

Unit Name: PA100 SAFETY RULES AND REGULATIONS Unit Number: PA100

Dates: Spring 2013 Hours: 10.00

Unit Description/Objectives:

Student will know and be able to demonstrate knowledge and procedures relating to the workplace in accordance with industry standards.

Tasks:

- PA101 Interpret workplace safety and MSDS sheets.
- PA102 Demonstrate how to lift and move heavy objects.
- PA103 Demonstrate how to handle and store flammable materials and toxic substances.
- PA104 Explain the purpose of OSHA and how it promotes safety on the job
- PA105 Demonstrate and explain appropriate safety precautions to take around job-site hazards.
- PA106 Demonstrate and properly wear personal protective equipment (safety goggles, hearing protection and respiratory protection.
- PA107 Describe fire prevention techniques.

PA108 - Follow safety rules for ECP (Exposure Control Procedures) for blood borne pathogens.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Instructional Activities:

Knowledge:

Interpret workplace safety and MSDS sheets. Explain the purpose of OSHA and how it promotes safety on the job Describe fire prevention techniques.

Skill:

Demonstrate how to lift and move heavy objects.

Demonstrate how to handle and store flammable materials and toxic substances.

Demonstrate and explain appropriate safety precautions to take around job-site hazards. Demonstrate and properly wear personal protective equipment (safety goggles, hearing protection and respiratory protection.

Follow safety rules for ECP (Exposure Control Procedures) for blood borne pathogens.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Solvents and oils. Drain pans and receptacles. Appropriate cleaning supplies. Manufacturers service manual Required gaskets, seals, lubricants, replacement parts MVACC Fire Extinguisher Safety Video MSDS sheets for program area Roth, A. C. (2012). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment



Unit Name: PA200 DEMONSTRATE KNOWLEDGE OF THE PRINCIPLES and DESIGN of 2-CYCLE and 4-CYCLE ENGINES Unit Number: PA200

Dates: Spring 2013 Hours: 7.00

Unit Description/Objectives:

Student will know and be able to describe and explain 2-cycle and 4-cycle engine operating principles, cylinder and valve arrangements, engine components, and manufacturer's model/serial/engine numbers to industry standard.

Tasks:

- PA201 Explain a manufacturer's model number, serial number and engine type number for twocycle and four-cycle engines.
- PA202 Identify the component parts in a short block of a 2-cycle engine and explain their purposes.
- PA203 Compare and contrast 2 and 4-cycle operations and applications.
- PA204 Explain 2- cycle engine operating theory.
- PA205 Explain 4- cycle engine operating theory.
- PA206 Explain different piston port and reed valves for two and 4 cycle stroke engines.

Standards / Assessment Anchors

Focus Standard/Anchor #1

13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Focus Standard/Anchor #2

 CC.3.5.9-10.1. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Define the four-stroke cycle and the two-stroke cycle List advantages and disadvantages of two cycle and four cycle engines Review terminology and vocabulary Discuss variation in engine design Explain differences between ports and valves

Skill:

Identify engine model#, type, and code Identify cylinder and valve arrangements Explain the concept of valve timing

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must:

Handle material in a safe and work-like manner.

Use personal protective equipment.

Use hand tools in a safe manner.

Follow manufacturer's directions when using any product, tool, equipment, etc.

Ensure adequate ventilation when working in enclosed areas.

Use tools and equipment in a professional work-like manner according to OSHA standards. Know and follow the established safety rules at all times.

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	Research
Writing Activities	Rubrics
Video/DVD	

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment "Engine cycles" power point presentation by Ryan Saucier. Various 2 and 4 - cycle engines in lab area.



Unit Name: PA300 DEMONSTRATE KNOWLEDGE OF LUBRICATION SYSTEMS Unit Number: PA300

Dates: Spring 2013 Hours: 11.00

Unit Description/Objectives:

Student will know and be able to demonstrate knowledge of lubrication systems at the level of proficient or higher according to industry standards.

Tasks:

- PA301 Describe lubrication systems and their functions.
- PA302 Describe API oil ratings and the meaning of SAE viscosity ratings.
- PA303 Describe the standard classification of 2-cycle oils.
- PA304 List common oil contaminants.
- PA305 Interpret engine oil application charts used in owners / operators manuals.
- PA306 Prepare pre-mixed fuel for a 2-cycle engine.
- PA307 Describe differences between splash lubrication systems and a pressure lubrication system.
- PA308 Describe the operation of an oil filtration system.
- PA309 Describe methods of checking the oil level in an engine.
- PA310 Explain the need for positive crank case ventilation.
- PA311 Identify the components and function of a crankcase ventilation breather assembly

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.

- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CC.3.5.9-10.1. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Define friction and explain how it affects the internal engine components List the functions of lubrication oil Explain the operation of pumps Explain the function of filtration systems

Skill:

List common oil contaminants Describe differences between splash lubrication systems and a pressure lubrication system Check oil level in an engine Identify the components and function of a crankcase ventilation breather assembly

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment SGE engine measurement, cleaning, inspection video Manufacturers service manual SGE engine dis assembly video SGE engine re-assembly video SGE iob sheet #3 SGE engine dis assembly checklist SGE engine reassembly checklist Basic hand tools. Stationary work bench. Drain pans and receptacles. Appropriate cleaning supplies. Manufacturers service manual Required gaskets, seals, lubricants, replacement parts assessment American Honda Motor Co. (2009). inc, Honda University, GP Engines Training materials flash/pdf/pps.



Unit Name: PA400 DEMONSTRATE KNOWLEDGE OF BASIC ELECTRICITY Unit Number: PA400

Dates: Spring 2013 Hours: 54.00

Unit Description/Objectives:

Student will know and be able to demonstrate knowledge of BASIC electrical systems at the level of proficient or higher according to industry standards.

Tasks:

- PA401 Demonstrate safe work habits when working with electrical systems.
- PA402 Demonstrate how to interpret electrical circuit and wiring diagrams while making correct electrical connections.
- PA403 Use a meter to measure resistance, continuity, amperage and voltage.
- PA404 Solve problems using Ohm's Law.
- PA405 Explain the proper procedure for battery disposal based on EPA and local ordinances and resistance.
- PA406 Describe series and parallel circuits and explain the different types of circuit failures.
- PA407 Identify terminals and connectors used in electrical systems.
- PA408 Describe and perform the diode test.
- PA409 Identify electrical wire sizes and selection based on an anticipated current load.
- PA410 Demonstrate applicable test procedures for testing series and parallel circuits.
- PA412 Check current flow in electrical systems and components
- PA413 Inspect, test and replace fusible links, fuses and circuit breakers.
- PA414 Demonstrate knowledge of American Wire Gage (AWG) wiring codes.
- PA415 Inspect a low-oil alert system.
- PA416 Solder a current carrying wire.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.2.P.B5 Explain how waves transfer energy without transferring matter. Explain how waves carry information from remote sources that can be detected and interpreted. Describe the causes of wave frequency, speed, and wave length.
- 3.2.P.B4 Explain how stationary and moving particles result in electricity and magnetism. Develop qualitative and quantitative understanding of current, voltage, resistance, and the connections among them. Explain how electrical induction is applied in technology.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Connecting Standard/Anchor

• CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.

- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
- CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

List the primary purposes of the ignition system Describe small engine ignition advance systems List the advantages of a solid state ignition system Describe the operation of a battery ignition system

Skill:

Demonstrate safe work habits when working with electrical systems Use a meter to measure resistance, continuity, amperage and voltage Describe series and parallel circuits and explain the different types of circuit failures Solder a current carrying wire

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment SGE Job sheet #10, "Ignition system service" SGE engine measurement, cleaning, inspection video Manufacturers service manual Small gas engine equipped with breaker points Small gas engine equipped with breaker-less ignition
DC electric starter
Automotive battery
Digital Multi meter
Battery load tester
DC alternator
Soldering equipment.
American Honda Motor Co.(2009). inc, Honda University,GP Engines Training materials
flash/pdf/pps.
Briggs and Stratton, (2009). Small Engine Care and Repair. Creative Publishing, Chanhassen, MN.
Equipment and Engine training Council (2009). EETC 4-stroke study guide. Oconomowoc, WI.



Unit Name: PA500 DEMONSTRATE KNOWLEDGE AND SERVICE OF COOLING SYSTEMS Unit Number: PA500

Dates: Spring 2013 Hours: 7.00

Unit Description/Objectives:

Student will know and be able to demonstrate knowledge and service of cooling systems at the level of proficient or higher according to industry standards.

Tasks:

- PA501 Demonstrate knowledge of the concept of heat transfer and the purpose of a cooling system.
- PA502 Perform a cooling system flush and cleaning on a liquid cooled engine.
- PA503 Remove, service, and replace a water pump hose and replace thermostat.
- PA504 Identify the components and function of a liquid cooled engine.
- PA505 Properly pressure test a liquid-cooled cooling system.
- PA506 Describe major causes of liquid-cooled engine overheating.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
- 3.2.P.B5 Explain how waves transfer energy without transferring matter. Explain how waves carry information from remote sources that can be detected and interpreted. Describe the causes of wave frequency, speed, and wave length.
- 3.2.P.B4 Explain how stationary and moving particles result in electricity and magnetism. Develop qualitative and quantitative understanding of current, voltage, resistance, and the connections among them. Explain how electrical induction is applied in technology.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

Supporting Standards/Anchors

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
- CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Explain how air cooling, exhaust cooling, and water cooling work to lower engine operating temperatures

Define the basic function of a water pump Describe outboard water circulation systems

Explain the function of a thermostat and a radiator

Skill:

Perform a cooling system flush and cleaning on a liquid cooled engine Remove, service and replace a water pump hose and replace thermostat Change engine coolant and clean coolant passages Identify the components and function of a liquid cooled engine Properly pressure-test a liquid-cooled cooling system Describe major causes of liquid-cooled engine overheating Describe major causes of air-cooled engine overheating Clean the cooling fins and blower housing on an air-cooled engine

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

WorksheetsProjectsQuizzesCheck ListsPre/Post TestsPresentationTime CardsResearchWriting ActivitiesRubricsVideo/DVDPresentation

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox.
Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI
Personal Protective Equipment
Air cooled small gas engine
Liquid cooled engine
Liquid cooled small gas or diesel engine
American Honda Motor Co. (2009). inc, Honda University, GP Engines Training materials
flash/pdf/pps.
Briggs and Stratton, (2009). Small Engine Care and Repair. Creative Publishing, Chanhassen, MN.
Equipment and Engine training Council (2009). EETC 4-stroke study guide. Oconomowoc, WI.



Unit Name: PA600 DEMONSTRATE KNOWLEDGE OF FUEL SYSTEMS Unit Number: PA600

Dates: Spring 2013 Hours: 48.00

Unit Description/Objectives:

Student will know and be able to demonstrate knowledge of the various components, their functions, and the principles of operation of small gas engine fuel systems according to industry standards.

Tasks:

- PA601 Identify the basic types of fuel systems used in power equipment.
- PA602 Identify the function of each component in the fuel system including carburetor, fuel filter, fuel pump, and electronic fuel injector.
- PA603 Identify types of carburetor designs and their functions, using proper terms.
- PA604 Use proper terms to describe the function of vacuum-feed, diaphragm, float, rotary, and slide valve carburetors.
- PA605 Identify and describe the idle fuel circuit and the main fuel circuit.
- PA606 Use proper terms to describe the "venturi" principle and variable venturi carburetors.
- PA607 Describe fuel enrichment devices including choke types, purging systems, and primers.
- PA608 Describe the function of a fixed orifice jet, high speed nozzle, emulsion tube, and purging system.
- PA609 Identify the common types of fuel filters and describe the difference between micron and mesh.
- PA610 Explain the theory, function, and components of electronic fuel injection (EFI).
- PA611 Explain the theory, function, and components of gaseous fuels.
- PA612 Identify types and grades of gasoline used in power equipment.
- PA613 Describe how fuel additives protect power equipment placed in seasonal storage.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Explain the importance of proper fuel-oil mixture in a two-cycle engine Describe the purpose of fuel filters Explain fuel pump operation Describe the operation of a pressurized fuel system Explain the importance of emission control Name the various types of fuel that can be used in a small engine and list the practical applications of each

Skill:

Identify the function of each component in the fuel system including carburetor, fuel filter, fuel pump, and electronic fuel injector

Use proper terms to describe the function of vacuum-feed, diaphragm, float, rotary, and slide valve carburetors

Use proper terms to describe the "venturi" principle, and variable venturi carburetors Properly handle and store flammable fuels

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student MUST:

Handle material in a safe and work-like manner.

Use personal protective equipment.

Use hand tools in a safe manner.

Follow manufacturer's directions when using any product, tool, equipment, etc.

Ensure adequate ventilation when working in enclosed areas.

Use tools and equipment in a professional work-like manner according to OSHA standards.

Know and follow the established safety rules at all times.

