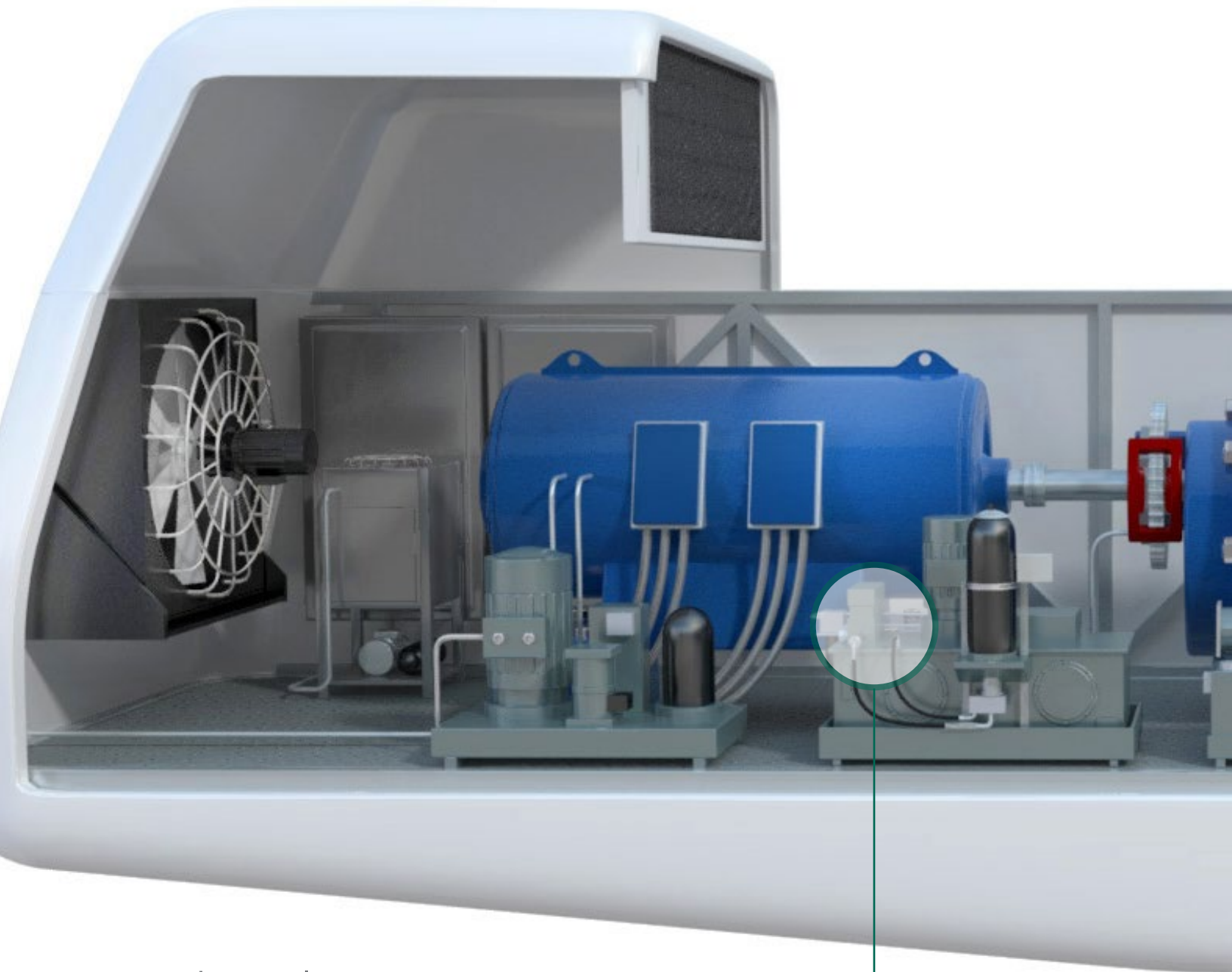
If the atmosphere is contaminated, oil will become dirtier and lubricant quality becomes compromised. Particulate contamination, once inside an operating system, will accelerate the generation of new contaminants due to machine wear. These contaminants damage critical components and act as a catalyst for oxidation, further degrading the condition of lubricants.

