VIRGINIA FFA ASSOCIATION

Virginia FFA Association
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Tractor Troubleshooting Event

Superintendents: David Balderson, State FFA Executive Director: TBA, Andy Seibel, Virginia Cooperative Extension

Sponsored By James River Equipment

Registration Deadline: September 21, 2019

Participants must register through the online registration system on vaffa.org. For State Fair entry system go to www.vaffa.org prior to September 21st. *Teams* will need to be entered under team or school name. *Individuals* will also need to be entered separately to be eligible for premiums and scholarships.

2019 Official Schedule

Date: Friday, September 27, 2019
Location: Best of Show Pavilion located in Harvest Landing
Contestants Meeting: 10:00 am
Contest Begins: 10:15 am
Awards Presentation: at the conclusion of the event

Participants must have a $5 Student Competition Ticket to enter the Fairgrounds. FFA Advisor/coach is responsible for ordering tickets directly from the following website. https://www.etix.com/ticket/c/70C6D1348E295CF78C50C6C43B8518C5/student-competitions

1. **Information can be found on the Virginia FFA website http://www.vaffa.org.**
2. The five individuals who have won their respective local, Federation, and Area Tractor Troubleshooting Contests are eligible to compete.
3. Event Rules are below.

AWARDS

1st	2nd	3rd	4th	5th
$100	$75	$50	$35	$25

Total amount offered by the State Fair of Virginia $285

Prizes
The Virginia FFA Association will provide medals for the top three individuals and sponsored plaques to area and state winners. Ribbons will be presented at the event and plaques will be presented at the Virginia FFA State Convention.

State Fair Scholarship Program
Contestants will be eligible to participate in the State Fair Scholarship Program. **Please see the State Fair website, www.statefairva.org, for more information regarding the State Fair of Virginia Scholarship Program and eligibility requirements for other available scholarships.**
Scholarships will be awarded to the top four teams:

1st	2nd	3rd	4th
$600.00	$400.00	$300.00	$200.00

TRACTOR TROUBLESHOOTING

DESCRIPTION:

Three components constitute this event: a written test, a diagnostic component, and a repair component. These three are designed to allow participants to demonstrate their knowledge of the theory of tractor operation, their ability to diagnose tractor malfunctions, and their skills in making repairs.

DATE DUE:

State Fair of Virginia
September 27, 2019

GENERAL EVENT INFORMATION

1. Each team consists of two members.
2. Local FFA advisors must use a competitive basis for determining participants to represent their schools.
3. Area events are subject to the same rules and regulations as the state event and must be held before June 1st of each year.
4. The winning area team competes in the state event.
5. FFA members who have competed in but have not won the state event are eligible to compete.
6. Safety glasses must be worn during the diagnostic component and the repair component. The school advisor is responsible for having the team suitably attired.
7. Smoking is not permitted in the event area.
8. Teams may be disqualified for any of the following reasons:
    a. failing to follow rules and regulations
    b. failing to obey judges' instructions
    c. operating tractors recklessly or violating common safety rules
    d. leaving tractors in an unsatisfactory condition
    e. behaving in a manner unbecoming a gentleman or lady or not in the spirit of the event or the school represented.
9. Each team must furnish its own equipment as follows:
    a. One set of tools consisting of sockets, wrenches, feeler gauge, screwdriver, and hammer.
    b. Test equipment is limited to the following:

i.	1 hydrometer	1 volt-ampere meter
ii.	1 dwell meter	1 tachometer
iii.	1 vacuum gauge	1 fuel pressure gage
iv.	1 compression gauge	1 test light
v.	1 jumper wire set 36" long	1 timing light
vi.	1 torque wrench	1 OHM kilovolt meter.

10. Results of the written test, diagnostic component, and repair component are totaled to determine each team's score.
11. The winning team receives a plaque for their school and a medal for each member. Second- and third place teams receive medals for each team member.

