

<b>PNEC</b>	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 1 of 8
		Date: 12.07.2012

# MAGNETIC PARTICLE EXAMINATION PROCEDURE

<b>PREPARED &amp; APPROVED BY</b>	<b>CERTIFIED BY</b>	<b>REVIEWED BY</b>

**Pallakki NDT Excellence Center**

Visit Us at: [www.pallakkindt.com](http://www.pallakkindt.com)

\*For reference only. PNEC not responsible for errors and omissions in the data if any.

<b>PNEC</b>	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 2 of 8
		Date: 12.07.2012

## TABLE OF INDEX

Clause no.	Description
1	Scope.
2	Reference Documents.
3	Qualification of Personnel.
4	Written Procedure requirements
5	Examination medium.
6	Surface preparation.
7	Method of Examination.
8	Technique of Magnetization.
9	Magnetic field adequacy and direction.
10	Calibration requirements.
11	Examination coverage.
12	Light intensity.
13	Interpretation.
14	Evaluation.
15	Acceptance standard.
16	Demagnetization.
17	Post cleaning.
18	Reporting.

**Pallakki NDT Excellence Center**

Visit Us at: [www.pallakkindt.com](http://www.pallakkindt.com)

\*For reference only. PNEC not responsible for errors and omissions in the data if any.

<b>PNEC</b>	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 3 of 8
		Date: 12.07.2012

## 1.0 SCOPE

This document describes the procedure to be followed for magnetic particle examination of welds, heat affected zone and parent metal in ferromagnetic materials by using Yoke type(Alternate Current) for detection of surface discontinuities in ferromagnetic materials only.

## 2.0 REFERENCE DOCUMENTS

- 2.1 ASME Boiler and Pressure Vessel Code Section V, Edition 2010.
- 2.2 ASME Boiler and Pressure Vessel Code Section VIII Division-1, Edition 2010.
- 2.3 ASME Boiler and Pressure Vessel Code Section VIII Division-2, Edition 2010.
- 2.4 PNEC/WP/01 Written Practice for Training, Qualification and Certification of NDE Personnel.

## 3.0 QUALIFICATION OF PERSONNEL

Magnetic particle examination shall be carried out by personnel certified as per the PNEC Written Practice for Training, Qualification and Certification of NDE Personnel. (PNEC/MT/01)

## 4.0 WRITTEN PROCEDURE REQUIREMENTS

- 4.1 This examination procedure shall be revised if there is any change in the essential or non-essential variables as given in Table T-721 of ASME Section V.
- 4.2 A change of a requirement in Table-721 of ASME Section V (refer PNEC/MT/01 Annx-1) identified as essential variable shall require re-qualification of this procedure by demonstration. A change of a requirement identified as a non-essential variable shall not require re-qualification of the written procedure. All changes of essential or non-essential variables from those specified within this procedure shall require revision of this procedure.

## 5.0 EXAMINATION MEDIUM

- 5.1 Ferromagnetic particles used shall be finely divided with high permeability and low retentivity and from a reputed manufacturer. The color shall be such as to give a good visual contrast. Following magnetic particle materials manufactured by magnaflux shall be used.
- 5.2 Wet particles shall be used with the suspension medium as water. The particle concentration shall generally be from 1.2% to 2.4% by volume. A centrifuge tube( shall be used to determine the particle concentration. Bath concentration shall be checked every time before use or every 8 hours during continuous examination. The temperature of wet particle suspension and the surface of the part shall be within specified manufacturer recommendations.

APPLICATION	BRAND AND COLOR	AVERAGE PARTICLE SIZE
Wet Visible	Magnaflux – Black	< 8 microns

**Pallakki NDT Excellence Center**

Visit Us at: [www.pallakkindt.com](http://www.pallakkindt.com)

\*For reference only. PNEC not responsible for errors and omissions in the data if any.

