IGNITE YOUR POTENTIAL 2024-2025

NYS SkillsUSA Standards

POWER EQUIPMENT TECHNOLOGY

PURPOSE

To evaluate each competitor's preparation for employment and recognize outstanding students for excellence and professionalism in engine and equipment diagnostics, overhaul, and repair of both liquid and air-cooled engines. It will also evaluate the ability to troubleshoot and overhaul the mechanical and hydraulic system components of a piece of powered equipment or machinery.

ELIGIBILITY

Open to active SkillsUSA members enrolled in programs with small, air-cooled engine repair, compact diesel engine repair or power equipment-related repair as an occupational objective.

CLOTHING REQUIREMENTS

NYS SkillsUSA – Mechanic

- White crew neck short- sleeved T-shirt
- Work pants or jeans,
- Leather or steel toed work shoes.
- Long hair must be restrained.
- Safety glasses with side shields or goggles, (Prescription glasses can be used only if they are equipped with side shields and approved by OSHA(Z-87). If not, they must be covered with goggles.)

Note: **Contestants must wear their official contest clothing to the contest orientation meeting.**

Also bring #2 pencil, resume, and safety assurance form

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
   a. All necessary engines, engine parts, workstations, test stands, power equipment, fuel, oil, and all basic hand tools as well as necessary specialty tools
   b. Industry manuals, including service and repair instruction manuals
2. Supplied by the competitor:
   a. All competitors must create a one-page resume to submit online. See "Resume Requirement" below for guidelines. Additionally, and as part of the competition, competitors will submit a hard copy of their resume at orientation.
   b. Safety glasses
   c. Something to write with

RESUME REQUIREMENT

Competitors must create a one-page resume to submit at orientation.

DEVICES

Cell phones or other electronic devices not approved by the NYS Chairperson will be collected by the contest chair during the competition. Chairpersons will announce their acceptance by listing it on their standard or at the orientation meeting. In case of emergencies advisors should allow the competitors to take their phones to the contest areas.

If the competitor uses their device in a manner which compromises the integrity of the competition, the competitor's score may be penalized.

SCOPE OF COMPETITION

This competition assesses understanding of the following:

- Two-stroke and four-stroke engines of various design types, 2 through 42 horsepower, single and multi-cylinder designs, including compact diesel engines
- Mechanical and hydraulic systems, drivetrains, steering, braking, and PTO systems
- Electrical systems, including battery-powered equipment both handheld, and mobile

KNOWLEDGE PERFORMANCE

All competitors are required to take the SkillsUSA professional development test at orientation.

The competition will include a written knowledge exam based on an industry standard test. Additionally, the test could cover manufacturer's engines, parts identification, ordering and/or related equipment. There will also be the possibility of additional written portions during the day of the skill event.

SKILL PERFORMANCE

The competition will include a series of power equipment technology testing stations to assess skill performance.

COMPETITION GUIDELINES

1. Competitors should understand both engine and electrical theory, engine and equipment operation, diagnostic, failure analysis and repair and testing of engines and related power equipment as identified in the Standards and Competencies section following.
2. The competition will include a series of workstations to assess skill performance. The number of stations will be determined by the technical committee. Topics include:
   a. General Competencies
   b. Electrical Systems
   c. Fuel and Governor Systems
   d. Cooling and Lubrication Systems
   e. Valves, Exhaust, and Engine Block Systems
   f. Diagnostic and Failure Analysis
   g. Shop Procedures
   h. Business Operations
   i. Mechanical and Hydraulic Systems

STANDARDS AND COMPETENCIES

PET 1.0 — General Competencies

1.1. Basic reading and comprehension
1.2. Understand basic two/four-stroke and compact diesel engine theory/troubleshooting
1.3. Understand fuel injection, carburetion, and other related fuel system theory.
1.4. Understand basic hydraulic and electrical theory
1.5. Read and interpret schematics for hydraulics and electrical systems
1.6. Understand mechanical/hydraulic drivetrains, steering, and braking systems
1.7. Communicate effectively to others
1.8. Demonstrate basic computer skills

PET 2.0 — Electrical Systems

2.1. Understand and be able to inspect, test, repair, or replace the ignition, starting, and charging system components
2.2. Demonstrate the correct use of a multimeter
2.3. Understand common power equipment electrical circuit logic, i.e., safety interlock circuit, ignition interrupt circuits
2.4. Demonstrate the ability to test a troubleshoot electrical system components

