

Product Bulletin

Frequently Asked Questions - Fyrquel® Fluids

General Topics

What are Fyrquel® Fluids?

Fyrquel® fluids are self-extinguishing (fire resistant) synthetic non aqueous triaryl phosphate ester fluids used in industrial hydraulic fluid and lubricant applications worldwide. Fyrquel® fluids have a long history of providing users with millions of hours of safe reliable operation. Phosphate ester fluids are classified by ISO as a separate class with the designation “HFDR”. Non phosphate ester type synthetic fluids are not self-extinguishing and therefore are separately classified as ISO HFDU.

Why should I use a phosphate ester fire resistant fluid?

Using a fire resistant fluid reduces the risk of a catastrophic fire and saves lives. Phosphate ester fluids are superior self-extinguishing fire resistant fluids. Fires involving mineral oils and non-self-extinguishing synthetic fluids propagate flame which risks creating a hard to extinguish fire. Fire events escalate rapidly. Using an inherently self-extinguishing ISO Class HFDR phosphate ester fluid is required by major steam turbine OEMs.

Why are Fyrquel® phosphate ester fluids preferred by major OEMS?

Phosphate esters are the preferred fire resistant hydraulic fluids specified by all major industrial and aviation OEMS like Airbus, BHEL, Boeing, Alstom, GE Energy, Hitachi, LMZ, MHI, Shanghai Turbine, Siemens, Westinghouse and others due the important fire safety advantages using self-extinguishing (fire resistant) phosphate ester type synthetic fluids. Other types of synthetic fluids are easily shown to continue to burn once ignited. Phosphate ester fluids are both flame resistant and self-extinguishing.

What is the self-extinguishing fire protection advantage of Fyrquel®?

The self-extinguishing advantage of Fyrquel® phosphate ester fluids is demonstrated on a short 5 minute video available on www.fyrquel.com. All other synthetic fluids including PAG Polyalkylene glycol and POE Polyol ester type have a much higher heat of combustion than phosphate esters and are easily shown in this simple demonstration to support their own combustion. Additionally, the phosphate core plays a role in suppressing fire much like the phosphate based chemicals used in fighting forest fires and in certain types of hand held fire extinguishers. Other global industry standards including ISO Spray Test ISO/DIS 15029-2, Hot Manifold Ignition Test ISO 20823 and the ISO 14935 Wick Test methods show this also.

Are all phosphate ester fire resistant Functional Fluids in the same category?

Fire resistant phosphate ester fluids have an excellent record preventing fires in industrial and in commercial aviation fluid applications. The performance requirements of these applications differ significantly and are served by two distinct different types of phosphate esters. The triaryl phosphate esters used in Fyrquel® fire resistant industrial hydraulic fluids and lubricants are much more stable and less volatile than the trialkyl phosphate ester used for the aviation hydraulic fluid application.

Are Fyrquel® fluids compatible with Nitrile also known as Buna N or Neoprene seals, O-rings or hoses?

Fyrquel® fluids are not rated compatible with Nitrile/Buna N or Neoprene. Contact your ICL Fyrquel® Representative or visit www.fyrquel.com to review the Product Bulletin titled [Compatibility](#) for a list of compatible materials, including Butyl Rubber, Fluorocarbon, EPDM, PTFE (DuPont Teflon), Nylon and others.

Do you recommend CPE or chlorinated polyethylene hoses for use with Fyrquel®?

We do not recommend hose material made of CPE. EPDM hoses are recommended. We generally do not recommend the use of any chlorinated elastomeric materials with Fyrquel.

Please summarize the Fyrquel® EH series turbine control fluids that are typically used in BHEL, Alstom, GE Energy, Hitachi, LMZ, MHI, Shanghai Turbine, Siemens, Westinghouse equipment?

