

## MECHANICAL MAINTENANCE SKILLS

COURSE 700: 5 DAYS: Max 4 Candidates

This course provides personnel with the necessary skills to perform mechanical maintenance, including the removal and replacement of equipment (pumps, gearboxes, motors and power transmission systems) and identification and rectification of bearing faults within these systems.

### PARTICIPANTS

Designed to benefit anyone required to undertake mechanical maintenance on production/process equipment. This course is equally suitable for production operatives or for craft personnel already involved in maintenance activities. The Mechanical Isolation (Course 620) is recommended for candidates who attend this course.

### COURSE PRESENTATION

The course format is very much 'hands-on' – the emphasis being on the development of sound practical skills within the context of safe working practices.



### COURSE OBJECTIVES

On completion of the course, participants will be able to

- understand the principles of preventive and first-line maintenance
- apply safe working practices
- describe a range of mechanical faults and plan suitable courses of action
- understand the principles of power transmission systems
- remove and refit taper-lock bushes, keyed shafts, belts, chains and couplings
- install and align shafts; tension drive train components
- identify types of bearing, their typical applications and common defects
- correctly remove and refit various types of bearings
- describe various methods of removing broken studs
- recognise stripped threads and correctly use thread repair equipment
- manufacture gaskets using industry standard techniques
- understand how to remove and replace seals and gland packing
- understand the operation of various gearboxes
- recognise various types of conveyor systems and their main components.

**Successful completion of the course leads to the award of the Technical Training Solutions Certificate of Competence 700: Mechanical Maintenance Skills.**

# What do candidates on the Mechanical Maintenance Skills course actually do?

The mechanical maintenance skills course begins by providing the candidates with an understanding of fault diagnosis by analysing various symptoms. These symptoms include excessive heat, vibration, smell or changes in speed. The aim is to make the candidate aware of the possible outcomes if action is not taken once a fault has been discovered. Because safety is always of paramount importance within our training methods, candidates are taught to write their own method statements for working on moving machinery. The instructor works with the groups to ensure all instructions are clear, short, and safe.

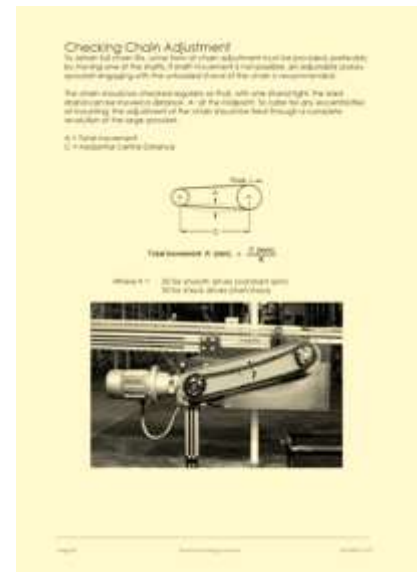
Candidates are provided with comprehensive course notes, which include the important technical reference material:



**Page 12 of the course notes, where we teach the candidates about fault finding on industrial machines, thinking about symptoms, faults and causes**



**Page 19 of the notes, with information about the properties of oils used in industrial machinery**



**Page 58 of the course notes covering the importance of setting the correct tension on chain drives, and how to make the necessary adjustments**

Throughout the course the technical instruction is interspersed with many practical exercises. The first of these is the manufacture of gaskets to fit between machined faces. Candidates are shown the various techniques and materials used to produce engineering seals within the workshop.

A wide range of example bearings are provided for inspection of wear along with suitable lubrication regimes.



**One of the demonstration ball bearings**



**One of the demonstration tapered rolling bearings**



**One of the demonstration linear bearings**

Candidates will practice removal and refitting ball races using pullers and correct engineering procedures.

**Candidates use bearing pullers to remove faulty bearings from an assembly using approved methods**



The course includes valuable exercises on the recognition of common screw threads, thread repair techniques, removal of broken studs, dismantling of gearboxes and the manufacture of gaskets.



