Mechanical Department Report
August 10, 2018
Acting Asst. CMO DS Elems

I'll try and keep things brief in this report. There are several items that I'd like to discuss in addition to the progress updates and project plans that I've been working on. WP917-D has had several issues with the cooling system that have lead to it being pulled from service several times this season which I'll discuss in a separate section. I've been working on plans for doing radiator work/replacement on several locomotives and have what I hope to be a solid plan for moving forward with the much needed work. Injector replacement is needed for several locomotives. Air brake work is needed to varying degrees on several locomotives; be it gasket/seal renewal, new feed-valve diaphragms, or total control stand and/or control valve replacement. I'll also be listing out the current known issues for all the locomotives that will be discussed in this report.

I'd like to thank Ethan Doty and Jason Peterich for helping me work on 917's water pump and also helping get the water pump off the 708 and assisting me in its teardown so it could be rebuilt.

Radiators

Several of our locomotives are in need of radiator repair or replacement. These include but are likely not limited to the 917-D, 921-D, 925-C, the rotary snail, 2001, 2873 and 1503. I still need to finish compiling a list of what type of radiator each locomotive uses and verifying that that is what is installed. At the moment WP708 is sitting in the shop and I've been soaking the fasteners to the cooling fan plates with penetrating oil with the plan of pulling the radiators out of it for inspection, testing and cleaning (ITC); once removed I'll likely haul them to A-1 in Reno for said ITC. Should the radiators be usable I plan to assemble the six core sections from the rear of 708 into a single six-core length assembly for installation in the right side of WP917-D. Since the six cores in the rear of 708 are made up of two triple-length assemblies, which is the same as in WP1503, I plan to pull the left side assembly from 1503 around the same time with the same lifting fixture. Likely I'll build the lifting fixture and pull the cores from the 1503 first so that the leaking core can be brazed. The assembly of multi-length cores will require the fabrication of an assembly fixture in addition the lifting fixtures, but I've found requisite plans and drawings and EMD Maintenance Instructions so the fabrication and overall project should go ok.

Part of getting the list together of what radiators go into what locomotive stems from there being three different sizes (thicknesses) of cores, from two main manufactures with two different methods of construction; some things *cannot* be assembled together into common multi-length core-assemblies. There is also to likelihood that some of our locomotives may have had the thicker cores installed to streamline logistics and part commonality as well as increase cooling capacity. Initially, the cores in the F7's and GP7's were thinner than the F9's and GP9's, which had smaller cores than the GP18's and GP20's etc. I believe that the 1503 would use the same size cores as the 2001, but I need to finish cross checking EMD's part numbers and then cross those to the current part number that the suppliers are using. If we need to purchase radiator cores, all three sizes (thickness) are available from several suppliers in single, double and triple-length cores (27, 54 and 81 inch long singe cores); I've not gotten any price quotes as of yet.

Locomotives

WP917-D

As mentioned in the introduction, 917 has been acting up this season. Most of the current issues revolve around the cooling system with the majority of the problems being ones that we've known about for some time; they've finely taken their toll. The only "new" issue that we finally traced down was the failure of the radiator shutters which happened sometime last season; as it turns out the air line that crosses over from the left to right side piston finally lost integrity and was venting to atmosphere. Anyways, here is a list of known items and some proposed solutions.

1. **Shutter failure**: Air piston feed line failure. Line was disconnected and outlet from left air piston was capped; right piston now has sufficient pressure and is operational. New cross-over line and fittings have been purchased.

   At the moment the left side shutters on 917 are operable. In the course of checking the shutter failure the operation of the thermostatic switch and fan relays was verified to be functional. In order to replace the air line at a minimum the #3 cooling fan will need to be pulled. I think it would be better to wait and do the replacement following the right side radiator work is done since that whole hatch over the engine will be coming off for that and would allow better access and more working room.

2. **Leaking water pumps**: The right bank pump leaked continually and the left bank pump leaked on occasion.

   The right bank pump has been replaced with a pump that I pulled from 708 and rebuilt, I need to as of this being typed fix the issue with the feed pipe to the pump inlet not sealing properly; that should be done by the BoD meeting. The left bank pump now leaks continually and I plan to deal with it when the locomotive is out of service during the radiator replacement.

3. **Dirty and now broken sight glass on water tank**: The sight glasses were filthy and leading to issues with getting proper readings on the coolant level. One sight glass broke during extraction.

   The top sight glass tube has been cleaned and reinstalled with new seals (both sights were starting to leak as well.) While backing off the top packing nut of the lower gauge the glass tube sheared and became exactly too short to be reused. I have a replacement on order which should arrive in Reno for me to pick up after work on either the 14th or 15 of this month (Tues or Wed next week); in the meantime I'll put in a temporary plastic tube or plug the gauge so that the tank can be filled.

4. **Radiator leak**: The core at the very front of the left side assembly is finally at the point that the locomotive needs to be refilled after being run through two or three RALs due to the volume of water being blown out of it while the engine is running.

   As outlined in the Radiators paragraph of the report there is a plan for replacing radiators in 917. I still need to confirm that the cores in 917 and 708 are of the same type. Trying to braze the core in-place is not feasible and would require most if not all of the same equipment/hatches to be removed as doing an assembly swab in order to gain proper access, as such I figured doing a full swap with good cores would be the best way to go.

5. **Leaking Injectors**: Eleven of sixteen injectors leak at the main body seal just as we had with the injectors in WP2001. Two of the eleven are very bad but two or three out the other nine leak excessively. The fuel contamination by the end of this season will likely put the locomotive out of service for next season unless a full oil change is done due to the fire/explosion hazard; changing of injectors would need to be done to prevent further contamination.