2.5. Demonstrate the ability to troubleshoot common electrical system issues utilizing a wiring schematic and a multimeter
2.6. Identify and properly repair signs of corrosion or damage in electrical systems, i.e., pinched or cut wire, corroded, loose or broken connections

PET 3.0 —Fuel and Governor Systems

3.1. Fuel Systems
- 3.1.1. Explain the theory of operation and be able to inspect, service, and repair both diaphragm-type and float-type carburetors
- 3.1.2. Inspect, service, and or repair various fuel system components such as; fuel regulators, filters, pumps, tanks, fuel lines, sensors, and solenoids
- 3.1.3. Demonstrate the ability to test and troubleshoot fuel system components for both carbureted (float & diaphragm) and electronic fuel injection systems
- 3.1.4. Test equipment-related fuel tanks, lines, and related systems and understand the procedures for testing for compliance systems as they are related to emission requirements and standards

3.2. Governor Systems
- 3.2.1. Understand and be able to explain the various governor systems
- 3.2.2. Inspect, service, adjust, and reassemble various governor systems
- 3.2.3. Understand and be able to explain which components cause engines to increase or decrease in the number of revolutions per minute

PET 4.0 — Cooling and Lubrication Systems

4.1. Cooling Systems
- 4.1.1. Recognize, test, and troubleshoot both liquid and air-cooled cooling systems of both engines and equipment
- 4.1.2. Understand and recognize signs of heat-related failures or problems

4.2. Lubricating Systems
- 4.2.1. Define and understand the various styles and types of lubrication systems
- 4.2.2. Demonstrate the ability to check oil levels and fuel/oil mixtures
- 4.2.3. Demonstrate the method of checking oil pressurized systems with the use of required tools
- 4.2.4. Understand and explain the various grades of oils and uses in the proper engines/equipment

PET 5.0 — Valves, Exhaust, and Engine Block Systems

5.1. Valves
- 5.1.1. Identify and be able to service various types and styles of valve train components; explain why the sealing function of these components is important

5.2. Exhaust Systems
- 5.2.1. Identify the various types of exhaust systems and explain how they relate to the engine and or equipment
- 5.2.2. Inspect and service exhaust and understand the procedures for testing for compliance systems as they are related to emission requirements and standards

5.3. Engine Block Components
- 5.3.1. Understand, identify and provide the necessary service/repair techniques to the various manufacturers within the industry; this could include disassembly,

inspection and measuring of crankshafts, connecting rod bearings, journals, cylinders, pistons, and rings

5.3.2. Complete repairs to correct torque of critical fasteners and replace any gaskets and sealants

PET 6.0 — Diagnostic and Failure Analysis

6.1. Demonstrate the proper use of the various specialized tools of the industry. i.e., pressure and vacuum gauges, compression gauges, air leak down testers, multimeter, tachometer, spark tester, OEM diagnostic tool and software, and any other required tools

6.2. Demonstrate the ability to test crankcase vacuum/pressure, cylinder compression, spark, voltage drop, high resistance, and amperage testing

6.3. Analyze failed engine/equipment components to determine the correct type of failure; select the best method to repair and estimate the cost of repair

PET 7.0 — Shop Procedures

7.1. Demonstrate the proper techniques in the care and use of tools and equipment

7.2. Demonstrate the ability to work accurately with precision instruments

7.3. Read, understand, and follow proper safety procedures; demonstrate the ability to use service, parts, and operation manuals as well as service bulletins

7.4. Perform tasks within assigned time limits

7.5. Give a verbal response to a customer and answer customer-related problematic questions

7.6. Prepare equipment for delivery

PET 8.0 — Business Operation

8.1. Demonstrate the ability to look up proper part numbers by using paper or electronic means

8.2. Prepare both shop work orders and warranty claims

8.3. Demonstrate the ability to calculate costs accurately

8.4. Understand and operate equipment within equipment manufacturer's guidelines

8.5. Understand effective customer interaction and professional customer communications and relations

PET 9.0 — Mechanical and Hydraulic Systems

9.1. Understand the theory of operation of transmissions, transaxles, steering, braking, and power take-off (PTO) components.

9.2. Disassemble and reassemble transmission, transaxle, steering, braking, and (PTO) power take-off components

9.3. Diagnose and repair potential problems with various transmission, transaxle, steering, braking, and Power take off (PTO)

9.4. Understand the different types of transmissions, transaxles, and hydraulic systems