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Air cooled small gas engine with carburetor Carburetor cleaning solution tank MSDS Personal protective equipment Briggs and Stratton, (2009). Small Engine Care and Repair. Creative Publishing, Chanhassen, MN. Equipment and Engine training Council (2009). EETC 4-stroke study guide. Oconomowoc, WI. Hand tools Power tools and abrasives Sealants and gaskets Solvents and oils Fuel system components



Unit Name: PA700 SERVICE FUEL SYSTEMS ON ALL ENGINES Unit Number: PA700

Dates: Spring 2013 Hours: 33.00

Unit Description/Objectives:

Student will know and be able to service fuel systems on all engines in accordance with manufacturer's recommendations.

Tasks:

- PA701 Inspect, disassemble, clean, and reassemble internal carburetor parts for wear.
- PA702 Remove, service, and replace a carburetor on a small gasoline engine.
- PA703 Remove, service, and replace a fuel system's air filter.
- PA704 Remove, service, and replace a fuel pump.
- PA705 Adjust carburetor choke linkage.
- PA706 Adjust carburetor mixture screws per OEM specifications.
- PA707 Adjust carburetor float level, adjust carburetor metering levers, remove, replace and repair fuel lines.
- PA708 Remove and replace a fuel tank, filters, caps and lines.
- PA709 Adjust an engine's idle speed after servicing a carburetor.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Summarize basic carburetor adjustments

Explain basic procedures for inspecting, overhauling, and adjusting diaphragm and float-type carburetors

Describe testing a fuel pump for proper operation

Demonstrate troubleshooting procedures for float-type and diaphragm carburetors

Skill:

Inspect internal carburetor parts for wear.

Remove, service, and replace a carburetor on a small gasoline engine.

Disassemble, clean, and reassemble carburetors.

Remove, service, and replace a fuel system's air filter.

Remove, service, and replace a fuel pump.

Remove and replace a fuel filter.

Adjust carburetor choke linkage.

Adjust carburetor mixture screws per OEM specifications.

Adjust carburetor float level, adjust carburetor metering levers, remove, replace and repair fuel lines. Remove and replace a fuel tank, filters, caps and lines.

Adjust an engine's idle speed after servicing a carburetor.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Writing Activities Rubrics Diagrams Individual Projects Check Lists Power Point

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Hand tools Small gas engine carburetor Required gaskets and seals MSDS Carburetor cleaning solvent Appropriate manufacturers technical manual

Monroe Career & Technical Institute Course Name: Power Sports & Small Engine Technologies



Unit Name: PA800 DEMONSTRATE THE KNOWLEDGE AND THE SERVICE PROCEDURES OF EXHAUST SYSTEMS **Unit Number:** PA800

Dates: Spring 2013 Hours: 7.00

Unit Description/Objectives:

Student will know and be able to demonstrate the knowledge and the service procedures of exhaust systems in accordance with manufacturer's recommendations and industry standards.

Tasks:

- PA801 Describe equipment problems that can occur from operating equipment with a removed or damaged exhaust system.
- PA802 State the danger of operating a power product in a closed area.
- PA803 Describe the purpose of an exhaust deflector and describe the purpose of a spark arrestor screen.
- PA804 Describe exhaust system nomenclature and function as well as types and terms associated with exhaust systems.
- PA805 Describe the theory and function of a single stage catalyst (catalytic converters).
- PA806 Describe the proper service cleaning procedures for exhaust ports and spark arrestor screens.
- PA807 Inspect, remove, service and replace an exhaust system.
- PA808 Describe and diagnosis oxygen sensor services

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

- Describe the purpose of an exhaust deflector and describe the purpose of a spark arrestor screen.
- Describe exhaust system nomenclature and function as well as types and terms associated with exhaust systems
- Describe the theory and function of a single stage catalyst (catalytic converters).
- Describe the proper service cleaning procedures for exhaust ports and spark arrestor screens

Skill:

Inspect, remove, service and replace an exhaust system

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and work-like manner. Use personal protective equipment. Use hand tools in a safe manner. Follow manufacturer's directions when using any product, tool, equipment, etc. Ensure adequate ventilation when working in enclosed areas. Use tools and equipment in a professional work-like manner according to OSHA standards. Know and follow the established safety rules at all times.

Assessment:

Diagrams
Individual Projects
Check Lists
Power Point

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Hand tools Small gas engine with exhaust system installed Briggs and Stratton, (2009). Small Engine Care and Repair. Creative Publishing, Chanhassen, MN. Equipment and Engine training Council (2009). EETC 4-stroke study guide. Oconomowoc, WI. Air impact gun. Air impact ratchet. Rotary air tools. Grinding tools. Air powered cutting tools. Stationary work bench Electric angle grinder. Solvents and oils. Appropriate cleaning supplies. Manufacturers service manual Required gaskets, seals, lubricants, replacement parts assessment



Unit Name: PA900 DEMONSTRATE SKILL WITH MEASURING SYSTEMS AND TOOLS Unit Number: PA900

Dates: Spring 2013 Hours: 11.00

Unit Description/Objectives:

Student will know and be able to demonstrate skill with measuring systems and tools and identify and use hand tools according to industry standards.

Tasks:

- PA901 Read a standard and a metric ruler
- PA902 Read and use a standard and metric micrometer
- PA903 Read and use a standard and metric dial indicator
- PA904 Use a standard and metric torque wrench
- PA905 Use a standard metric dial caliper.
- PA906 Calculate displacement and horse power.
- PA907 Calculate work, power, torque, area and volume.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

Focus Standard/Anchor #2

CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.

- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.

CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
- CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

List the reasons why small engine components must be measured carefully Review the proper use of common hand tools and measuring equipment Explain why quality tools and measuring instruments should be used when servicing small gas engines

Skill:

Read a standard and a metric ruler Read and use a standard and metric micrometer Read and use a standard and metric dial indicator Use a standard and metric torque wrench Use a standard and metric dial caliper Calculate displacement and horse power Calculate Work, Power, Torque, Area and Volume Identify common hand tools used in the repair of outdoor power equipment Identify specialty tools used in overhaul Follow rules for hand tool safety Follow specific rules for portable electric hand tool safety

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Writing Activities Rubrics Diagrams Individual Projects Check Lists Power Point

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Micrometer Dial caliper Steel ruler Dial indicator Feeler Gage Hand tools Small gas engine short block engine build sheet SGE Job Sheet #2 Unit #900/100, job #1 learning guide.



Unit Name: PA1000 IDENTIFY AND USE HAND TOOLS Unit Number: PA1000

Dates: Spring 2013 Hours: 12.00

Unit Description/Objectives:

Student will know and be able to demonstrate skill with measuring systems and tools and identify and use hand tools according to industry standards.

Tasks:

- PA1001 Identify common hand tools used in the repair of outdoor power equipment.
- PA1002 Identify specialty tools used in overhaul.
- PA1003 Follow rules for hand tool safety.
- PA1004 Follow specific rules for portable electric hand tool safety.
- PA1005 Follow safety use of air, hydraulic, and machine tools.

