| **COMPETENCY BASED LEARNING MATERIAL** | |  |
| --- | --- | --- |
|  | |  |
| drive train drivetrain2drive train1 | | | |
| *Sector:* AUTOMOTIVE/LAND TRANSPORT SECTOR | | | |
| *Distinctive Area of Competence and Qualifications:* **Automotive Servicing NC I** | | | |
| *Unit of Competency:* Perform Periodic Maintenance of Drive Train | | | |
| Module Title:  **Performing Periodic Maintenance of Drive Train** | | | |
| C:\Users\AIT\Desktop\logo.jpg | **AUTOHUB INSTITUTE OF TECHNOLOGY** | | |

# 

**NATIONAL CERTIFICATE LEVEL 1**

**QUALIFICATION LEVEL**

**COMPETENCY-BASED LEARNING MATERIALS**

| **No.** | **Basic Competencies** | **Module Title** | **Code** |
| --- | --- | --- | --- |
|  | Receive and Response to Workplace Communication | Receiving and Responding to Workplace Communication | 500311101 |
|  | Work with Others | Working with Others | 500311102 |
|  | Demonstrate Work Values | Demonstrating Work Values | 500311103 |
|  | Practice Housekeeping Procedures | Practicing Housekeeping Procedures | 500311104 |

| **No.** | **Common Competencies** | **Module Title** | **Code** |
| --- | --- | --- | --- |
|  | Validate Vehicle Specification | Applying Appropriate Sealant/Adhesive | ALT723201 |
|  | Move and Position Vehicle | Moving and Positioning Vehicle | ALT832212 |
|  | Utilize Automotive Tools | Performing Housekeeping | ALT723214 |
|  | Perform Mensuration and Calculation | Performing Mensuration and Calculation | ALT723215 |
|  | Utilize Workshop Facilities And Equipment | Performing Safety Practices | ALT723216 |
|  | Prepare Servicing Parts and Consumables | Reading, Interpreting and Applying Specifications and Manuals | ALT723217 |
|  | Prepare Vehicle For Servicing and Releasing | Using and applying Lubricant/Coolant | ALT723218 |

| **No.** | **Core Competencies** | **Module Title** | **Code** |
| --- | --- | --- | --- |
|  | Perform Pre-Delivery Inspection | Performing Pre-Delivery Inspection | ALT723372 |
|  | Perform Periodic Maintenance of Engine | Performing Periodic Maintenance of Engine | ALT723373 |
|  | **Perform Periodic Maintenance of Drive Train** | **Performing Periodic Maintenance of Drive Train** | **ALT723374** |
|  | Perform Periodic Maintenance of Brake System | Performing Periodic Maintenance of Brake System | ALT723375 |
|  | Perform Periodic Maintenance of Suspension System | Performing Periodic Maintenance of Suspension System | ALT723376 |
|  | Perform Periodic Maintenance of Steering System | Performing Periodic Maintenance of Steering System | ALT723377 |

**HOW TO USE THIS COMPETENCY BASED LEARNING MODULE**

Welcome to the Module: **Performing Periodic Maintenance of Drive train**. This module contains training materials and activities for you to complete.

The unit of competency ***Perform Periodic Maintenance of Drive Train*** contains the knowledge, skills and attitudes required for ***Automotive Servicing NC I*** . It is one of the Core Modules at ***National Certificate Level I (NC I )***.

You are required to go through a series of learning activities in order to complete each learning outcome of the module. In each learning outcome there are Information Sheets, Resource Sheets and Reference Materials for further reading to help you better understand the required activities. Follow these activities on your own and answer the self-check at the end of each learning outcome. Get the answer key from your instructor and check your work honestly. If you have questions, please don’t hesitate to ask your facilitator for assistance.

**Recognition of Prior Learning (RPL)**

You may already have some or most of the knowledge and skills covered in this module because you have:

* been working for someone
* already completed training in this area

If you can demonstrate to your trainer that you are competent in a particular skill or skills, talk to him/her about having them formally recognized so you won’t have to do the same training again. If you have qualifications or Certificates of Competency from previous trainings, show them to your trainer. If the skills you acquired are still relevant to this module, they may become part of the evidence you can present for RPL.

At the end of this learning material is a Learner’s Diary, use this diary to record important dates, jobs undertaken and other workplace events that will assist you in providing further details to your trainer or assessors. A Record of Achievement is also provided for your trainer to complete once you completed the module.