### Water Levels in Wind Turbine Gearboxes and Hydraulic Systems Should Be Kept Below 40% relative humidity (RH). In Practice, This Means <100ppm in Most Applications.

If the atmosphere is humid or has frequent temperature fluctuations, the oil is probably moisture-laden and lubricant quality is compromised. Sources of water ingress in wind turbines include atmospheric ingress through the breather, migration through shaft seal interfaces, leaky water coolers and new oil that has not been pre-filtered.

## How and Where We Can Help

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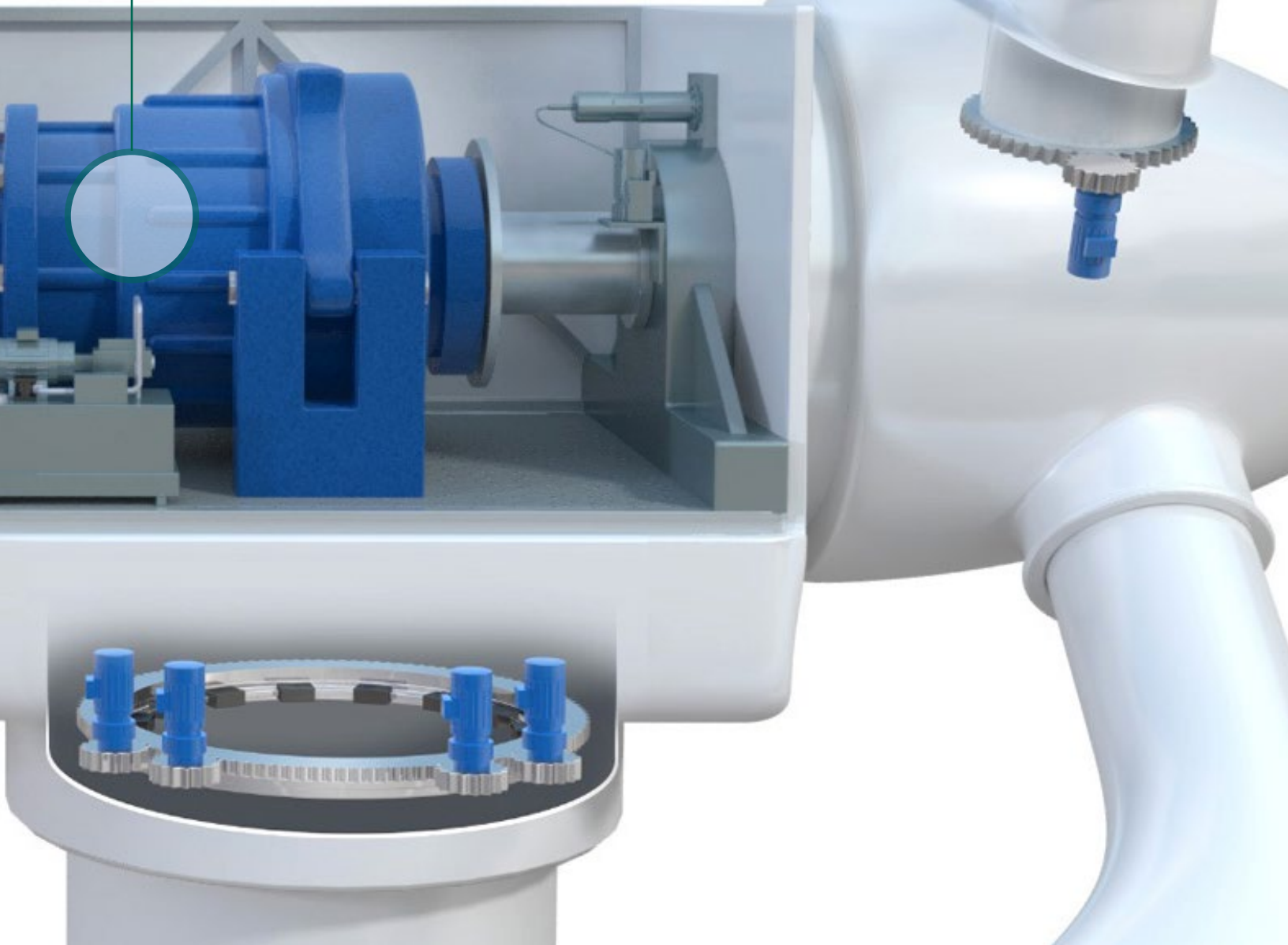


