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RING MAINTENANCE TIP #11
RING OIL TYPES AND THEIR EFFECT ON RING SPINNING AND TWISTING PRODUCTIVITY

REVIEW: Ring Tip #1 covered the extreme importance of regular chemical cleaning of the ring's internal structure. Ring Tip #2 covered the importance of the external cleaning of the surfaces of the ring, holder, rails, and separators. Ring Tip #3 covered the avoidance of ring breakage. Ring Tip #4 covered avoiding ring breakage with sintered rings. Ring Tip #5 dealt with reducing ring heat and the plant electric bill. Ring Tip #6 reviewed controlling ring oil usage with sintered rings. Ring Tip #7 covered the non-recommended addition of chemical ring cleaners to ring oil. Ring Tip #8 covered periodic wick replacement for sintered and solid steel rings. Ring Tip #9 summarized the importance of traveler fit and weight in ring spinning and twisting. Ring Tip #10 covered sintered ring pore volume, oil bleed rates, and oil viscosity.

GENERAL: The ability of a ring oil to prevent ring pore or passageway plugging and contamination of wicks and felts has a very pronounced effect on ring spinning and twisting productivity. The plugged ring typically increases frame KW consumption by 15% and ring temperature significantly, while reducing traveler life. The plugged ring causes ring leakage and a resultant housekeeping problem, and wasted oil. Some of the leaked oil reaches the ring face intermittently, causing variation in tensions up and down the frame. It is one of the major sources of broken ends (and/or chafed yarn). The varying tensions also cause damage to the fibers within the yarn bundle. As soon as oil stops flowing through the ring as designed, the ring becomes subject to chatter-marking, scalloping, and fretting corrosion, and in the case of the sintered ring, pore-smearing. These damaging effects are progressive and, if not corrected early by refacing and internal cleaning, will ultimately lead to destruction of the ring. Ring oil choice is extremely important to maintaining high productivity.

Ring oils may be divided into three categories:
1) Pure Synthetic Ring Oils
2) Petroleum Ring Oils
3) Parasynthetic Ring Oils

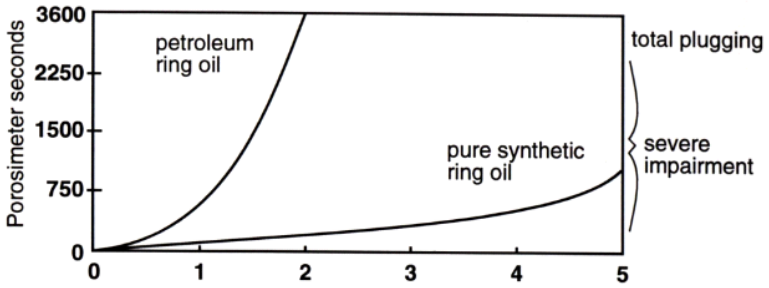
PURE SYNTHETIC RING OILS: A PURE synthetic oil is a reacted, manmade product that contains NO petroleum. It is formed by controlled reaction. It can be synthesized from various hydrocarbons including wood, corn, and surprisingly, petroleum feed stocks. A pure synthetic ring oil is about 2.5 to 3.0 times as expensive as petroleum ring oil.

- The primary reason for using a synthetic is to avoid ring plugging in sintered and Herr-type solid steel rings and fouling of wicks and felts in all ring types.
- Pure synthetics contain about 1/20th the amount of particulate matter found in petroleum ring oils.
- A pure synthetic for all practical purposes does not oxidize or decompose to form gummy deposits both on the ring and almost more importantly within ring pores or passageways.

Although there are many different types of synthetic lubricants, there are only two types that are used today and both are fully compatible and miscible with petroleum ring oils:

1) **POLYAFAOLEFINS (PAOS)** are clear oils with good solvency of petroleum decomposition products, virtually no tendency to breakdown and form harmful deposits. Yarns stained with PAOs show no fluorescence.
2) **DIESTERS** are straw colored oils whose primary advantage is strong solvency for petroleum decomposition products. Yarns stained with diester do, unfortunately, fluoresce. A long-term drawback to diesters is their tendency to hydrolyze and form weak acids. These acids, over many years, attack both the carbon steel ring, the copper content of a sintered ring and holders, and other parts in the immediate area of the ring. Diesters also attack O-ring seals.

In general, an open porosity ring (e.g., PSM-40) run with a pure synthetic in a relatively clean plant environment only needs cleaning and rebuilding about every 4 to 5 years; a ring run with petroleum ring oil needs internal cleaning at least every two years. Fine porosity rings, which are more susceptible to plugging (see Ring Tip 10) and usually used with fine denier manmade fibers and worsted need more frequent internal cleaning, typically yearly on petroleum and every 2 to 3 years with synthetic.



Typical Rate of Plugging of Sintered and Herr-Type Rings Pure Synthetic vs Petroleum

Other reasons for using a pure synthetic is that they are a little more slippery than petroleum; in KW tests on both plugged and cleaned rings, power consumption is about 5% less with a pure synthetic. Black stains on the yarn from oxidized petroleum ring oil are avoided.

WHEN SHOULD A PURE SYNTHETIC BE USED? It is almost imperative to use a pure synthetic in fine porosity rings. Pure synthetic should be used with either a new ring, or an internally clean ring. The plant should not expect that a pure synthetic would gradually clean a plugged ring. At Epic, we are only aware of one case where this happened, as measured by KW meter and Porosimeter when cleaning took place over two years. We do not recommend using a pure synthetic until the ring has been internally cleaned, because the plugged ring leaks, making the added cost of synthetic a waste of money.

PETROLEUM RING OILS are divided into two categories:

1) **PARAFFINIC PETROLEUM OILS**, including **WHITE OILS**, are used but are not recommended by Epic. The chief drawback of paraffinic oil is its tendency to oxidize easily and to form heavy gummy, and/or rock-hard ring plugging deposits. Yarns stained with paraffinic oils fluoresce.

   White oils are simply paraffinic oils that have been refined to remove color; most of the particulate matter within the oil still remains. Yarns stained with white oils show only mild fluorescence. Our work at Epic Ring Service in cleaning and rebuilding rings on a somewhat qualitative basis strongly suggests that white oils will plug rings faster than their unrefined paraffinic parents.

2) **NAPHTHENIC PETROLEUM OILS** are a light straw color and do show a mild tendency to fluoresce on yarn. In comparison to paraffinic oils, the naphthenic oils show a significantly lower tendency to oxidize and form gummy, ring plugging deposits. They do not approach the pure synthetic oil in their ability to reduce oxidization and the formation of deposits. If a petroleum is to be used, it is our opinion that a naphthenic oil is clearly the best choice.

PARASYNTHETIC OILS are widespread and use petroleum oil to dilute a pure synthetic oil in order to reduce the cost. The most typical combination is a large percentage of white oil added to a low concentration of PAO because it makes the oil look like pure PAO synthetic. It is unfortunate that the ASTM has not defined the words “synthetic oil” to mean a pure synthetic oil containing no petroleum; the result is that some vendors are selling at a premium price ring oils, labeled as synthetic, with little or no synthetic in it other than additives.

Our experience at Epic Ring Service in cleaning and rebuilding rings is that any addition of a petroleum oil to a pure synthetic base means that very little is gained in avoiding ring plugging. The typical parasynthetic with a high concentration of white oil in the ring oil means very rapid ring plugging.

If you did not receive Ring Maintenance Tips #1, 2, 3, 4, 5, 6, 7, 8, 9 and/or 10, contact Epic.