This learning material was prepared to help you achieve the required competency, in **Performing Periodic Maintenance of Drive Train NC I**. This will be source of information for you to acquire the knowledge and skills in this particular trade independently and your own pace with minimum supervision or help from your instructor.

In doing the activities to complete the requirements of this module, please be guided by the following:

* Talk to your trainer and agree on how you will both organize the training under this module. Read through the module carefully. It is divided into sections that cover all the skills and knowledge you need to successfully complete.
* Work through all information and complete the activities in each section. Read the information sheets and complete the self-checks provided in this module.
* Most probably your trainer will also be your supervisor or manager. He/She is there to support you and show you the correct way to do things. Ask for help.
* Your trainer will tell you about the important things you need to consider when you are completing the activities and it is important that you listen and take notes.
* You will be given plenty of opportunities to ask questions and practice on the job. Make sure you practice your new skills during regular work shifts. This way you will improve both your speed and memory and also your confidence.
* Talk to more experienced work mates and ask for their guidance.
* Use self-check questions at the end of each section to test your own progress.
* When you are ready, ask your trainer to watch you perform the activities outlined in this module.
* As you work through the activities, ask for written feedback on your progress. Your trainer keeps feedback/pre-assessment reports for this reason. When you have completed this learning material and feel confident that you have had sufficient knowledge and skills, your trainer will arrange an appointment with a registered assessor to assess you. The results of the assessment will be recorded in your Competency Achievement Record.

**TABLE OF CONTENTS**

QUALIFICATION : Automotive Servicing NC I

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive train

MODULE TITLE : **Performing Periodic**

**Maintenance of Drive Train**

**CORE COMPRETENCY**

| **ELEMENTS** | **PERFORMANCE CRITERIA** | **PAGE** |
| --- | --- | --- |
| 1. Perform Pre-Service Preparation | * 1. Pre-delivery Checklist is obtain , Vehicle is identify and locate base on the PDI documents. Required Items for PDI are prepared based on the prescribed PDI process, Coordinate transfer of vehicle to the designated/appropriate place for PDI. |  |
| 1. Conduct Preventive Maintenance of Drive Train | * 1. Walk-around is conducted according to industry practices .Factory-loaded parts are inspected following manufacturer standard procedure. Vehicle is restored following standard operating procedures, Vehicle is checked following standard operating procedures. Minor corrective measures are applied following manufacture’s manual, Inspection Checklist is accomplish based on manufacture’s standards   2. PPEs are worn based on OSHS. |  |
| 1. Perform post-service activities | * 1. Injection re-checking timing device is used without error   2. Interpreted result is without error   3. Timing advance operation checked |  |
|  |  |  |
|  |  |  |

QUALIFICATION : Automotive Servicing NC I

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

PERFORMANCE CRITERIA:

1. **LO 1: Perform Pre-Service Preparation** 
   1. Job requirements are determined based on drive train repair order
   2. Servicing information is sourced from service manual
   3. Vehicle mileage is used as reference for changing fluid following

manufacturer’s specification

* 1. Fluid condition are inspected according to manufacturer’s service workshop

manual

* 1. Fluids are acquire according to vehicle specification
  2. Tools are prepared based on the drive train repair order
  3. Hazard and risk associated in the workplace are manage following OSHS.

1. **LO 2: Conduct Periodic Maintenance of Drive Train**

2.1 Fluids are replaced according to manufacturer’s service manual.

2.2 Drain plug is cleaned following manufacturer’s service manual

2.3 Propeller shaft are lubricated according manufacturer’s service workshop

manual

2.4 Cracks and leaks of drive train components are inspected following

manufacturer’s service workshop manual.

2.5 Findings are reported to immediate supervisor following company operating

procedures.

2.6 Safety practices are applied following OSHS. on manufacture’s standard

* 1. PPEs are worn

1. **LO 3: Perform Post-Service Activities**

3.1 Fluid level is confirmed following company’s standard procedure.

3.2 Initial quality inspection is performed based on workplace procedure

3.3 Vehicle is turned over to immediate supervisor for final inspection to ensure

work is done according to workplace standard expectations

3.4 Waste are disposed according to good house keeping practices

3.5 Job done is written down on the repair order.

3.6 Workplace is restored according to company’s standard procedure.

3.7 Safety practices are applied following OSHS

.

