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RING MAINTENANCE TIP #10
SINTERED RING PORE VOLUME, OIL BLEED RATES, AND OIL VISCOSITY

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.

HIGH DENSITY RINGS NEED MORE FREQUENT CLEANING

Sintered rings do not all have the same porosity or structure.

1) European style rings (Eadie, Carter/Borgosesia, Reiners & Furst) have relatively thick cross-sections, averaging about 0.180" (4.5mm). The European style ring is formed using a coarser carbon steel powder to produce a more open internal porosity.

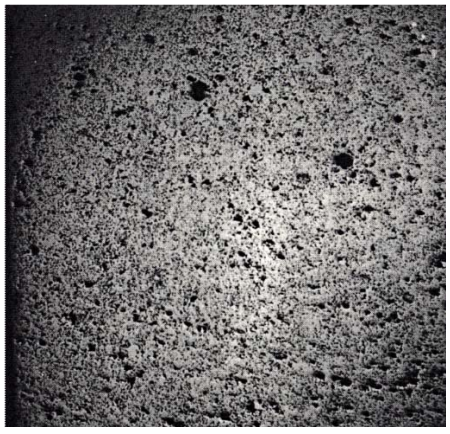
2) American style rings (Merriman and extended to include Kanai) have narrower cross-sections of about 0.100" (2.5mm). These rings are made with a finer carbon steel powder, to produce a tighter pore structure.

Oil flow through the ring is a function of pore size or ring density and the thickness of the ring. Thus a thin, American style ring with higher density can bleed oil at the same rate as a thicker, European ring with lower density.

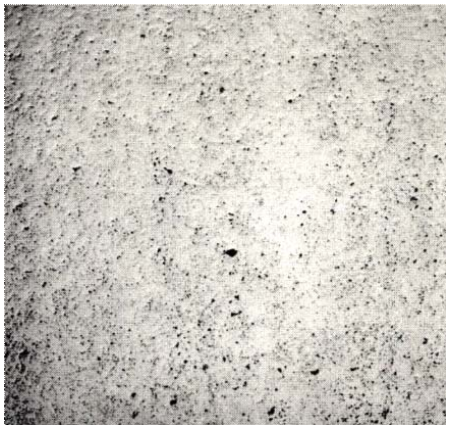
Ring density can also be varied by increasing or decreasing pressures on the ring, when it is pressed into a "green" structure (a structure with very little strength). Ring strength, or integrity, is produced by sintering, or heating, the steel ring very close to its melting point. Sintering basically welds the steel particles together where they contact each other.

Manufacturers vary the pore size to produce rings more suitable for the operating conditions. (See magnified photographs below.)

Open Porosity Ring
(Eadie PSM-40)



Medium Porosity Ring
(Merriman Open or Eadie PSM)



Tight Porosity Ring
(Merriman Tight or Eadie PSM-70)

For demonstration purposes, it is helpful to use the world standard of Eadie rings, because Eadie designates its rings by marks on the OD (outside diameter) of the ring. (See chart)

		Porosity	Void Space	Bleed Secs*	Typical Use
PSM-40	3 Marks	Very Open	~30%	+/-8	Heavy Denier Yarns (Tire Cord, Carpet Yarn)
PSM	1 Mark	Medium	~20%	~55	Medium Denier Yarns (Wool, 250-800 denier yarns)
PSM-70	2 Marks	Very Dense	~15%	~125	Fine Denier Yarns (Worsted, fine denier manmade)

*On Porosimeter

As a standard point of reference, an American style ring, such as a standard Merriman, used in tire cord or carpet yarn will also bleed in about eight seconds (even though it only has about 20% void space). This is because the ring is much narrower than the European style ring.

Heavier denier (>1000) yarns require more oil flow because of high traveler weights and tensions. Rings running finer deniers require much less oil flow because traveler weights and tensions are lower. Heavy denier rings almost invariably are run with nylon travelers which are less abrasive to the ring.

Finer denier yarns (e.g., worsted and manmade) are usually run with steel travelers. The engineering concept behind the tight porosity ring is to provide greater surface or wear area to prevent damage (chatter-marking, scalloping, and pore-smearing) by the steel traveler. The finer porosity also limits oil flow. In theory, this makes sense.

In practice, we see many 10,000s of tight porosity rings being sent to us for refacing because of damage from the steel traveler. Because a tight porosity ring fouls so easily and rapidly from particulate matter and petroleum ring oil oxidation, complete plugging usually occurs within a few months. With a pure synthetic ring oil, total plugging may occur in 1 to 2 years. The loss of lubrication produces chatter-marking, scalloping, and pore-smearing.

Ring plugging can be greatly slowed by use of a pure synthetic ring oil (containing no petroleum). Tight porosity rings should probably be cleaned and rebuilt (a service provided by Epic) yearly to prevent damage to the ring and to maintain even tensions and reduce yarn breaks.

Most fine denier rings run ISO32 (160 SUS) or lighter ring oils in order to get adequate oil flow. Heavier denier rings are typically run with an ISO 46 (215 SUS) or ISO 68 (305 SUS) ring oil.

The theory of the tight porosity for fine denier yarns is, in our opinion, defeated by rapid pore plugging. The plant is better off with a more open pore structure that keeps the traveler lubricated and resists wear damage of the ring surface. Oil flow can be controlled by changing oil viscosity. As the ring plugs, oil viscosity can be reduced to an ISO 22 (100 SUS) oil to increase oil flow. Going lighter than an ISO 22 ring oil can easily result in loss of film strength and damage to the ring.

WITH A NEW OR RECENTLY CLEANED RING, THE PLANT CAN ALSO CONTROL OIL FLOW THROUGH LEVELS IN THE RESERVOIR:

INDIVIDUAL RESERVOIR: Oil level should always be kept below the wick hole (usually half way up in the reservoir). With fine denier yarns, the fill of the reservoir should only be a moist felt pad and perhaps a slight excess of oil in the bottom of the reservoir. When the ring becomes plugged, it is necessary to fill above the wick hole in order to flood the ring OD in hopes that oil will leak around the ring and get to the ring face. The ring however, should be removed for internal cleaning.

MANIFOLD RESERVOIR: Oil level can be reduced in the manifold to slow oil flow. Alternatively, it should be raised to increase flow as the ring plugs. When the ring becomes completely plugged, raising the level to the top of the manifold does nothing; the ring must be removed for internal cleaning.

It is worth noting that rings with high porosity are relatively easier to internally clean than low porosity rings, because the chemical reagents used in cleaning can more readily enter the rings to effect cleaning.

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