

University of Wales Trinity Saint David

School of Engineering

Engine Workshop – Stripping an Engine

Engineering Applications and Study Skills: M4X02063

Alexander Baldwin

1801714

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1 Introduction

Engines can break down and stop functioning. If this happens, they might have to be stripped down for a solution to be found or for the problem to be fixed. Knowledge of taking apart an engine is crucial not only for fixing but also to get a better understanding on how they work. The Ford Zetec engine was originally released in 1995 and is an inline 4 dual overhead camshaft (DOHC) design which runs on petrol. The engine block and head were made out of aluminium and the dry weight of the 1.6L engine used was 81kg. The engine that was being disassembled had no fluids inside and the timing did not have to be kept during the strip therefore making the process easier and quicker. Oil filter was also kept on the engine as there were some fluids inside and oil spills were not wanted in the workshop due to safety. One of the aims of the workshop was to develop an understanding of the area being used to strip down the engine and the tools required to do so. The second aim, was to strip down the engine completely by the end of the session.

2 Background Research

The workshop legislation that was researched were lifting operations and lifting equipment, supply of machinery (1992), noise at work (1989) and personal protective equipment at work (1992).

2.1 Personal Protective Equipment (PPE)

- Steel toe boots for foot protection from any falling car parts or tools.
- Overalls to protect clothes and skin from any oils.
- Long hair tied up to not get caught in any parts of the engine.

2.2 Health and Safety

- Careful where hands are placed because engines have many sharp parts. If cut, keep an eye on wound for 24 hours in case of infection. If wound gets infected, consult a medical practitioner.
- Look where walking as oil could have been spilled on the floor and can cause someone to slip. If oil spill is spotted, let technician on hand know about it as soon as possible.
- As some engine parts are heavy, care is required when picking them up as they could cause injury.
- Check all tools before use to make sure they are not faulty or damaged. If a faulty or damaged tool is found, let the technician on hand know and it will be replaced.
- In case of fire, leave immediately from closest fire exit, leaving all belongings behind.

(HSE, 1999)

3 Methodology

3.1 Equipment

- Ford 1.6L Zetec engine
- Engine stand
- Ratchet
- Sockets (8mm, 10mm, 13mm, 16mm, T55)
- Spanners (8mm, 10mm)
- Spinner handle
- Socket extension
- Breaker bar
- Bowls for bolts

3.2 Stripping the Engine

Wiring disconnected from crankshaft and camshaft sensors. Ignition coils popped out by hand and engine cover removed using a 10mm socket connected to a ratchet to reveal the camshafts. Water pump pulley then removed by unscrewing 4 bolts using the 8mm spanner. To remove the bolts from the rotating water pump pulley, the spanner was placed across the pulley to get better leverage on the bolts therefore making it easier for them to be unbolted.

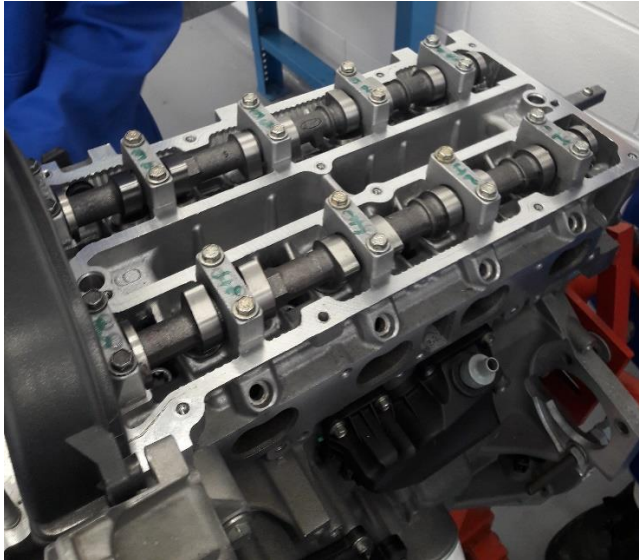


Figure 1 - Picture showing the dual overhead camshaft (DOHC).