**RESOURCES:**

Jack Erjavec & Robert scharff, **Automotive Technology, A system Approach**, 2nd Ed.

Crouse, W.H. and Anglin, D.L., **Automotive Mechanics,** 10th Ed.,

Santos, G.N. and Lebron G.B., **Chemistry.**

Don Kowels, **Basic Automotive Service and Maintenance.**

QUALIFICATION : Automotive Servicing NC I

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 1 : Perform Pre-Service Preparation**

PERFORMANCE CRITERIA

**LO 1: Perform Pre-Service Preparation**

* 1. Job requirements are determined based on drive train repair order
  2. Servicing information is sourced from service manual
  3. Vehicle mileage is used as reference for changing fluid following

manufacturer’s specification

* 1. Fluid condition are inspected according to manufacturer’s service workshop

manual

* 1. Fluids are acquire according to vehicle specification
  2. Tools are prepared based on the drive train repair order
  3. Hazard and risk associated in the workplace are manage following OSHS.

RESOURCES:

1. Jack Erjavec and Robert scharff, **Automotive Technology, A system Approach**, 2nd Ed.
2. Crouse, W.H. and Anglin, D.L., **Automotive Mechanics,** 10th Ed.,
3. Santos, G.N. and Lebron G.B., **Chemistry.**
4. Don Kowels, **Basic Automotive Service and Maintenance.**

**INFORMATION SHEET : 1**

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive

Train

MODULE TITLE : Performing Periodic Maintenance of Drive

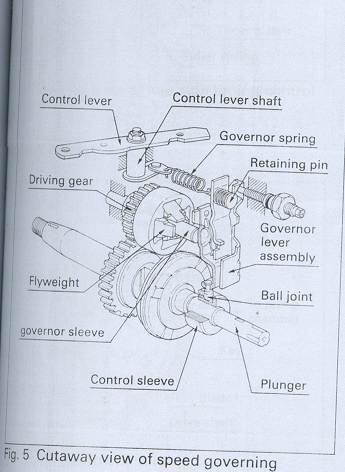
Train

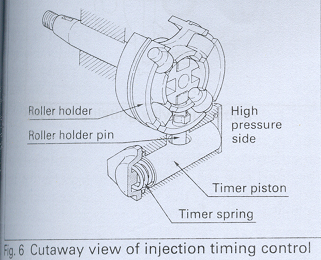
**LEARNING OUTCOME 1 : Perform Pre-Service Preparation**

**Pre-delivery Inspection Checklist**

\*\*\*In the lower part of the injection pump is the timer, in the centre of which the timer piston is positioned.

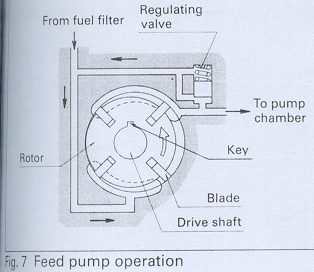
One the lower pressure side of the timer piston is a timer spring with a predetermine set force; the pump chamber fuel oil pressure acts on the opposite side (high pressure side). The timer piston position changes in accordance with the balance of these two forces, to rotate the roller holder via the roller holder pin. When the timer piston compresses the timer spring, the injection timing is advanced (the roller holder rotates in the reverse rotation direction), and through the timer piston movement on the opposite direction the injection timing is retarded. Injection timing is controlled by the above.



****

**FEED PUMP**

The feed pump comprises a rotor, blades and liner. Drive shaft rotation is transmitted through a key to the rotor to rotate the rotor. The inside circumference of the liner is eccentric to the centre of rotor rotation. Four blades are installed in the rotor. Centrifugal force forces the blades outward during rotation to contact the inside surface of the liner and form four fuel oil chambers. Therefore, the volume of these four chambers increase through rotor rotation to suck fuel oil from the fuel tank. Conversely, when the volume of these four chambers decrease fuel oil is pressurized.



**REGULATING VALVE**

Feed fuel pump oil delivery pressure increases proportionately with an increase in an injection pump speed. However, the total fuel oil injection quantity necessary for the engine is considerably less than the delivered by the feed pump. Therefore, In order to prevent an excessive increase in the pump chamber pressure caused by the excess oil, and to adjust the pump chamber pressure so that it is usually within the specified limit, a regulating valve is installed near the feed pump outlet. The timer performs timing control using the pump chamber pressure, which is regulated by the regulating valve.