## Hydraulic Unit

The turbines use a hydraulic system that provides a braking mechanism for a unit, but can also be used for hydraulic pitch control on the blades. The oil in this application not only transmits power, but it also provides lubrication, heat transfer, and transports contaminants to be filtered out.

# Gearbox

Gearboxes in wind turbines differ from those in high-speed machinery. In industrial gearboxes, the progress of failure can occur in weeks, days, or even hours. In wind turbines, the impact of contaminants on slower turning gear drives is slow and insidious. Nevertheless, the mean time between failure (MTBF) for gears and shaft-support bearings can be increased by as much as two to three times by maintaining optimum levels of fluid cleanliness and dryness.





# Solutions for Wind Turbine Contamination Control

## Desiccant Breathers

High -capacity and dirt-holding cartridge filter, good for those very dusty and dirty environments and reduces contamination of your oils by removing solid particles (down to 3µm). Standard on all TDB, ACL, and KL Series models.

The oil mist reducer is situated inside the standpipe, made from polypropylene for maximum chemical compatibility. Mimicking nature's intricate honeycomb design, this feature allows oil mist to coalesce and drain back into the reservoir, rather than compromising the desiccant. Exclusive to all sizes within the Extended Series® models.



High-capacity check valves allow for increased airflow at low cracking pressure. Standard on all VentGuard™ and Extended Series® models.

## Disposable Breathers

	Standard Series	VentGuard™ Series	Extended Series®
Check Valves		☑	☑
Vibration Resistance (female thread)			☑
Integrated Oil Mist Reducer			☑
Amount of Desiccant - lbs (kg)	.3 (.1) to 2 (.9)	.3 (.1) to 2 (.9)	1.2 (.54) to 4.2 (1.91)
Adsorption Capacity - fl oz (ml)	2 (50) to 12 (359)	2 (50) to 12 (359)	7.7 (228) to 27 (798)
Air Flow Rate - cfm @ 1 Psid	4 to 16	1 to 12	27 to 765
Flow Rate - gpm (l/min)	31 (118) to 120 (453)	11 (41) to 90 (340)	180 (680) to 202 (765)

## Serviceable Breathers

	TDB Series	ACL Series	KL Series
Check Valves	☑	☑	☑
Integrated Oil Mist Reducer	☑		
High Dirt-Holding Capacity	☑	☑	☑
ZR gel volume - cc	300 to 1,000	300 to 600	300 to 2,000
Adsorption Capacity - fl oz (ml)	2.8 (86) to 9.3 (288)	2.8 (86) to 5.8 (172)	2.8 (86) to 19.5 (576)
Air Flow without Check Valves - cfm (l/min)	24.7 (700) to 53 (1,500)	24.7 (700)	24.7 (700) to 53 (1,500)
Air Flow with Check Valves - gpm (l/min)	10.6 (300) to 14.1 (400)	10.6 (300)	10.6 (300) to 14.1 (400)

# Offline Filtration Units

Extremely efficient radial offline filtration and dehydration in a single process

