

# Magnetic Particle Inspection (MPI) - Overview

## NDT Inspection Method Applicability

The typical use of magnetic particle inspection methods (a.k.a., MPI and MT) are to detect cracks, inclusions, seams, laps, and other discontinuities at or near the surface of ferromagnetic materials. Typical materials that fall into this category include "plain carbon steels" (i.e., ferrite matrix phase - those containing < .8% carbon), low grade stainless steel, cast iron, etc. [Note that a quick and easy test to determine the suitability of MPI is to place a magnet on the part. If the part is not magnetic, MPI is not an applicable test method.]

In general, MPI can be applied at any point during the manufacture and/or in-service use of a ferromagnetic part. MPI cannot be used on non-ferromagnetic materials or on parts with interfering coatings. Surface defects as small as .015" (.38mm) can be reliably detected with MPI.

## Benefits of Contracting MTC for MPI Services

We are a NADCAP certified facility with qualified NDT personnel in accordance with MIL-STD-410. We are a self-owned company, providing **independent** inspection services, free of any potential conflict of interest.

As of 2002, we have 40 years of MPI service experience. Our MPI staff includes Level II and III personnel. Our general turnaround is within 24 hours for typical batch sized jobs.

We offer the following types of MPI methods:

- Wet Fluorescent Continuous\*
- Wet Fluorescent Residual\*
- Visible Dry Powder (Red Dye)
- Visible Dry Powder (Black Oxide)

*\* using an oil carrier, not water*

The vast majority of the MPI we do is laboratory based, wet fluorescent using an oil carrier. However, we also do some field inspection work using MPI, typically based upon the visible dry powder (red dye) method.



*Tie Rod Standard in MPI booth under UV Light*



*Level II Inspector applying wet fluorescent continuous method on a rod shot (simulation for photo, not under normal UV light conditions)*

## Inspection Service Overview

The following are the basic steps involved in conducting an MPI examination (note that this example case is for a wet fluorescent continuous method):

- A. Receipt/Traveler Documentation
- B. Pre-Inspection Part Demagnetization
- C. Pre-Inspection Surface Cleaning
- D. Magnetize the Part
- E. Application of Magnetic Particles (flow)
- F. Visual Inspection under UV Lighting
- G. Evaluation & Disposition of Any Indications
- H. Repeat steps D through H, where applicable
- I. Post Inspection Part Demagnetization
- J. Post Inspection Cleaning
- K. C-of-C Documentation
- L. Pack & Ship

## Applicable Codes & Standards

Metals Testing Company's MPI methods comply with and have been approved for numerous aerospace and miscellaneous applications. A *sampling* of such specifications and requirements that we are approved for include:

General Electric Specification P3TF9  
Pratt & Whitney Specification MPM  
Rolls Royce Specification RPS 700, RPS 713  
SAE's AMS 2640  
MIL-STD-1949  
ASTM E1444

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