**INJECTION PUMP TIMING.**

The injection pump is synchronized or timed to the engine’s crankshaft through drive gears. The pump is designed to create or build up high pressure (15,000 psi to as high as 30,000 psi). This allows the diesel fuel to be injected into the cylinder as a fine mist or spray. As a mist, the fuel rapidly evaporates when it is introduced to the high pressure, temperature air charge in the cylinder and allows for ignition of the fuel. In order for the engine to operate smoothly, the following fuel injection conditions must exist.

* Pressure must be available at the precise instant of fuel injection into the chamber.
* Injection rate must be equal for all the cylinders so there are equal power pulses from each cylinder.
* Pressure must shut off at the precise instant to control the total amount of fuel to be injected.

SELFCHECK : 1

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 1 : Perform Pre-Service Preparation**

ANSWER THE FOLLOWING QUESTIONS:

1. In setting Injection timing, first, technician A says set first the piston 1 to top dead center, while technician B says set the timing mark first. Who is correct?
2. Technician A c. Both A and B
3. Technician B d. Neither A nor B
4. Which of the following is *not* an advantage that fuel injection offers over carburetion?
5. Learner air/fuel ratio
6. Better fuel economy
7. No choke requirements
8. Lower engine torque
9. The length of time that an injector is energized is called \_\_\_\_\_\_\_\_\_\_\_\_\_.
10. Intermittent system
11. Pulse system
12. Injector pulse width
13. Open loop mode
14. The governor on a diesel injection system is responsible for \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
15. Injection timing
16. Injection timing advance
17. Fuel metering
18. Both A and B

**ANSWER SHEET : 1**

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 1 : Perform Pre-Service Preparation**

1. A
2. C
3. C
4. B

QUALIFICATION : Automotive Servicing NC I

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 2 : Conduct Periodic Maintenance of Drive**

**Train**

PERFORMANCE CRITERIA

**LO 2: Conduct Periodic Maintenance of Drive Train**

2.1 Fluids are replaced according to manufacturer’s service manual.

2.2 Drain plug is cleaned following manufacturer’s service manual

2.3 Propeller shaft are lubricated according manufacturer’s service workshop

manual

2.4 Cracks and leaks of drive train components are inspected following

manufacturer’s service workshop manual.

* 1. Findings are reported to immediate supervisor following company operating

procedures.

2.6 Safety practices are applied following OSHS. on manufacture’s standard

2.7 PPEs are worn

**RESOURCES:**

Jack Erjavec & Robert scharff, **Automotive Technology, A system Approach**, 2nd Ed.

Crouse, W.H. and Anglin, D.L., **Automotive Mechanics,** 10th Ed.,

Santos, G.N. and Lebron G.B., **Chemistry.**

Don Kowels, **Basic Automotive Service and Maintenance.**

INFORMATION SHEET : 2

QUALIFICATION : Automotive Servicing NC I

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 2 : Conduct Periodic Maintenance of Drive**