The brief description is shown in blue. However, if you are comparing the Fyrquel® fluids to other resale brands of self-extinguishing (fire resistant) phosphate ester fluids, sold by some oil companies in the past, know that most all these products are composed of the older or 1st generation Trixylyl Phosphate just like the below listed 1st generation ICL products named **Fyrquel® EHC N** and **Fyrquel® L**. The 3rd Generation **Fyrquel® EHC Plus** product features the most modern more sustainable Trixylyl Phosphate-Free design. Only Fyrquel® EHC Plus has the advantages of being biodegradable, not classified by the United Nations General Harmonized System (GHS) as hazardous and not Transport Regulated. Note that Phosphate Esters fluids also have a long history of safe use protecting Leningradsky Metallichesky Zavod (LMZ) OEM design power plants from the risk of fire. ICL supplies a special product named Fyrquel® L solely for the LMZ steam turbine application. Although not a part of this specific question and answer, the **Fyrquel® L** product has the same Trixylyl Phosphate chemical name, CAS and EC numbers as **Fyrquel® EHC N** but it is differentiated by specific properties required for the LMZ application.

Product Series	Fyrquel® Electro-Hydraulic Control Fluids
Chemical Family	Triaryl phosphate ester, Aryl phosphate
Product Function	Self-extinguishing (fire resistant) fluids
ISO Class	HFDR

<u>Product generation</u>	<u>First generation triaryl phosphate ester</u>
Product name	Fyrquel® EHC N (also Fyrquel® L used in LMZ equipment)
Chemical name	Trixylyl phosphate
CAS number	25155-23-1
EC Number	246-677-8
Synonym(s)	Trixylenyl phosphate, TXP; Phenol, dimethylphosphate (3:1)
Empirical Chem. formula	C24H27O4P
Europe REACH	01-2119531415-46-0001

<u>Product generation</u>	<u>Second generation triaryl phosphate ester</u>
Product name	Fyrquel® EHC
Chemical name	Butylated triphenyl phosphate ester based mixture with Trixylyl phosphate
Product identifier	Butylated triphenyl phosphate ester based mixture with Trixylyl phosphate
REACH Registration No.	01-2119519251-50-0000 [68937-40-6]; 01-2119531415-46-0001 [25155-23-1]

Product name	Fyrquel® EHC S
Chemical name	Butylated triphenyl phosphate mixture containing > 10% triphenyl phosphate This older generation product is still supplied by ICL but no longer promoted.
Product identifier	Phenol, isobutyleneated, phosphate (3:1)
Synonym(s)	tert-butylphenyl diphenyl phosphate mixture
REACH Registration No.	01-2119519251-50-0000 (t-butylphenyl diphenyl phosphate [68937-40-6])

<u>Product generation</u>	<u>Third generation triaryl phosphate ester</u>
Product name	Fyrquel® EHC Plus
Chemical descript.	Butylated triphenyl phosphate mixture, typically < 2-3% triphenyl phosphate
EC Number	273-065-8
REACH Registration No.	01-2119990477-21-0000 (tBUTPP low TPP)
MOC Compatibility	Same Materials of Construction Compatibility as prior generation phosphate esters
Mixability	Completely interchangeable and miscible with earlier phosphate ester fluids
OEM Approved	Alstom, Westinghouse, GE Energy, Siemens, Shanghai Turbine, Harbin Turbine
Changing Fluids	Consult with your Fyrquel® Representative

What are the main types of fire resistant fluid and how do they function?

There are two main types of fire resistant fluids. Water based fluids, sometimes referred to as “aqueous fluids” rely on water content to provide fire resistance. Conditions which would result in the loss reduction of water content in these types of fluids could seriously affect their fire resistant properties. ISO classifies these fluids as HFAE, HFAS, HFAB and HFC, depending on the formulation and how much water is present. ‘Synthetic non aqueous fluids’ rely on their chemical composition to confer fire resistance. Fyrquel® fluids are in this category and are classified by ISO in a singular HFDR classification due to the unique self-extinguishing (fire resistance) behavior. ISO classifies non-phosphate ester type synthetic fluids in the separate ISO Class HFDU. The HFDU category includes Polyol Esters (POE), Polyalkylene Glycols (PAG) and vegetable oils. The next Q&A explains the superiority of the HFDR phosphate ester fluids like Fyrquel® fluids compared to other types of non-water based synthetic fluids.

