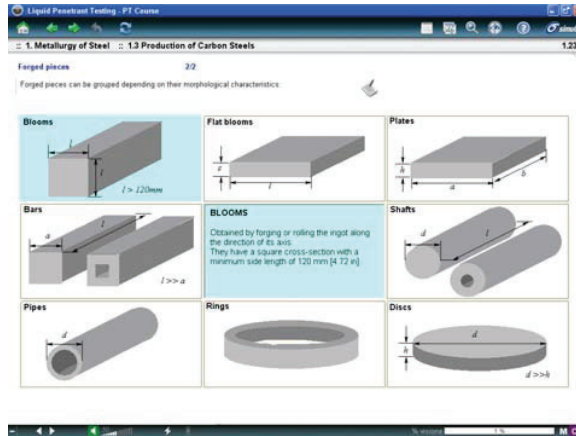


PT - LIQUID PENETRANT TESTING

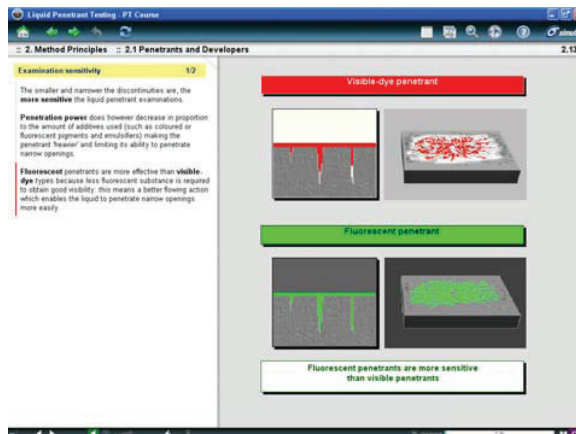
1. METALLURGY OF STEEL

- 1.1 Steel
- 1.2 Heat Treatments
- 1.3 Production of Carbon Steels
- 1.4 Study of Defects
- Self-evaluation test



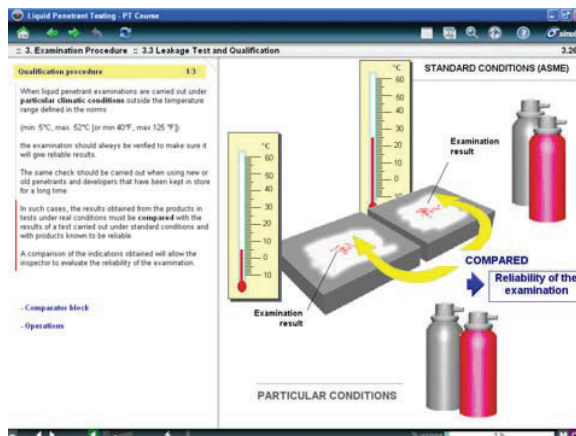
2. METHOD PRINCIPLES

- 2.1 Penetrants and Developers
- 2.2 Light Sources
- Self-Evaluation Test



3. EXAMINATION PROCEDURE

- 3.1 Preliminary Activities
- 3.2 Examination Operations
- 3.3 Tests
- Self-Evaluation Test



