



Helicopter Engine Intake Protection

“Cut my costs, but increase my rotorcrafts’ safety, mission capability and engine availability!”

To remain competitive in aviation today, the issue of cost control is increasingly important. One device that can save substantial amounts of money – while significantly increasing safety – is the Centrisep® Engine Advanced Protection System (EAPS).

The Inflow Problem

Turbines require large quantities of air to operate effectively, so airborne contaminants pose a significant challenge. The cleanliness of the inlet air is vital to prevent damage to the precision high speed rotating equipment in turbine engines. High tech helicopter engines require proven protection.

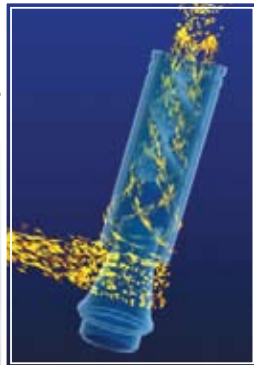
The Centrifugal Force Solution

Now a vital component on rotorcraft, efficient inlet air cleaner systems will eliminate particles in the critical size ranges, responsible for engine component wear, using inertial forces. These Centrisep EAPS are designed and built by Pall Aerospace.

How the Centrisep EAPS works

Centrisep EAPS remove contaminants such as foreign objects, dust, sand, snow, water and salt spray from the inlet air, exhausting the pollutants overboard continuously via a scavenge system.

Contaminated air enters the Centrisep EAPS and is given a swirling motion by the vortex tube.



This causes the heavier particles and water droplets to be separated from the air stream due to inertia, and they move outwards to the wall of the vortex tube. They are then scavenged overboard with a small portion of the inlet air. The clean air then passes down the center of the outlet tube.



Fit and Forget, Purge and Protect

Centrisep EAPS are ‘fit and forget’, virtually maintenance free, self-cleaning units. The filter does not block, therefore pressure drop remains constant and no by-pass door is required. The Centrisep EAPS is the best insurance for your helicopter investment.

Bottom Line Benefits

Overall, the Centrisep EAPS makes your helicopter safer, more reliable and more cost-effective by protecting the engine against harmful contaminants. It extends your mission capability in adverse conditions, minimises FOD, and reduces unscheduled engine removals. A real boost to the aircrew’s peace of mind, and a real benefit to operators seeking optimized productivity

Depending on the helicopter type, the power penalty induced by the Centrisep EAPS is either small or even nil.

Latest Centrisep EAPS Technology Protects

- Agusta A109, A119, A129, AB139
- Bell 427
- Boeing Chinook CH-47
- Upgrades for AS350 (all models), SA315B, SA316B, etc.
- Eurocopter NH90, Tiger
- HAL DHRUV
- Pilatus PC6



Centrisep EAPS protects helicopter engine air intake



Sand and Dust

Sand and dust ingestion causes compressor erosion, turbine blade glazing, and component wear that can lead to vibration and component fatigue, and it also blocks blade cooling passages. The Centrisep EAPS has a high sand and dust separation efficiency.

Snow

Build-up of snow on the fuselage upstream of the engine air intake can lead to engine flameout and/or the same effects as FOD. The Centrisep EAPS offers excellent protection against snow, and has been certified to JAR/FAR specifications on many applications, both in re-circulating and falling snow, with no further flight restrictions on the helicopter.



Icing

The most stringent natural and laboratory icing tests have shown that ice accretes at the periphery of the tube inlet and sheds under its own weight or under aerodynamic forces. Extensive flight tests with fully de-iced helicopters have proven that the Centrisep EAPS was never the limitation for flight in icing conditions. The limitation always came from something else, most of the time the rotor.

Salt

The long term effect of salt on engines is corrosion, but in hover at low levels above sea-waters, salt can accumulate on the rotating parts and significantly degrade performance. The Centrisep EAPS can separate up to 80 % of salt spray, thus reducing salt fouling significantly. However this does not exempt maintenance personnel from flushing the engine daily after maritime operations.



Rain

Heavy rain can be a serious problem for helicopters, causing flameout and compressor damage. When water accumulates on the fuselage, at a stagnation point upstream of the engine air intakes, a mere half cup-full ingested as a slug is enough to cause engine flameout. The Centrisep EAPS can handle and separate most of this water slug, with the remaining droplets entering the engine intake in the form of a harmless spray.



