

PREPRODUCTION INITIATIVE-NELP MAGNETIC PARTICLE FLUID PURIFIER TEST PLAN

SITE: NAS NORTH ISLAND

1.0 OBJECTIVE

This test plan describes the data collection procedure for testing the Mayhew MP-1 fluid purifying system in an operational environment at AIMD, 500 Division, North Island Naval Air Station, San Diego, CA. The system will filter magnetic particle fluid. The data will be used to determine the system's cost effectiveness, overall performance, efficiency, and ability to interface with site operations.

2.0 DESCRIPTION

In its nondestructive inspection facilities, the Navy currently uses magnetic particle fluid to detect surface defects in various aircraft and ship metal substrate components. This fluid consists of a mixture of fluorescent-coated magnetic particles suspended in a light petroleum distillate. When the mixture is poured over a magnetized part, the magnetic particles are naturally attracted to any defects on the part surface. The part is then viewed under a black light, which causes the particles to glow and makes the crack easily visible. The fluid and particles fall back into the tank and are reused multiple times.

Over time the magnetic particles lose their fluorescent coating and the fluid picks up debris from the parts. When the fluid degrades, it is disposed of as hazardous waste. The frequency at which the fluid is changed depends on the number of parts that are inspected at the facility in which it is used. Approximately 10 gallons of fluid must be disposed of each time degradation occurs.

The MP-1 is a portable purification system designed to filter and purify fluids. The filter media to be used is the M7G1, a combination of virgin wool and cedar chips, which removes particulate, moisture, residue, and acidity from the fluid. The unit's inlet and outlet hoses are both placed directly into the magnetic particle fluid. The fluid first enters a 40-mesh strainer designed to keep large objects from entering the pump. A 2.5-gpm pump then moves the fluid through the filter and out the discharge hose. The magnetic particle fluid will be circulated through the system a number of times until the desired fluid clarity is achieved. A pressure gauge on the filtration unit indicates the pressure drop across the filter. After several uses, the pressure drop across the filter will increase. When the pressure drop reaches 55 psi, the filter must be discarded and replaced. The filter must be discarded as hazardous waste; however, the oil may be reused, thereby greatly decreasing the quantity of waste.

3.0 TEST PLAN

The magnetic particle fluid purifier will be tested in an operational environment. Data will be collected regarding the system's effectiveness in removing spent particles from the solution, the fluid's reusability, the cost savings realized, and waste volume reduction.

3.1 Approach

The necessary quantitative and qualitative data will be acquired from data sheets completed during system operation and maintenance

3.1.1 Instructions for Completing the Operational Data Sheet

System

- **Date:** Record the date the unit is used.
- **Operator(s):** Indicate who operated the equipment.
- **Fluid Quantity:** Record the approximate quantity (in gallons) of fluid to be purified..
- **Time to Purify:** Record how long the unit is run.
- **Quality of Fluid Before Purifying:** Describe the quality of the fluid before it is run through the system. Criteria to consider include clarity of fluid, amount of dirt and debris in fluid, amount of particles, etc.
- **Quality of Fluid After Purifying:** Describe the quality of fluid after it is run through the system. Compare it to the fluid before it was purified. Indicate if the fluid is sufficiently purified to accept new magnetic particles.

Filter

- **Pressure:** Record the pressure indicated on the pressure gage.
- **Change Filter:** Indicate if it was necessary to change the filter. If so, record how long it took to change the filter, and describe how easy or difficult it was to change the filter.
- **Additional Comments:** Provide any additional information regarding the system's performance.

3.1.2 Instructions for Completing the Maintenance/Repair Data Sheet

- **Date:** Record the date the unit is used.
- **Operator(s):** Indicate who operated the equipment when the problem was discovered.
- **Description of What Happened:** Describe what caused the equipment to be out of service (type of equipment failure).
- **Reason:** List the reasons (if known) that the equipment needs maintenance.
- **Amount of Downtime Due to Failure:** Record the amount of time the equipment was out of service.

- **Repair Parts Required/Cost of Repair (if known):** List any costs incurred due to the maintenance action, if known (cost of replacement parts, man-hours spent on maintenance, etc.).
- **Corrections to Prevent Future Occurrences:** Describe any possible actions that could have prevented the downtime (better maintenance, improved design, etc.).
- **Additional Comments:** Provide any information concerning unit maintenance.

OPERATIONAL DATA SHEET

Date: _____
Operator(s): _____
Fluid Quantity (Gal): _____
Time to Purify: _____

Please comment on the quality of the fluid before purifying:

Please comment on the quality of the fluid after purifying:

FILTER

Pressure: _____

Was it necessary to change the filter? _____ If so, how long did it take? _____

Comment on the ease or difficulty of changing the filter: _____

Additional Comments:

MAINTENANCE/REPAIR DATA SHEET

Date: _____
Operator(s): _____

Description of What Happened:

Reason:

Amount of Downtime Due to Failure:

Repair Parts Required/Cost of Repair (if known):

Corrections to Prevent Future Occurrences:

Additional Comments:
