

DIESEL MECHANIC



DT TEST AN ENGINE ON A DYNAMOMETER

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1. MODULE OBJECTIVE

1. Fit an engine onto a dynamometer, test run it to manufacturer's specifications and complete the attached engine test report.

2. LEARNING OBJECTIVES:

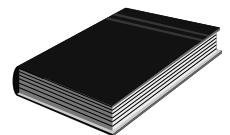
1. An engine.
2. All the necessary tools and equipment.

3. ASSESSMENT AND EVALUATION CRITERIA:

1. There must not be any damage to any fasteners.
2. There must not be any damage to any equipment.
3. The engine must have reached running temperature before the maximum load is applied.
4. All the following hoses must be connected to the correct gauges :
 - a) Oil pressure,
 - b) Fuel pressure,
 - c) Turbo boost pressure,
 - d) Crankcase pressure, and
 - e) Coolant temperature.
5. There must not be any fuel leaks.
6. There must not be any oil leaks.
7. There must not be any water leaks.
8. The engine test report must be completed.

ADDITIONAL RESOURCES:

1. A demonstration by a competent person, e.g. your instructor.
2. Workshop manual.
3. Audio-visual aids, if available.



HAZARD IDENTIFICATION AND CONTROL (HIAC) FORM**DT****TEST AN ENGINE ON A DYNAMETER**

STEPS IN OPERATION / PROCESS	POTENTIAL ACCIDENT / INCIDENT	CONTROLS(BY RESPONSIBLE PERSON)
<ul style="list-style-type: none"> • Use hand tools • Test the Engine on an Dynamometer and connect the fuel line and Battery cables. 	<ul style="list-style-type: none"> • Using damaged tools or wrong tools for the job can cause injury and damage to equipment. • Diesel fuel and Battery acid can be detrimental to health if it comes into contact with eyes and skin. 	<ul style="list-style-type: none"> • Always use the correct tool for the job. • Ensure tools are in good condition. • Use tools correctly. • Wear appropriate PPE where necessary. • Always take good care of tools. Maintain, clean and store it properly. • Wear appropriate PPE where necessary.

NOTE: Before doing the practical work contained in this module, the learner must study the content of the above HIAC form again and then sign the statement below.

The above risks, which will be encountered in this module, are fully understood and will be controlled during the practical work.

Signature of Learner: _____ Date: _____

Signature of Training Officer: _____

ENGINE TEST REPORT (A - D)						
A. PRE-STARTING						
1. Prime Lube Oil System		2. Prime Fuel System		3. Adjust Valves and Bridges		
4. Check and Set Fuel Timing		5. Adjust Governor		6. Adjust Injector Racks		
B. BASIC ENGINE RUN-IN						
Time at Speed	Time		RPM	KW/BHP	Water Temp	Lube Oil Pressure
	Start	Stop				
C. BASIC RUN-IN INSPECTION						
1. Check oil at Rocker Mechanism						
2. Inspect for :						
(a) Lube Oil Leaks		(b) Fuel Oil Leaks		(c) Water Leaks		
3. Check and tighten all External Bolts.						
D. INSPECTION AFTER BASIC RUN-IN						
1. Tighten Cylinder Head and Rocker Shaft bolts						
2. Adjust Valves (hot)						
3. Adjust Fuel Timing						
4. Adjust Governor Gap						
5. Adjust Injector Racks						

E. FINAL RUN-IN		
Time Start Stop	Top RPM No Load Full Load	KW/BHP
Air Box Pressure Full Load		
Crankcase Pressure Full Load		
Fuel Oil Pressure Ret. Man. F/Load		
Lube Oil Temperature Full Load	Idle Speed	
Lube Oil Pressure	Full Load	Idle
<p> $KW = \frac{T \times RPM}{9545} = \frac{_x}{9545}$ $= __ KW$ </p> <p> $BHP = \frac{T \times RPM}{5250} = \frac{_x}{5250}$ $= __ BHP$ </p>		