Timing belt cover bolted off using the ratchet with an 8mm socket. Camshaft pulleys taken off by unbolting two 13mm bolts with a 13mm socket connected to a ratchet. Keeping the timing was not done to reduce the time of disassembly. Camshaft bearings removed using a 10mm socket connected to a ratchet and set aside, with their respective bolts, in the order that they were taken out. This is to ensure that they are put back the way they came out to not cause any unwanted errors in the rebuild. Camshafts then removed from the engine.



Figure 2 - Picture showing camshafts and camshaft pulleys.

Engine head removed using a breaker bar with a T55 socket connected. As the engine head was heavy, it was picked up and put down on the bench with care to not cause any injuries. Engine gasket was put aside on the bench. Pistons were then visible inside the engine block.

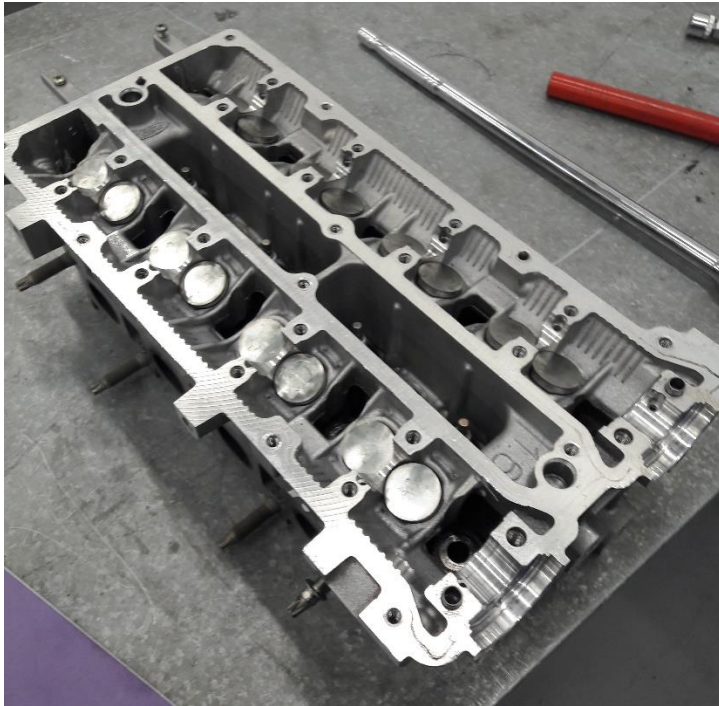


Figure 3 - Picture showing engine head.

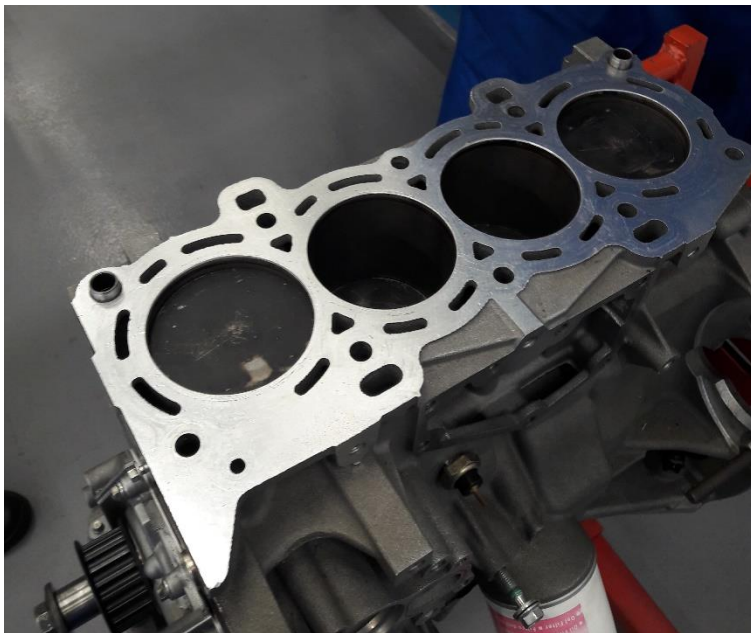


Figure 4 - Picture showing pistons inside engine block.

Engine then rotated 180° on the engine stand so that the sump was facing upwards. Using a ratchet with a 10mm socket connected, all bolts removed and sump was taken off to reveal the windage tray.

