RULER™ Remaining Useful Life Evaluation Routine

ASTM INTERNATIONAL Standards Worldwide

What is RULER ™ ?

RULER™ stands for **R**outine **U**seful **L**ife **E**valuation **R**outine by Linear Sweep Voltammetry (LSV)
RULER :

- Test Method to determine and monitor the Remaining Useful Life (RUL)of turbine oils and other lube oils.
- By measuring remaining Antioxidant Additives (oxidation inhibitor additives) in turbine oils and other lube oils.
- Result in % remaining of antioxidant additive (oxidation inhibitors) in turbine oils (compare the new fresh oil with Used(In-service) oil .

RULER™ is ASTM approval test method : ASTM D-6971-04 [3] and ASTM D-6810-02 [4]
" Testing and monitoring antioxidant additives (oxidation inhibitors) level is important for controlling the degradation of turbine oils and industrial oils and their remaining useful life (RUL) "
Refer : ASTM D-4739-02 [1] and ASTM D-6224-02 [2]

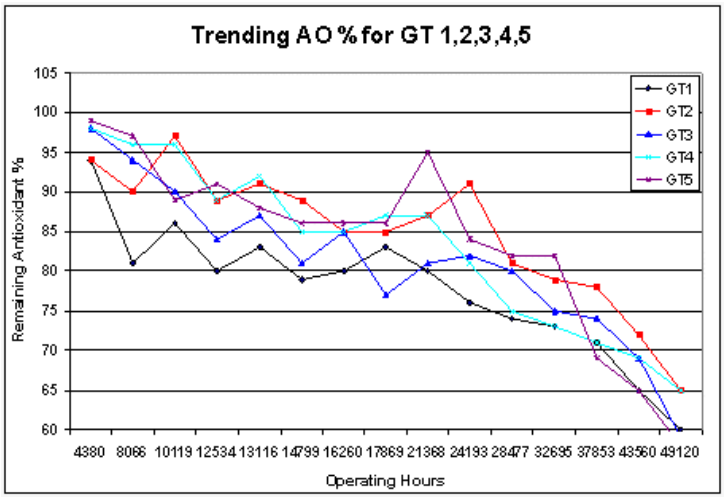


Figure 1 : The trending graphs for RULER data (antioxidant concentration) for 5 Gas Turbine (GT1-5) v.s. operating hours of gas turbines.

Note for Turbine Oil Monitoring Program :

- RULER can be screening tool and more frequent scheduling test to monitor remaining useful life(RUL) of turbine oils which can prompt end-users to perform RPVOT (RBOT) when needed . See Figure 2 .
- RULER is not a replacement for RPVOT (RBOT) and FTIR , but it will be complementary test or as an effective way to monitor remaining useful life (RUL) of turbine oils . See Figure 2
- RPVOT(RBOT) test will often provide not only poor repeatability data but also high fluctuation data .
- By combining RULER+RPVOT+FTIR , will be more reliable information for right and better decision . See Figure 2
- Recommend to be an effective Turbine RUL monitoring program , with monthly testing of RULER and FTIR and testing RPVOT every 6 month and/or whenever RULER and FTIR show some abnormal data. See Figure 2

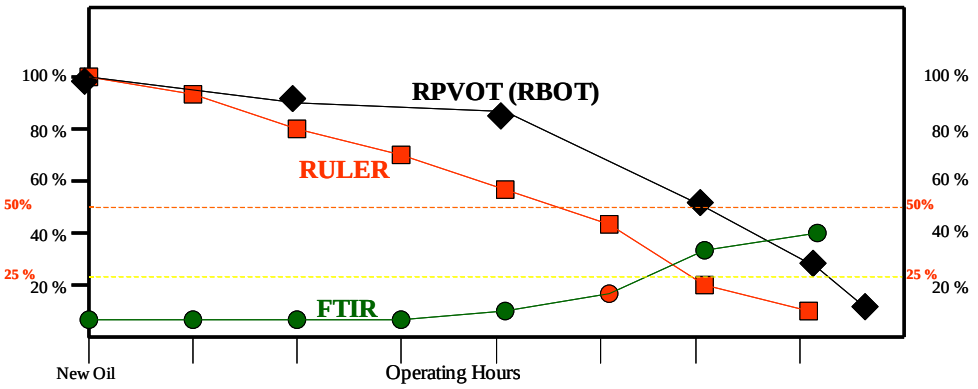
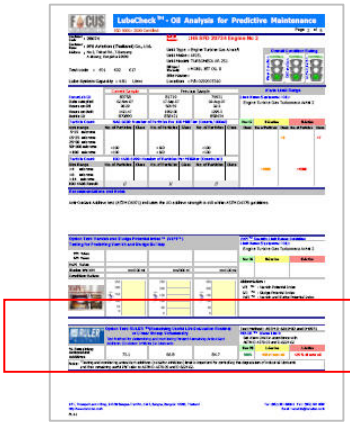


Figure 2: Effective Monitoring Program for Turbine Oils System

Reference :

1.ASTM D-4738-02 : Standard Practice for In-Service Monitoring of Mineral Turbine Oils for Steam and Gas Turbine
2.ASTM D-6224-02 : Standard Practice for In-Service Monitoring of Lubricating Oils for Auxiliary Plant Equipment
3.ASTM D-6971-04 : Standard Test Method for Measurement of Hindered Phenolic and Aromatic Amine Antioxidant content in Non Zinc Turbine Oil by Linear Sweep Voltammetry (LSV).
4. ASTM D-6810-02 : Standard Test Method for Measurement of Hindered Phenolic Antioxidant Content in HL Turbine Oil by Linear Sweep Voltammetry (LSV)



Oil Analysis Report