Standards / Assessment Anchors

Focus Standard/Anchor #1

13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Instructional Activities:

Knowledge:

Demonstrate the proper use of hand tools Explain why quality tools should be used when servicing small gas engines

Skill:

Identify common hand tools used in the repair of outdoor power equipment Identify specialty tools used in overhaul Identify specialty tools used in overhaul

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must:

Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Diagrams
Quizzes	Individual Projects
Writing Activities	Check Lists
Rubrics	Power Point

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Hand tools Small gas engine short block Engine build sheet SGE Job Sheet #2 Unit #900/100, job #1 learning guide.



Unit Name: PA1200 WELD WITH AN ELECTRIC WELDER Unit Number: PA1200

Dates: Spring 2013 Hours: 4.00

Unit Description/Objectives:

The student will know and be able to perform the correct adjustments to an electric welder and weld a broken frame on a piece of outdoor power equipment.

Tasks:

- PA1201 State and follow safety rules for using an electric welder.
- PA1202 Wear personal protective equipment.
- PA1203 Adjust welding amperage for a specific welding repair.
- PA1204 Weld a broken metal part on a piece of outdoor power equipment.
- PA1205 Light and adjust the flame on a cutting torch.
- PA1206 Heat and cut with an oxyacetylene torch.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
- 3.2.P.B3 Analyze the factors that influence convection, conduction, and radiation between objects or regions that are at different temperatures.
- 3.2.C.B3 Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process.
- 3.1.C.A2 Describe how changes in energy affect the rate of chemical reactions.
- 3.2.12.B3 Describe the relationship between the average kinetic molecular energy, temperature, and phase changes.

Focus Standard/Anchor #2

• CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
- CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Identify types of metals and appropriate welding medium. Describe proper surface preparation prior to welding. Describe required personal protective equipment. Score 100% on PDE arc welder safety test.

Skill:

Adjust welding amperage for a specific welding repair. Weld a broken metal frame on a piece of outdoor equipment.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions Practice welding scrap metals of varying sizes and thicknesses.

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Power Point Presentation	Rubrics

Resources/Equipment:

Arc welder

MIG Welder

PDE "Safety Guidelines for Technology Education & Elementary Science/Technology Education" mac arc welding safety information sheet and arc welder safety test.



Unit Name: PA1300 DIAGNOSE PERFORMANCE PROBLEMS ON A 2-CYCLE GASOLINE ENGINE **Unit Number:** PA1300

Dates: Spring 2013 Hours: 9.00

Unit Description/Objectives:

Student will know and be able to perform the proper inspections and test procedures required to diagnose performance problems on 2-cycle engines in accordance with the principles of systematic troubleshooting and industry standards.

Tasks:

- PA1301 Diagnose performance problems in a 2-cycle gasoline engine
- PA1302 Check engine for top end compression.
- PA1303 Check engine for base/ primary compression (bottom end).
- PA1304 Inspect the fuel system for proper operation.
- PA1305 Perform a carburetor pressure test.
- PA1306 Inspect the ignition system for proper operation using a spark tester.
- PA1307 Inspect the exhaust port for carbon obstructions.
- PA1308 Operate the engine to check for proper starting and power output under load.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

List the three systems required for basic engine operation.

Identify possible failures in the three basic systems and their relationship to engine performance.

Define scavenging.

Describe cross-scavenging and loop-scavenging.

Differentiate between "Check", "Inspect", and "Service".

Describe systematic troubleshooting.

Skill:

Diagnose performance problems in a 2-cycle gasoline engine Check engine for top end compression. Check engine for base/ primary compression (bottom end). Inspect the fuel system for proper operation. Perform a carburetor pressure test. Inspect the ignition system for proper operation and perform a 3-point spark test. Inspect the exhaust port for carbon obstructions. Check crankcase integrity with a pressure/vacuum pump. Operate the engine to check for proper starting and power output under load.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines, Milwaukee, WI **Personal Protective Equipment** SGE Job sheet #8, "2-cycle engine reassembly" SGE Job sheet #9, "General engine troubleshooting" SGE Job sheet #10, "Ignition system service" SGE Job sheet #11, "Fuel system service" "Small engines.com", URL - http://small-engines.com/index.html Strap wrench. Flywheel holder. Spark tester. Solvents and oils. Overhead gantry crane. Drain pans and receptacles. Appropriate cleaning supplies. Manufacturers service manual Required gaskets, seals, lubricants, replacement parts Cylinder honing hand tools. Cylinder boring machine. Cylinder honing machine. Hydraulic lifting tables. Stationary work bench. Hydraulic floor jack. Hydraulic motorcycle/atv jack


Unit Name: PA1400 DIAGNOSE PROBLEMS ON A 4-CYCLE GASOLINE ENGINE **Unit Number:** PA1400

Dates: Spring 2013 Hours: 78.00

Unit Description/Objectives:

Student will know and be able to perform the proper inspections and test procedures required to diagnose performance problems on 2-cycle engines in accordance with the principles of systematic troubleshooting and industry standards.

Tasks:

- PA1401 Check the fuel pump pressure.
- PA1402 Pressure test the carburetor.
- PA1403 Operate the engine to check for proper starting and acceleration.
- PA1404 Differentiate hunting/surging symptom between the fuel system and governor system.
- PA1405 Perform a cylinder balance test and demonstrate understanding of findings
- PA1406 Perform a cylinder compression test.
- PA1407 Perform a cylinder leak-down test.
- PA1408 Perform an oil pressure test.
- PA1409 Test an ignition system using a spark tester.
- PA1410 Inspect the engine for a partially-sheared flywheel key.
- PA1411 Remove, inspect and replace points and condenser.
- PA1412 Remove, replace, and test an ignition armature assembly (ignition coil, ignition).
- PA1413 Test and replace high tension lead(s).
- PA1414 Test the solid-state transistor-controlled discharge system.
- PA1415 Test a capacitive ignition system.
- PA1416 Demonstrate timing procedure for an engine with ignition points.
- PA1417 Demonstrate timing procedures on an engine with a solid state/ electronic ignition system.
- PA1418 Measure primary and secondary resistance.
- PA1419 Check/replace an engine ignition kill switch.
- PA1420 Inspect the cooling system.
- PA1421 Check for damage to the cooling fins or fan.

PA1422 - Identify debris clogging cooling air fins.

- PA1423 Identify the proper order of assembling an air intake system.
- PA1424 Remove and replace an intake manifold

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

 CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

List the three systems required for basic engine operation.

Identify possible failures in the three basic systems and their relationship to engine performance.

Differentiate between "Check", "Inspect", and "Service".

Describe systematic troubleshooting.

