UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
PSC Box 20041
Camp Lejeune, North Carolina 28542-0041

FESCR 8203

STUDENT OUTLINE

REBUILD AMERICAN BOSCH FUEL NOZZLE

LEARNING OBJECTIVE

1. Terminal Learning Objective: Provided with faulty nozzles, required tools, test equipment, replacement parts, shop supplies, cleaning materials, and references, rebuild the nozzles to a serviceable condition, per the references. (3524.06.10)

2. Enabling Learning Objectives:

a. Provided with a faulty American Bosch fuel nozzle, required tools, test equipment, replacement parts, shop supplies, cleaning materials, TM 9-2815-220-34, Nozzle Multiclean Operating and Servicing Manual, and Nozzle Testmaster Operating and Servicing Manual, perform a nozzle pretest, per the references. (3524.06.10a)

b. Provided with a faulty American Bosch fuel nozzle, required tools, test equipment, replacement parts, shop supplies, cleaning materials, and TM 9-2815-220-34, disassemble the nozzle, per the reference. (3524.06.10b)

c. Provided with a faulty American Bosch fuel nozzle, required tools, test equipment, replacement parts, shop supplies, cleaning materials, TM 9-2815-220-34 and Nozzle Multiclean Operating and Servicing Manual, inspect the nozzle components for serviceability, per the references. (3524.06.10c)

d. Provided with a faulty American Bosch fuel nozzle, required tools, test equipment, replacement parts, shop supplies, cleaning materials, TM 9-2815-220-34, replace the unserviceable components, per the reference. (3524.06.10d)

e. Provided with a faulty American Bosch fuel nozzle, required tools, test equipment, replacement parts, shop supplies, cleaning materials, and TM 9-2815-220-34, assemble the nozzle, per the reference. (3524.06.10e)

f. Provided with a faulty American Bosch fuel nozzle, required tools, test equipment, replacement parts, shop supplies, cleaning materials, TM 9-2815-220-34, Nozzle Multiclean Operating and Servicing Manual, and Parts List and Operating Instructions for Fuel Injector Nozzle Tester, calibrate the Nozzle, per the references. (3524.02.10f)

OUTLINE

1. COMPOSITION AND DESIGN CHARACTERISTICS OF AMERICAN BOSCH FUEL NOZZLES

a. The upper nozzle body is one of the largest components and contains a high pressure inlet connection at the upper end, a high pressure fuel passage, or duct, a leak-off duct and leak-off connection. The lower end of the body is machined to accept the pressure adjusting spring and spacers. The lower face is lapped to a fine surface finish to mate with the lower nozzle body.

b. The lower spring seat provides a seat for the pressure adjusting spring and a piloting surface for the nozzle valve.

c. The nozzle spacer is just what its name implies. It is located in the space between the upper and lower nozzle body. The nozzle spring and lower springs seat that was just mentioned are contained in the spacer. Both faces of the spacer are lapped to a fine finish to provide gasketless, high pressure sealing surfaces between the upper and lower nozzle bodies. The spacer also acts as a valve stop.

d. The lower nozzle body contains the spray holes for the discharge of fuel. It also contains the nozzle valve, which controls the flow of fuel.

e. The nozzle capnut encompasses the lower nozzle body and also secures the lower nozzle body and spacer to the upper nozzle body.

f. The last component is the nozzle retainer, also one of the larger components. The nozzle retainer is located around the outside of the upper nozzle and is used to secure the complete nozzle assembly into the engine.

2. PRINCIPLES OF OPERATION

a. This nozzle is a closed, differential, hydraulically operated type.

(1) Closed means the nozzle is composed entirely of closed lines and passages where the fuel is not open to the atmosphere.

(2) Differential means the nozzle is operated by fuel pressure acting on the differential surface of the nozzle valve. The differential

surface is nothing more than a larger surface or shoulder on the valve. Fuel enters under this differential surface and pushes upward to unseat the valve.

