DuPont Sustainable Solutions

Maintenance & Reliability Multi-Craft Training Curriculum

BASIC SKILLS

BASIC SKILLS
17 Training Hours

Workplace Reading
- Basic Skills
- Literal Comprehension: Main Idea
- Literal Comprehension: Relationships
- Inference
- Study Skills

Workplace Mathematics
- Whole Numbers
- Fractions
- Decimals
- Introduction to Algebra

Mechanical Print Reading
- Orthographic Projection
- Drawing Format & Dimensioning
- Drawing Types & Symbols
- Thread Specifications

Gaging & Measurement Types & Fundamentals Procedures & Operation

Rigging
- Equipment Basics
- Operations

PROCESS OPERATIONS

APPLIED PHYSICS
4 Training Hours
- Quantifying Physical Characteristics
- Properties of Fluids
- Physical Force
- Temperature & Heat

APPLIED CHEMISTRY
3 Training Hours
- General Chemistry
- Inorganic Chemistry of Water
- Organic Chemistry

OPERATORS & THEIR RESPONSIBILITIES
6 Training Hours
- Normal Operations
- Startup Operations
- Abnormal Operations
- Shutdown Operations
- Hand Tools
- Equipment Care

GENERAL MAINTENANCE

OPERATOR INSPECTION
9 Training Hours
- Pneumatic System Inspection
- Vacuum System Inspection
- Air Compression System Inspection
- Fasteners & Equipment Structure Inspection
- Electrical Equipment Control System Inspection
- Motor Drive System Inspection
- Belt Drive, Chain Drive & Gear Box Inspection
- Clutches & Brakes Inspection
- Lubrication System Inspection

MAINTENANCE TROUBLESHOOTING
5 Training Hours
- Troubleshooting Procedures
- Power Distribution & Lighting Systems
- Motors & Motor Controls
- Pumps & Compressors
- Hydraulic Circuits & HVAC

MACHINE TECHNOLOGY

BASIC SKILLS
17 Training Hours
- Safety Procedures & Guidelines
- Hand Tools & Their Use
- The Use of Measuring Tools
- The Vertical Milling Machine: Parts & Operation
- Vernier Caliper & Vernier Protractor
- The Pedestal Grinder
- Sharpening Drill Bits by Hand or the Drill Press
- Drill Presses: Sensitive & Radial Arm
- Drill Press Operations
- Vertical Band Saws: Parts, Accessories & Operation

BASIC ENGINE LATHE
14 Training Hours
- Identification of Parts & Care of the Engine Lathe
- Engine Lathe Accessories
- Cutting Speeds & Feeds for Lathe-Ferrous, Non-Ferrous Plastics
- Grinding a Right-Hand Roughing Tool
- Grinding a Round-Nose Finishing Tool
- Mounting & Truing Work in the Four-Jaw Independent Chuck
- Three Methods of Facing Work to Length
- Straight Turning Work of Two Diameters
- Turning Between Centers
- Drilling, Boring & Reaming Work Held in a Lathe Chuck
- Turning a Radius
- Taper Turning on the Lathe
- Filing & Polishing on the Engine Lathe
- Knurling on the Lathe

COMPUTER NUMERICAL CONTROL
15 Training Hours
- Introduction
- Preparing for Programming
- Absolute & Incremental Positioning
- One- & Two-Axis Linear Milling
- Three-Axis Linear & Circular Milling
- Completed Milling Programs
- Drilling, Boring & Spot Facing
- Subroutines
- Special Cycles
- Mirroring
- Quick Coding Procedures
- Polar Coordinate Programming
- Scaling & Engraving Programming
- Rotation
- Cutter