Do all ‘Synthetic Non Aqueous Fluids’ provide similar fire resistant fluid performance?

Fire resistance performance differs significantly when comparing the different types of synthetic fluids. Fyrquel® triaryl phosphate esters are superior fire resistant fluids due to being both self-extinguishing and difficult to ignite. Non-phosphate ester type synthetic fluids, including those that are composed of Polyol ester (POE) and Polyol Ether also known as Polyalkylene glycol (PAG) are easily shown to continue to burn once ignited.

What about the Electric Power Research Institute (EPRI) evaluation of ISO Class HFDU synthetic fluids?

In 2011 EPRI published their Turbine Electrohydraulic (EHC) Fluid Evaluation. EPRI, Palo Alto, CA: 2011. 1024580. This report is available to power plants that are EPRI members and also available for purchase from EPRI. ICL purchased this report and can discuss the information contained within this report but USA copyright laws prevent ICL from distributing copies. Contact your Fyrquel® Representative if you are interested in learning about the EPRI Evaluation Results.

Does the important self-extinguishing fire protection advantage of Fyrquel® phosphate ester fluids rely on additives or change during service?

No, the self-extinguishing fire protection property is an inherent feature of phosphate esters and does not rely on additives, remains unchanged during service and unaffected by filtration.

Why are only phosphate ester fluids specified by steam turbine OEMS for EHC systems?

Phosphate ester fluids have been proven in use for more than 40 years safely protecting turbines from the risks of fire. The unique and key self-extinguishing property of phosphate esters provides equipment operators with passive fire suppression protection. This may reduce the need for costly active fire suppression systems to be added to the power plant. Using the self-extinguishing Fyrquel® fluids reduces the risk of spray, hot surface and wick scenario fires, including pipe insulation and liquid pool fires. The fluids are optimally designed to protect equipment from valve erosion, have non corrosive compatibility with all metals, have excellent lubricating properties for long pump life, are operationally stable for long fluid service life, maintain viscosity without shearing during service, have excellent air release and low chlorine content.

What is the shelf-life of Fyrquel® fluids?

The shelf life of Fyrquel® hydraulic fluids and lubricants kept in factory sealed drums properly stored under shelter in a dry, cool area is a minimum of five years from the date of manufacture. Slight water contamination will not negatively affect the performance of the fluid. However, more water will cause the fluid to take on a hazy appearance as the solubility limit is exceeded and will accelerate fluid deterioration. Additional water will be seen as a separate water layer on top of the heavier than water Fyrquel® fluid. The fluids will not show deterioration by visual inspection as fluid analysis is needed. ICL does not recommend that users break the important factory seal to open drums and field sample the fluids far in advance of use. Doing this can inadvertently cause contamination, especially water and fine particulate contamination. It is normally not possible to field sample fluid properly from drums without contaminating the sample. ICL-IP recommends contacting a Fyrquel® Representative if a concern about the suitability of new fluid for service.

Fyrquel[®] EHC Plus Next Generation Fyrquel[®] EH Series Product

What is the new Fyrquel[®] EHC Plus fluid?

It is an improved next generation modern phosphate ester turbine control or EHC fluid. Fyrquel[®] EHC Plus is a readily biodegradable, non-aqueous fire resistant fluid with required steam turbine OEM specified self-extinguishing fire resistance. Phosphate ester type fluids are classified by ISO in a separate ISO Class HFDR due to the unique self-extinguishing characteristic. Visit www.fyrquel.com to view a 5 minute video to better understand the mentioned self-extinguishing advantage and to compare to other type fluids. We also urge readers to visit www.fyrquel.com in order to review the Advantages of the Next Generation Fyrquel EHC Plus bulletin that is listed in the General Information section and available in multiple languages.