Skill:

Check the fuel pump pressure.

Pressure test the carburetor.

Operate the engine to check for proper starting and acceleration.

Differentiate hunting/surging symptom between the fuel system and governor system.

Perform a cylinder balance test and demonstrate understanding of findings

Perform a cylinder compression test.

Perform a cylinder leak-down test.

Perform an engine crankcase vacuum test.

Perform an oil pressure test.

Test an ignition system using a spark tester.

Inspect the engine for a partially-sheared flywheel key.

Remove, inspect and replace points and condenser.

Remove and replace an ignition armature (ignition coil, ignition).

Test and replace ignition armature assembly.

Test and replace high tension lead(s).

Test the solid-state transistor-controlled discharge system.

Test a capacitive ignition system.

Demonstrate timing procedure for an engine with ignition points.

Demonstrate timing procedures on an engine with a solid state/ electronic ignition system.

Measure primary and secondary resistance.

Check/replace an engine ignition kill switch.

Inspect the cooling system.

Check for damage to the cooling fins or fan.

Identify debris clogging cooling air fins.

Identify the proper order of assembling an air intake system.

Remove and replace an intake manifold

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment SGE Job sheet #7, "4-cycle engine reassembly" SGE Job sheet #9, "General engine troubleshooting" SGE Job sheet #10, "Ignition system service" SGE Job sheet #11, "Fuel system service" "Small engines.com", URL - http://small-engines.com/index.html Briggs and Stratton "The Power Channel" Failure analysis course @ http://www.thepowerportal.com/nA/English/PowerChannel/Courses/FailureAnalysis.htm. Basic hand tools. Cylinder compression tester Cylinder leak-down tester Spark tester Crankcase vacuum tester Precision measuring tools Manufacturer's service manual

Monroe Career & Technical Institute Course Name: Power Sports & Small Engine Technologies



Unit Name: PA1500 OVERHAUL a 4-CYCLE ENGINE **Unit Number:** PA1500

Dates: Spring 2013 Hours: 31.00

Unit Description/Objectives:

Student will know and be able to independently perform the various operations and sequences necessary to overhaul a 4cycle engine from initial disassemble to serviceable final product.

Tasks:

- PA1501 Disassemble the block.
- PA1502 Remove, inspect and replace an oil seal..
- PA1503 Inspect balance system; inspect shaft(s) and bearings for damage and wear valve guides for wear.
- PA1504 Inspect and measure camshaft bearings for wear and damage.
- PA1505 Measure crankshaft end play and run-out, and repair crankshaft if damaged.
- PA1506 Inspect valve train parts; valves, rocker arms, lifters, studs, and push rods.
- PA1507 Inspect valve guides for wear.
- PA1508 Inspect valves and valve seals; resurface or replace.
- PA1509 Replace valve stem seals.
- PA1510 Use a valve spring compressor to install valve springs.
- PA1511 Adjust valves (mechanical), and hydraulic lifters.
- PA1512 Measure cylinder bore and compare against OEM specifications
- PA1513 Ream a cylinder ridge and deglaze.
- PA1514 Install a new crankshaft, with bearings, if needed.
- PA1515 Install a piston using a ring compressor.
- PA1516 Install new rings for wear; check end and side clearance.
- PA1517 Verify camshaft timing according to manufacturer's specifications.
- PA1518 Install all gaskets where needed, according to specifications.
- PA1519 Torque fasteners according to manufacturer's specifications
- PA1520 Install and adjust linkages and controls.
- PA1521 Initiate start-up procedures for test run.

PA1522 - Check top no-load speed object governor as needed.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

 CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

• CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Explain simple engine operation.

Describe four-stoke cycle engine operation and explain the purpose of each stroke.

List the qualities of gasoline that make it an efficient fuel for small engines.

Explain why gasoline is atomized in the small engine.

Identify the basic components of a small engine and describe the function f each part. Describe the procedure for removing an engine from an implement

List the steps involved in disassembling and engine

Explain the procedures involved in re boring a cylinder Describe piston and piston ring construction

Explain the purpose of ring end gap

Summarize the function of the crankshaft

Describe the proper procedures for valve reconditioning

Skill:

Inspect the engine for signs of trouble before removal.

Remove store and label external parts.

Remove flywheel and related parts.

Disassemble internal parts, including rotating and reciprocating groups, Making critical measurements when required.

Given an engine, required tools and applicable service manual, you will be able to:

- Disassemble the engine to the part-level.
- Adjust the valve clearance in accordance with the service manual.
- Adjust the ignition coil installation gap in accordance with the service manual.
- Replace the limiter cap and pilot screw in the carburetor.
- Tighten the bolts securing the connecting rod cap, flywheel and case cover to the torques specified in the service manual.

Given an engine, required tools and the service manual, you will be able to:

Perform the following inspections and judge if the parts in question are usable.

- Check the piston ring groove for carbon deposit.
- Check if the piston rings fit to the piston operate smoothly.
- Measure piston ring end gaps.
- Measure cylinder I.D.
- Measure piston skirt O.D.
- Measure connecting rod big end I.D.
- Measure crankshaft bearing O.D.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation Research Rubrics

Resources/Equipment:

Overhead gantry crane.

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment SGE engine dis assembly video SGE engine re-assembly video SGE engine measurement, cleaning, inspection video SGE job sheet #3 SGE engine dis assembly checklist SGE engine reassembly checklist Basic hand tools. Gear and flywheel pullers. Valve cutting tools. Valve seating tools. Valve spring compressors. Air impact gun. Air impact ratchet. Rotary air tools. Grinding tools. Air powered cutting tools. Cylinder honing hand tools. Cylinder boring machine. Cylinder honing machine. Hydraulic lifting tables. Stationary work bench. Hydraulic floor jack. Hydraulic motorcycle/atv jack. Manual lawn tractor jack. Bench grinder. Electric angle grinder. Drill press. Strap wrench. Flywheel holder. Spark tester. Solvents and oils.

Drain pans and receptacles. Appropriate cleaning supplies. Manufacturers service manual Required gaskets, seals, lubricants, replacement parts assessment Viable 4-cycle engine American Honda Motor Co.(2009). inc, Honda University,GP Engines Training materials flash/pdf/pps.



Unit Name: PA1600 CONDUCT A FAILURE ANALYSIS ON GASOLINE ENGINES Unit Number: PA1600

Dates: Spring 2013 Hours: 13.00

Unit Description/Objectives:

Student will know and be able to find the root cause of failure on a failed engine.