COMPUTER NUMERICAL CONTROL LATHE
15 Training Hours
- CNC Lathe Safety & Machine Configuration
- The Coordinate Systems with Part & Machine Zero
- CNC Tooling, Workholding & Offsets
- Introduction to Programming for the CNC Lathe
- Rapid Positioning & Interpolation Commands
- Spindle Speeds & Feed Commands
- Tool Nose Compensation
- OD/ID Stock Removal
- Irregular Path Stock Removal
- End Face Stock Removal
- Multiple-Pass, Thread-Cutting Cycle
- Drilling Canned Cycles
- Tapping Canned Cycles
- Boring Canned Cycles
- Visual Quick Code

MAINTENANCE PRINCIPLES
1 Training Hour
- Maintenance Principles

MECHANICAL MAINTENANCE

FLUID POWER
29 Training Hours

Hydraulics
- Harnessing Hydraulic Power
- The Hydraulic Circuit
- Pumps & Actuators
- Control Valves
- Hydraulic Fluid
- Hydraulic Systems Safety & Maintenance
- Hydraulic System Troubleshooting

Industrial Hydraulics
- Basic Principles & Application
- Types & Concepts
- Function & Operating Principles
- Maintenance & Troubleshooting

Hydraulic Power Systems & Troubleshooting
- Identification & Operation
- Troubleshooting Techniques

Centrifugal Pumps
- Design & Function
- System Characteristics & Selection
- Operation & Maintenance
- Troubleshooting & Disassembly
- Reassembly & Installation

Pneumatics
- The Power of Compressed Air
- The Pneumatic Circuit
- Processing Air
- Using Compressed Air
- Pneumatic Control Valves
- Working Safely with Pneumatic Systems
- Pneumatic System Maintenance
- Troubleshooting Pneumatic Systems

Industrial Seals
- Types, Materials & Properties
- Gaskets & Packings: Inspection & Installation
- Mechanical Face Seals: Troubleshooting & Installation

BOILER OPERATION & CONTROL
5 Training Hours
- Introduction to Boilers
- Boiler Design & Construction
- Boiler Feedwater & Steam
- Boiler Fuel & Air

POWER TRANSMISSION
14 Training Hours

Machinery Lubrication
- Lubricating Oil: Types, Properties & Handling
- Lubricating Oil: Equipment & Procedures
- Lubricating Greases: Types, Applications & Equipment

Industrial Bearings
- Application & Technology
- Maintenance & Installation
- Troubleshooting

Industrial Drives
- Belt Drives
- Chain Drives
- Enclosed Drive Systems
- Complete Drive Packages
- Gears & Gear Systems
- Shaft Joining & Coupling Devices

Clutches & Brakes
- Types & Applications
- Troubleshooting

HVAC&R
8 Training Hours
- Complete System Troubleshooting
- Air Handlers: Mechanical Systems
- Air Handlers: Calibration
- Chillers: Mechanical Components
- Chillers: Leak Check & Electrical
- Cooling Towers: Maintenance & Troubleshooting
- Condensers: Maintenance & Troubleshooting
- Ammonia Refrigeration

PIPEFITTING
11 Training Hours
- Introduction to Pipefitting
- Piping Systems & Standards
- Pipe Fittings & Joints
- Measuring Pipe & Drawings
- Offsets
- Manual & Electric Threaded Pipe
- Flanged Pipe
- Plastic Pipe
- Accessories & Specialty Equipment
- Tubing
- Hoses

STEAM TRAPS
3 Training Hours
- Types, Principles & Functions
- Sizing, Installation & Monitoring
- Diagnostics & Troubleshooting

PREDICTIVE MAINTENANCE

VIBRATION ANALYSIS
6 Training Hours
- Predictive Maintenance & Machine Vibration
- Machine Vibration, Basic Theory
- Preparing for Data Collection
- The Data Processing System
- Data Collection
- Data Analysis

MACHINERY OIL ANALYSIS
3 Training Hours
- Fundamentals & Methods
- Strategies, Options & Testing
- Establishing an Effective Program

ULTRASONICS
3 Training Hours
- Basic Principles
- Leak Detection
- Mechanical & Electrical Inspection