Is the new product compatible with other Fyrquel[®] fluid products?

Fyrquel[®] EHC Plus is fully miscible, interchangeable and compatible with all Fyrquel[®] phosphate ester fluids maintained in normal condition with no change required in materials of construction of equipment.

What are the advantages compared to current products?

Fyrquel[®] EHC Plus is formulated with needed oxidative resistance, air release protection and features a more sustainable product design. Visit www.fyrquel.com to self-serve for more information in the Product Information section, available in multiple languages. It is Steam Turbine OEM approved.. We recommend that customers switch to Fyrquel[®] EHC Plus in consultation with a Fyrquel[®] Representative.

What is the price difference between the older trixylyl phosphate products and the modern product?

The new product is normally lower priced. Contact your Fyrquel[®] Representative.

How does the United Nations “General Harmonized System” (GHS) impact Fyrquel[®] fluids?

Both the Europe REACH regulations and the revised USA OSHA Hazard Communication Standard require adopting GHS hazard classification rules and using GHS hazard symbols on traditional MSDS and labels but on a slightly different time schedule. In the USA, chemical manufacturers must convert an old MSDS to the new SDS hazard communications no later than 2015. ICL has already made this change on most Fyrquel[®] products. The good news is that Fyrquel[®] EHC Plus does not require any GHS classification or transport regulation because of its recognized safer environmental and human health profile. We recommend that power plant operators contact a Fyrquel[®] Representative to learn how easy it is to switch to the modern phosphate ester Fyrquel[®] EHC Plus.

Product Handling and Health, Safety and Environment

How can I obtain the latest copies of product literature, application guidelines and SDS?

Contact your Fyrquel[®] Representative. Self-serve copies are also available on www.icl-ip.com after registration. SDS is available in various languages and regional formats. Note that worldwide hazard communication standards that governed formatting of MSDS and labels changed to generally adopt the United Nations Generalized System of Classification (GHS) and these important documents are now named SDS. In Europe this has already been implemented, in the USA the competent authority OSHA issued a revised hazard communication standard that requires implementation of GHS classification on new SDS no later than 2015. ICL has already updated most product MSDS to the new SDS formats.

What does it mean that Trixylyl Phosphate was proposed added to a list of candidate materials to a European list of “Substances of Very High Concern”?

Contact your Fyrquel[®] Representative to receive a copy of a letter from our HERA Department announcing the news that the European Chemical Agency (ECHA), listed Trixylyl Phosphate as a candidate “Substance of Very High Concern”, as part of the broad EU REACH chemical use regulations. It appears that this proposal may be accepted by the REACH authorities over time. If accepted, this will trigger EU ECHA REACH rules urging that users substitute to modern self-extinguishing phosphate esters, that do not contain Trixylyl Phosphate. The good news is that users that have depended on the self-extinguishing performance of a phosphate ester fluid to protect property, equipment and people from fire can continue to get this performance by easily switching to the modern phosphate ester Fyrquel[®] EHC Plus.

Do Fyrquel[®] EH series fluids contain Trixylyl Phosphate?

Older 1st and 2nd generation fluids do. The ICL recommended product named Fyrquel[®] EHC Plus does not.

Will ICL discontinue the older generation Fyrquel[®] fluids?

ICL has no current plans to discontinue the above listed 1st and 2nd generation TXP containing fluids. However, ICL is committed to continue actively recommending users to make the easy switch to the modern phosphate ester Fyrquel[®] EHC Plus. We urge readers to visit www.fyrquel.com in order to review the Advantages of the Next Generation Fyrquel EHC Plus one page bulletin that is listed in the General Information section and that is available in multiple languages.

Is the Trixylyl Phosphate-Free formulation the reason for the better Health, Safety and Environment (HSE) profile?