Tasks:

- PA1601 Classify failures into 5 major categories; electrical, fuel, ignition, lubrication, and compression.
- PA1602 Identify the effects of insufficient lubrication on engine components; piston cylinders, etc.
- PA1603 Identify and describe engine failures caused by the breakdown of fuel.
- PA1604 Identify the effects of overheating on engine component parts.
- PA1605 Define detonation, pre-ignition and effects on engine components.
- PA1606 Identify engine failure caused by lean mixture of fuel.
- PA1607 Identify the effects of over speeding on engine component parts.
- PA1608 Identify the signature
- PA1609 Identify exhaust port piston scoring and large end bearings due to over speeding.
- PA1610 Identify the effects of excessive vibration on engine block and mounting base.
- PA1611 Inspect a damaged engine and identify the symptoms, types and causes of failures.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

Focus Standard/Anchor #2

 CC.3.6.11-12.F. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Supporting Standards/Anchors

- CC.3.5.9-10.1. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

List the three systems required for basic engine operation. Identify possible failures in the three basic systems and their relationship to engine performance.

Differentiate between "Check", "Inspect", and "Service". Describe systematic troubleshooting.

Skill:

Classify failures into 5 major categories; electrical, fuel, ignition, lubrication, and compression. Identify the entrance path and the effects of abrasives on several failed engines.

Identify the effects of insufficient lubrication on engine components; piston cylinders, etc. Find the root cause of failure on a failed engine.

Identify and describe engine failures caused by the breakdown of fuel.

Identify the effects of overheating on engine component parts.

Define detonation, pre-ignition and effects on engine components.

Identify engine failure caused by lean mixture of fuel. Identify the effects of over speeding on engine component parts. Identify the signature "breakage" of a connecting rod on a failed engine. Identify exhaust port piston scoring and large end bearings due to over speeding. Identify the effects of excessive vibration on engine block and mounting base. Inspect a damaged engine and identify the symptoms, types and causes of failures.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Proj
Quizzes	Che
Pre/Post Tests	Pres
Time Cards	asse
Writing Activities	Res
Video/DVD	Rub

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. SGE Job sheet #7, "4-cycle engine reassembly"

SGE Job sheet #8, "2-cycle engine reassembly"

SGE Job sheet #9, "General engine troubleshooting"

SGE Job sheet #10, "Ignition system service"

SGE Job sheet #11, "Fuel system service"

"Small engines.com", URL - http://small-engines.com/index.html

Briggs and Stratton "The Power Channel" Failure analysis course @

http://www.thepowerportal.com/nA/English/PowerChannel/Courses/FailureAnalysis.htm.

Any Manufacturer's service manual specific to a particular engine.

Clevite 77 form# CL77-3-402 "Engine Bearing failure analysis guide". @

http://engineparts.com/publications/CL77-3-402.pdf.

American Honda Motor Co.(2009). inc, Honda University, GP Engines Training materials flash/pdf/pps.

Projects Check Lists Presentation assessment Research Rubrics



Unit Name: PA 1700 SERVICE ELECTRICAL AND MANUAL STARTING SYSTEMS **Unit Number:** PA1700

Dates: Spring 2013 Hours: 15.00

Unit Description/Objectives:

Student will know and be able to inspect, service, repair, and replace an electrical and manual starter and electrical and manual starter components according to industry standards.

Tasks:

- PA1701 Identify and describe the parts of a recoil starting system.
- PA1702 Disassemble starter housing.
- PA1703 Replace a starter spring.
- PA1704 Replace a manual starter rope.
- PA1705 Troubleshoot a starting / safety interlock circuit.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

 CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Supporting Standards/Anchors

- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
- CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Describe the function of a manual starting system. Describe the various types of manual starting systems. Identify specifications in the appropriate service manual. Use industry terminology.

Skill:

Identify and describe the parts of a recoil starting system. Disassemble starter housing. Replace a starter spring. Replace a manual starter rope. Troubleshoot a starting / safety interlock circuit.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Honda university "Training Materials Flash/PDF" CD. Appropriate service manual.



Unit Name: PA1800 SERVICE ELECTRICAL STARTING SYSTEMS Unit Number: PA1800

Dates: Spring 2013 Hours: 10.00

Unit Description/Objectives:

Student will know and be able to inspect, service, repair, and replace an electric starter and electric starter components and supporting systems according to industry standards.

Tasks:

PA1801 - Remove, service, and replace a Direct Current starter.

PA1802 - Remove, service and replace and Alternating Current starter.

PA1803 - Identify and describe the components of a DC starting system.

PA1804 - Perform a 12-volt DC starter motor current draw test.

PA1805 - Remove, test and replace a starter relay or solenoid.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Focus Standard/Anchor #2

 CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Supporting Standards/Anchors

- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Vocabulary

Describe basic units of electrical measurement. Apply Ohm's law. Describe the function of a electric starting system. Identify the two types of electrical starting systems. Define polarity Identify specifications in the appropriate service manual.

Skill:

Remove, service, and replace a Direct Current starter. Remove, service and replace and Alternating Current starter. Identify and describe the components of a DC starting system. Perform a 12-volt DC starter motor current draw test. Remove, test and replace a starter relay or solenoid. Identify, remove, service and replace battery ignition system components Identify, remove, service and replace electronic ignition system components.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation assessment Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Honda university "Training Materials Flash/PDF" CD. Briggs and Stratton "The Power Channel" electrical systems instructional video's @ http://www.thepowerportal.com/nA/English/PowerChannel/FindaVideo.htm?FB_Values=!!&F1_ajax Enabled=1&F1_DocID=36421&F1_keywordFilter=&F1_PageNum=1&. Appropriate service manual. Electric starters. Solenoids. Electric start equipped engines.



Unit Name: PA1900 SERVICE IGNITION SYSTEMS Unit Number: PA1900

Dates: Spring 2013 Hours: 10.00

Unit Description/Objectives:

Student will know and be able to inspect, service, repair, and replace a manual starter and manual starter components according to industry standards.

Tasks:

- PA1901 Identify, remove, service and replace battery ignition system components
- PA1902 Identify, remove, service and replace electronic ignition system components.
- PA1903 Remove, test and replace a coil or electronic ignition.
- PA1904 Check and set ignition timing.
- PA1905 Check engine RPM.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Supporting Standards/Anchors

CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Describe the function of a manual starting system. Describe the various types of manual starting systems. Identify specifications in the appropriate service manual. Use industry terminology.

Skill:

Identify, remove, service and replace battery ignition system components Identify, remove, service and replace electronic ignition system components. Remove, test and replace a coil or electronic ignition. Check and set ignition timing. Check engine RPM.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation assessment Research Rubrics

Resources/Equipment:

Roth, A. C. (2012). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Honda university "Training Materials Flash/PDF" CD



Unit Name: PA2000 SERVICE AND TEST CHARGING SYSTEMS Unit Number: PA2000

Dates: Spring 2013 Hours: 8.00

Unit Description/Objectives:

Student will know and be able to test and service equipment charging systems.