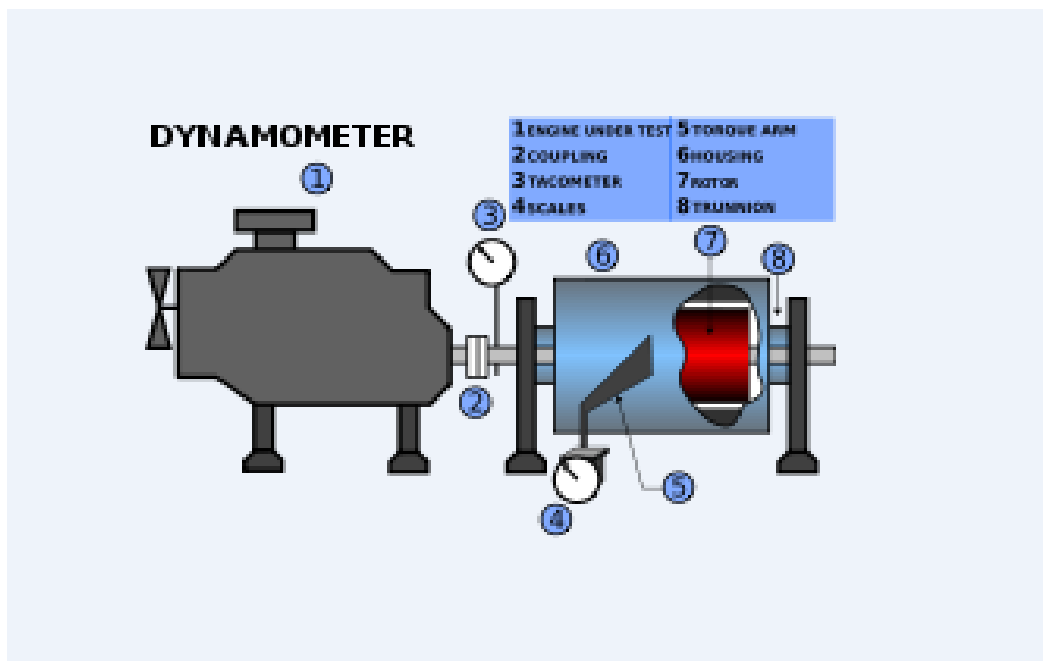
1. INTRODUCTION

The dynamometer is a device for applying specific loads to an engine. It is used during physical and visual inspection and to check the engine whilst it is operating. It is an excellent method of detecting improper tune-ups, misfiring injectors, low compression and other malfunctions. Its correct use may save an engine from damage at a later date.

The purpose of a dynamometer is to measure the engine output. Its basic components are a frame, a heat exchanger and a torque loading and measuring device.

Fig. 1 below shows a dynamometer in a typical test room set up.

FIG 1



The engine is connected through a universal coupling to the absorption unit. The load on the engine may be varied from zero to maximum by decreasing or increasing the resistance in the unit.

The power absorbed is generally measured in torque (Newton metres or foot pounds) on a suitable scale. The torque value is used to obtain the power (KW - Kilowatt or BHP - brake horsepower) developed in the engine by using the formulae below:

$$\text{kW} = \frac{\text{T} \times \text{RPM}}{9545}$$

Where
 kW = Kilowatt (kW)
 T = Torque in foot pounds (ft/lbs)
 RPM = Revolutions per minute

or

$$\text{BHP} = \frac{\text{T} \times \text{RPM}}{5250}$$

where
 BHP = Brake horsepower
 T = Torque in foot pounds (ft/lbs)
 RPM = Revolutions per minute.

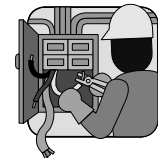
Some dynamometers indicate BHP or kW readings directly.

2. INSTRUMENTATION

The following instruments must be fitted to the dynamometer so that the engine test report may be completed.

- a) **Pressure gauges** must be connected to :
- the engine main oil galleries,
 - the fuel line or fuel manifold, and
 - the turbo charger.

- b) **A temperature gauge** must be connected to the sump, or a thermometer installed in the dipstick hole in the sump.
- c) When testing a two-stroke engine, **a pressure gauge** or a **mercury filled manometer** must be connected to the air box and a **water filled manometer** to the blower inlet.
- d) **A temperature gauge** must be connected to the water outlet manifold
- e) A **pressure gauge** or a **water filled manometer** must be connected to the crankcase.
- f) A **pressure gauge** or a **mercury filled manometer** must be connected to the exhaust manifold.



Practise

Referring to these notes and to the operator's manual for the dynamometer, practice mounting an engine onto the dynamometer and connecting all the gauges and electrical connections, e.g. starter, charging system, etc.

NB: Do not attempt to start the engine.

Ask your Training officer to check your work and to sign you off when you have reached the required standards. Then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

3. PRE-STARTING PROCEDURE

- a. Fill the sump with the correct oil.
- b. Prime the fuel system.
- c. Adjust the valve clearance.
- d. Adjust the fuel timing.
- e. Adjust the governor (two-stroke engines only).
- f. Adjust the injector rack (two-stroke engines only).
- g. Complete section A of the engine test report.

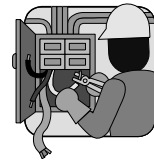
4. BASIC ENGINE RUN-IN INSPECTION AND RUN-IN

- a. Check that all the water valves and fuel valves are open.
- b. Check that the exhaust system is properly connected to the engine.
- c. Start the engine.

NB: Always start the engine with minimum dynamometer resistance.

- d. Set the engine at idling speed and check the lubricating oil pressure.
- e. Check all the connections to ensure there are no leaks.
- f. Let the engine run for 10 minutes.
- g. Refer to your workshop manual and load the engine to specifications and calculate and record the power, engine speed, time, water temperature and the oil pressure at idling speed, half-speed and maximum speed.
- h. Complete section B in the engine test report.
- i. Do a run-in inspection and check each item indicated in section C on the engine test report.

DO THE PRACTICE ON THE NEXT PAGE.



Practise

Referring to these notes and the workshop and the operator's manuals, you must practice :

- a) Completing the pre-starting procedure and section A of the engine test report.
- b) Doing an engine run-in and run-in inspection.
- c) Completing section B and C on the engine test report.

Ask your Training officer to check your work and to sign you off when you have reached the required standards. Then go on to the next section.

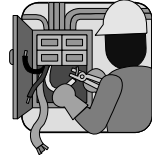
LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

5. INSPECTION AFTER BASIC RUN-IN

- a. Re-torque the cylinder head bolts.
- b. Re-torque the rocker arm shaft bolts.
- c. Do a tune-up on the engine.

6. FINAL RUN-IN

- a. Start the engine.
- b. Record all the items under different loading as indicated in section E of the engine test report.



PRACTICE

Referring to the workshop manual, these notes and the operator's manual for the dynamometer, you must practice:

- a) Re-torquing the cylinder head and rocker arm bolts,
- b) Doing a tune-up on the engine,
- c) Doing a final run-in,
- d) Completing sections D and E of the engine test report.

Ask your Training officer to check your work and to sign you off when you have reached the required standards. Then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



REMEMBER ALWAYS WORK SAFE
Once you have passed the entire self-test and practices, you are now at liberty to request a Formative Assessment from your assessor.