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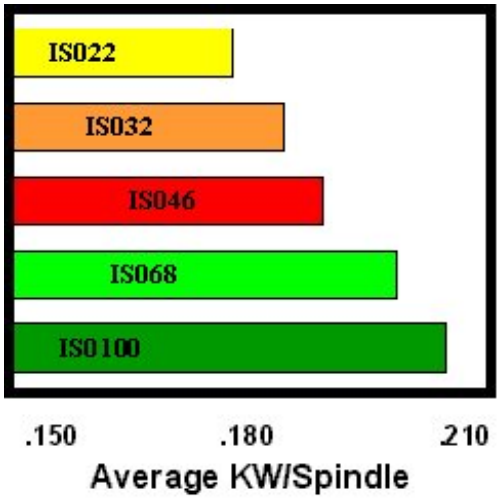
# RING MAINTENANCE TIP #12
# RING OIL VISCOSITY AND THE LUBRICATED RING

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. Ring Tip #11 covered ring oil types and their effect on ring spinning and twisting productivity.

CORRECT OIL VISCOSITY CHOICE for a lubricated ring depends on such factors as ring type (sintered and sintered porosity, Herr-type solid steel or wicked solid steel), yarn denier or count and related running tensions, internal ring cleanliness in the case of sintered or Herr type rings, and average plant temperatures. The choice also depends on oil type, pure synthetic, naphthenic petroleum (e.g., Naptex) or paraffinic petroleum; white oil is a paraffinic oil.

DESIGNATION OF VISCOSITY: Although there are several different standards used worldwide to designate oil viscosity, ISO (or International Standards Organization) viscosities is becoming the most standard. The conversion in approximate values is shown in the chart below (right).

AXIOMS ON VISCOSITY CHOICE: Oil viscosity should be as low as possible to permit easy, low friction sliding of the traveler, but heavy enough to provide long-term film strength to protect the ring from abrasion of a steel traveler or a nylon traveler with particulate matter trapped between it and the ring. TOO LOW A VISCOSITY* will result in ring damager and excessive oil waste through leakage. TOO HIGH A VISCOSITY* can mean too low an oil flow and certainly wastes an enormous amount of electricity (KW) by forcing the traveler to plow through a viscous oil film. Refer to the chart below as an example.




| ISO GRADE or Centistokes @ 40°C or 104°F | Sayboldt or SSU "seconds" | Redwood #1 | Engier Degrees |
|---|---|---|---|
| 22* | 100 | 88 | 3.0 |
| 32 | 150 | 130 | 4.3 |
| 46 | 220 | 180 | 5.5 |
| 58 | 270 | 235 | 7.7 |
| 68 | 310 | 270 | 8.8 |
| 100* | 460 | 400 | 13.0 |

*Use of these two viscosities generally indicates a severe problem. See text.

VISCOSITY INDEX is the resistance of the oil to breakdown under increasing heat. Most plants have an average room temperature of 80°F (30°C).

The running of FINE DENIER yarns (e.g., manmade draw twisting, worsted and glass) will generally exhibit ring temperatures no more than 10°F or 6°C above room temperature, so viscosity index is not important. HEAVIER DENIER yarns (carpet yarn, tire cord, twine, etc) will often exhibit ring temperatures 35°F or 21°C above room temperature. IF TEMPERATURES ARE HIGHER, THIS INDICATES THAT A PROBLEM EXISTS WITHER WITH THE TRAVELER (excessive weight or an unsteady traveler) OR THE LUBRICATION OF THE RING (usually the need to clean the ring internally and rebuild with new wick/felt/seals or reface the ring- services performed by Epic Ring Service).

PURE SYNTHETIC RING OIL has a very high viscosity index, or a very high resistance to thinning, under increasing heat so that, for all practical purposes, high heat either in the plant or heat produced by high tensions or a plugged ring is rather unimportant. However, PETROLEUM RING OILS do have a lower viscosity index or a greater tendency to thin under increasing heat. Paraffinic petroleum oils (including white oil) have a slightly better resistance to thinning

than a naphthenic oil, but these paraffinic oils should be avoided because of their wax content and tendency to oxidize and form ring plugging deposits. If petroleum oil is to be used, naphthenic oils are preferred. Although there are additives to improve viscosity index and/or alter the basic viscosity of petroleum ring oils, these additives all induce rapid ring plugging and should be avoided. Check with your ring oil supplier to make sure they are NOT USING ADDITIVES to either increase viscosity index or to alter base oil viscosity. Synthetic oil viscosity should only be achieved by blending two synthetic base stocks, and not by using long chain additives to artificially produce the desired viscosity.