**Train**

**Physical Inspection**

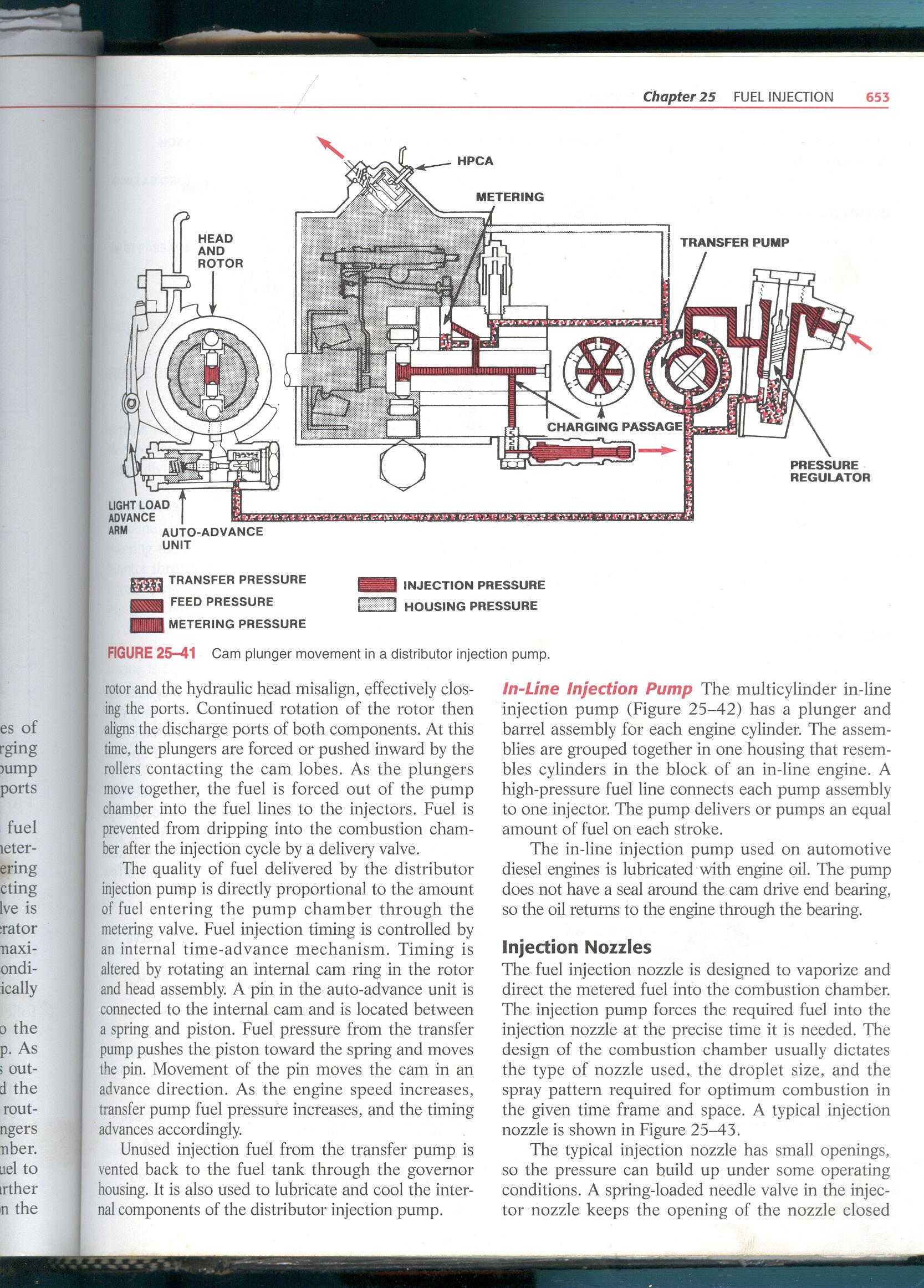
Some distributor pump designs are a single unit, mad up of a supply pump, governor and injection pump. The supply pump draws the fuel from the fuel tank and delivers it to the distributor pump housing. The injection pump then increases the fuel pressure to the levels needed for the combustion. The **governor** controls the speed of the engine.

Other designs contain a transfer pump, governor, and injection pump within the distributor pump housing. This design also uses an external supply pump to deliver fuel to the transfer pump. The transfer pump increase fuel pressure and passes the fuel on to the injection pump where it is further pressurized for injection into the cylinders.

**A. Distributor Injection Pumps.**

A distributor injection pump is driven by engine’s crankshaft by timing gears. These gears drive the pump rotor, which is fitted into a close-tolerance bore. There are two types of distributor pumps. One type uses two plungers that operate in a cross-drilled bore in the distributor rotor. The other type uses a single plunger. The two-plunger design allows the plungers to move outward the opposite each other when the pump chamber is filled with fuel. The plungers are forced together by internal cam lobes. This reduces the size of the chamber and forces fuel through injectors. Typical cm plunger movement in a distributor injection pump is shown in Figure 25-41.

As the rotor turns, the holes in the rotor and the pump’s head align with each other and allow fuel to flow between the rotor and the head. When the holes are misaligned, fuel flow stops. The holes in both components are referred to as ports. Two types of ports are utilized: charging ports and discharging ports. When the charging ports are aligned, the pump chamber fills with fuel. When the discharging ports are aligned, fuel injection takes place.



A vane transfer pump draws and pushes fuel through passages in the pump’s head to a fuel metering valve. The size of the opening in the metering valve is controlled by the accelerator pedal acting through governor. A small opening in the valve is maintained in idle speed. Depressing the accelerator causes the valve opening to increase. When the maximum engine speed is attained or an over speed condition exists. The governor takes over and automatically begins to close the valve.