- Integrated compact pump & motor
- Modular unit to suit your specific requirements
- Available with and without water removal filter

## Hydraulic Applications

### OLU1A30HB

- For reservoir volumes up to 357 gal (1,350 L)
- Cellulose depth filter material

### OLU1B60HB

- For reservoir sizes up to 713 gal (2,700 L)
- Cellulose depth filter material

## Gearbox Applications

### OLU1B60A5V

- For reservoir sizes up to 713 gal (2,700 L)
- Glass fiber filter material



	OLU1A30HB	OLU1B60HB1	OLU1B60A5V
Nominal Flow (gpm / lpm)	2.1 / .55	1.11 / 4.2	1.11 / 4.2
Max Oil Temperature (F / C)	176 / 80	176 / 80	176 / 80
Max Pressure Filter Housing (bar)	20	20	20
By-Pass Openings Pressure	6.2 bar (at 0 bar back pressure)	6.2 bar (at 0 bar back pressure)	6.2 bar (at 0 bar back pressure)



# Solutions for Wind Turbine Contamination Control



## Connected Breather

### Wired and Wireless Connections

Take a proactive approach to water ingress with the market’s first connected and most accurate breather. Unlike any other breather on the market, our connected breathers eliminate the subjectivity of color-changing desiccant media. Our patent pending IsoLogic® Sensor Technology provides a precise measurement of your breather’s life to eliminate replacing a breather too late or too soon.

- Monitor headspace humidity to determine the source of water ingress as either from the inside or the outside.
- Monitoring breather condition in real time to remotely identify moisture problems, eliminating costly up-tower services work.
- View all breather statuses and trend data on the web platform from anywhere, anytime. All you need is the internet.



	Wireless	Wired
Module Power	<ul style="list-style-type: none"><li>• Supply Source: Three AAA Batteries (each rated 1.5 V DC, Max 1200 mAh)</li><li>• Supply Voltage: 4.5 V DC</li><li>• Operational Current Rating: 30 mA</li><li>• Life Expectancy: 2 years (use and temperature dependent)</li></ul>	<ul style="list-style-type: none"><li>• Supply Voltage: 9–28 V DC</li><li>• Operational Current Rating: 30 mA</li></ul>
Connectivity/Data Output	<ul style="list-style-type: none"><li>• 2.402 - 2.480 GHz Bluetooth 4.0 Low Energy</li><li>• Communication Range: up to 100ft (30m) line of sight</li></ul>	<ul style="list-style-type: none"><li>• A Coding - M8, 4 Pin Male</li><li>• Serial: RS485 Half Duplex</li></ul>
Module Environment	<ul style="list-style-type: none"><li>• 13.56 MHz RFID (Module &amp; Sensor-board Communication)</li><li>• Intended for indoor and outdoor use</li><li>• Altitude up to 5000 meters</li><li>• Maximum Relative Humidity: 100% at up to 130°F (54°C)</li><li>• Dustproof / Waterproof (IP66)</li><li>• Hazardous Ratings: Not rated for hazardous locations</li><li>• FCC, CE, Reach, RoHS, Anatel</li></ul>	<ul style="list-style-type: none"><li>• 13.56 MHz RFID (Module &amp; Sensor-board Communication)</li><li>• Intended for indoor and outdoor use</li><li>• Altitude up to 5000 meters</li><li>• Maximum Relative Humidity: 100% at up to 54°C (129°F)</li><li>• Dustproof / Waterproof (IP66)</li><li>• Hazardous Ratings: Not rated for hazardous locations</li><li>• FCC, CE, Reach, RoHS</li></ul>



# Condition Monitoring

## Connected Off-Line Units

Connected Off-Line Units enable you to keep your oil clean and monitor oil conditions real-time in one economical installation by integrating our Contamination Monitoring Sensor (CMS). The CMS measures and displays particulate contamination, moisture and temperature levels in various fluids.