   Like what we did with WP2001 last November it is recommended that all sixteen injectors be replaced, oil filters replaced and the crankcase be drained and new oil added. Due to the nature of the contamination being a fuel leak the engine doesn't need to be flushed, but inspections of the main bearings and crankpin and bearing will need to be done. Assuming that we are able to purchase injectors at $128 per unit and the price for a 55gal. drum of oil stay in the $900 range we are looking at around $3600 dollars for all injectors and 2/3 of a crankcase worth of new oil (four drums.)

   I would also suggest pulling the three or four 645 power assemblies from the block that were installed. Having the whole block assembled with 567C power assemblies would streamline and simplify future work to the engine in 917 and likely cut down on some of the problems we've had with the 645 assemblies that came out of the SP4450 (mainly knocking and smoking.) While intermediate injectors are available to even out power output to those of the other 567 assemblies in the engine they would be an oddball component to have to keep track of. An opportune time to do the injector and possible power assembly work would be while the engine is shopped for the radiator work.

   Note: UTEX 567C assemblies are available either totally new, assembled from rebuilt components or variations thereof; I'm currently trying to get some price quotes on both B and C assemblies for possible future work on other units.

6. **Nose and body panel work**: This is pretty self explanatory.

SP2873

SP2873 has some of the same issues as WP917-D such as issues with injectors and the cooling system. Other than needing to be close to a water riser to stay topped off due to the radiator leaks and its near constant RAL usage it has performed about as well as any other season.

1. **Leaking water pumps**: The right bank pump seems to leak the most.
   I'll try to schedule the rebuilding or swapping out of the pumps with rebuilds for the end of this season or next spring.

2. **Leaking Radiator**: The very rear core on the right side of the locomotive leaks excessively now. Locomotive needs to be kept near water risers and the water level checked regularly.

   I hope to round up a source of radiators of this size and type. I'm not certain but I do not think that the cores in 708 are of the same type though I may be able to make up a triple-length assembly of smaller cores to install in place of the assembly with the leaking core. There may be the remote possibility of repairing the core if the damage isn't too bad but I'm not optimistic at this point.

3. **Leaking water tank**: The water tank still has a hole in it that leaks onto the fuel pump.

4. **Leaking crankcase access cover seals**: The seals at the handle stems of the access covers are worn out and leaking on several of the covers.

   I've bought new nylon washers to reseal the cover stems. The leaking cover on 917 has already been done so I know that the washers will at least fit.

5. **Leaking seals/gaskets on oil cooler**: The seals/gaskets on the oil discharge side of the oil cooler are slowly getting worse.

   I need to check but I think we have the gaskets in stock. For the moment the leaks are still pretty slow but leave oil on the floor of the engine room.

6. **Air leak at R1 brake piston**: There is an air leak on the very front right brake piston. Likely a bad piston cup.

   I'll need to check our inventory but I believe we have spare piston cups of the proper size. If not they are available from various suppliers. We can either rebuild the piston that is on the truck or see if we can pull one off of something else that has a piston of the same travel length and rebuild it and then do a swap.

7. **Leaking automatic cutout handle seal**: There is an air leak at the handle.

   I don't believe we have this part on hand. We have piles of other 24RL stands put there seals and gaskets would be suspect.

WP707

WP707 only has a few things that to be addressed at the moment. If we replace the injectors then we have a good locomotive for use on special events and for special rentals.

1. **Leaking injectors**: Nine of sixteen injectors leak at the main body seal.

   At the moment the oil hasn't been contaminated beyond use provided enough fresh oil is added when the crankcase level is topped off. I'd recommend not using the locomotive until it has a full injector replacement otherwise we'll run into the same safety issues with fuel dilution as 2001 (until last year) and 917. A full set of sixteen injectors will run about $2400 assuming a unit price of $128 each, plus the shipping which is about $350. If need be to get the work done this season I'm willing to pay for half of the cost of a set of injectors minus the shipping costs.

2. **Feed-valve issues**: The feed-valve had been acting up last season. Suspected bad diaphragm.

   I don't believe that we have any diaphragms in stock. While we have a bunch of 24RL brake stands and valves their seal, gaskets etc. are likely just as bad or worse that what is currently on our equipment.

3. **Shutters**: The air pistons for the shutters were removed some time ago. Currently not a big issue during as the shutters are jammed open and the fans seem to work just fine.

WP1503

Currently the only major issue I'm aware of is the hole in the one radiator core. I've outlined the plan for that previously in the report. I'd like to try and get the horn bracket moved down to the front of the cab and the proper size air line run to it before the locomotive is painted. Since it did get a new governor installed a few years back, the injector racks should probably all be checked and set and the injector timing checked as well.

Mechanical Instruction & Lessons

Due to the need to get more people trained and the types of mechanical projects that will likely be undertaken in the near future, as well as being asked by several members about getting involved, I'd like to try and hold an instruction class this fall. I was hoping to give instruction on the replacement of injectors and the requisite setting/adjustment of the fuel racks and timing of injectors following their replacement or the replacement of a governor. The instruction period would likely last a couple of days minimum depending on how long each daily session lasts.

I'd like to give a course in the spring on performing annual inspections, and while typically done in the spring early enough that weather usually prevents most people from working on site, there are a few options. One of the locomotives not usually brought on line until later in the season may be useful; 2001 which will need its full annual inspection either this fall or spring 2019 and 707 will need an annual prior to any operation.

I may also try and fit something in this season for the inspection and rebuilding of water pumps with the equipment in our shop.