SERVICE GUIDE FOR QUINTOLUBRIC® 865 SERIES

DESCRIPTION OF THE MOST IMPORTANT PROPERTIES OF THE FLUID IN SERVICE AND TOLERANCES

Summary

Lubricants are the life blood of hydraulic systems. When monitored and maintained regularly, QUINTOLUBRIC® 865 Series fluids can reach a lifetime of up to 35,000 system hours (~4 years, depending on the leakage rate, higher fluid lifetimes can be achieved). The optimal lifetime is achieved when the fluid is kept clean and dry, in combination with proper filtration, air breather control, and running at the lowest possible temperature. The optimum operating temperature range is 40-50°C (95-120°F).

Monitoring through in-service oil analysis, an important element of predictive maintenance, can provide information about machine wear, as well as lubricant contamination and condition. By checking the appearance, viscosity, water content, acid number, cleanliness and solid metal and additive contents, the condition of the fluid can be measured.

Appearance - Fresh fluid color is yellow to amber, and will evolve to dark amber over time. But a dark color does not mean the product is in a bad condition. A better judgment of the fluid's condition can be made after checking additional parameters.

Viscosity - A lower viscosity usually indicates the presence of contaminants, such as a lower viscosity fluid - mineral oil or phosphate ester. A higher viscosity could indicate the presence of water, a higher viscosity fluid or fluid degradation.

Water content - When the fluid is running in a hydraulic system, the maximum recommended water content is 0.20% (2,000 ppm), preferably below 0.10% (1,000 ppm) as water can cause corrosion, sludge formation, filter & valve blockage and increased wear.

Acid number (AN) - This will increase with use, fresh QUINTOLUBRIC® 865 will have an initial AN value of < 2.0 mg KOH/g, and can reach 8.0 mg KOH/g. This is when the fluid in the system should be discarded and replaced with new QUINTOLUBRIC® 865 Series fluid.

Cleanliness - To maximize component and fluid life, cleanliness needs to be managed. Hydraulic component OEMs have recommended particle counts for the fluid, so the recommended contamination level in a hydraulic system during operation will depend on the design and hydraulic components used.

Solid metal and additive contents - To determine the level of (abrasive) metals and concentration of additives (e.g. Phosphorous), the fluid can be analyzed with modern analytical techniques showing the amounts of a large number of wear and additive metals. Each element can be compared with its initial value in fresh fluid, which indicates the level and type of contamination and the degradation of the fluid.

It is recommended to perform analyses on QUINTOLUBRIC® 865 Series fluids at least 2 times per year.

Temperature

It is recommended to keep the temperature of the hydraulic fluid as low as possible. The maximum recommended operating temperatures for the QUINTOLUBRIC® 865 Series fluids are:

- 55°C (131°F) maximum reservoir temperature
- 70°C (158°F) maximum system temperature

Data sheets for the QUINTOLUBRIC® 865 Series, are available on quintolubric.com, and include a graph that show product life at various temperatures (considering the fluid is in a clean and dry condition). The higher the temperature, the shorter the lifetime of the fluid, however the performance of the hydraulic fluid will not be jeopardized.

At tank temperatures of 40-50°C (104-122°F) (and considering the fluid is in a clean and dry condition) a lifetime of > 35,000 system hours is easily achievable.

