CASE STUDY

EASTMAN

Eastman Turbo Oil 2197™ exhibits **best-in-class performance** in reducing critical vent tube coking.

Customer

Dare MedFlight

Location

Dare County, North Carolina

Industry

Rapid medical transportation

Website

http://www.darenc.com/ems/emsmedf.asp

Customer evaluation

Dare MedFlight operates a BK-117 helicopter powered by two LTS101 engines and was previously using a competitor's HPC oil in both engines. A side-by-side comparison tracking Eastman Turbo Oil 2197™ versus the competitor's HPC oil was conducted.

Highlights

- Eastman Turbo Oil 2197 provided a higher level of thermal stability over the competition, leading to less coke buildup.
- Operator was able to decrease the frequency of cleanings.
- Customer will make the switch to Eastman Turbo Oil 2197.

Contact

TurboOil@eastman.com

"After performing this comparison and seeing the difference between the two products for myself, I requested that our new helicopter be delivered with Eastman Turbo Oil 2197 already in both engines."

—Howard Wilson, director of maintenance, Dare MedFlight

The challenge

Currently, due to the high performance capable (HPC) oil being used, Dare MedFlight is required to clean the engine vent lines on the two engines of their BK-117 helicopter every 15–20 service hours. This can be a tedious and time-consuming process, and as a rapid medical transportation provider, time is of the essence for Dare MedFlight.

Within the aviation industry, there may be some confusion about the options available when choosing HPC oil that best fits the needs and provides the highest quality performance benefits for specific operators.

While many aircraft operators are making the switch to HPC oils, few have a full understanding of all the approved products available for their engine. Instead, operators tend to stick with the original recommendation from the service provider or the original engine manufacturer (OEM) without fully investigating other approved products and their benefits.

Eastman Turbo Oil 2197 offers an increased level of thermal stability over the competition, reducing critical vent tube coking. Reduced coking can lead to an increase in aircraft performance and decrease the frequency of required cleanings for operators.

The solution

A side-by-side performance comparison was conducted using Turbo Oil 2197 and a competitor's HPC oil. Conclusive in-service data of the two products was a powerful testament to the proven performance of Turbo Oil 2197 and its higher level of thermal stability compared to the competition. The test provided evidence of improved engine operation

through reduced vent tube coking with Turbo Oil 2197, and this improved performance led to a decrease in the frequency of engine vent cleanings for the operator.

Performing direct product comparisons such as this may set the stage for an industrywide shift towards decreasing the frequency of engine vent cleanings by ushering in an inspection-based system to determine cleaning intervals rather than basing the decision solely on service hours. In addition, this comparison can be used as a benchmark to promote the availability of Turbo Oil 2197 and the relative performance benefits over established competitor products.

The test (general setup)

The oil evaluation program was conducted by Dare MedFlight using their BK-117 helicopter powered by two LTS101-750B1 engines, operated in Dare County, North Carolina.

The purpose of the evaluation was to track the performance of Turbo Oil 2197 compared to their current HPC lubricant, specifically monitoring the thermal stability and carbon or coke buildup in the engine vent tubes. Prior to the test commencement, Dare MedFlight was using a competitor's HTS oil in both engines and they were eager to see whether a side-by-side comparison and lab-based performance test could demonstrate a difference in performance capabilities between the two products and, ultimately, affect their operations.

Dare MedFlight introduced Turbo Oil 2197 into one of the engines and retained the competitor's HTS oil in the other. Dare MedFlight used both oils side by side and tracked their performance in relation to carbon deposition in the vent tubes, also regularly conducting standard oil condition testing.

Both HTS oils used are fully approved for the LTS101 engines per Service Bulletin LT101-71-00-0263, and Dare MedFlight followed normal maintenance procedures outlined by the OEM and other relevant governing regulations to maintain the helicopter in an airworthy condition. They also maintained the integrity of the test program by collecting the appropriate data for this test and controlled proper oil usage in each engine.

LTS101 engines

- Each engine had about 5000 service hours.
- Both engines had recently completed the 1800-service-hour hot section inspection.
- Both engines logged just over 150 service hours since this inspection.
- All AD, SL, etc., have been complied with since the required upgrade to HTS oil.