Tasks:

- PA2001 Explain storage battery theory and perform maintenance.
- PA2002 Identify types of charging systems including an under flywheel alternator and a belt drive alternator.
- PA2003 Perform a current drain test using a DC shunt or its equivalent.
- PA2004 Troubleshoot a charging circuit.
- PA2005 Test a charging system.
- PA2006 Test a voltage regulator.
- PA2007 Test an alternator's output.
- PA2008 Remove and replace an alternator, a voltage rectifier, and a diode.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

Focus Standard/Anchor #2

• CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

List the three systems required for basic engine operation.

Identify possible failures in the three basic systems and their relationship to engine performance.

Differentiate between "Check", "Inspect", and "Service".

Describe systematic troubleshooting.

Skill:

Explain storage battery theory and perform maintenance.

Identify types of charging systems including an under flywheel alternator and a belt drive alternator.

Perform a current drain test using a DC shunt or its equivalent.

Troubleshoot a charging circuit.

Test a charging system.

Test a voltage regulator.

Test an alternator's output. Remove, service, and replace an alternator, a voltage rectifier and a diode.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe ar

Handle material in a safe and workmanlike manner Use protective clothing and equipment

Use hand tools in a safe manner

Use adequate ventilation when working in enclosed area

Follow manufacturer's directions when using any product, tool, equipment, etc.

Use proper safety precautions when using /operating hand tools

Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Honda university "Training Materials Flash/PDF" CD. Briggs and Stratton "The Power Channel" electrical systems instructional video's @ http://www.thepowerportal.com/nA/English/PowerChannel/FindaVideo.htm?FB_Values=!!&F1_ajax Enabled=1&F1_DocID=36421&F1_keywordFilter=&F1_PageNum=1&. Appropriate manufacturers service manual. American Honda Motor Co.(2009). inc, Honda University,GP Engines Training materials flash/pdf/pps.



Unit Name: PA2100 SERVICE LUBRICATION SYSTEMS Unit Number: PA2100

Dates: Spring 2013 Hours: 6.00

Unit Description/Objectives:

Student will know and be able to service and repair engine lubrication systems in accordance with manufacturer's specifications.

Tasks:

- PA2101 Identify types of filters used on power equipment.
- PA2102 Interpret charts that outline oil applications.
- PA2103 Change engine oil and filter on a variety of outdoor power equipment.
- PA2104 Select proper oil and grade.
- PA2105 Prepare a fuel/oil mixture for a 2-cycle engine.
- PA2106 Service a crankcase breather assembly.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

 CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Supporting Standards/Anchors

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

• CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Describe the meaning of API and SAE standards. Describe and demonstrate viscosity. Identify specifications in the appropriate service manual. Review the importance of preventive maintenance.

Skill:

Label types of oil filters used on power equipment. Interpret charts that outline oil applications. Change engine oil and filter on a variety of outdoor power equipment. Select proper oil and grade. Prepare a fuel/oil mixture for a 2-cycle engine. Service a crankcase breather assembly.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Appropriate service manual.

American Honda Motor Co.(2009). inc, Honda University,GP Engines Training materials flash/pdf/pps. Briggs and Stratton, (2009). Small Engine Care and Repair. Creative Publishing, Chanhassen, MN. Equipment and Engine training Council (2009). EETC 4-stroke study guide. Oconomowoc, WI. Solvents and oils.

Overhead gantry crane.

Drain pans and receptacles.

Appropriate cleaning supplies.

Manufacturers service manual

Required gaskets, seals, lubricants, replacement parts

Valvoline motor oils certification course and exam.

Timken Tech-series on-line lubrication certification course and exam.



Unit Name: PA2200 IDENTIFY AND SERVICE GOVERNORS Unit Number: PA2200

Dates: Spring 2013 Hours: 9.00

Unit Description/Objectives:

Student will know and be able identify and describe three different types of governor systems and perform static and dynamic governor adjustment according to industry standard and specific manufacturer's recommendations.

Tasks:

PA2201 - Perform static and dynamic governor adjustments.

PA2202 - Remove, service, and replace pneumatic and mechanical governor.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Standard/Anchor #2

 CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Supporting Standards/Anchors

- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Describe the purpose of governor system. Describe and demonstrate static and dynamic governor adjustments.

Skill:

Identify the purpose of the governor system.

Use proper terms to describe governor systems and functions including pneumatic (vane) governor systems and mechanical governor systems.

Perform static and dynamic governor adjustments.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD

Projects Check Lists Presentation assessment Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Honda university "Training Materials Flash/PDF" CD. Briggs and Stratton "The Power Channel" Governor systems video's @ http://www.thepowerportal.com/nA/English/PowerChannel/FindaVideo.htm?FB_Values=!!&F1_ajax Enabled=1&F1_DocID=36421&F1_keywordFilter=&F1_PageNum=1&. Tachometer.



Unit Name: PA2300 SERVICE BRAKING SYSTEMS Unit Number: PA2300

Dates: Spring 2013 Hours: 6.00

Unit Description/Objectives:

Student will know and be able to inspect, remove, service, and repair mechanical, hydraulic, and electrical braking systems on a variety of equipment in accordance with industry standards and specific manufacturer's recommendations.

Tasks:

- PA2301 Inspect, remove, service and repair mechanical brake systems.
- PA2302 Inspect, remove, service and repair hydraulic brake systems.
- PA2303 Inspect, remove service and repair drum and disc brakes.
- PA2304 Demonstrate knowledge of the hydraulic theory
- PA2305 Change hydraulic fluid.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
 - 1.1.11.C Use knowledge of root words and words from literary works to recognize and understand the meaning of new words during reading. Use these words accurately in speaking and writing.

Supporting Standards/Anchors

- CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Define energy and the types of energy that exist. Define The law of conservations of energy. Define energy transfer. Apply knowledge of energy to the purpose of braking systems.

Skill:

Inspect, remove, service, and repair mechanical brake systems. Inspect, remove, service, and repair hydraulic brake systems. Inspect, remove, service, and repair drum and disc brakes.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	Projects
Quizzes	Check Lists
Pre/Post Tests	Presentation
Time Cards	assessment
Writing Activities	Research
Video/DVD	Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Briggs and Stratton, (2009). Small Engine Care and Repair. Creative Publishing, Chanhassen, MN. Manufacturers' service manual.

Meritor Bullpen on-line brake fluid basics certification course and assessment.