Fuel from the metering valve is routed to the charging ports on the distributor injection pump. As the fuel inters the pump, it forces the plunger outward or away from each other. At idle speed the metering valve is almost closed. Very little fuel if routed to the pump chamber. This forces the plungers slightly outward, partially charging the chamber. Depressing the accelerator pump causes more fuel to enter the chamber and forces the plungers farther apart. As the rotor turns, the charging ports on the rotor and the hydraulic head misalign, effectively closing the ports. Continued rotation of the rotor then aligns the discharge ports of both components. At this time, the plunger are forced or pushed inward by the rollers contacting the cam lobes. As the plungers move together, the fuel is forced out of the pump chamber into the fuel lines to the injectors. Fuel is prevented from dripping into the combustion chamber after the injection cycle by a delivery valve.

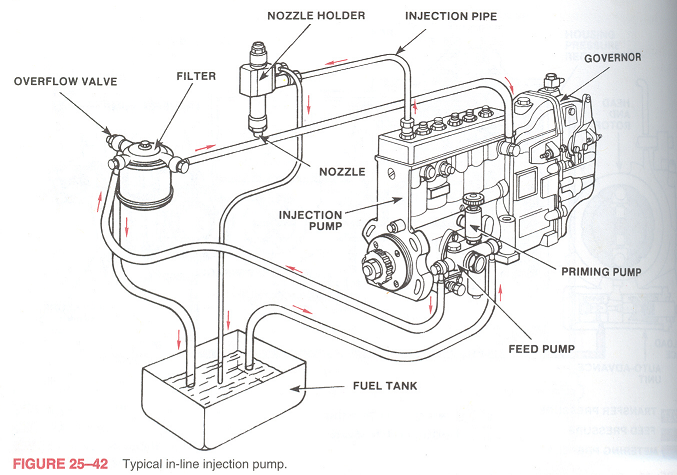
The quality of the fuel delivered by the distributor injection pump is directly proportional to the amount of fuel entering the pump chamber through the metering valve. Fuel injection timing is controlled by the internal time-advance mechanism. Timing is altered by rotating an internal cam ring in the rotor and head assembly. A pin in the auto-advance unit is connected to the internal cam and is located between a spring and piston. Fuel pressure from the transfer pump pushes the piston toward the spring and moves the pin. Movement of the pin moves the can in an advance direction. As the engine speed increases, transfer pump fuel pressure increases, and the timing advance accordingly.

Unused injection fuel from the transfer pump is vented back to the fuel tank through the governor housing. It is also used to lubricate and cool the internal components of the distributor injection pump.

**B. In-Line Injection Pump**

The multicylinder in-line injection pump (Figure 25-42) has a plunger and barrel assembly for each engine cylinder. The assemblies are grouped together in one housing that resembles cylinders in the block of in-line engine. High-pressure fuel line connects each pump assembly to one injector. The pump delivers or pumps an equal amount of fuel on each stroke.

The in-line injection pump used on automotive diesel engines is lubricated with engine oil. The pump does not have the seal around the cam drive end bearing, so the oil returns to the engine through the bearing.