## Oil Quality Sensor

The OQS puts you in control with real-time monitoring of oil degradation and water ingress. Expensive oil changes are now based on oil condition, not on historical schedule.

### Addressable Issues

- Moisture/Water
- Glycol, fuel
- Dirt, soot
- Process contamination
- Total Acid No. (TAN)
- Total Base No. (TBN)
- Wear particles
- ISO cleanliness changes
- Viscosity breakdown
- Polymer shear

## Contamination Monitoring Sensor

The CMS in-line contamination monitor automatically measures and displays particulate contamination, moisture and temperature levels in various hydraulic fluids. It is designed specifically to be mounted directly to systems, where ongoing measurement or analysis is required, and where space and cost are limited.

### Addressable Issues

- Oxidization process
- Moisture/Water
- Dirt
- Process contamination
- Wear particles
- ISO cleanliness changes
- Viscosity breakdown



# Solutions for Wind Turbine Contamination Control

## Interchangeable Filter Elements

Our interchangeable elements meet or exceed all OEM specs and provide high-efficiency filtration with low pressure drop. With a high dirt-holding capacity, they are ideal for highly contaminated lubricants.

Product Specification	1300R-KE50 (5 Micron)	1300R-KE50 (10 Micron)	2200R-KE50 (5 Micron)	2200R-KE50 (10 Micron)	2600R-KE50 (5 Micron)
Part Code	DC-C1300RS16CV-B4-KE50	DC-C1300RS16EV-B4-KE50	DC-C2200RS31CV-B4-KE50	DC-C2200RS31EV-B4-KE50	DC-C2600RS36CV-B4-KE50
Filtration Rating (Performance $\beta x(c) \geq 1000$ per ISO 16889)	7 $\mu m$	12 $\mu m$	7 $\mu m$	12 $\mu m$	7 $\mu m$
Clean $\Delta P$ (Performance per ISO 3968)	<1 psi / <1 bar ( $\Delta P$ )	<1 psi / <1 bar ( $\Delta P$ )	<1 psi / <1 bar ( $\Delta P$ )	<1 psi / <1 bar ( $\Delta P$ )	<1 psi / <1 bar ( $\Delta P$ )
Apparent Dirt Holding Capacity (Performance per ISO 16889)	.6 lb / 290 g	.6 lb / 290 g	1.4 lb / 650 g	1.4 lb / 650 g	1.36 lb / 620 g
Collapse Pressure Rating (Performance per ISO 2941)	145 psi / 10 bar ( $\Delta P$ )				
Replacement Pressure	50 psi / 3.5 bar				
Flow Direction	Outside to Inside				
By-Pass Cracking Pressure	58 psi / 4 bar				
By-Pass Element Rating	50 $\mu m$ Stainless Steel Mesh				
Temperature Range	-4 °F to 212 °F / -20 °C - 120 °C				

Product Specification	2600R-KE50 (10 Micron)	C1063-KE50 (5 Micron)	C1063-KE50 (10 Micron)	C1083-KE50 (5 Micron)	C1083-KE50 (10 Micron)
Part Code	DC-C2600RS36EV-B4-KE50	DC-C10630DS30CV-KE50	DC-C10630DS30EV-KE50	DC-C10830D30CV-B4-KE50	DC-C10830D30EV-B4-KE50
Filtration Rating (Performance $\beta x(c) \geq 1000$ per ISO 16889)	12 $\mu m$	7 $\mu m$	12 $\mu m$	7 $\mu m$	12 $\mu m$
Clean $\Delta P$ (Performance per ISO 3968)	<1 psi / <1 bar ( $\Delta P$ )				
Apparent Dirt Holding Capacity (Performance per ISO 16889)	1.36 lb / 620 g	.66 lb / 300 g	.66 lb / 300 g	.66 lb / 300 g	.66 lb / 300 g
Collapse Pressure Rating (Performance per ISO 2941)	145 psi / 10 bar ( $\Delta P$ )				
Replacement Pressure	50 psi / 3.5 bar				
Flow Direction	Outside to Inside				
By-Pass Cracking Pressure	58 psi / 4 bar	N/A	N/A	58 psi / 4 bar	58 psi / 4 bar
By-Pass Element Rating	50 $\mu m$ Stainless Steel Mesh				
Temperature Range	-4 °F to 212 °F / -20 °C - 120 °C				