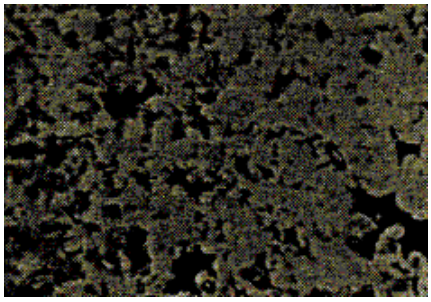
PURE SYNTHETIC RING OIL AXIOM: Pure synthetic ring oil has about 1/14$^{th}$ the vapor pressure of petroleum ring oil. Unlike petroleum ring oil, almost no synthetic is vaporized from the ring face and lost into the plant air. Very little synthetic is required to maintain an oil film on the ring face. For this reason, the plant generally uses one higher ISO viscosity than with petroleum to maintain an adequate film on ring faces.

**YARN TYPES AND DESIRED VISCOSITY**:

FINER DENIER YARNS (generally under 800 denier, such as glass, draw twisted manmade and worsted) should generally be run with lighter viscosity oils (for example, ISO 32 if a petroleum, or ISO 46 if a pure synthetic). Because tensions are low, there is not the need for the high film strength of heavy oil; the lighter viscosity permits easy traveler siding. The traveler does not have to plow through a heavy oil.

HEAVIER DENIER YARNS (generally over 800 denier or under 8 Ne Cotton Count, such as carpet yarn, tire cord and twine) in spinning or twisting mean higher tensions and therefore require a heavier oil to provide film strength to protect the ring. Typically, this will be an ISO 46 or 58 if a petroleum, or and ISO 58 or 68 if a synthetic.

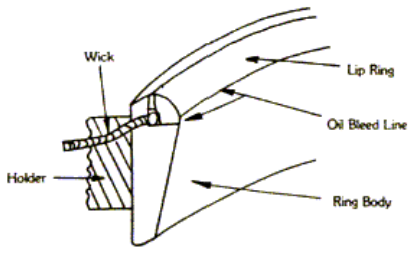
SINTERED RINGS: Most sintered rings in service are of the open porosity type (e.g., Eadie PSM-40 or standard Merriman) and when either new or cleaned should generally be run, depending on denier, with an ISO 32 or 46 petroleum, or an ISO 46 or 68 synthetic. Denser sintered rings (often used in worsted or fine denier manmade or, for example, Eadie PSM or PSM-70) should run lighter oils such as an ISO 32 petroleum or ISO 46 synthetic. These higher density rings plug rapidly and should be internally cleaned more frequently.



Internal Sintered Ring Structure (25X)

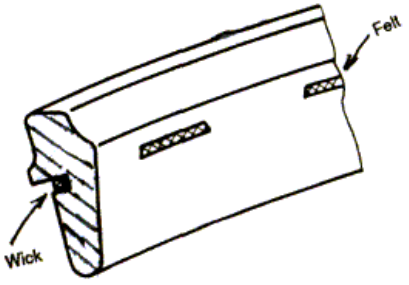
However, most sintered rings that have not been professionally cleaned within 2 to 3 years, if run on petroleum, or 3 to 5 years if run on pure synthetic become completely plugged internally. Ring faces only receive oil intermittently from leakage around the ring. Some plants, instead of having the rings cleaned internally and rebuilt, have wrongly dropped viscosities down to ISO 10 and ISO 22 viscosities in order to get some oil flow through the ring. This has resulted in high leakage and its housekeeping problems; long term, there is insufficient film strength so that permanent ring damage occurs.

SOLID STEEL RINGS are of two types, the Herr ring (a two part ring with internal passageways and a bleed line) and the European style with a wick and/or felt which is woven into the face of the ring. Although the solid steel ring was widely used in producing almost all yarn types, it has been replaced in the last 20 to 30 years by the more efficient (when internally clean) sintered ring, except when running worsted, where a steel traveler is used. Film strength is extremely important in order to prevent ring damage by the steel traveler.




HERR TYPE RINGS (left) are just as subject to internal plugging and need for internal cleaning and rebuilding as the sintered ring and should generally be run with an ISO 46 or 58 petroleum or an ISO 58 or 68 synthetic.

EUROPEAN STYLE RINGS (right) require frequent wick replacement in order to maintain ring efficiency and generally run on ISO 32 to ISO 46 petroleum or ISO 46 or ISO 58 synthetic.




The above is intended to guide the plant toward the best viscosity for the given conditions and does not replace a certain amount of experimentation to find the best viscosity for the given conditions.

If you did not receive Ring Maintenance Tips #1, 2, 3, 4, 5, 6, 7, 8, 10 and/or 11, contact Epic.

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