THERMOGRAPHY
3 Training Hours
- Basic Operation
- Operating Procedures & Implementation
- Practical Applications

ADVANCED VIBRATION: AC INDUCTION MOTORS
2 Training Hours
- AC Induction Motors, Part I
- AC Induction Motors, Part II

INSTRUCTOR-LED

ON-SITE TRAINING
- Maintenance Management Processes
- I-R Thermography for Electrical Maintenance
- LASER Shaft Alignment
- Optical Alignment

ELECTRICAL MAINTENANCE

MECHANICAL ELECTRICAL CONTROL SYSTEMS
7 Training Hours
- Introduction to Control Schematics
- Creating Schematics
- Electrical Lockout
- Design & Troubleshooting
- Energy Management
- Electronic Controls
- Responsive Systems

Electrical Measurement
1 Training Hour
- Basic Electrical Measurement: Digital Multimeters and Clampmeters

ELECTRICAL MAINTENANCE

BASIC ELECTRICAL THEORY
21 Training Hours

AC/DC Theory
- Current
- Voltage
- Resistance
- Ohm's Law
- Magnetism
- Electrical Measurement
- DC Circuits
- Inductance & Capacitance
- Alternating Current
- AC Measurement
- Capacitive Circuits
- Inductive Circuits
- Transformers
- Tuned Circuits

Applied DC Fundamentals
- Voltage, Resistance & Current
- Ohm's Law & DC Circuits
- Electronic Components & Magnetism
- Electronic Schematics & Circuit Analysis

Electrical Fundamentals
- Basic Electricity
- Ohm's Law

INDUSTRIAL ELECTRICITY
7 Training Hours

Industrial Electricity
- Basic Principles
- Alternating Current
- Conductors
- Wiring
- Installation, Distribution & Lighting
- Generators & Motors
- AC Motor Control & Current Measurement

MOTORS & MOTOR CONTROLS
12 Training Hours

Motor Controls
- Basic Motor Controls & Relays
- Overload Relays
- Time Delay Relays
- Schematic Symbols
- Schematics & Wiring Diagrams
- Starting Methods for Squirrel Cage Motors
- Wye-Delta, Synchronous & Wound Rotor Controls
- Installing & Troubleshooting Control Systems

DC Motors
- Basics & Internal Parts
- Maintenance & Troubleshooting

DC Motor Controllers
- Controller Function & Operation
- Maintenance Procedures & Applications

MOTOR DRIVES
6 Training Hours
- Motor Drive Identification
- Open & Closed Loop Systems
- Variable Speed AC Drives
- Servo & Stepper Motors
- AC Motor Operation
- AC Drive Selection & Setup

ELECTRONICS
6 Training Hours

Basic Electronic Components & Their Measurement
- Types & Diagrams
- Controls & Applications
- Operation & Troubleshooting

Electronic Circuits
- Basic Principles
- Characteristics & Operation
- Logic Fundamentals, Types & Application

INSTRUMENTATION & CONTROL

BASIC PROCESS CONTROL
9 Training Hours
- Feedback Control
- Process Control Modes
- Process Characteristics
- Process Variables
- Instrumentation Symbols
- Instrument Loop Diagrams
- Piping Instrumentation Drawings
- Mechanical Connections
- Electrical Connections

CALIBRATION & TEST EQUIPMENT
6 Training Hours
- Primary Calibration Standards
- Pneumatic Test Equipment
- Electronic Test Equipment
- Oscilloscopes
- Instrumentation Errors
- Instrumentation Calibration

CONTINUOUS PROCESS CONTROL
4 Training Hours
- Principles of Continuous Control
- Applications of Heat Exchanger Control
- Applications of Distillation Control
- Applications of pH Control