Unit Name: PA2400 SERVICE CLUTCHES AND EQUIPMENT DRIVES Unit Number: PA2400

Dates: Spring 2013 Hours: 12.00

Unit Description/Objectives:

Student will know and be able to independently perform service procedures on belts, clutches, and equipment drives and their components on outdoor power equipment and power sports equipment according to manufacturer's service specifications.

Tasks:

PA2401 - Inspect, service, or replace belts and tensioning devices.

- PA2402 Inspect, service, or replace centrifugal clutches.
- PA2403 Inspect, service, or replace clutch discs.
- PA2404 Inspect, service, or replace sprockets and chains.
- PA2405 Inspect, service, or replace an electric power take-off.
- PA2406 Inspect, service, or replace universal joints.

Standards / Assessment Anchors

Focus Standard/Anchor #1

13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

Focus Standard/Anchor #2

 CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Describe various types of drive devices including belts and tensioning devices. Describe and demonstrate the purpose and function of clutches. Demonstrate drive device service procedures. Demonstrate clutch service procedures. Review safety and pinch points.

Skill:

Inspect, service, or replace belts and tensioning devices. Inspect, service, or replace centrifugal clutches. Inspect, service, or replace clutch discs. Inspect, service, or replace sprockets and chains. Inspect, service, or replace an electric power take-off. Inspect, service, or replace universal joints.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets	
Quizzes	
Pre/Post Tests	
Time Cards	
Writing Activities	
Video/DVD	

Projects Check Lists Presentation assessment Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Drain pans and receptacles. Appropriate cleaning supplies. Manufacturers service manual Required gaskets, seals, lubricants, replacement parts Hydraulic lifting tables. Stationary work bench. Hydraulic floor jack. Hydraulic motorcycle/atv jack. Manual lawn tractor jack. Air impact gun. Air impact ratchet. Rotary air tools. Grinding tools. Air powered cutting tools. Basic hand tools. Gear and flywheel pullers. assessment Timken Tech on-line roller bearing, needle bearing, lubrication certification course and exam.


Unit Name: PA2500 ORDER REPAIR PARTS AND KEEP RECORDS Unit Number: PA2500

Dates: Spring 2013 Hours: 21.00

Unit Description/Objectives:

Student will know and be able to order repair parts and keep records according to industry standards.

Tasks:

- PA2501 Interpret illustrations, graphs, diagrams, and tables in repair manuals.
- PA2502 Use reference materials, service manuals, and parts tables to find parts.
- PA2503 Take inventory of parts in stock.
- PA2504 Determine parts and specifications using a computerized or microfiche parts reference database.
- PA2505 Complete a service order form.
- PA2506 Interpret time and flat rate information.
- PA2507 Order materials and supplies from a catalog.

Standards / Assessment Anchors

Focus Standard/Anchor #1

 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

Focus Standard/Anchor #2

 CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

Supporting Standards/Anchors

- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
 - CC.3.5.9-10.G. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Standards/Anchors

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

Instructional Activities:

Knowledge:

Demonstrate knowledge of graphing and graphing software. Demonstrate knowledge of service manuals, parts manuals, and parts data-bases.

Skill:

Interpret illustrations, graphs, diagrams, and tables in repair manuals. Use reference materials, service manuals, and parts tables to find parts. Take inventory of parts in stock. Complete a service order form. Determine parts and specifications using a computerized or microfiche parts reference database. Interpret time and flat rate information. Order materials and supplies from a catalog.

Remediation:

Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment:

Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must: Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Presentation Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Briggs and Stratton "The Power Channel" Charging systems @ http://www.thepowerportal.com/nA/English/PowerChannel/Courses/chargingsystems.htm. Manufacturers service manual Mathaids.com time worksheets.



Unit Name: L2600 CERTIFICATIONS Unit Number: L2600

Dates: Fall, 2013 Hours: 380.00

Unit Description/Objectives:

Students will know and be able to obtain EETC certifications.

Tasks:

L2601 Obtain EET Four Stroke Certification

L2602 Obtain EETC Two Stroke Certification

L2603 Obtain EETC Electrical Certification

L2604 Obtain EETC Driveline /Hydro Certification

Standards / Assessment Anchors

Focus Anchor/Standard #1:

 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Selfadvocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Anchor/Standards:

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.D2 Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.2.12.B1 Analyze the principles of rotational motion to solve problems relating to angular momentum and torque.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E5 Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Focus Anchor/Standard #2:

• CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

Supporting Anchor/Standards:

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

Connecting Anchor/Standard:

 CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Anchor/Standards:

CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

Instructional Activities:

Knowledge:

Certification is the culmination of the students learning experience. Students will demonstrate knowledge of essential elements and principles that verify a level of knowledge needed for employment in the industry.

Thorough review is required. Students will create an industry "dictionary". Pre-learning will consist of anticipation guides, INSERTS (maxx teaching), and "find it" exercises. Students will cite sources in MLA format.

Students will utilize training videos, on-line manufacturer training courses, text, workbooks, study guides, teacher notes, and network with students from other areas.

- DEMONSTRATE KNOWLEDGE OF THE PRINCIPLES AND DESIGN OF 2-CYCLE AND 4-CYCLE ENGINES
- DEMONSTRATE KNOWLEDGE OF LUBRICATION SYSTEMS.
- DEMONSTRATE KNOWLEDGE OF BASIC ELECTRICITY.
- DEMONSTRATE KNOWLEDGE OF COOLING SYSTEMS.
- DEMONSTRATE THE KNOWLEDGE AND THE SERVICE PROCEDURES OF EXHAUST SYSTEMS.

Skill:

- DIAGNOSE PERFORMANCE PROBLEMS ON A 2-CYCLE GASOLINE ENGINE.
- DIAGNOSE PROBLEMS ON A 4-CYCLE GASOLINE ENGINE.
- CONDUCT A FAILURE ANALYSIS ON GASOLINE ENGINES.

Remediation: Review with teacher assistance Individual or group tutoring Study guides Extended time

Enrichment: Work on live work projects to enhance skill Participate in classroom leadership activities and competitions

Safety:

Student must:

Handle material in a safe and workmanlike manner Use protective clothing and equipment Use hand tools in a safe manner Use adequate ventilation when working in enclosed area Follow manufacturer's directions when using any product, tool, equipment, etc. Use proper safety precautions when using /operating hand tools Use tools and equipment in a professional work-like manner according to OSHA standards Know and follow the established safety rules at all times

Assessment:

Worksheets Quizzes Pre/Post Tests Time Cards Writing Activities Video/DVD Projects Check Lists Research Rubrics

Resources/Equipment:

Roth, A. C. (2009). Small gas engines. Tinley Park, Illinois: Goodheart-Willcox. Radcliffe, Bruce (2010) Small Engines. Milwaukee, WI Personal Protective Equipment Basic hand tools Precision measuring tools Manufacturer's service manual