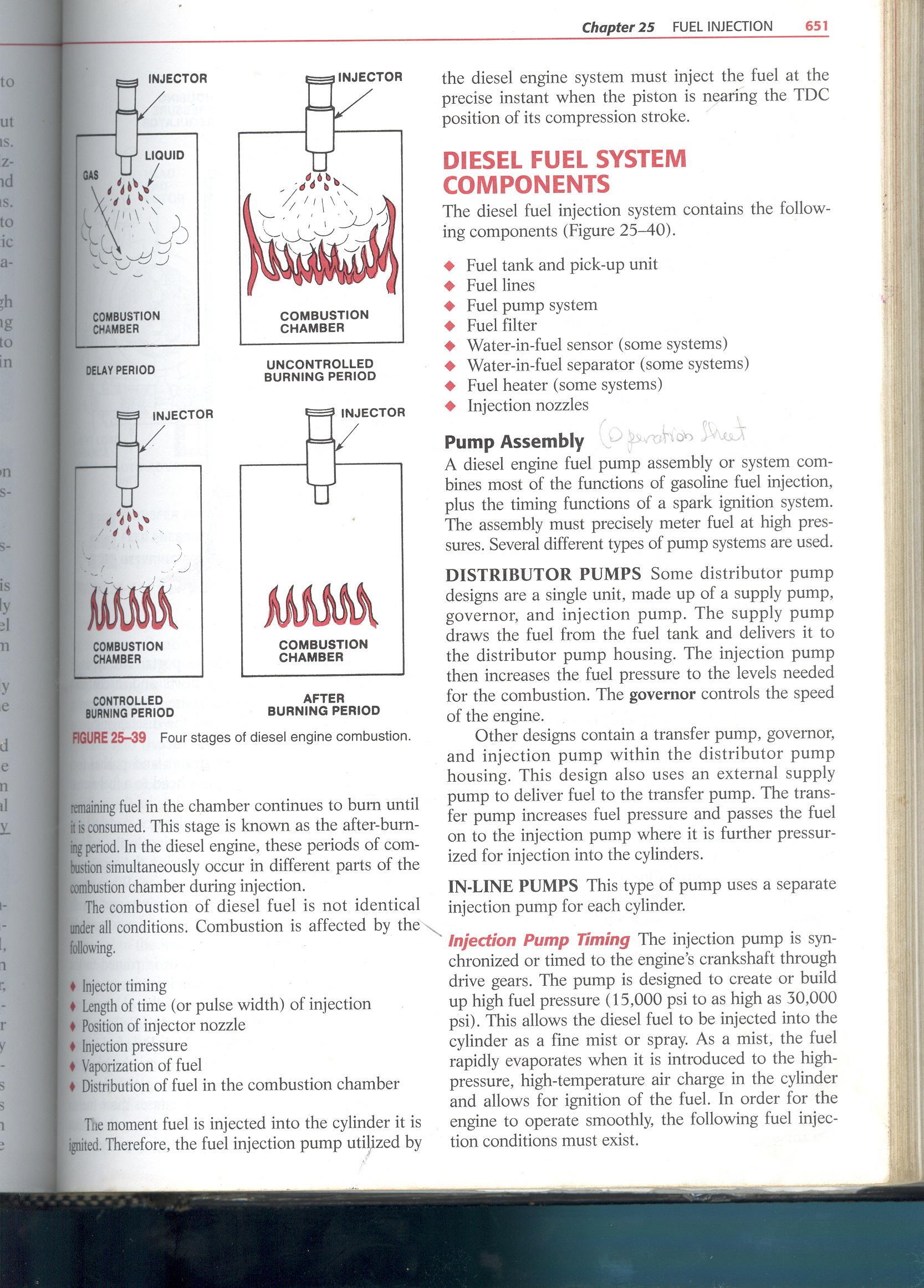
**HIGH-PRESSURE DIESEL FUEL INJECTOR**

All diesel engines use a high-pressure fuel injection system that differs from gasoline fuel injection systems in several key areas.

1. A diesel engine uses higher fuel injection pressures than a gasoline engine.
2. Ignition in a diesel engine takes place as the fuel is injected into the cylinder. The heat of the highly compressed air ignites the fuel charge. A diesel engine does not have an electrical ignition system like that found on gasoline engines.
3. The output power of diesel engine is directly proportional to the fuel charge injected into the combustion chamber.
4. In diesel engines, the amount of fuel to be injected is limited by a governor. This device limits the air/fuel ratio for a diesel engine up to a maximum of 10 to 1 by weight. The air fuel ration of a typical for atypical gasoline engine is approximately 14.7 to 1 by weight.

**Combustion Cycle**

Combustion in a diesel engine occurs in four sequential stages or periods: the delay period, the uncontrolled-burning period, the controlled-burning period, and the after-burning period (Figure 25-39). When the fuel is first injected into the combustion chamber, there is an initial delay as the fuel changes from a liquid state to a vapor or a gas state. This liquid-to-vapor conversion is necessary so the fuel burns. The delay period is followed by a period of uncontrolled burning of the fuel already injected into the chamber. This period is followed by a controlled-burning period as the injector continues to feed fuel into the combustion chamber. If and when the fuel injection stops, all the remaining fuel in the chamber continues to burn until it is consumed. This stage is known as the after-burning period. In the diesel engine, these periods of combustion simultaneously occur in different parts of the combustion chamber during injection.



The combustion of diesel fuel is not identical under all conditions. Combustion is affected by the following.