PREPARATION FOR THE EVENT

1. The State Executive Director serves as the event coordinator and establishes an event committee.
2. The event committee consists of the event coordinator, a timekeeper, and team judges.
3. The event coordinator is responsible for the following:
    a. developing a written test
    b. securing tractors
    c. supervising the placement of tractors at the event site
    d. determining and supervising the installation of the malfunctions
    e. providing the tune-up specifications
    f. assembling the judges prior to the event to check each tractor for correct specifications and malfunctions
    g. informing teams of the makes and models of tractors used in the event

h. briefing the judges and participants before the event
i. ensuring that dry chemical fire extinguishers are accessible
j. managing the overall operation of the event.

4. The timekeeper is selected by the event coordinator. The timekeeper is responsible for the following:
    a. supervising the drawing for event vehicles
    b. recording the time for each team
    c. ensuring that team judges remain in the assigned area and comply with all requirements.
5. The advisors of the competing teams serve as team judges. The judges observe the progress of diagnosis and repair but do not interfere unless the repairs are damaging the vehicle or endangering the participants. Judges may not assist the teams in locating or correcting malfunctions. Team judges also are responsible for the following:
    a. ensuring that all malfunctions are corrected before the team leaves the event site
    b. remaining with participants throughout the event
    c. signaling the timekeeper when a team is finished
    d. ensuring that tractors are in perfect running order after the repair event is completed.

EVENT COMPONENTS

A. Procedures for the Written Test

1. Advisors of teams competing in the event are responsible for submitting 10 test questions to the State Executive Director at least 10 days before the event. The State Executive Director serving as event coordinator selects 50 questions for the test. The written test questions are not made available to participant before the testing event.
2. Each participant must take the written test. The test is composed of 50 true/false and multiple-choice questions.
3. The time limit for the test is 25 minutes.
4. Each question is worth one point. The highest score per team member is 50 points; the highest team score is 100 points.
5. All questions will be taken from the following references:
    a. Tractor Maintenance—Principles and Procedures (AAVIM)
    b. Fundamentals of Service: Tractors (John Deere)
    c. Fundamentals of Maintenance Service (John Deere)
    d. Fundamentals of Machine Operation: Agricultural Machinery Safety (John Deere).
    e. Fundamentals of Service: Engines (John Deere).

B. Procedures for the Diagnostic Event

1. The number of tractors used in the event is equal to the number available.
2. Each event has two malfunctions. A short description of the problem to be diagnosed appears on each tractor.
3. Each team has 15 minutes per tractor to identify the two malfunctions. No repair work is done in this phase of the event.
4. Teams rotate to each tractor in the event.
5. Different tractor models, including both gasoline and diesel engines, are used in the event.
6. Malfunctions relate to air; fuel; power train; and electrical, braking, and hydraulic systems.
7. A list of possible malfunctions is provided at the end of the event rules.
8. Teams receive 10 points for each malfunction that is diagnosed correctly.

C. Procedures for the Repair Event

1. After the diagnostic event, teams draw for tractors.
2. Each team has 20 minutes to correct the two malfunctions.
3. Road testing of tractors is not allowed.
4. New parts are not provided. If a part is broken by the team, no credit is given for repairing the malfunction. If a defective part is found, the original part is made available for replacement.
5. All work must be performed within the designated repair area. Only judges and team members are allowed in this area.
6. Stall testing is not allowed.
7. Test equipment used by the teams in making repairs is left by the tractor for use by the judges in checking the completed work.
8. Once repairs are completed, the tractor should operate according to standards provided by the event coordinator prior to the event.
9. Teams earn 50 points per corrected malfunction. The following standards apply:
    a. Timing is within 2 degrees of specification.
    b. Point gap is within .002 of specification.
    c. Engine speed is within 50 rpm of specification.
    d. Bolts are torqued within 10 lbs. of specification.

e. Clutch free travel is within 1/2" of specification.
f. Brake pedal travel is within 1" of specification.
g. Valve clearance is within .001 of specification.
h. Other standards are announced before the event.

