Oklahoma CTE

Wind Energy: Wind Turbine Technician (2012)

Adopted 2012

Operational Skills

A. Turbine Fundamentals

1. Identify the component, component location, and describe the general function and purpose of the following components:
Foundation
Tower
Ladder
Nacelle
Hub
Blades
Main Shaft
Gearbox
High speed shaft
Generator
Brake system
Controllers
Transformers
Yaw assemblies
Pitch systems
Hydraulic station
Tower cables
Safety cable
Service lift and climb assist
Anemometer
Wind vane
FAA lighting
Internal crane
Sensors and general operation
2. Understand importance of referring to work instructions or maintenance manuals to determine how each job function is accomplished.

B. Maintenance Operations

1. Understand SCADA basics.
2. Understand maintenance operations in general.
3. Describe the function of a service report, demonstrate how to properly complete a service report, and explain what happens and where it goes when a service report is completed.
4. Explain purpose and difference between scheduled and unscheduled maintenance.
5. Describe function and general operation of sensors and instrumentation used in wind turbines to monitor pressure, temperature, flow, and level.

C. Cranes and Rigging

D. Project Operations

1. Balance of plant requirements and expectations pertaining to wind turbine operation.
2. Identify components that make up balance of plant including: roles and responsibilities of wind farm personnel positions, and chain of command. (Not specific to maintenance of wind turbine)

Mechanical Skills

A. Bearings

1. Understand basic bearing types designed for different loads.
2. Understand installation.
3. Understand maintenance/visual inspection.
4. Understand replacement.
5. Understand lubrication.
6. Understand do's and don'ts (best practices).

B. Cooling/Heating Systems

1. Understand inspection, maintenance, and operation (types of coolant, function, flow meters, types of systems for air a fluid).

C. Fasteners and Torquing

1. Basic understanding of metallurgical characteristics as it pertains to fasteners.
2. Demonstrate safe use of various torque and tension equipment.
3. Understand basic hi-torque use and proper techniques of mechanical, electrical, and hydraulic torque wrench assembly and use.
4. Define the difference between torquing and tension.
5. Demonstrate proper use and storage in handling of mechanical torque wrench; use of a skidmore and torque log.

D. Gearboxes

1. Basic characteristics of gearboxes: types of gear systems in gear boxes, maintenance, filter, cleanliness, lubrication, pumps, impurities.
2. Understand process and significance of oil sampling.
3. Understand inspection methods: normal wear or damage, gear ratios, input/output torque and force requirements.
4. Do's and don'ts, functions, general operations.

E. Hydraulic Systems

1. Basic theory of hydraulics.
2. Basic understanding of hydraulic symbols and charts.
3. Demonstrate component verification and component function including: function of various pumps, meaning of pump parameters, and types of hydraulic systems.
4. Understand function, implementation, and disassembly and assembly of hydraulic components: cylinders, pumps, valves, filters, concepts of hydraulic circuit construction and uses.

F. Lubrication

1. Basic principles of lubrication: sampling, different types of lubricants and uses, lubrication methods, basic knowledge of auto lubers.
2. Contamination control and effects of poor lubrication.
3. Oil and grease; oil base (soap, clays, synthetic animal byproduct); impurities, byproducts; selflubricators, grease gun; maintenance and troubleshooting.

G. Shaft Alignment

1. Demonstrate knowledge of basic principles, methods and techniques of shaft alignment, such as laser equipment in the laser alignment process.

H. Tools and Test Equipment

1. Demonstrate proper tool inspection and inventory tool control.
2. Steps for taking care of a defective tool.
3. Demonstrate ability to measure and interpret information from test equipment and tools.
Multimeter voltage detectors.
4. Demonstrate proper selection of test equipment.

I. Yaw Systems

1. Basic understanding of Yaw systems.
2. Maintenance routines: potential failures and preventive maintenance.
3. Function of Yaw control system including: wind vane, anemometer, yaw angle (alignment vs. misalignment), and Yaw drive system.

Electrical Skills

A. Electrical Theory

1. Understand and comprehend basic electrical theory.
2. AC/DC voltage and current priniciples, resistance (series and parallel circuits), inductance, and capacitance.
3. Understand power generation principles.
4. Understand and identify electrical components such as motor starter, manual switches, control relays.
5. Demonstrate ability to work safely around transformers.

B. Basic Wiring

1. Ability to inspect conductors and connectors used in wind turbines through visual inspection to identify the following: open circuit, shorted circuit, ground, turbine type wiring connectors.
2. Understand the limitations of wire gauge capacity.
3. Circuit diagnostics tools used in basic wiring such as: voltage testing, ohm meter testing, basic wiring tools.
4. Describe the methods of conductor strain relief, insulation and termination of conductive paths.
5. Demonstrate insulation testing.
6. Wiring diagrams, schematics, U.S. and European component symbols.

C. Bonding and Grounding, and Lighting Protection

1. Ability to inspect bonding and grounding points (to include lightning protection) inside and outside of turbine.
2. Understand proper grounding techniques, theory, significance.
3. Basic understanding of how a wind turbine detracts and dissipates lightning.

D. Motors and Generators

1. Basic theory and operation of motors and generators.

E. PLC – Basic Fundamentals

1. Basic functions of PLC and applications.

F. SCADA Basics

1. General aspects of SCADA including: operability and limitations, how general fiber optics operate, type of data collection in industry (use of data).

General Work Skills

A. Basic Computer Skills

1. Able to create, save, and modify documents; online learning, e-mail etiquette.
2. Able to transfer reports electronically with picture documentation.
3. Possess technical communications skills.
4. Fluent in basic use of Microsoft Word and Excel.

B. Report Writing and Reading Comprehension of Technical Documents.

1. Ability to clearly and properly convey technical information to others in written format.
2. Ability to read, comprehend, and plan work from a technical inspection or condition report.
3. Ability to use manufacturer documents in the O&M of the WECS.

C. Conversion of Units

1. Understanding metric symbols and ability to distinguish between metric and English (SAE) units in volume, pressure, distance, force, mass, temperature, and length.

D. Schematics

1. Basic reading and component identification of schematics (symbols and difference between U.S. and European schematics).

E. Soft Skills

1. Ability to communicate/work in small group operations, and in teams.
2. Professional conduct, respect, courteous.
3. Customer service skills to meet customer needs.
4. Cultural awareness and the ability to workwith people of other cultures, age, gender, and beliefs.