Yes but only partly since there is more to the formulation advantage of Fyrquel[®] EHC Plus. As generally explained in other FAQ and in the recommended Advantages of the Next Generation Fyrquel EHC Plus bulletin Fyrquel[®] EHC Plus features a more sustainable product design and is recommended to replace older generation phosphate ester products. Yes, the more sustainable product design features the subject Trixylyl Phosphate-Free design, but is also due to a modern production platform that makes the industry preferred t-butylated phenyl phosphate ester with a new and previously unattainable low Triphenyl Phosphate content.

How should I store Fyrquel[®] fluids?

Fyrquel[®] hydraulic fluid and lubricant drums should be stored under shelter in a dry and cool area. Improper storage can expose the fluid to water and dirt contamination which can harm equipment and accelerate deterioration. If stored outdoors, drums should be covered or placed horizontally to prevent water from pooling on the top of the drum. Drum tops should be cleaned and dried before opening. Temperatures in the range of 27 to -38 °C provide good flow rates for fluid transfer. The product SDS should be consulted to review proper handling.

What Personal Protection Equipment is recommended?

Consult ICL product SDS for specific recommendations. Your Fyrquel[®] Representative can also assist. Under normal conditions of use, workers should use standard industrial hygiene measures including wearing gloves, safety glasses or goggles to avoid bodily contact. Safety shower and eye baths should be available. Splashes on skin usually involve incidental exposure. Skin should be washed using soap and water and clothing should be laundered. Medical attention is usually not necessary.

Are the Fyrquel[®] phosphate ester fluids biodegradable?

Most modern phosphate ester fluids are rated readily biodegradable.

What is the best way to clean up after a spill?

Again always consult the current SDS. At ambient temperature phosphate esters have essentially no volatility and cleanup operations from walls, cable trays and floors would not require specialized Personal Protective Equipment PPE such as respirators, and simply require using absorptive materials such as speedy dry, kitty litter, or clay absorbents. Areas such as cable trays would require wiping with dry rags. Depending upon the composition of the cable insulation, wiping with rags treated with odorless mineral spirits may be necessary in order to avoid plasticization of the elastomer used in the insulation. Porous structures such as cement flooring or cinder block can be scrubbed with a solution of common trisodium phosphate (TSP) containing detergent. Painted surfaces exposed to phosphate esters may be stripped unless the paint is an epoxy type of formulation.

What if leaked fluid contacts hot surfaces?

Consult the SDS. If you are using a self-extinguishing phosphate ester fluid like Fyrquel[®] you will normally not have a fire event only a smoke event and requiring minimal cleanup. Since some heated surfaces such as pipe insulation is porous, at high temperature, special considerations must be made in order to limit worker exposure to potentially irritating vapors. This is true for mineral oil and all types of fluids. We recommend that when smoke or fumes are present from any leaked fluid that the area be ventilated with fresh air and that workers entering this area be equipped with appropriate personal protective equipment (PPE). For situations involving smoke or fumes originating from leaked Fyrquel[®] fluid in contact with hot surfaces we recommend a full face air purifying respirator equipped with cartridges designed for the removal of organic vapors and acids. Depending on the supplier this may require two separate canisters in a stacked orientation, or dual function canisters may be available. Any insulation which has been wetted with fluid should be removed and replaced with new insulation.

Fluid Maintenance

Can the different Fyrquel® fluids be mixed?

Fyrquel® fluids can be physically mixed in any proportion with other phosphate ester fluids. Fyrquel® fluids are available in varied viscosities and designed for specific applications. Contact your Fyrquel® Representative for a specific recommendation.

What are the recommended operating fluid limits for Fyrquel® fluids?

Users should follow OEM recommendations and consult with a Fyrquel® Representative.

Does the viscosity of Fyrquel® fluids change during service?

Phosphate esters are formulated without the need for viscosity modifying additives or polymers and retain viscosity indefinitely during service providing users with long service life. Other fluids may lose viscosity during service due polymer shearing or may increase in viscosity due to oxidative decomposition which results in further polymerization of the base stock molecules. Other types of non-phosphate ester fluids may require frequent or annual replacement. Of course, operating fluid viscosity for all types of fluid will also change as a consequence of physically mixing with liquid contamination by water, oils of a different viscosity grade or solvents.

