



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
 Issue : 1
 Date : 12-12-2016
 Page : 1 of 7

Contents	Level 1	Level 2	Level 3
1.0 Introduction, Terminology, History of NDT	1.0 Generalities on NDT: What is testing? What is the purpose of NDT? At what stage of the life of a "product" is NDT performed? How does it add value? Who may carry out NDT? Main NDT methods.	1.0 Generalities on NDT: What is testing? What is the purpose of NDT? At what stage of the life of a "product" is NDT performed? How does it add value? Who may carry out NDT? Main NDT methods.	1.0 Generalities on NDT: What is testing? What is the purpose of NDT? At what stage of the life of a "product" is NDT performed? How does it add value? Who may carry out NDT? Main NDT methods.
	1.1 Eddy current testing: Definition: electromagnetic interaction between a sensor and a test object conducting electricity, providing information on physical characteristics of the test object. History of the method	1.1 Eddy current testing: Definition: electromagnetic interaction between a sensor and a test object conducting electricity, providing information on physical characteristics of the test object. History of the method	1.1 Eddy current testing: Definition: electromagnetic interaction between a sensor and a test object conducting electricity, providing information on physical characteristics of the test object. History of the method
	1.2 Terminology EN 1330 –1and –2 EN 1330- 5	1.2 Terminology EN 1330 –1and –2 EN 1330- 5	1.2 Terminology EN 1330 –1and –2 EN 1330- 5



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
 Issue : 1
 Date : 12-12-2016
 Page : 2 of 7

2.0	2.0 Fundamentals	2.0 Fundamentals	2.0 Fundamentals
Physical principles and associated knowledge	<p>2.1 Electricity : elements</p> <p>Direct current : current, voltage, resistance, conductance, Ohm's law, resistivity, conductivity. Units, conductivity values for some metals.</p> <p>Alternating current : sinusoidal current and voltage, amplitude, frequency, period, phase.</p>	<p>2.1 Electricity : elements</p> <p>Direct current : current, voltage, resistance, conductance, Ohm's law, resistivity, conductivity. Units, conductivity values for some metals.</p> <p>Alternating current : sinusoidal current and voltage, amplitude, frequency, period, phase. Vector representation</p>	<p>2.1 Electricity : elements</p> <p>Direct current : current, voltage, resistance, conductance, Ohm's law, resistivity, conductivity. Units, conductivity values for some metals.</p> <p>Alternating current : sinusoidal current and voltage, amplitude, frequency, period, phase. Vector representation, Other periodic currents</p>
	<p>2.2 Magnetism</p> <p>Magnetism : magnetic field, lines of force, magnetic field strength. Permeability, flux density (induction). Flux. Hysteresis loop. Units.</p>	<p>2.2 Magnetism</p> <p>Magnetism : magnetic field, lines of force, magnetic field strength. Permeability, flux density (induction). Flux. Hysteresis loop. Reluctance. Magneto-motive force. Units.</p> <p>Diamagnetism, paramagnetism, ferromagnetism.</p>	<p>2.2 Magnetism</p> <p>Magnetism : magnetic field, lines of force, magnetic field strength. Permeability, flux density (induction). Flux. Hysteresis loop. Reluctance. Magneto-motive force. Units.</p> <p>Diamagnetism, paramagnetism, ferromagnetism.</p>
	<p>2.3 Electromagnetism</p> <p>Magnetic field created by a current, (wire, coil). Electromagnetic induction phenomenon, inductance, Electromagnetic coupling.</p>	<p>2.3 Electromagnetism</p> <p>Magnetic field created by a current, (wire, coil). Electromagnetic induction phenomenon, inductance, mutual induction. Electromagnetic coupling.</p>	<p>2.3 Electromagnetism</p> <p>Magnetic field created by a current, (wire, coil). Electromagnetic induction phenomenon, inductance, mutual induction. Electromagnetic coupling.</p>



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
 Issue : 1
 Date : 12-12-2016
 Page : 3 of 7

	<p>Induced currents and secondary field. Lenz's law Eddy current distribution in conducting materials - depth of penetration, amplitude, phase - characteristic frequency Impedance.</p>	<p>Induced currents and secondary field. Lenz's law Eddy current distribution in conducting materials - planar wave: standard depth of penetration, amplitude, phase - cylindrical conductors: characteristic frequency Impedance. Complex plane representation. Impedance plane diagrams</p>	<p>Induced currents and secondary field. Lenz's law Eddy current distribution in conducting materials - planar wave: standard depth of penetration, amplitude, phase - cylindrical conductors: characteristic frequency Impedance. Complex plane representation. Impedance plane diagrams</p>
<p>3.0 Product knowledge and related capability of the method and derived techniques</p>	<p>Applications of eddy current testing: Metal sorting Measurement of a physical parameter: conductivity, ferrite content, thickness of coatings, etc... Detection of local discontinuities (flaws). Capabilities : - depth of penetration, conductive materials - Non contact, high speed, high temperature, may be mechanised. Techniques: single frequency, multifrequency, multiparameter.</p>	<p>Manufacturing related discontinuities (typical flaws) Service induced discontinuities (flaws). Material properties influencing eddy current testing: conductivity, permeability, Product characteristics influencing eddy current testing: condition (surface condition, heat treatment, cold working, temperature, etc...), shape, wall thickness, accessibility Products being tested : Semi-finished products, pipes, heat exchanger tubes, mechanical parts (e.g. car, railway and aircraft industry), welds (e.g. offshore) Applications of eddy current testing : Metal sorting Measurement of a physical parameter : conductivity, ferrite content, thickness of coatings, etc... Detection of local discontinuities (flaws)</p>	<p>Manufacturing related discontinuities (typical flaws) Service induced discontinuities (flaws). Material properties influencing eddy current testing : conductivity, permeability, Product characteristics influencing eddy current testing : condition (surface condition, heat treatment, cold working, temperature, etc...), shape, wall thickness, accessibility Applications of eddy current testing : Metal sorting Measurement of a physical parameter : conductivity, , thickness of coatings, etc... Detection of local discontinuities (flaws) Capabilities : - depth of penetration, conductive materials - Non contact, high speed, high temperature, may be mechanised.</p>



