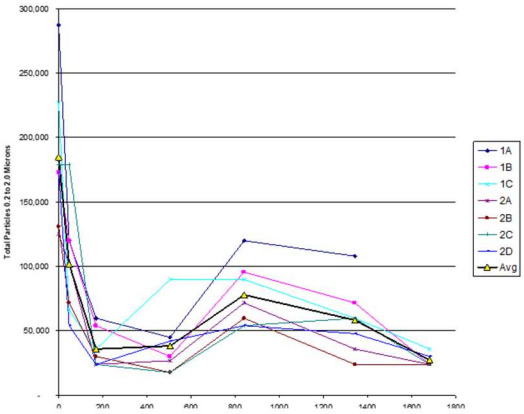
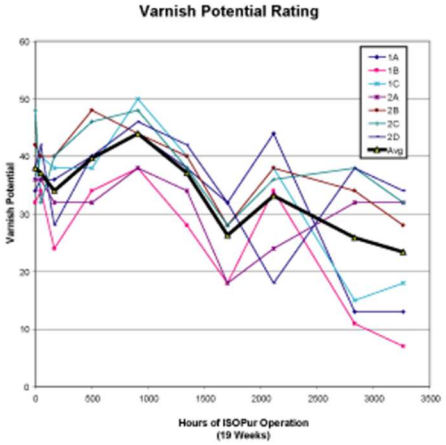
Varnish accumulation in turbine lube oil systems has long been a challenge affecting turbine efficiency and reliability. This case study delves into the 21-year application of Balanced Charge Agglomeration (BCA) technology for varnish removal, spanning 104,000 run hours. It underscores BCA's efficacy in maintaining clean oil, enhancing turbine performance, and ensuring operational longevity.

Initial 2.0 – 0.2 micron particle draw down



Initial varnish potential draw down



The implementation of Balanced Charge Agglomeration (BCA) technology in the turbine lube oil system involved installing a 10 GPM ISOPur system with the PLC control option, a choice specifically made by the power plant. These systems, operating as dedicated kidney loop systems at 100% capacity, had their filters replaced every 3 to 4 months, aligning with ISOpur's recommendations.

The equipment comprised the ISOPur BCA™ purification system with associated controls and monitoring mechanisms. The PLC control option facilitated efficient and automated

system operation. Monitoring procedures were established with a monthly, quarterly, and annual oil testing regimen, offering valuable insights into oil condition for proactive maintenance and optimal BCA system performance.

The maintenance schedule, incorporating regular filter replacements and oil testing, ensured peak efficiency of the BCA technology throughout the 21-year study period. This systematic approach significantly contributed to successful varnish removal and oil purification.

Here's a summary of the findings after 21 years and 104,000 run hours:

Particle ISO Counts:

- Average particle ISO counts: 15/12/10, indicating a notable reduction in particle counts and the effectiveness of BCA technology in maintaining clean oil.

Varnish Potential:

- Average varnish potential number: 5.6, showcasing substantial varnish removal achieved with BCA treatment.

RPVOT:

- Average RPVOT: 67.8%, indicating good oil oxidation stability and extended oil life, enhancing turbine performance.

Varnish Levels Before and After BCA Treatment:

- Prior to ISOPur BCA systems, varnish potential levels were concerning but significantly decreased post-treatment, with no signs of varnish soluble and insoluble.

Improvements in Turbine Performance, Reliability, and Maintenance Costs:

- No servo valve failures related to varnish in 21 years, highlighting improved reliability and reduced downtime.
- Two major overhauls completed without a varnish flush, demonstrating BCA's effectiveness in preventing varnish-related issues.
- Oil still meeting required specifications after 104,000 run hours, showing longevity and sustainability of BCA-treated oil.

- Significant cost savings achieved by avoiding varnish-related maintenance and extending oil life, enhancing overall operational efficiency and reliability.

Recommendations for Ongoing Maintenance and Monitoring with Upgraded BCA Technology:

1. **Utilize Latest BCA Technology:** Take advantage of upgraded BCA technology from ISOPur for enhanced oil purification efficiency.
2. **Regular Training and Support:** Ensure maintenance personnel receive ongoing training and technical support for optimal system operation.
3. **Optimized Filter Replacement:** Adjust filter replacement schedules based on enhanced BCA system capabilities.
4. **Enhanced Monitoring:** Leverage advanced monitoring features for proactive issue identification and performance optimization.
5. **Documented Performance Metrics:** Maintain detailed records for tracking improvements and compliance with best practices.

These practices, along with the tangible benefits observed, make a strong case for BCA technology's continued use and exploration in power generation and other industries seeking improved oil purification and equipment reliability.