10. Teams completing repair work before 20 minutes have elapsed receive additional credit of two points for each minute or major fraction thereof left in the 20-minute time period.
11. If a mechanical failure over which no one has any control should occur, the event is deemed an act of nature without claim or recourse on behalf of the participant.
12. The event committee rules on any condition not covered herein. Their decision is final.

RESULTS:

Top individuals and teams will be recognized at the state fair at the conclusion of the event.

TIEBREAKERS:

The following activities are used to break a tie between teams or individuals. The win goes to the individual or team with the highest written examination score(s). If still tied, the win goes to the individual or team with the most correct answers during event 1. If still tied, the win goes to the team with the fastest time in the repair event.

Tractor Troubleshooting Score Sheet

EVENT TOTAL

Written Test

1 point per question answered correctly
(50 questions x 2 students = 100 total possible points)

Diagnosis

10 points per correctly diagnosed malfunction
(100 possible points)
Tractor A __
Tractor B __
Tractor C __
Tractor D __
Tractor E __
Tractor F __

Repair

50 points per correction x 2 corrections = 100 points possible
__ engine speed within 50 rpm of specification
__ bolts torque within 10 lbs of specification
__ cluth free travel within ½" of specification
__ brake pedal travel within 1" of specification
__ other standards announced prior to the event

Safety

Minus 10 points total for **NOT** using safety glasses

GRAND TOTAL _____

ENGINE MALFUNCTIONS

The following list contains example of engine and hydraulic system malfunctions for both diesel and gasoline tractors.

Diesel Tractor

Failure of Engine To Crank
•duel-range shift lever not in neutral position
•loose, grounded, shorted, or broken wiring
•discharged or weak battery
•inoperative starting motor

Engine Cranks but Fails To Start

Fuel System

•lack of fuel in tank
•excessive air
•fuel shut-off control rod in the "off" position
•fuel tank sediment bowl shut-off valve in the "off" position
•fuel filters clogged
•injection pump idle speed set too slow

Air System

•air cleaner inlet tube restricted
•plugged or clogged air cleaner

Rough Engine Operation

•injection pump incorrectly timed
•faulty injectors
•faulty injection pump

Excessive Engine Exhaust Smoke

•faulty injectors
•incorrect injection pump timing
•clogged air cleaner
•improper valve adjustment
•burned, worn, or sticking valves
•excessive operation at low idle speed or loads

Loss of Power

•plugged fuel filter
•worn rings, pistons, or sleeves, burned or sticking valves
•faulty injection pump governor action
•faulty throttle or governor linkage
•blown head gasket
•brakes dragging
•improper valve adjustment
•connecting rod or main bearings too tight
•clogged air cleaner
•fuel shut-off rod linkage incorrect
•faulty pump timing

Excessive Fuel Consumption

•faulty injectors
•pump timing incorrect
•excessive fuel pressure line leakage
•throttle linkage incorrect
•burned, worn, or sticking valves
•worn pistons, rings, or sleeves
•improper valve adjustment, worn or bent push rods
•engine overheating
•clutch slippage
•brakes dragging
•excessive exhaust back pressure
•faulty cooling system thermostat
•clogged air cleaner or air pipe

Erratic Misfire

•faulty injectors
•weak or broken valve springs
•sticky valves
•excessive air in the system
•plugged fuel filters
•water in fuel

Gasoline Tractor

Failure of Engine To Crank

•dual-range shift lever not in neutral position
•loose, grounded, shorted, or broken wiring
•discharged battery
•inoperative starting motor

Engine Cranks but Fails To Start

(Ignition Spark Failure)
•loose, grounded, shorted, or broken ignition wiring
•mechanical failure of spark plugs-cracked or broken porcelain, incorrect gap setting, electrodes fouled
•distributor failure
•faulty coil