# Varnish Removal System

Varnish is a common problem for a wide range of hydraulic fluids and gear oils. It results in stickiness around the valves, shorter fluid life, shorter filter life and unscheduled downtime. This is the most complete varnish removal and prevention system on the market. It removes oxidation by-products and prevents varnish formation during the cool down.

- Removes soluble and insoluble varnish contaminants
- Prolongs oil health by reducing additive consumption
- Reduces and prevents servo valve sticking
- Efficiently cleans without adding water or other by-products to the system

<b>Nominal Flow</b>	0.26 GPM (1 l/min) per cartridge
<b>Apparent Dirt Holding Capacity</b>	4.3 lb (1.955 g)
<b>Water Absorption</b>	0.69 gal (2.6 liters)
<b>By-pass Opening Pressure</b>	72.5 psi (5 bar)
<b>Pump Safety Valve</b>	217 psi (15 bar)
<b>Fluid Temperature</b>	68° - 176° F (20° - 80° C)
<b>Power Supply</b>	See ordering code
<b>Inlet Connection</b>	Depending on the pump, contact a Des-Case or RMF representative
<b>Outlet Connection</b>	1/2" BSPP female
<b>System Seal</b>	FPM (Viton)
<b>Fluid Compatibility</b>	Mineral oil, synthetic ester, phosphate esters (for other fluids, please contact us)
<b>Dimensions</b>	Unit dependent, contact a Des-Case or RMF representative
<b>Weight</b>	Unit dependent, contact a Des-Case or RMF representative





# Solutions for Wind Turbine Contamination Control

## Lubricant Storage & Transfer

We offer systems such as filter carts, drum toppers and oil transfer containers, providing a cost effective solution to maintaining fluid cleanliness and storage solutions for wind farms.



### Filter Cart

Filter carts are essential for pre-filtering new oil, transferring up-tower, filtering contaminated systems, collecting oil samples or flushing new or repaired systems.



### Drum Topper

When oil is going to be stored in drums, this compact, portable and lightweight filtration system can be used for filtering new oil directly from the drum, filling transfer containers and can act as an offline filter for up-tower equipment.



### Drum Filter Cart

When oil is going to be stored in drums, this cart is ideal for pre-filtering new oil, transferring up-tower, filtering contaminated systems, collecting oil samples or flushing new or repaired systems. A drum adapter kit with a desiccant breather is included for complete contamination control.

Des-Case drum adapter kit equipped with a desiccant breather.

# Lubricant Storage & Handling

For a wind farm, having a dedicated lubricant storage and handling area equipped with lubricant storage systems can efficiently clean and transfer oil for immediate use.



## LT-Series Lubricant Management System (LT-LMS)

Simple, stackable and easy storage meets solid contamination control practices in a unique design. Dedicated filtration per container ensures no cross-contamination of fluids, while disposable desiccant breathers prevent dirt and water ingress. These all-in-one systems are completely customizable—offering various flow rates, container sizes, quick connect fittings and accessories.

## Did You Know?

New oil isn't clean. One of the best places to start any improvement is in the lube room. While it may not have the biggest effect on the quality of the lubricant in each machine, it helps to set the tone for the whole lubrication program, changing the way mechanics, lubricators and operators think about lubrication.

## Oil Transfer Containers

The first best practice solution to keep oil clean and dry during oil transfer. With non-desiccant and desiccant breather options, as well as quick connects for clean filling. These containers isolate oil from the environment providing the ultimate in best practice contamination control.





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