1. Injector Timing
2. Length of Time (or pulse width) of injection
3. Position of the injector nozzle
4. Injection pressure
5. Vaporization of Fuel
6. Distribution of fuel in the combustion chamber

The moment fuel is injected into the cylinder it is ignited. Therefore, the fuel injection pump utilized by the diesel engine system must inject the fuel at the precise instant when the piston is nearing the TDC position of its compression stroke.

**Pump Assembly**

A diesel engine fuel pump assembly or system combines most of the functions of gasoline fuel injection, plus the timing function of a spark ignition system. The assembly must precisely meter fuel at high pressures. Several different types of pump systems are used.

SELFCHECK : 2

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 2 : Conduct Periodic Maintenance of Drive Train**

ANSWER THE FOLLOWING QUESTIONS:

1. In setting Injection timing, first, technician A says set first the piston 1 to top dead center, while technician B says set the timing mark first. Who is correct?
2. Technician A c. Both A and B
3. Technician B d. Neither A nor B
4. Which of the following is *not* an advantage that fuel injection offers over carburetion?
5. Learner air/fuel ratio
6. Better fuel economy
7. No choke requirements
8. Lower engine torque
9. The length of time that an injector is energized is called \_\_\_\_\_\_\_\_\_\_\_\_\_.
10. Intermittent system
11. Pulse system
12. Injector pulse width
13. Open loop mode
14. The governor on a diesel injection system is responsible for \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
15. Injection timing
16. Injection timing advance
17. Fuel metering
18. Both A and B

ANSWER SHEET : 2

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 2 : Conduct Periodic Maintenance of Drive Train**

1. A
2. C
3. C
4. B

QUALIFICATION : Automotive Servicing NC I

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 3 : Perform Post-Service Activities**

PERFORMANCE CRITERIA

**LO 3: Perform Post-Service Activities**

3.1 Fluid level is confirmed following company’s standard procedure.

3.2 Initial quality inspection is performed based on workplace procedure

3.3 Vehicle is turned over to immediate supervisor for final inspection to ensure

work is done according to workplace standard expectations

3.4 Waste are disposed according to good house keeping practices

3.5 Job done is written down on the repair order.

3.6 Workplace is restored according to company’s standard procedure.

3.7 Safety practices are applied following OSHS

RESOURCES:

Jack Erjavec and Robert scharff, **Automotive Technology, A system Approach**, 2nd Ed.

Crouse, W.H. and Anglin, D.L., **Automotive Mechanics,** 10th Ed.,

Santos, G.N. and Lebron G.B., **Chemistry.**

Don Kowels, **Basic Automotive Service and Maintenance.**

INFORMATION SHEET : 3

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 3 : Perform Post-Service Activities**

**SELF CHECK : 3**

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 3 : Perform Post-Service Activities**

ANSWER THE FOLOWING QUESTIONS:

1. The timer pointer in relation with the timing mark on the timing device hub during injection pump timing procedures should be \_\_\_\_\_\_\_\_\_\_\_\_
2. Near with each other
3. Far from each other
4. In line with each other
5. None of the above
6. Unless injection timing is considered, the engine will\_\_\_\_\_\_\_\_.
7. Still function normally
8. Run the engine but low in power
9. Inefficient in fuel consumption
10. Not operate as it is designed.
11. Which of the following should be done as a preliminary step before attempting an idle adjustment of a fuel injection system?
12. Blocking the drive wheels
13. Connecting the tachometer
14. Checking and adjusting base ignition timing
15. All of the above
16. Bottom-fed injectors are used in \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
17. Throttle body injection system
18. Port injection system
19. Both A and B
20. Neither A nor B

**ANSWER SHEET : LO 3**

UNIT OF COMPETENCY : Perform Periodic Maintenance of Drive Train

MODULE TITLE : Performing Periodic Maintenance of Drive Train

**LEARNING OUTCOME 3 : Perform Post-Service Activities**

ANSWER:

1. The **Throttle Body Injection (TBI)** served as a steeping stone for the carburettors to more advance port fuel injection systems. The throttle body units is similar in size and shape to a carburettor and, like a carburettor, mounts on the intake manifold. The injector(s) spray fuel down into a throttle body chamber leading to the intake manifold. The intake manifold feeds the air/fuel mixture to all cylinders. While the **Port Fuel Injection (PFI)** systems use one injector at each cylinder. They are mounted in the intake manifold near the cylinder head where they can inject the fine, atomized fuel mist as close as possible to the intake valve.
2. D
3. D
4. B