Quaker Houghton™
Forward Together™

SERVICE GUIDE FOR QUINTOLUBRIC® 865 SERIES

DESCRIPTION OF THE MOST IMPORTANT PROPERTIES OF THE FLUID IN SERVICE AND TOLERANCES

PARAMETER (TEST METHOD)	NEW FLUID	IN SERVICE OPERATING RANGE	PARAMETER CHANGES DUE TO	POSSIBLE SYSTEM EFFECTS:		RECOMMENDED ACTIONS
				TOO HIGH	TOO LOW	
Appearance	Clear yellow to light amber liquid	Clear yellow to dark amber liquid	• Hazy fluid from water or dirt	• Increased Wear • Corrosion & Sludge • Filter & valve blockage	Not Applicable	• Improve filtration • Remove water • Refresh fluid
Viscosity (ASTM D 445) 865-46 865-68	mm²/s or cSt 41.4 – 50.6 61.2 – 74.8	mm²/s or cSt 41.4 - 55.2 61.2 - 81.6	• Thermal degradation • Shear degradation • Equipment malfunction • Incorrect fluid addition • Water contamination	• Cavitation • Decreased flow rate • Increased pow-er consumption • Over heating • Decreased response time	• Increased wear • Increased flow rate • Decreased efficiency • Relief valve overload	• (Partially) refresh the fluid
Water Content (Karl Fischer)	< 0.05% (500ppm)	<0.20% (2000ppm)	• Heat exchanger failure • Humid air • Improper storage of fluid	• Increased Wear • Corrosion & Sludge • Filter & valve blockage	Not Applicable	• Remove water • (Partially) refresh the fluid
Total Acid Number (TAN) (ASTM D974)	< 2.0 mg KOH/g	< 8.0 mg KOH/g	• Thermal, Oxidative & Hydrolytic degradation	• Corrosion & Seal softening • Reduced fire resistance	Not Applicable	• (Partially) refresh the fluid
Metals Aluminum Barium Boron Cadmium Calcium Chromium Copper Iron Lead Magnesium Manganese Molybdenum Nickel Phosphorus Silicon Silver Sodium Sulfur Tin Titanium Vanadium Zinc	(ppm)(ICP) 0 0 0 0 < 10 0 0 0 0 0 0 0 0 85-150 < 15 0 < 10 500 0-300 0 0 0	(ppm)(ICP) <10 <10 <10 <10 <20 <10 <10 <10 <10 <5 <10 <5 <10 100 <20 <10 <20 500 < 350 <10 <10 <200	• Wear particles • Corrosion • Addition incorrect fluid • External ingress of dirt through poor sealing • Affecting galvanised coating due to too high of an Acid number • Pollution from Zn containing hydraulic fluids	• Increased wear • Filter blockage	P must be > 80 ppm S must be > 400 ppm	• Improve filtration • (Partially) refresh the fluid
Cleanliness ISO LEVELS >4/>6/>14 (ISO 4406)	19/16/11 (for container and drum)	Dependent on system requirements	• Wear particles • Oil degradation • External ingress of dirt through poor sealing • Moisture contamination	• Higher wear & filter usage • Poor filterability • Valve jamming • Varnishing & Sludge	Not Applicable	Improve filtration or fluid purification

SERVICE GUIDE FOR QUINTOLUBRIC® 865 SERIES

DESCRIPTION OF THE MOST IMPORTANT PROPERTIES OF THE FLUID IN SERVICE AND TOLERANCES

Appearance

Fresh fluid – The color of QUINTOLUBRIC® 865 Series fluids are yellow to amber, and have a clear appearance.

Dark appearance – The QUINTOLUBRIC® 865 Series contains antioxidants that slow the oxidation process of the ester. The antioxidants will be consumed during use of the fluid until a certain critical level is reached. After reaching this critical level the ester starts to oxidize at a higher rate. The oxidation process results in the formation of dark colored oxidation products.

Presence of metals like iron and copper catalyze the oxidation process. High temperature and the presence of air (oxygen) also increases the oxidation rate.

A dark color does not mean the product is in a bad condition. A better judgment of the fluid's condition can be made after checking the additional 4 standard parameters: acid number, viscosity, water content and solid contamination.

A dark colored fluid can have a low acid number and provide a long fluid life.

Hazy appearance – A hazy appearance generally points to water contamination. The QUINTOLUBRIC® 865 Series fluids start showing haziness from 0.20% (2,000 ppm) of dispersed water (this is valid for room temperature). Also contamination with a water glycol solution results in a hazy appearance.

Other color – If the fluid shows another color (not in the yellow to brown range), it has been contaminated with another fluid (not QUINTOLUBRIC® 865 Series fluids).

Acid Number

The acid number is measured as the quantity of base, expressed in milligrams of potassium hydroxide per gram of sample (mg KOH/g), required to titrate the dissolved sample to a specific colormetric endpoint. The acid number is determined according to ASTM D974. Fresh QUINTOLUBRIC® 865 Series-products will have an initial acid number not exceeding 2.0 mg KOH/g.

During use, the acid number of QUINTOLUBRIC® 865 Series will increase. The acids formed are weak acids that are harmless toward seals and metals. They are completely different from mineral acids or phosphoric acids (as generated in phosphate esters), both of which both can be aggressive toward metals and seals.