ELECTRONIC MAINTENANCE
12 Training Hours
- Solid State Devices
- Integrated Circuits & Op Amps
- Sensor & Transducer Principles
- Transmitters
- Transducers
- Controllers, Indicators & Recorders
- Tuning
- Sampling Systems & Gas Chromatograph Valves
- Gas Chromatograph Ovens & Controllers
- Spectroscopic Analyzers
- Electrochemical Analyzers
- Instrument Loop Troubleshooting

PROCESS MEASUREMENT
8 Training Hours
- Temperature 1: Thermometers & Thermocouples
- Temperature 2: Resistance & Radiation Devices
- Pressure 1: Manometers & Gages
- Pressure 2: Indicators & Transmitters
- Level 1: Level Measurement & Gages
- Level 2: Level Indicators & Transmitters
- Flow 1: Flow Measurement
- Flow 2: Flow Sensors

SMART DIGITAL INSTRUMENTATION
4 Training Hours
- Understanding HART Protocol
- Applications of Smart Field Devices
- Configuring, Calibrating & Testing Smart Field Devices
- FOUNDATION™ Fieldbus

CONTROL VALVES & ACTUATORS
4 Training Hours
- Basics & Function
- Types & Design
- Fundamentals & Selection
- Sizing & Installation

ControlLogix
9 Training Hours

ControlLogix
- Introduction to the ControlLogix PLC Family
- Introduction to RSLogix™ 5000 Software
- Creating & Using Tags & the Program Editor
- Basic Instructions
- Advanced Programming & Analog Devices
- PLC Troubleshooting

Using RSLogix™
- Configuring Hardware & Software
- Programming & Editing
- Testing & Troubleshooting

PROGRAMMABLE LOGIC CONTROLLERS
5 Training Hours
- Fundamentals
- Programming
- Inputs & Outputs
- Troubleshooting
- Communications & Advanced Programming

FIELDBUS
14 Training Hours
- Fieldbus Curriculum Overview
- The Road to Fieldbus
- Fieldbus Wiring
- Fieldbus Devices
- Introduction to Configuration
- Introduction to Control Strategy
- Control Strategy
- Data Flow & Communications
- Fieldbus Calibration
- OPC
- Introduction to Troubleshooting
- Troubleshooting
- Fieldbus Maintenance
- Maintenance Exercises

SUSTAINABILITY

DuPont™ Energy Efficiency Featuring DuPont Owner-Operator Content
17 Training Hours
- Energy Management Best Practices
- Energy System Instrumentation & Controls
- Theory of Steam Generation
- Fuels & the Combustion Process
- Boilers & Auxiliaries
- Emission Control & Ash Handling
- Steam Distribution
- Steam Turbines & Condensers
- Electricity Generation & Distribution
- Pumping Systems
- Cooling Towers
- Water Treatment
- Compressed Air
- Refrigeration
- HVAC & Indoor Air Quality

DRESSER-RAND®*

DRESSER-RAND®
24 Training Hour

Reciprocating Products
- Recip-Compressor Major Components
- Recip-Compressor Theory
- Recip-Compressor Piston End-Clearance
- Recip-Compressor Rod Run-Out
- Recip-Compressor Frame Lubrication
- Recip/Engine-Crankshaft Web Deflection
- Recip-Compressor Rod Packing Fundamentals
- Recip-Compressor Rod Packing Reconditioning
- Recip-Compressor Wedge Ring Packing
- Recip-Compressor Divider Block Cylinder & Packing Lubrication
- Recip-Compressor Pump to Point Cylinder & Packing Lubrication
- Recip-Compressor Set Screw Type Valve Cover
- Bolt Torque
- Recip-Compressor Crosshead & Piston Supernut
- Engine-Major Components
- Engine-Two Cycle Theory
- Engine-Four Cycle Theory
- Engine-Pre-Ignition & Detonation
- Engine-Balancing Firing Pressures

Turbo Products
- Centrifugal-Compressor Types
- Centrifugal-Compressor Surge

Steam Products
- Steam-Turbine Major Components
- Steam-Turbine Operation
- Steam-Turbine Overspeed Trip Systems

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