Engine Cranks but Fails To Start

(Carburetion Failure)
•choke not pulled out when engine is cold
•throttle closed
•fuel shut-off valve not open
•fuel tank empty
•clogged vent in fuel cap
•clogged fuel filter or screens
•restricted fuel line
•restricted carburetor passages
•maladjustment of needle valves
•water deposits in carburetor
•air cleaner inlet tube restricted
•clogged air cleaner
•throttle and/or governor linkage inoperative or incorrectly adjusted
•air leak in fuel line
•cracked or broken intake manifold
•valves sticking

Engine Cranks Slowly

•weak battery
•crankcase oil too heavy for temperature
•defective starter or connections

Excessive Fuel Consumption

•fuel leak
•fouled air cleaner
•idle adjustment incorrect
•main jet adjustment incorrect

Updated 06/13/2017

•timing incorrect
•automatic spark advance not working properly
•distributor points need replacing
•spark plugs need torquing or replacing
•faulty wiring
•improper valve timing
•burned, worn, or sticking valves
•worn pistons, rings, or sleeves
•improper valve adjustment, worn or bent push rods
•engine overheating
•clutch slipping
•brakes dragging
•excessive exhaust back pressure

Excessive Oil Consumption
•oil leak
•plugged breather pipe
•worn valve guides
•worn, broken, or ill-fitted rings
•worn, scored, or out-of-round cylinders or pistons
•worn ring grooves
•inverted rings
•stuck piston rings
•worn neoprene oil guard gaskets on the intake valves

Loss of Power
•dirty or improperly adjusted carburetor
•faulty ignition
•worn rings, pistons, or sleeves; burned or sticking valves
•faulty governor operation
•faulty throttle, governor, or choke linkage
•crank in intake manifold or leaky gasket
•blown head gasket
•brakes dragging
•improper valve adjustment, worn or bent push rods
•connecting rods or main bearings too tight
•excessive exhaust back pressure
•clogged air cleaner

Erratic Misfire
•dirty carburetor
•weak or broken valve springs
•sticking valves
•faulty ignition

Pre-ignition
•poor grade of fuel
•ignition timing too far advanced
•engine overheating
•heavy carbon deposits in the combustion chamber
•spark plugs of improper heat range
•insufficient tappet clearance
•burned or worn valves
•improper distributor advance

Continuous Misfire
•stuck or burned valves
•blown head gasket
•faulty ignition
•improper timing

Engine Overheating
•thermostat stuck closed
•water leakage
•fan belt slippage
•clogged radiator core
•carburetor mixture too lean
•improper ignition timing
•fouled cooling system
•engine too tight
•improper valve timing

Hydraulic System Problems

Low Oil Pressure (Power Shift Transmission)
•clogged transmission oil filter element
•clogged hydraulic oil filter element
•low oil supply

Transmission Oil Overheats
(Power Shift Transmission)
•low oil supply
•oil cooler air passages clogged
•excessive shifting under heavy load

Hydraulic Oil Overheats
•low oil supply
•oil cooler air passage clogged

Insufficient Hitch Transport Clearance
•center link too long
•lift links too long
•implement not level
•implement improperly adjusted

Hitch Fails To Lift
•excessive load on hitch
Hitch Drops Slowly
•speed-of-drop valve set improperly

Hitch Too Active
•selector lever in wrong position
No Hitch Response To Draft Load
•selector level in wrong position
•speed-of-drop too slow

Remote Cylinder Will Not Lift Load
•excessive load
•breakaway coupler not completely engaged

Remote Cylinder Rate of Travel Incorrect
•incorrect flow control valve setting

No Remote Cylinder Float Position
•control rod in lower hole on control lever

Direction of Remote Cylinder Travel Reversed
•improper hose connections

Brake Pedal Bottoms When Engine Stops
•bleed screws left open
•air in system

Updated 06/13/2017