<b>PNEC</b>	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 4 of 8
		Date: 12.07.2012

## **6.0 SURFACE PREPARATION**

The weld and adjoining areas up to about 1"(25.4mm) shall be clean. Wherever surface irregularities could mask indications due to discontinuities appropriate methods like grinding or brushing shall be employed to remove the irregularities and examination surface shall be dry, free of dirt, oil, grease, mill scale, welding flux or spatter.

Non-magnetic thin surface coatings for white contrast enhancement may be used.

## **7.0 METHOD OF EXAMINATION**

Examination shall be done by continuous method in which current is applied while the magnetic current remains on.

**7.1** Wet particles shall be applied with spray bottles or plastic squeeze bottles to get gentle even spread. The magnetizing field shall be applied after the particles have been applied. Flow of particles shall stop with application of magnetic field. However wet particles may be applied during the application of the magnetizing field if they are not applied directly to the examination area and are allowed to flow over the examination area or are applied with low velocities insufficient to remove accumulated particles.

## **8.0 TECHNIQUE OF MAGNETIZATION**

**8.1** Yoke Technique shall be used. Electromagnetic yokes shall be used to accomplish magnetization using Alternating Current (AC) only. Care should be taken to ensure that the legs of the yoke are in good contact with the examination part and sits squarely and firmly on the part to be examined.

**8.2** Lifting Power of Yoke – The electromagnetic yoke shall have a lifting power of at least 10 lbs. (4.5 kg) in AC mode, at maximum pole spacing to be used for examination. Each weight shall be calibrated and marked with the applicable nominal weight prior to first use. A weight need only be verified again if damaged in a manner that could have caused a potential loss of material.

## **9.0 MAGNETIC FIELD ADEQUACY AND DIRECTION**

**9.1** Adequacy of the applied magnetic field and its direction may be verified by pie shaped. Magnetic Particle Field Indicator, which shall be placed on examination surface such that copper plated, side is away from inspected surface. Suitable field is indicated when clearly defined lines of magnetic particle forms across the copper face of the indicator when magnetic particles are applied simultaneously with magnetizing force. This verification shall be done before each examination.

## **10.0 CALIBRATION REQUIREMENTS**

### **10.1 Yoke**

Lifting power of yoke shall be checked at least once a year or whenever the yoke has been damaged or repaired.

### **10.2 Lux Meter**

Lux meter shall be calibrated at least once a year or whenever the meter has been repaired. If the meter has not been in use for one year or more, calibration shall be done before use.

**Pallakki NDT Excellence Center**

Visit Us at: [www.pallakkindt.com](http://www.pallakkindt.com)

\*For reference only. PNEC not responsible for errors and omissions in the data if any.

<b>PNEC</b>	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 5 of 8
		Date: 12.07.2012

### **11.0 EXAMINATION COVERAGE**

Sufficient overlap will be given to ensure complete coverage at established examination sensitivity. Each area shall be examined at least twice with magnetic lines of force approximately perpendicular to each other.

### **12.0 LIGHT INTENSITY**

Minimum light intensity of 1000 Lux is required at the examination surface during examination and evaluation. It has been established that a hand lamp of 220V/100W bulb (without reflector) when held at a distance of 250 mm will give a minimum 1000 Lux within a circle of diameter 250mm directly below the bulb center. Light source, technique used, and light level verification shall be demonstrated one time, documented, and maintained on file.

### **13.0 INTERPRETATION**

**13.1** Surface discontinuities are indicated by accumulation of magnetic particles which contrast with the examination surface. However, all such indications are not necessarily imperfections, since excessive surface roughness, magnetic permeability variations (such as edge of heat affected zones), etc., may produce similar indications.

**13.2** Interpretation shall identify if an indication is false, non-relevant or relevant. False or non-relevant indications shall be proven as false or non-relevant. Interpretation shall be carried out to identify the location and character of indications.