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
 Issue : 1
 Date : 12-12-2016
 Page : 4 of 7

		<p>Capabilities: - depth of penetration, conductive materials Non contact, high speed, high temperature, may be mechanised.</p> <p>Techniques : single frequency, multifrequency, multiparameter. Remote field.</p> <p>Codes and standards</p>	<p>Techniques : single frequency, multifrequency, multiparameter. Remote field.</p> <p>Codes and standards</p>
4.0 Equipment	<p>4.0 Eddy current testing system: Instrument, probe, reference blocks.</p>	<p>4.0 Eddy current testing system: Instrument, probe, reference blocks.</p>	<p>4.0 Eddy current testing system: Instrument, probe, reference blocks.</p>
	<p>4.1 Relevant standards: - EN 13860-1 and EN 13860-2</p> <p>Measurements: absolute, differential, others Output and signal display</p>	<p>4.1 Relevant standards: - EN 13860-1 and EN 13860-2</p> <p>General purpose application instrument : essential functions Probe functions: combined or separate transmit- receive Probe family : surface, coaxial Probe designs Measurements : absolute, differential, others Output and signal display Reference blocks : material, design, production, storage. Mechanised equipment standards</p>	<p>4.1 Relevant standards: - EN 13860-1 and EN 13860-2</p> <p>General purpose application instrument : essential functions Probe functions: combined or separate transmit- receive Probe family : surface, coaxial Probe designs Measurements : absolute, differential, others Output and signal display Reference blocks : material, design, production, storage. Mechanised equipment Codes and standards</p>



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
 Issue : 1
 Date : 12-12-2016
 Page : 5 of 7

<p>5.0 Information prior to testing</p>	<p>Information on the product : grade, metallurgical condition, shape. Type of discontinuities anticipated and location, duty of the product. Extent of examination. Information on test conditions : temperature, humidity, access, availability, unwanted interfering signals, electric and/or magnetic disturbances.</p>	<p>Information on the product : grade, metallurgical condition, shape. Type of discontinuities anticipated and location, duty of the product. Extent of examination. Information on test conditions : temperature, humidity, access, availability, unwanted interfering signals, electric and/or magnetic disturbances.</p> <p>- Preparation of written instructions</p>	<p>Information on the product : grade, metallurgical condition, shape. Type of discontinuities anticipated and location, duty of the product. Extent of examination. Information on test conditions : temperature, humidity, access, availability, unwanted interfering signals, electric and/or magnetic disturbances.</p> <p>Use of other NDT methods Codes, standards, specifications.</p>
<p>6.0 Testing</p>	<p>Reference blocks : design, production, storage.</p> <p>Operating conditions : Excitation frequency and if necessary auxiliary frequencies Probe speed, probe clearance, probe vibration and centring</p> <p>Calibration curves</p> <p>Settings : data acquisition procedure/instructions</p>	<p>Reference blocks : design, production, storage.</p> <p>Probe : selection, as a result of the information in 5.0, Operating conditions as a result of the information in 5.0 : Excitation frequency and if necessary auxiliary frequencies Probe speed, probe clearance, probe vibration and centring</p> <p>Calibration curves Settings : data acquisition procedure</p>	<p>Reference blocks : design, production, storage.</p> <p>Probe : selection or design, as a result of the information in 5.0, Operating conditions as a result of the information in 5.0 : Excitation frequency and if necessary auxiliary frequencies Probe speed, probe clearance, probe vibration and centring</p> <p>Calibration curves Settings : data acquisition procedure</p>



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
 Issue : 1
 Date : 12-12-2016
 Page : 6 of 7

7.0 Evaluation And Reporting	7.0 Evaluation NOT APPLICABLE	7.0 Evaluation. Characterisation of the indications : single frequency analysis, multifrequency analysis, data analysis procedure	7.0 Evaluation. Characterisation of the indications : single frequency analysis, multifrequency analysis, data analysis procedure
	7.1 Reporting Examination report	7.1 Reporting Reporting level Examination report	7.1 Reporting Reporting level Examination report
8.0 Assessment	NOT APPLICABLE	Acceptance criteria Codes, standards	Acceptance criteria Significance of discontinuities Codes, standards
9.0 Quality aspects	9.0 Personnel qualification (according to EN ISO 9712) Equipment verification	9.0 Personnel qualification (according to EN ISO 9712) Equipment verification Written instructions Traceability of documents	9.0 Personnel qualification (according to EN ISO 9712) Equipment verification Format of working procedures, Traceability of documents Other NDT qualification and certification systems A review of applicable NDT application and product standards



AFRICAN NDT CENTRE
COURSE CURRICULUM
EDDY CURRENT TESTING LEVEL 1, 2 and 3

Doc No : CC-ET
Issue : 1
Date : 12-12-2016
Page : 7 of 7

10.0
Developments

NOT APPLICABLE

General information

Array probes
Pulsed eddy currents
Non inductive techniques : Magneto-Optical
Imaging, SQUID,
Giant magneto resistance,...

Imaging
Modelling