Why is routine fluid analysis important?

Contamination and deterioration are normal consequences of any hydraulic fluid use and periodic fluid analysis is an important part of a fluid management program alerting users when corrective action is needed to avoid operating with severely contaminated or deteriorated fluids.

What fluid analysis properties does ICL-IP recommend?

We recommend monitoring viscosity, acidity, moisture, chlorine content, and particle count, also fluid resistivity for the Electro-Hydraulic Control (EHC) or turbine control fluid application. Viscosity will change due to contamination by other liquids. Water content measures the dissolved water content and indicates risk of hydrolysis. Fluid acidity is the best single property indicator of a fluid's remaining useful service life and stability. Resistivity directly measures risk of damaging servo valve erosion through an electro kinetic wear mechanism. Particle count measures cleanliness which can result in valve erosion and deposit formation.

What is considered excessive operating fluid temperature?

71° C (160 F) is the maximum recommended operating temperature. Typically users maintain Fyrquel® fluids within 49-57 ° C (120-135 ° F) range and setting 60 ° C (140 F) as an alarm limit.

What is the chloride (reported as chlorine) content in your fluid?

Typically it is less than 30 ppm.

What is considered a normal value for the acid number in mg KOH/g for your fluid?

New Fyrquel® fluid as supplied in the drum is typically 0.01 to 0.02 Total Acid Number (TAN). Most Fyrquel® fluid users easily maintain operating fluid in a range of 0.05 to 0.10 TAN. TAN is a property which responds in a linear fashion to the concentration of acidic species which are present in the fluid. Current best practices are to add new fluid to a clean hydraulic system, measure the fluid acidity (TAN) and cleanliness 1-2 days after filling a system and record this as the starting or the baseline value.

What is considered an abnormal acid number in mg KOH/g?

Greater than 0.15 TAN is abnormal. Most Fyrquel® fluid users today are easily maintaining their operating fluid in a range of 0.05 to 0.10 TAN. The hydrolysis breakdown reaction is auto catalytic which means that an abnormally high TAN like 0.15 causes an increase in the rate of the normally slow hydrolysis reaction. A fluid acidity (TAN) value of 0.20 or higher is evidence that fluid has severely degraded. Severely degraded fluid should be replaced.

What is the recommended way to maintain your acid number?

The best way to maintain Fyrquel® fluid in top condition is to keep the system as dry as possible, avoid unnecessary high temperature conditions and most importantly maintain a low acid number. Because the hydrolysis reaction is catalyzed by the presence of acids, the rate of acidity (TAN) increase is slower when operating fluids are maintained at the recommended low acidity. Fullers Earth, BASF Selexsorb® GT and ion exchange media are typically used for maintaining operating fluid in good chemical condition by removing acid species as they form. Only purchase acid control or acid absorbing filters from experienced reputable suppliers.

What is the recommended way to reduce the acid number of your fluid?

It is much better to maintain fluid at a low acid number than to allow the acid number to increase up to a set level and then try to reduce it. Once a fluid exceeds 0.20 TAN, filtration will not normally be effective returning the fluid to reliable condition. Contact your Fyrquel® Representative for an individual recommendation. Like all other critical fluids, phosphate ester reservoir fluids should be replaced whenever exceeding the OEM recommended fluid acidity limit, or getting severely contaminated liquids or solids.

What causes acid number to increase?

Phosphate ester fluids provide oxidation stability benefits over traditional petroleum oil. However, unlike petroleum oil, phosphate esters can react with water in a process known as hydrolysis to form acid phosphates. This process is generally referred to as acidification. Phosphate ester fluids will normally increase in acidity as a normal consequence of use, unless actively filtered by acid control filtration. The concentration of these acid phosphates within the fluid is what is measured when determining the Total Acid number (TAN). This and oxidative thermal breakdown are the primary way phosphate esters breakdown in service: “water is needed, heat accelerates the process and the mild acid phosphate that is produced catalyzes further breakdown”.