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Hot Gas Ingestion (HGI)

HGI is a common phenomenon which occurs when helicopters hover with tail wind, or during sideways or rearwards flight, causing increased engine inlet gas temperatures and potential flow/temperature distortion. With the Centrisep EAPS, the ingested hot gas is quickly and uniformly redistributed by the swirling process inside the vortex tubes, resulting in uniform, stable air flow into the engine intake.

Foreign Object Damage (FOD)

Foreign Object Damage (FOD) causes significant damage to aircraft and parts, and may cause death and injury to workers, pilots and passengers; associated costs to the aerospace industry have been estimated at US\$4 billion per year. The Centrisep EAPS offers excellent protection against FOD, particularly when combined with a screen.

Brownout

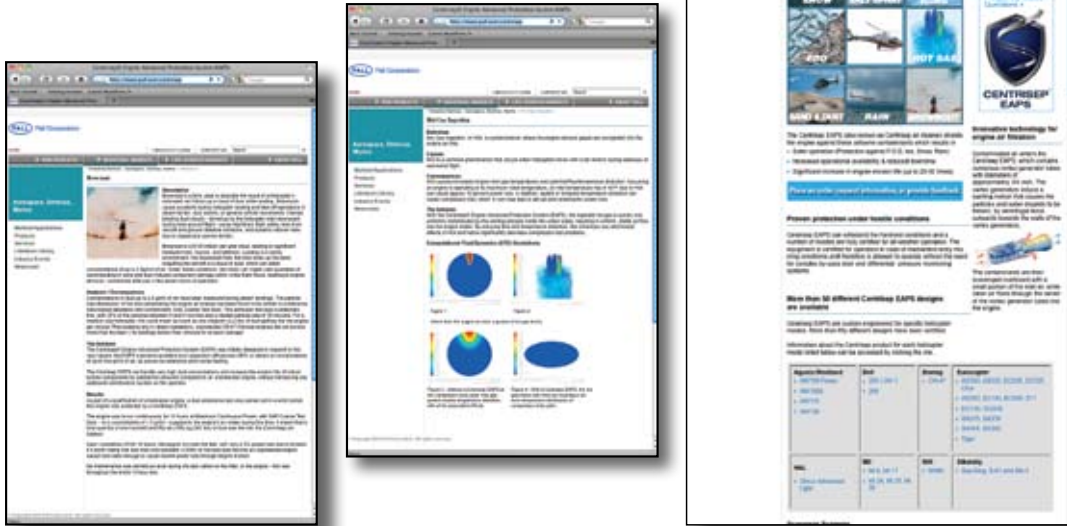
Brownout is a \$100 million per year issue, leading to significant hardware loss, injuries, and fatalities. Landing in a sandy environment, the downwash from the rotor kicks up the sand, engulfing the aircraft in a cloud of dust, which can attain concentrations of up to 2.5 g/m³ of air. Under these conditions, the motor can ingest vast quantities of sand resulting in sand and dust induced component damage within a few flight hours, leading to engine removal - sometimes after just a few dozen hours of operation. The Centrisep EAPS can handle extremely high dust concentrations and increase the erosion life of critical turbine components by up to 25 times compared to an unprotected engine, without introducing any additional maintenance burden on the operator.

All ten AS 350 escort helicopters were equipped with Pall/CGTM latest design Centrisep EAPS. During the 3-week desert rally, 1,000 landings in brownout conditions were accomplished by the fleet with no engine degradation.



Centrisep EAPS: The Website

In today's worldwide helicopter community, there is a great, widespread demand for better engine air intake protection. In a concerted effort to respond to the community's demands, Pall Aerospace has launched a website entirely dedicated to Engine Air Inlet cleaning technology and experience.



Worldwide Contributions to Enrich the Rotorcraft World

Better handling of machinery as complex as rotorcraft is based on operational and flying experience, and in-service technical experience. So the more input of different experiences and case-histories we can share, the more varied the flying conditions and operational environments described by contributors, the more valuable the Centrisep EAPS site resource will be to the rotorcraft community.

Contacts

Centrisep EAPS systems are supported worldwide from our sales and support bases in Australia, China, Europe, India, Japan, the Mid-East, South Africa and the US.

For more information: www.pall.com/centrisep



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