The procedure (detailed)

Preparation

- Vent tubes on both engines were cleaned.
- One oil sample was taken from each of the two engines and sent to Eastman Aviation Solutions Technology group for analysis (as is—with competitor oil in both engines to set a baseline).
- The engine designated to use Turbo Oil 2197 was drained as thoroughly as possible and filled with new oil.
- The engine with Turbo Oil 2197 was run for 10 hours.
- After 10 hours, the engine was drained again and refilled with Turbo Oil 2197.
- Dare MedFlight took fresh oil samples from each engine and sent them to the Eastman Aviation Solutions Technology group for analysis.
- After all these setup steps were completed, the comparative evaluation program began.

During testing

- Oil consumption data was tracked for each engine.
- Amount of coke buildup in the vent tubes for each engine was assessed periodically.
- Each instance of vent tube cleaning was noted along with the time intervals in between.
- Pictures were taken when conditions allowed.
- Oil samples were taken from each engine at normal intervals (150 hours) and sent to the Eastman Aviation Solutions Technology group for analysis.
- All engine operations, conditions, temperatures, chip lights, hot starts, etc., were recorded for both engines throughout the evaluation period.
- Unscheduled maintenance that may have affected one or both engines was recorded.

The results

Dare MedFlight took oil samples from each engine on 9 different occasions, and each sample was analyzed by Eastman Aviation Solutions Technology group.

Used oil sample results

- Both engines maintained bulk oil properties within expectations (no differences between oil brands).
- No difference was demonstrated on oil property maintenance (no implied impact on oil life).

Engine vent line results

- The Vapor Phase Coking Test found significantly less coke buildup on the engine vent tube using Turbo Oil 2197.

Eastman Turbo Oil 2197

Competitor HPC oil

- As previously stated, in addition to collecting the samples, Dare MedFlight also took pictures of the engine vent tube from each engine to record visual evidence of coke buildup.
- Images of both engine tubes were collected every 20–25 service hours.
- The collected images clearly display a difference in coke buildup between the two engine vent tubes.

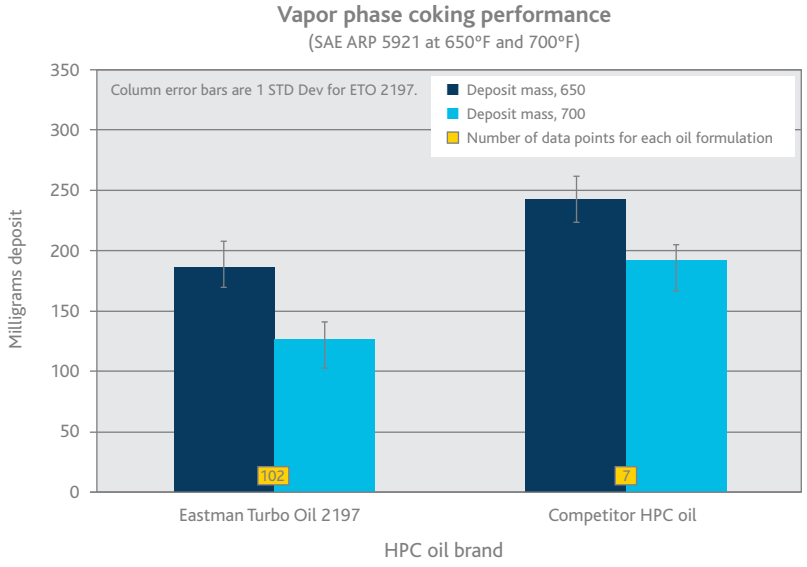
Conclusion

This conclusive in-service data is not only a powerful testament to the proven performance of Eastman Turbo Oil 2197 but also a strong argument for an industrywide migration towards an inspection-based determination of required cleaning intervals.

Based on the images collected by Dare MedFlight and a very strong correlation with the results of the Vapor Phase Coking Performance test, it is clear that Turbo Oil 2197 provides a higher level of thermal stability over the competitor's product.

In addition, while Dare MedFlight did complete the required inspections of the engine vent line every 15–20 hours during the test phase, there was never enough coke buildup to prompt cleaning the vent tube from the engine operating with Turbo Oil 2197. Instead, the operator decided, of their own accord, that switching to an 80–100 service hour cleaning was more appropriate while using Turbo Oil 2197.

The hands-on experience of the operator, coupled with the visual evidence and data results, further endorse the switch to an inspection-based system to determine cleaning intervals rather than one based solely on service hours.



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Eastman Corporate Headquarters
P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, +(1) 423-229-2000

www.eastman.com/locations

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