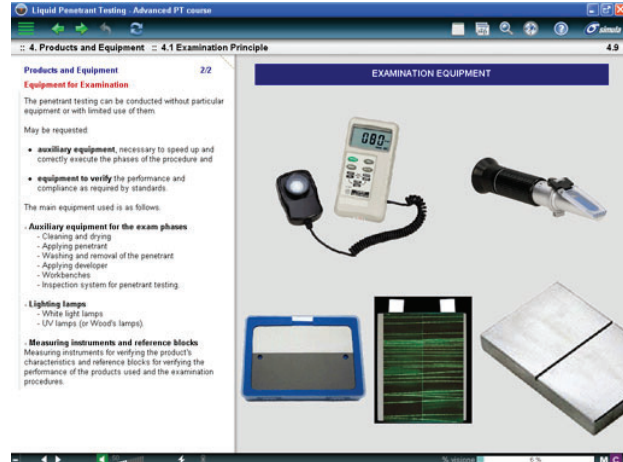
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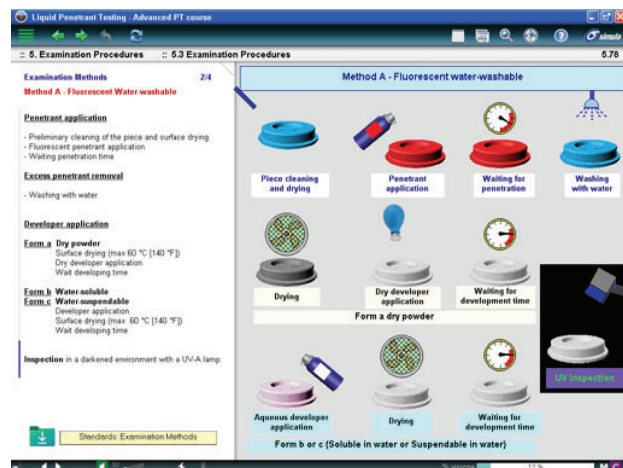
4. PRODUCT AND EQUIPMENT

- 4.1 Examination Principle
- 4.2 Liquids Penetrant
- 4.3 Developers
- 4.4 Solvents and Emulsifiers
- 4.5 Examination Equipment
- 4.6 Performance and Features
- Self-Evaluation Test



5. EXAMINATION PROCEDURE

- 5.1 Preliminary Activities
- 5.2 Examination Phases
- 5.3 Examination Procedures
- 5.4 Detectable Discontinuities
- 5.5 Qualification and Leak Test
- Self-Evaluation Test



VIDEOTHEQUE

FINAL TEST: Over 500 final tests.

NORMS: Over 40 norm references

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LIQUID PENETRANT TESTING: DETAILED CONTENTS

1. METALLURGY OF STEEL ([>> PT](#))

1.1 Steel

- Introduction
- Components
- Solidification
- Iron-Carbon Diagram

1.2 Heat Treatments

- Introduction
- Annealing
- Normalization

1.3 Production of Carbon Steels

- Manufacturing Process
- Classification of Products
 - Forged pieces
 - Castings
 - Rolled plates
 - Pipes
 - Welded joints

1.4 Study of Defects

- Discontinuities in steel
- Discontinuities in forged pieces
- Discontinuities in castings
- Discontinuities in rolled plates
- Discontinuities in pipes
- Discontinuities in welded joints

1.5 Self-evaluation test

- Steel
- Heat Treatments
- Production of Carbon Steels
- Study of Defects

2. METHOD PRINCIPLES ([>> PT](#))

2.1 Penetrants and Developers

- Examination Principle
- Penetrants Classification
- Chemical Characteristics
- Physical Properties
- Other Properties
- Examination Sensitivity
- Developers
- Developers Classification
- Synthesis of the Characteristics

2.2 Light Sources

- Classification
- Black Light Lamp
 - Structure and components
 - Efficiency Verification
 - Distance of lighting system
 - Cleaning and Maintenance

2.3 Self-Evaluation Test

- Penetrants and developers
- Light sources

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3. EXAMINATION PROCEDURE [\(>> PT\)](#)

3.1 Preliminary Activities

- Test piece inspection
- Standards References
- Selection of method and type of liquid

3.2 Examination Operations

- Introduction
- STEP 1: Surface Cleaning
- STEP 2: Penetrant Application
- STEP 3: Dwell Time
- STEP 4: Penetrant Removal
- STEP 5: Developer Application
- STEP 6: Evaluation of the Indications
- Synthesis of Operation

3.3 Tests

- Leakage Test
- Procedure Qualification
 - Comparator block
 - Operations

3.4 Self-Evaluation Test

- Examination operations
- Tests

4. PRODUCT AND EQUIPMENT [\(>> PT\)](#)

4.1 Examination Principle

- Examination Principle
- Detectable Defects
- Types of Materials and Applications
- Advantages of Method
- Limitations of Method
- Products for Examination
- Equipment for Examination