Do phosphate ester fluids breakdown forming corrosive phosphoric acid?

Phosphate esters do not break down forming corrosive phosphoric acids.

What is the pH of your fluid at a normal value for the acid number?

pH is not applicable because pH is defined as H⁺ ion concentration in aqueous solution. Since phosphate esters are not miscible with water it is impossible to measure pH accurately in phosphate ester fluids.

What type of filtration is normally used?

Most OEM designed phosphate ester systems are equipped with standard particulate removing in-line filters and separate auxiliary or off-line, filters that are designed to remove solids, water and maintain low acid content.

What impact does water have in your fluid?

Water is a necessary component in the normal hydrolysis reaction but it is not the main driver in the hydrolysis reaction. This is because the hydrolysis reaction is temperature dependent. However, a maximum limit of 0.10-0.20 water content in operating fluids is recommended.

What is the recommended way to remove water from your fluid?

Phosphate ester is a heavier than water fluid and normally has very low miscibility with water which allows for good separation. The best way to remove gross water contamination is to use a “wet vacuum cleaner” to remove the water layer from the top of the fluid level in the reservoir. Removal of water which persists as a second phase but is not in sufficient quantities so as to be efficiently removed via the ‘vacuum cleaner’ method can be removed by a coalescing filter. The best way to remove dissolved water content is by use of water absorbing filter media and using vacuum dehydration for larger fluid fill systems. Contact your Fyrquel® Representative for a recommendation.

How much water can your fluid absorb at 110F?

Newer fluid maintained in good <0.10 TAN condition may be able to solubilize roughly 4000-4500 ppm water. However temperature and fluid acidity will impact how much water can actually be absorbed and be solubilized within the phosphate ester. As both variables increase, the solubility of the water in phosphate ester will increase.

What is the water separability of your fluid?

Using standard water separability ASTM D 1401 test vigorously mixing 40 ml fluid and 40 ml water and measuring time to get 2 layers, phosphate esters maintained in good condition typically show a water separability value <5 minutes. Users should know that emulsions are not a risk for operating fluids except under the most extraordinary gross water contamination event scenario.

What contaminants will impact the water separability of your fluid?

Any contaminant which alters the solubility of water in the phosphate ester phase will increase the water separability.

What is the color value of your fluid?

New fluid has an ASTM color value less than 1.5 and an APHA color value that is less than 300. Older generation phosphate ester fluids are inherently darker than the modern next generation Fyrquel EHC Plus.

If your color value changes what does this indicate?

It is normal for operating or used fluid to darken over long periods of time. This does not indicate a reduction in operational quality. Fluid darkening can be an indicator of the effects of localized thermal and oxidative degradation occurring with a small volume of stagnant fluid that when mixed with the circulating fluids causing darkening. Contact your Fyrquel[®] Representative for an individual recommendation.

Can phosphate ester turbine control fluids cause varnishing of servo valves?

All fluids and oils can degrade forming insoluble materials causing varnishing of servo valves. The key to preventing varnishing in phosphate ester fluid system is to monitor fluid condition and avoid operating with degraded fluid which is signaled by 0.20 TAN or greater fluid acidity.

My servo valve repair services firm reported finding silt and varnish internal contamination. Do I need to do more than repair the servo valves?

Check your current and prior 2 year fluid analysis history, including the important fluid acidity and particle cleanliness trends. If the results indicate a condition of severe solid or liquid contamination or degradation, this critical operating fluid should always be quickly replaced before causing problems or varnishing. In addition, when replacing operating fluid that has exceeded the OEM limits for fluid acidity we recommend before refilling to first rinse or flush the system with an intermediate flushing fluid to remove the old fluid residues. A Fyrquel[®] Representative can discuss general System Cleaning Options and Guidelines. Visit www.fyrquel.com to review a one page guideline.