MAINTENANCE OF OIL AND WATER BATH FOR MAGNETIC PARTICLE INSPECTION

By Kevin Walker

Bath Maintenance

Bath maintenance is important due to changes of the vehicle solution during use. These changes, in some cases, can prevent indications from forming. Changes in the vehicle solution can include:

- Lower concentration of magnetic particles due to drag-out (the loss of material as a carry over)
- Loss of liquid due to film, which adheres to the part
- Loss of liquid due to evaporation (especially for water vehicle)
- Contamination of bath from plant dust, dirt and oil from parts not properly cleaned
- Miscellaneous debris or foreign material

Bath Strength

The amount of magnetic particles per gallon of fluid in the bath is called its' strength or concentration. Your bath strength will determine if you can properly locate a discontinuity. If your concentration is below the recommended strength, weak indications will be produced or possibly no indications will appear; therefore, defects will not be detected. If your concentration is too high, indications may be masked by heavy background. Normally the usable limits of bath strength are quite broad, but for consistent results, the bath strength should be constant at all times. Bath strength should be checked at least once each day. To check the strength of the bath, the entire bath should be thoroughly mixed and agitated, circulating the bath at least 15 minutes before a check is recommended. The most widely used method is by gravity settling in a graduated ASTM approved pear shaped centrifuge tube. Per ASTM E 1444, the settling tube must be 100-ml

Settling Range

- Fluorescent particles be 0.1 - 0.4 ml,
- Non-fluorescent particles be 1.2 - 2.4ml.

Maintaining Bath Strength

Maintaining proper bath strength over long periods of time may be difficult since two forces can effect it. **Drag-out** (the loss of fluid deposited on the part) and **evaporation**. Measures that are needed to correct bath strength for each cause is different. This is especially true with water baths due to the higher evaporation rate compared to oil baths. In hot weather, the bath should be checked more often. Special conditioners must be added to a water bath to perform the inspection.

These conditioners are either pre-mixed in a concentrate of magnetic particles and conditioners or the conditioners are added separately. Since these conditioners have a lower evaporation rate than water the conditioner and the particles will build up in the bath as the water evaporates. Therefore, you will need only to add water to maintain the proper balance of particles and conditioners in the bath. In the case of an oil bath, just add oil. To build up bath strength from lost due to drag-out, particles, conditioners (for water bath) and fluid must be added to maintain bath strength. For units that are constantly in use drag-out would be the main cause for volume loss. For units that are occasionally used evaporation would be a concern.

Bath Contamination

Dirt Contamination of a bath can be determined in the magnetic particle-settling test. Since the magnetic particles are heavier than the dirt, these particles will settle faster. A distinct layer can be seen above the magnetic particles, this layer must be excluded when determining the concentration level. The cleaning of parts prior to inspection is very important to prevent dirt contamination of the bath. When the layer of dirt reaches the same volume as the magnetic particles, the bath should be changed or cleaned as this will obstruct the formation of proper indications.

Procedure to clean a contaminated water bath:

1. Drain the contaminated water bath.
2. Fill the tank to 90% of capacity (80% water and 10% of a neutral aqueous cleaner).
3. Turn on the pump, and circulate the cleaner solution through the unit for 30 minutes.
4. Turn off the pump, and drain the unit.
5. Fill the unit again with fresh clean water.
6. Turn the pump on and circulate clean water through the unit for a few minutes.
7. Turn off the pump, and drain the unit.
8. Fill the unit again with fresh clean water.
9. Turn the pump on and circulate clean water through the unit for a few minutes.
10. Turn off the pump, and drain the unit.
11. Repeat steps 7 & 8 if necessary. When the unit is thoroughly clean, add fresh water and magnetic particle material.

Depending upon the volume of usage a bath may require to be changed or cleaned, at least once a week. In some situations, you may wish to convert your bath from an oil system to water system or vice versa. The following are procedures for both types of conversions.

Procedure to change oil system to a water system:

1. Drain the unit completely from the bottom of the re-circulation pump. Add water to the tank. The volume should be slightly more than the operating volume. (For example; a 10 gallon tank should have 11 -12 gallons of water.)
2. Add to the water, 8 fluid ounces of WA-2B wetting agent. Re-circulate through the spray nozzle for 15 minutes. You can also add soap to the water but you will have a foaming problem. Do not use an alkaline cleaner as it could damage the pump seals.
3. While water solution is recirculating, scrub all surfaces of the unit with a brush, including tank, grilles, and head and tailstock area. ***NOTE:*** This step is very important. Any oil remaining could later contaminate water bath.
4. Repeat steps 1 – 4
5. Drain unit completely.
6. Add water to the tank. Recirculate through the spray nozzle for 10 minutes.
7. Repeat steps 6 – 7.
8. Drain unit again completely.
9. Charge unit with water and add magnetic particle material.

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