(3) Hydraulically operated means it is operated by fluid under pressure. The fluid is the fuel and the pressure is created by the fuel injection pump.

b. Fuel, under high pressure created by the fuel injection pump, enters the nozzle assembly at the fuel inlet fitting at the top of the nozzle and flows down the high pressure passage, or duct, through the nozzle spacer duct and into the pressure chamber in the lower nozzle body.

c. When the fuel pressure exerts sufficient force on the differential surface of the valve to overcome the opposing spring preload, the valve is lifted off its seat, thus allowing fuel to enter the sac where it is directed through the spray holes into the combustion chamber. The fuel is atomized as it exits the spray holes and enters the combustion chamber.

d. At the end of the pump injection stroke, there is a sudden drop in line pressure which results in a rapid pressure drop in the nozzle pressure chamber. Since the pressure adjusting spring is exerting a downward force on the nozzle valve and is no longer opposed by fuel pressure in the chamber, the valve is immediately reseated in the nozzle body, closing the nozzle.

e. A slight amount of controlled clearance between the nozzle valve outside diameter and the nozzle body inside diameter allows a small amount of leakage past the valve into the adjusting spring chamber in the nozzle spacer. This leakage is required to provide lubrication for the valve spring seat and adjusting spring.

3. NOZZLE IDENTIFICATION DATA

a. All nozzles are marked with a series of letters and numbers for identification purposes. One set of letters and numbers is located on the upper nozzle body and another is located on the lower nozzle body. These letters and numbers are codes used by the manufacturer to indicate such things as nozzle type, length and diameter, opening pressure requirements, spray cone angles, special features, minor changes, and type of material used in production of the nozzles.

b. These identification letters and numbers do not identify anything for us but they must be used when ordering replacement components to repair a nozzle. Make certain that you use replacement parts with exactly the same numbers as those on parts you are replacing.

4. PROCEDURES REQUIRED TO REPAIR AND TEST THE AMERICAN BOSCH FUEL NOZZLE

a. Instructions

(1) Detailed instructions for repairing the nozzle are contained in the manual that was issued to you at the beginning of this block of instruction. Follow those instructions carefully to effect those repair procedures on the training aid nozzle to which you have been assigned.

(2) Have the instructor assigned to your station check your work at each point designated in this student outline.

(3) Refer to TM 9-2815-220-34 for the procedures used to perform the repair steps listed. Use the index to locate the instructions in the manual and read the instructions carefully before performing each task.

b. Disassemble the Nozzle

(1) Remove the copper gasket.

(2) Remove the preformed packings.

(3) Remove the connector tube.

(4) Loosen the capnut.

(5) Remove the capnut.

(6) Remove the retainer spring.

(7) Remove the lower nozzle body and valve.

(8) Remove the nozzle spacer.

(9) Remove the lower spring seat.

(10) Remove the nozzle spring.

(11) Remove the spring seat.

(12) Remove the shims.

(13) Remove the seat spacer.

(14) Remove the nozzle retainer from the upper nozzle body.

(15) Remove the preformed gasket from the upper nozzle body.

STOP! Have instructor initial.

c. Cleaning and Inspection

(1) Clean the nozzle components.

(2) Inspect the lower nozzle body.

(3) Inspect the nozzle valve.

(4) Install the nozzle valve into the lower nozzle body and check movement.

(5) Explain to the instructor the procedures for lapping sealing surfaces.

STOP! Have instructor initial.

(6) Inspect the nozzle spacer.

(7) Measure the pounded area of the nozzle spacer.

Record Reading _____.

(8) Inspect the nozzle spring.

(9) Inspect the retaining spring.

(10) Inspect the nozzle spring seats.

(11) Inspect the seat spacer and shims.

(12) Inspect the upper nozzle body.

(13) Inspect the nozzle retainer.

(14) Inspect the capnut.

(15) Inspect the tube connector.

STOP! Have instructor initial.

d. Assemble the Nozzle

(1) Install the nozzle valve into the lower nozzle body.

(2) Install the preformed packings.

(3) Install the upper spring seat, shims, and seat spacer onto the nozzle spring.

(4) Install the upper spring seat, shims, seat spacer and spring into the upper nozzle body.

(5) Install the lower spring seat.

STOP! Have instructor initial.

(6) Install the nozzle retainer.

(7) Install the nozzle spacer.

(8) Install the retainer spring.

(9) Install the lower nozzle body and valve.

(10) Install the capnut.

(11) Torque the capnut.

STOP! Have instructor initial.

e. Test the Nozzle

(1) Mount the nozzle on the nozzle tester.

(2) Perform the opening pressure test.

(3) Perform the nozzle spray pattern test.

(4) Perform the nozzle leakage test.

(5) Perform the chatter test.

(6) Remove the nozzle from the tester.

STOP! Have instructor initial.

REFERENCE

TM 9-2815-220-34
Nozzle Multiclean
Nozzle Tester