

Homogenizer Pump Drive End Oil Contamination

This bulletin will explain the possible routes of entry for substances that can break down lubricating oil and possibly damage bearings and rotating shafts. The oil that is specified for use in the drive end of APV Gaulin machines is carefully selected to meet certain demanding criteria. However, in the absence of preventative measures, even the highest grade of oil will succumb to excessive water entrainment, product buildup, sludge, and other impurities which may find their way into the gearcase.

Without a doubt, an excessive amount of water in the oil is a prime cause of bearing problems and/or failures. APV Gaulin classifies excessive as anything more than a cup of water drained from the drive end daily. In order to properly troubleshoot a potential water problem, the water should be drained off of the crankcase daily, after the machine has been down for a minimum of four hours, to allow time for the water to "drop out". Knowing the ratio of water to oil can save you time when troubleshooting, since different entry paths will allow more water than others. Note: If excessive water is found in the gearcase, always drain, clean and refill with fresh oil before restarting the machine.

How does water get in to a sealed case? There are basically three possible routes of entry:

1. **Baffle Packing/Seals**

This is the packing/seal group located in the plunger well directly behind the cylinder block. The plunger adapters reciprocate through the packings/seals into the plunger well and back into the drive end with each revolution of the eccentric shaft. At the same time, cooling water is being sprayed onto the plungers, which are just forward of the plunger adapters. As a result, water is constantly collecting on the adapters, and with the reciprocal action the natural tendency is for it to be carried into the drive end on the backstroke. The integrity of the baffle packing/seals is therefore very important.

However, even brand new packing/seals will not keep 100% of the water out. They are designed as a wiping device, and serve a two-fold purpose: to keep water out and oil in.

One of the keys to longer packing/seal life is keeping the adapters free of nicks and burrs to prevent "nipping" of the seals. On the larger production-size machines, an adjustable packing arrangement is utilized. It is easily recognized by the large gland nuts on the back wall of the plunger well. These should be kept snug and should not be overtightened, which could result in deformation and failure of the baffle packing. The packing arrangement is actually two pieces of a flex-braided packing sandwiched by two thin Teflon[®] wiper rings. This design does not require high compression and will normally provide good service for two years on average.

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The smaller production-size and pilot-plant models utilize a spring-loaded, non-adjustable lip seal to provide a barrier against water/oil creep. You should also ensure that the packing cooling water is directed into the rear of the packing bore, not down onto the plungers where it would be less efficient and prone to splashing back onto the plunger adapters. You should have a steady stream of water (one to two gpm) with no splashing in the well area. To reduce the amount of water carried back, a water-drip ring (thick, black, rubber washer) should be fitted onto each plunger adapter to reduce water creep. These are supplied with every new machine and are also available as a part order.

How do I know if the problem lies in the baffle sealing area? It stands to reason that if water is getting in through this area, then oil will also be escaping and should be visible on the plunger adapters. The best way to determine if the water is getting in is to aim a stream of water directly at the front of the baffle seal area, while monitoring the backside of the baffle stuffing area by removing the drive end cover. This should be done while the machine is down and locked out for safety reasons. If water can be seen from the drive end side of the seal area, the packing (if adjustable) should be snugged down. If this does not stem the flow or if you have the lip seal design, they should be replaced as quickly as possible. Please consult your service manual or contact the APV Gaulin Service Dept. for instructions on replacing baffle packing/seals.

Note: If you find any trace of your product in the gearcase or the oil itself, usually that is a result of plunger packing failure or a buildup of old product within the plunger well. In either case, the drive end should be drained of oil, cleaned with mineral spirits and new oil installed, as soon as possible. Generally, products mixing into the oil will settle to the bottom of the case and impede proper oil flow through the suction strainer of the oil pump, resulting in bearing damage as well.

2. Oil Cooler (not applicable on all models)

The oil cooler on APV Gaulin machines is typically mounted on the exterior of the drive end or in the motor compartment. On newer machines it can be found within the rear service panel area, mounted to the subbase and piped in series with the hydraulic oil cooler. It is a shell-and-tube-type cooler, and the copper tubes can be attacked by hard water or chemicals and can develop leaks, allowing the water to mix with oil and find its way into the drive end. If suspect, the coolers can be pressure tested with shop air and should hold up to 100 lbs. of air without leaking.

How can I easily determine that it is the cooler without pressure testing? One of the symptoms of a bad cooler is copious amounts of water showing up in the oil in a short period of time.

If you have an oil cooler and suspect it is the cause of the problem, the easiest way to check it is to disconnect the incoming oil line from the cooler (with machine down and locked out) and turn the water supply on to the cooler. If water is seen on the oil side, then the cooler should be replaced.

3. Condensation.

This type of water contamination can vary widely in the amount of moisture that can collect because of room temperature differences, relative humidity, cooling water temperatures, etc. Condensation is usually a minor contributor to oil contamination, but can be a problem if allowed to collect over time.

How do I differentiate condensation from other forms of water contamination? Inspect the underside of the top cover and the oil lines for beads of water collecting on these surfaces. To avoid moisture buildup on these surfaces, try to keep the incoming water at ambient temperature. Condensation forms when the cooled oil flows through the warm lines, which are heated up from the oil below them in the sump.

Additional factors affecting oil performance are:

Excessive Heat

Excessive heat within the drive end can quickly break down the oil and severely reduce its ability to lubricate. The viscosity is affected, rendering the oil thin and lowering the pressure at which it is pumped. The proper oil pressure is usually between 35 - 40 psi. The oil temperature should never exceed 150½F.

Incorrect Filter

Using an incorrect oil filter of the wrong micron particle-size specification can also break the oil down by restricting flow through the lubrication and cooling system. There will be a pressure imbalance across the filter, possibly starving the bearings of oil. If you have any doubts about the filter being used, contact the APV Gaulin Service Dept.

Clogged Oil Lines

Restricted or clogged oil lines can also lead to bearing failure for obvious reasons. Whenever the oil is changed, the sump should be cleaned with mineral spirits, and it is advisable to blow all the oil lines out with high pressure (shop) air at the same time.

Worn Drive Components

Worn drive components such as gears, sleeve and roller bearings can generate particles of various metals which are potentially harmful. The oil filter will trap a high percentage of these, but they can destroy the wearing surfaces of the eccentric shaft, connecting rods, etc., over the long run.

Failure to Make Scheduled Oil/Filter Changes

Failure to make scheduled oil and filter changes account for a high percentage of drive end problems. It is very important to change the oil and filter every 6 months or 500 hrs., whichever comes first.

Hopefully, this bulletin covers most of your questions about oil contamination and the ways to prevent it. If you have any others, please contact APV at (888) 278-4321.

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