

Guest Lecture - Frank Claydon GRM Consulting

23/10/19 - 1pm in 12007

Frank Claydon on Development of a Multi Physics Approach to Engine Block Optimisation - A Collaborative Project.

I attended this guest lecture for many different reasons. Firstly, I know Frank was an ex-student of the university and I also noted that he had a broad collection of different companies he had worked for. Both these points ^{interested} ~~interested~~ me in that he could give a ^{helpful} ~~helpful~~ insight on life after graduating and potentially give more information on the path he took since then. Also, the title of his presentation clearly indicates that he has worked within the area of Engine Design in the industry, which is one of my key interests. ~~Also~~ I was also intrigued ~~that~~ in what it was like working in a collaborative project like he did.

It was interesting to hear Frank talk about the path he took after graduating. He worked for Treharne Automotive Engineering (TAE) for 4 years where he was involved in diagnostics and engineering solutions, product development and project reorganisation. He then decided he needed a change in field. He joined GRM Consulting in March 2016 as a project engineer using Finite Element Analysis which he later used in his part-government funded collaboration with Ricardo, engine design and ~~the~~ analysis software products, who are a company involved in engine design and analysis software products, and led by Jaguar Land Rover. Finite Element Analysis is a numerical tool used for solving problems defined by ordinary or partial differential

equations, for example $F = kx$ where 'F' is the force applied, 'k' is element stiffness, and 'x' is displacement. This equation is used for statics within FEA.

The collaborative project, called The Latitude Project, was used to investigate fuel economy benefits derived from testing diesel technologies for inclusion on future vehicle ~~program~~ programmes. The project had a total value of £12.6 million with £6.3 million of which was funded by a grant.

The project was used to reduce the mass of the engine block which in turn reduced total vehicle mass and therefore its emissions. This was achievable by the collaboration between different companies. For example, Ricardo had analysis ^{software} programmes.

I found it interesting how they used Topology to determine the optimal thickness of material needed for each part ~~at~~ within the engine block.

It was also interesting to hear how the collaboration worked, and the difficulties which came with it. Such as practical challenges like relationships between companies and timings to more technical challenges ~~like~~ they encountered like optimising heat transfer.

I was very pleased to have ~~intended~~ attended Frank's lecture. It gave me many insights within the industry which will help me when I come to graduating from the university. I was very interested on what he had to say about working in a collaborative project, and I will think of this if I ever get a chance to do something similar.

Engine Workshop - Session 1 of Engine Strip-down and rebuild.

15/11/19 - 1pm in 1Q018

Instructor: Barry John

Aim:

- To outline the plans for sessions of the ~~next~~ ^{next} 5 weeks.
- To outline the health and safety regulations in the workshop.
- In our set groups, start the strip-down of the engine assigned to us to as far as we can go in the ~~time~~ 3 hour session.

Engine number: 7

Engine: Ford 1.6L Zetec SE

Health and Safety

Before any engine ~~disassembly~~ disassembly started, the ~~to~~ health and safety measures were communicated from our instructor as these are very important within this workshop due to the high number of hazards that are present. Barry told us what is expected of us, what to be careful of, and if anything happened, to report it to him immediately. He also mentioned the hand care products available ~~on the~~ by the sink and ~~if~~ rubber gloves were available if needed.

PPE

- Steel toe cap boots - must be worn at all times
- Protective overcoat - to be worn at all times
- ~~Protective~~ ~~for~~ disposable gloves available

Procedure

After being put into our groups and assigned to an engine, we went about how to start the strip down of the engine. Our engine was a 1.6 litre Ford engine which you can see in Figure 4 in the accompanying word document. It was already mounted on a trolley for us, so it ~~was~~ could be easily moved or rotated to give us a better position throughout the process. We started with taking off all the plastic casings on the engine and other connecting parts, such as exhaust ~~Next, we took~~ manifold and the distributor. Next, we used our ratchet wrench to undo bolts to remove the cylinder head cover. After, we went onto ~~taking off~~ removing the camshaft pulley and cam belt, and alternator. For each part we took off the engine, we placed on a separate storage trolley and all bolts went into compartments for each stage of the engine. This would help us in the future when we come to rebuilding the engine back up. Next, we undid bolts to release the cylinder head off the engine block. This also allowed us to the head gasket.

End of Session

~~This is~~ By the end of the session we had made a good start to the disassembly of the engine. After the introduction to the sessions we ~~are~~ are going to have in the workshop over the following weeks. There were no Health and Safety issues during the session.

Machine Workshop - Introduction to a Lathe

11/10/2019 - 1pm in IQ021a

Instructors: Andrew Tibbott
David Cooper

Aim:

- To have an introduction to the lathe to be shown its features, what jobs it can carry out, and its health and safety precautions
- To be set a task and to carry out the first ~~step~~ steps of this task.

Health and Safety

Health and safety is of paramount importance in the workshop. Detailed precautions have been communicated from the instructors including ones involved with the lathe. For example the brake on the machine, and the emergency power-off switch on the wall by each machine. Also any issues or injuries that happen are to be reported to the instructors if it is not to their knowledge already.

Personal Protective Equipment (PPE)

- Steel toe cap boots to be worn at all times in the workshop.
- Protective overcoat
- Safety glasses to be worn when operating machinery
- If required, long hair or any strings/toggles on clothes must be tied back to avoid entanglement.

Procedure

Each Student is issued with a technical drawing, a solid steel cylinder block approximately 100mm in length and 45mm in diameter, a lathe to work on and tools to ~~attach~~^{attach} to it.

The cylinder block is positioned in the chuck so that there is plenty of material within the ~~chuck~~ chuck, and only a small amount projecting out from it. This means that ~~the~~ when operating the lathe, the cylinder is spun safely and ~~more~~ accurately without lateral movement when cutting tools are used. ~~It~~ This means very accurate measurements can be ~~seen~~ achieved. The chuck is tightened with the chuck key, and the guard is pulled down.

The lathe and the cutting tool is then used to cut away a small amount of material on the face shown out of the chuck. This produces a ~~smooth~~ smooth level surface on the face of the cylinder. The cylinder is removed from the chuck and put back in with the other face showing. The previous steps are repeated.

The cylinder block is then removed from the lathe and taken to a digimatic height gauge. The length of the cylinder was recorded to be 113.80mm. The faces were smoothed to remove any material to give a more accurate value.

Looking at the ~~technical~~ technical drawing, see figure 1 on word document, the length of the desired product is 105mm. So, the block is positioned safely back in the lathe, and cutting tools are ~~is~~ used to produce the required length. Using the computer measurements on the lathe,

0.5mm of material is cut away from the side face of the block for a 8.8mm distance from one end. until all the material for that distance is removed.

Next, ~~0.5mm~~ The diameter of the block was measured using a micrometer. This apparatus uses a vernier scale to give highly accurate measurements. The diameter measured was 44.85mm.

~~The block~~ By looking at the technical drawing, Figure 1, the next logical step was to remove material from one side to create the 23mm shoulder.

So, the block was reinserted into the lathe. The cutting tool was brought to the ^{side} face of the cylinder block while the machine is on. The diameter measurement is then inserted into the ~~computer~~ digital readout system.

Then ~~I~~ I began to cut away 0.5mm ^{at a time} of material for 22.5mm from one ~~side~~ end of the block. I continued to do so till the diameter reached 35mm.

End of Session

The day's session in the workshop and on the lathe was a success. The introduction to the lathe was helpful and my skills on the machine are improving. ~~Also~~ ~~health~~ See figure 3 ~~to~~ for the total progress achieved after the first session on the lathe. ~~Also~~ There were no health and safety issues during the session.