4.2 Liquids Penetrant

- **Introduction**
- **Types of Penetrants**
 - Fluorescent Penetrants
 - Color Contrast Penetrants
 - Combined Penetrants
 - Penetrants for Special Applications
- **Penetrants Classification**
 - Water Washable Penetrants
 - Solvent Removable Penetrants
 - Post-Emulsification Penetrants
 - Examination Methods
 - Examination Sensitivity
- **Characteristics and Properties**
 - Characteristics of Penetrants
 - Physical and Chemical Properties
 - Other Properties

4.3 Developers

- **Introduction**
- **Developers Classification**
- **Developers Forms**
 - Dry Developers (Form a)

4.4 Solvents and Emulsifiers

- Introduction
 - **Solvents**
 - Types of Solvents
-

- Wet Developers (Forms b, c, d, e)
 - Aqueous Developers (Form b)
 - Aqueous Developers (Form c)
 - Non-aqueous Developer (Form d, e)
 - Other Forms of Developers (Form f)

 - Developer Application
 - Developer Composition
 - Developer Characteristics
 - Advantages / Disadvantages of Developers
 - Synthesis of the Characteristics
- Use of Solvents

 - **Emulsifiers**
 - Types of Emulsifiers
 - Lipophilic Emulsifier (oil-based)
 - Hydrophilic Emulsifier (water-based)
 - Emulsifiers Comparison

 - **Emulsifier Application**
 - Preparation
 - Application Mode

 - Emulsification Time
 - Washing and Complete Removal Control
 - Emulsifiers Characteristics

4.5 Examination Equipment

- **Light Sources**
- Black Light Lamp
- UV Lamp Types
- Mercury Vapor UV Lamps
- LED UV Lamps
- Cleaning and Maintenance
- **Measuring Instruments**
- Photometer
- UV-A Radiometer
- Refractometer
- Photo Fluorimeter
- **Reference Blocks**
- EN ISO Blocks (Type 1 and 2)
- TAM Panel
- Comparator Block
- Comparator Rules
- **Penetrant Test Kit**
- **Inspection Systems**
- Types of plant
- Stations of a plant
- Plant configuration

4.6 Performance and Features

- **Performance Check**
- Removability check
- Sensitivity evaluation
- Contamination and degradation check
- Color Dye and fluorescence check

- **Features Check**
- Penetrant features check
- Developer features check

Self-Evaluation Test

- Examination Principle
- Penetrants and Developers
- Solvents and Emulsifiers
- Examination Equipment
- Performance and Features Check

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5. EXAMINATION PROCEDURE (>> PT)

5.1 Preliminary Activities

- Test Piece Inspection
- Choice Method and Penetrant
- Standards References
- Written Procedure

5.2 Examination Phases

- Introduction
- STEP 1: Surface Cleaning
- STEP 2: Penetrant Application
- STEP 3: Penetration (Dwell) Time
- STEP 4: Removing Excess Penetrant
- STEP 5: Developer Application
- STEP 6: Inspection
- Post Cleaning
- Operations Synthesis

5.3 Examination Procedures

- **Examination procedures**
- Examination with color contrast penetrants
- Examination with fluorescent penetrants
- Examination with water-washable penetrants
- Examination with solvent removable penetrants
- Examination with post-emulsifiable penetrants

- **Examination Methods**

Method A - Water Washable Fluorescents

Method B and D - Post-emulsifiable Fluorescents

Method C - Solvent Removable

- **Safety Standards**

5.4 Detectable Discontinuities

- Detectable Discontinuities
- Main Discontinuities

5.5 Qualification and Leak Test

- **Qualification Procedure**
- Comparator Block
- Operations
- **Leak Test**
- **Examination at Nonstandard Temperatures**
- Examination at Low Temperatures
- Examination at High Temperatures

5.6 Self-Evaluation Test

- Preliminary Activities
- Examination Operations
- Examination Procedures
- Detectable Discontinuities
- Qualification and Leak Test

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