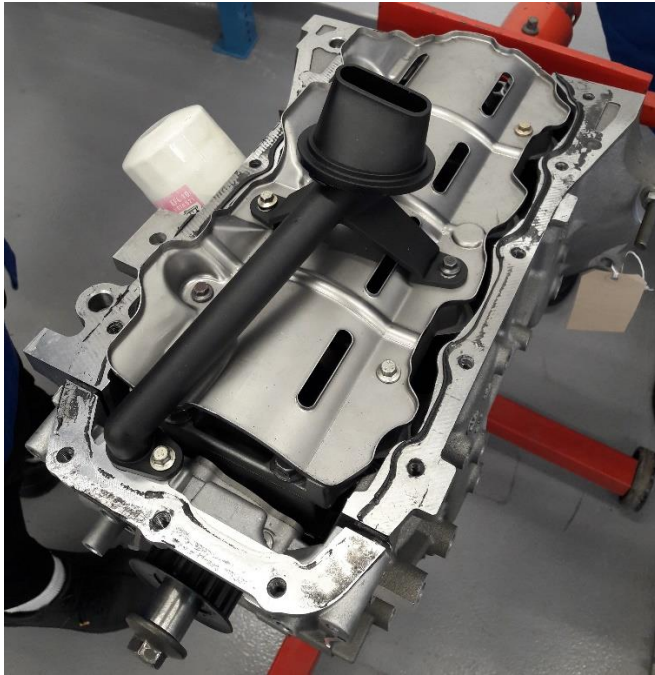


Figure 5 - Picture showing the windage tray.

Windage tray removed with a 10mm socket connected to a ratchet. Lower main bearings then bolted off using a ratchet with a 13mm socket connected to it. Next, pistons were pushed out of the top of the engine, which was facing downwards, using a breaker bar. Once all four pistons were taken out, crankshaft was then removed.

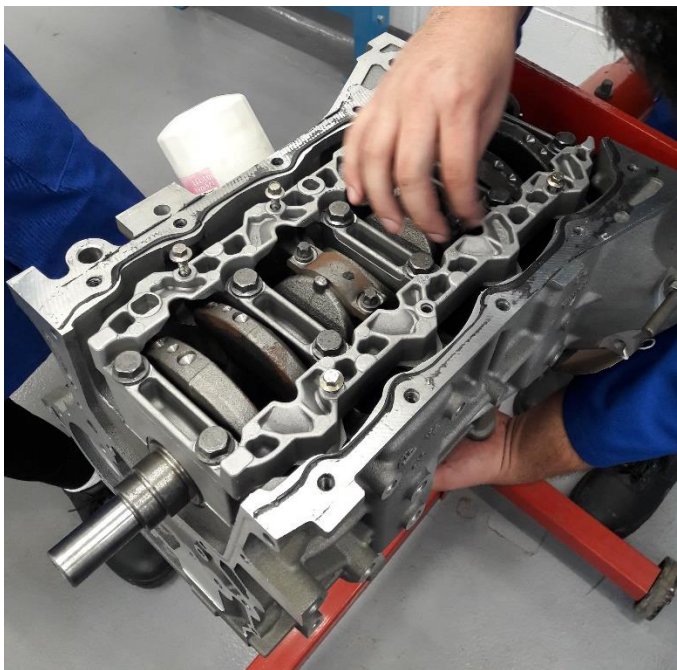


Figure 6 - Picture showing the removal of the lower main bearings.

All parts placed carefully on the workbench and bolts were placed in bowls in terms of size, so when the engine would be rebuilt, respective bolts would be found easily and the rebuild would result in fewer errors.



Figure 7 - Picture showing all parts removed from the engine block.

4 Discussion and Conclusion

Introduction to the engine workshop was given out with great detail. This introduction also included where tools were located and how to use the tools provided. Nothing went wrong during the strip down process of the engine as there was a good understanding of how it is done prior to the task. The engine was completely stripped by the end of the session. A few bolts were missing on some parts of the engine and some threads were stripped. This was due to the engine being previously stripped and rebuilt by students, and therefore bolts were lost or overtightened.

5 References

HSE (1999) *Health and safety in engineering workshops* - HSG129.