When the acid number reaches a value of around 8.0 mg KOH/g the QUINTOLUBRIC® 865 Series fluids are recommended to be refreshed. New fluid will need to be installed in the system. Operating temperatures, system leakage and fluid make up, as well as contamination, all affect the lifetime of the fluid.

Viscosity

The kinematic viscosity is determined according to the ASTM D445 method. The recommended operating viscosity range for the QUINTOLUBRIC® 865 Series is:

- 865-46: 41.4 – 55.2 mm²/s at 40°C
- 865-68: 61.2 – 81.6 mm²/s at 40°C

A lower viscosity usually indicates the presence of a lower viscosity fluid, such as a mineral oil or phosphate ester, as a contaminant. A higher viscosity could indicate the presence of a higher viscosity fluid or polymerization.

Polymerization can take place in systems with high acid numbers where the degradation products combine to form larger molecules with a higher viscosity.

The reported operation specifications are only valid for a temperature of 40°C (104°F). Systems will have different temperatures in various components and various climate conditions. As temperatures vary, so will viscosities, the absolute minimum and maximum viscosities are dictated by the components of the hydraulic system. In general they are very wide, between 10 and 1,000 mm²/s. More specific data is available from component suppliers. They will indicate an optimum range where the component has its maximum efficiency, for example, 20 to 80 mm²/s.

Water Content

The manufacturing specification for the QUINTOLUBRIC® 865 Series regarding the water content is max. 0.05% (500 ppm). This means the QUINTOLUBRIC® 865 Series contains a maximum 0.05% (500 ppm) water when leaving the Quaker Houghton factory. The water content is measured according to the Karl Fisher titration method.

Quaker Houghton™
Forward Together™

SERVICE GUIDE FOR QUINTOLUBRIC® 865 SERIES

DESCRIPTION OF THE MOST IMPORTANT PROPERTIES OF THE FLUID IN SERVICE AND TOLERANCES

When the fluid is running in a hydraulic system, the maximum recommended water content is:

- 0.20% (2,000 ppm) for application in dynamic hydraulic equipment, preferable however below 0.10% (1,000 ppm)

If the water content rises, it is advised to take the following steps to reduce it:

- Water will be in the ester as small droplets (dispersion)
- Let the system rest and most of the water will sink to the bottom of the reservoir
- Drain the water from there
- Special water absorbing filters can also be used to remove small amounts of water
- Some filter suppliers provide a service where they connect a purifier that cleans and dries the fluid. A purifier heats the fluid under vacuum and lets the water evaporate. These units are called vacuum dehydrators

Cleanliness Level

Quaker Houghton manufactures the QUINTOLUBRIC® 865 Series with a maximum cleanliness level of ISO 4406:99 16/14/11 (± NAS 1638 class 5) for the UNPACKED product. After production, the products are pumped into trucks (bulk), containers or drums. Quaker Houghton guarantees for container and drum deliveries ISO 4406:99 19/16/11 (± NAS 1638 class 7) as a maximum.

The recommended contamination level in a hydraulic system during operation depends on the design and hydraulic components used.

Metal and Additive Contents

To determine the level of (abrasive) metals and concentration of additives (e.g. Phosphorous) the fluid can be analyzed by ICP.

The ICP analysis shows the amounts of a large number of elements (wear and additive metals). The amounts are usually reported in ppm or mg/kg.

Recommended Operation Specification levels QUINTOLUBRIC® 865 Series products:

- An Iron (Fe) content of > 100 ppm indicates that abrasive wear and/or corrosion takes place. Wear and/or corrosion usually occur as a result of having a period of high water contamination (> 2,000 ppm water)
- If a high level of iron is detected it is recommend to check if water is present in the hydraulic system (take fluid samples at lowest places in the system and/or dead ends of the system and measure the water content)
- Also check the system components for the presence of wear/corrosion. If there is evidence of wear or corrosion, replace the component(s)
- A Zinc (Zn) content of > 100 ppm indicates that the system may contain zinc plated material or zinc based paint. Zinc may dissolve in the QUINTOLUBRIC® 865 Series in time
- The dissolved Zinc usually has no negative influence on the performance of the hydraulic fluid

Quaker Houghton™
Forward Together™