



ICB® FRF PRODUCT BULLETIN

Meet ICB® FRF. Safe, reliable and cost-effective chemistry solution for in-service phosphate ester fluids focused on the root cause of degradation: acid formation and varnish precursor accumulation.

OVERVIEW

Phosphate esters are fire-resistant fluids (FRFs) used in turbine electro-hydraulic control (EHC) systems throughout the power generation industry. Used primarily for their fire-resistant properties and thermal stability, these synthetic fluids hydrolyze and oxidize readily during service, creating harmful acids and phenols. These breakdown products are established varnish precursors that must be removed to ensure reliable servo valve performance in EHC systems.

ICB FRF, patented ion-exchange technology, is designed to address phosphate ester chemistry, removing acids, phenols and varnish while simultaneously improving resistivity. More importantly, ICB FRF removes varnish precursors responsible for the primary mechanical failure pathways in EHC systems.

With 30 years of proven results, ICB FRF is an engineered workhorse designed to address phosphate ester fluid chemistry, preventing EHC failures and saving end-users hundreds of thousands of dollars in costly fluid replacement and system flushing.



ICB FRF FEATURES AND BENEFITS

- 10x more acid-scavenging capability
- The only filter system specifically engineered to remove FRF varnish
- Eliminates the cause of servo valve sticking
- Eliminates servo strainer plugging
- Improves resistivity and fluid color
- Manages fluid chemistry, extending fluid life, reducing consumption costs and environmental impacts
- Removes dissolved metals such as calcium, magnesium and sodium which are contributed from obsolete acid filters
- Creates a trouble-free operating environment with predictable outcomes and costs
- Eliminates the need for costly chemical flushes
- Maintains fluid condition standards required by ASTM D8323
- Drop-in replacement for OEM filters, sized to fit existing acid-scavenging systems (retrofit)



ICB FRF PLUG AND PLAY SOLUTION

ICB FRF is sized to fit existing OEM acid-scavenging systems as a drop-in replacement for obsolete filters. To retrofit ICB FRF into an existing system, there are 3 'commandments' to follow.

Commandment #1: Fluid Flow

ICB FRF offers optimized axial flow to maximize bed depth and media contact time, resulting in lower velocity. For this reason, flow is very important and must be adhered to. Flow is the most important property in determining the performance in your system. When we retrofit, flow measurement via an installed flow meter or manual calibration is required.

Commandment #2: Fluid Temperature

ICB FRF is engineered to work at a fluid temperature of $\geq 40^{\circ}\text{C}$ (104°F) and $< 85^{\circ}\text{C}$ (185°F). Depending on the viscosity, working outside of these fluid temperatures can increase differential pressure and is not recommended.

Commandment #3: Operating Pressure

The minimum operating pressure when using ICB FRF is 2 bar or 25 psi or 3.5 bar or 50 psi on the high side. Poor fluid quality, low temperatures, or increased flow will cause pressure to be higher.



YOU ARE ONE STEP CLOSER TO TROUBLE-FREE OPERATION

Understanding if you are in compliance with ASTM D8323 is a crucial first step in the trouble-free operation of your critical turbine electro-hydraulic control system.

Submit an oil sample today to get a comprehensive, ASTM D8323-compliant, understanding of your in-service FRF's condition and remaining lifetime so that it can be aligned with future maintenance windows and proactive strategies for optimization.

From advanced testing to expert interpretation of results, our team of professional and PhD chemists are here to provide the data you need to make informed decisions about your critical assets. You can expect more when you partner with our Fluid Technical Center.

Our Phosphate Ester test package, applicable for electro-hydraulic control (EHC) oils and/or fire-resistant fluids, includes:

- Acid Number ▪ MPC Varnish Potential ▪ Patch Weight ▪ Resistivity (20°C)
- Phenol Levels ▪ Water Content ▪ ISO Particle Count ▪ Dissolved Metals
- Fluid Color ▪ Viscosity (40°C)

Our Fluid Technical Center reported analysis and results will be utilized to determine ICB FRF sizing and a complete fluid treatment plan inclusive of ICB FRF filter change out intervals to achieve fluid stability.