### **14.0 EVALUATION**

**14.1** The size of an imperfection may be larger than the imperfection that causes it; however, the size of indication is the basis for acceptance evaluation. Only indications which have any dimension greater than 1.5 mm shall be considered relevant.

**14.2** A linear indication is one having a length greater than three times the width.

**14.3** A rounded indication is one with circular or elliptical shape with a length equal to or less than three times the width.

### **15.0 ACCEPTANCE STANDARD**

ASME Code Section VIII Division-1 Appendix-6  
ASME Code Section VIII Division-2 Part 7.5.6.2

### **16.0 REPAIR REQUIREMENTS**

**16.1** Any indication, which is believed to be non-relevant, shall be regarded as an imperfection unless it is shown by re-examination by the same method or by the use of other nondestructive methods or by surface conditioning, that no unacceptable imperfection is present.

**16.2** Un-acceptable imperfections shall be repaired and re-examined to assure complete removal. When an imperfection is repaired by chipping or grinding and subsequent repair by welding is not required, the excavated area shall be merged with the surrounding surface so as to avoid sharp notches, crevices or corners.

**Pallakki NDT Excellence Center**

Visit Us at: [www.pallakkindt.com](http://www.pallakkindt.com)

\*For reference only. PNEC not responsible for errors and omissions in the data if any.

<b>PNEC</b>	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 6 of 8
		Date: 12.07.2012

**16.3** Where welding is required after removal of an imperfection, the area shall be cleaned and examined by suitable methods to ensure the removal of the imperfection and welding performed in accordance with qualified welding procedure.

**16.4** After repairs, the repaired areas shall be blended into the surrounding surface so as to avoid sharp notches, crevices or corners and re-examined by the magnetic particle method and by all other methods of examination that were originally required for the affected area, except that, when the depth of repair is less than the radiographic sensitivity required, re-radiography may be omitted.

**16.0 DEMAGNETIZATION**

Demagnetization shall be done where residual magnetism in the part can interfere with subsequent process or usage. Demagnetization when required shall be carried out after completion of test. During magnetic particle examination residual magnetism in the part exceeding 3 Gauss shall be demagnetized.

**17.0 POST CLEANING**

Surface examined shall be cleaned with dry or wet cotton rag immediately after evaluation of indications.

**18.0 REPORTING**

Reporting shall be done on report Format as per PNEC/MT/01, Annexure – 2.

Non-Reject able & Reject able indications shall be recorded. Reject able indications as a minimum, the type of indications (linear or rounded), location and extent (Length or diameter or aligned) shall be recorded by sketch or photographs may be use.

PNEC	<b>MAGNETIC PARTICLE EXAMINATION PROCEDURE</b>	Doc. No. PNEC/MT/01.REV 0
		Page: 7 of 8
		Date: 12.07.2012

## MAGNETIC PARTICLE EXAMINATION REPORT

<b>Client:</b>				
<b>Date of Test:</b>		<b>Report No. :</b>		
<b>Job Description:</b>		<b>Magnetic Particle Equipment :</b>		
<b>Job Order No.:</b>		<b>Type of Current:</b>		
<b>Drawing No.:</b>		<b>Magnetic Particle:</b>		
<b>Material:</b>		<b>Powder Color :</b>		
<b>Thickness:</b>		<b>Lighting Equipment Illumination:</b>		
<b>Procedure No.</b>		<b>Surface condition:</b>		
Sl. No.	Job Identification	Location	Type of Discontinuity	Result
:Sketch:				
<b>EXAMINED BY</b>		<b>INSPECTED BY</b>		<b>WITNESSED BY</b>
Name :		Name:		Name:
Signature:		Signature:		Signature:
Level :		Designation:		Designation:
Date :		Date :		Date :

**Pallakki NDT Excellence Center**

Visit Us at: [www.pallakkindt.com](http://www.pallakkindt.com)

\*For reference only. PNEC not responsible for errors and omissions in the data if any.