Candidates use thread repair tools on the course

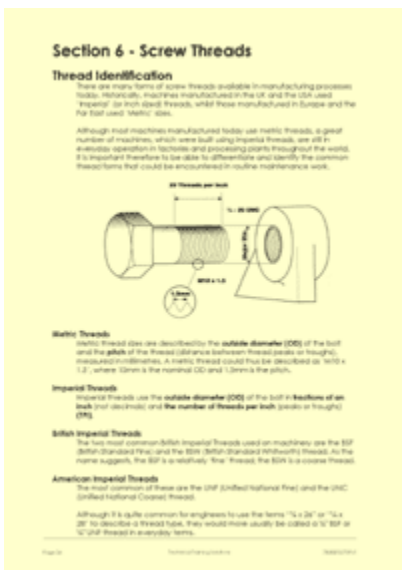


Candidates disassemble and re-assemble gearboxes

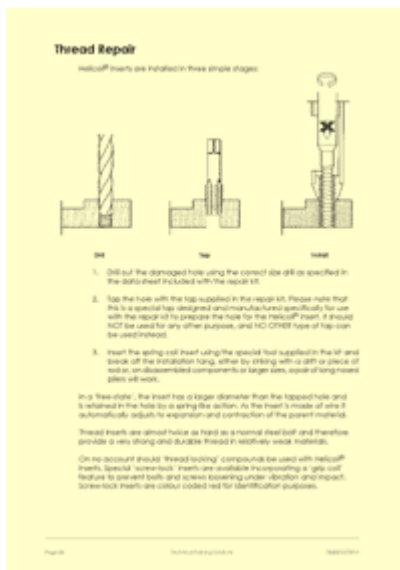


Candidates make gaskets on the course

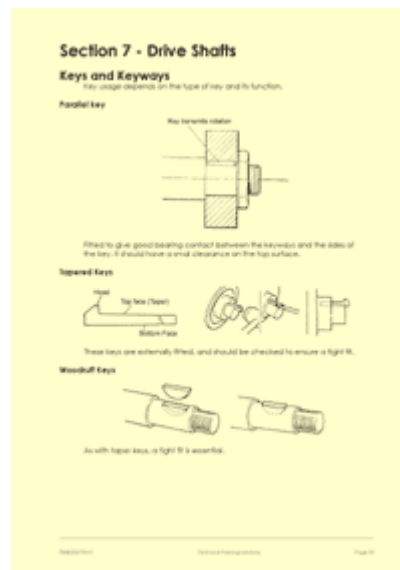
The following are some example pages from the course notes for this stage of the mechanical maintenance skills course, describing the common screw threads encountered on industrial machinery, how broken threads should be repaired and how drive shaft keyways should be fitted:



Page 36 of the course notes, describing the various screw threads commonly encountered on industrial machinery



Page 38 of the course notes, describing how threads should be repaired

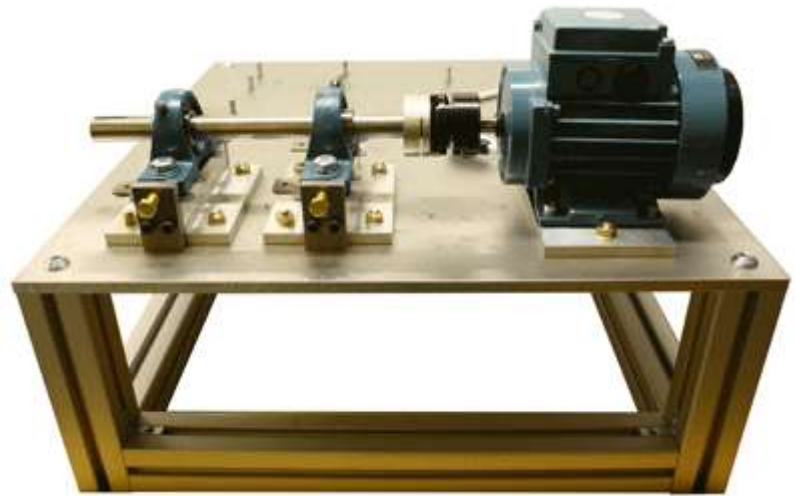


Page 39 of the course notes, describing how drive shaft keyways work

With the emphasis on practical skills, candidates will use special rigs to practice the alignment of shafts, motors and pulleys. Because poor shaft alignment results in early bearing failure and cracked castings, candidates are taught to shim and align moving parts to a high accuracy using traditional engineering methods. Torque wrenches are used to tighten critical parts, as well as discovering what settings were used on existing component parts.

**The Motor Shaft Alignment Exercise.**

**Candidates insert shims and make adjustments to the bearing positions so that the line shaft is perfectly straight.**



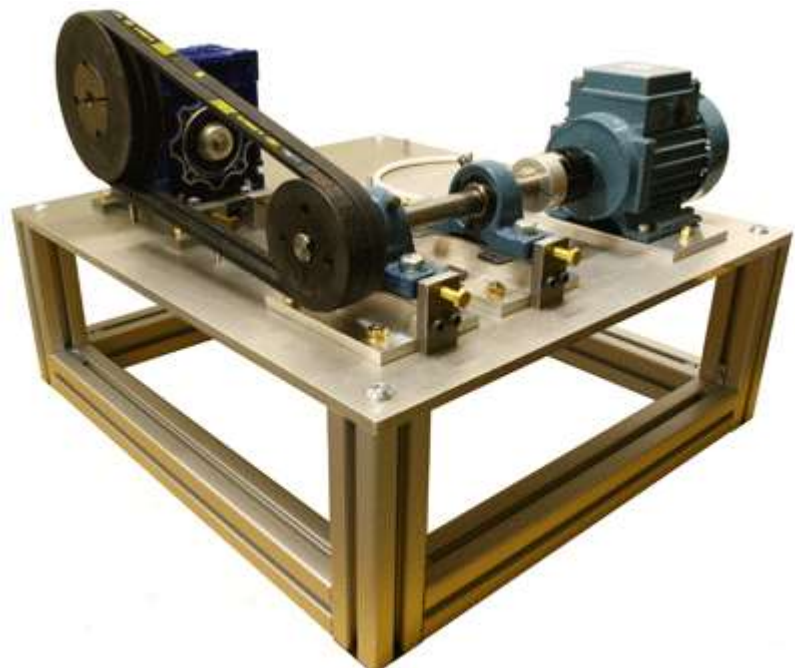
**As the candidates assemble the motor and shaft, they check using a dial gauge that it is aligned correctly.**



**The Vee Belt Tension and Alignment Exercise.**

**The candidates need to select the appropriate pulleys and fit them correctly to the drive shafts. Candidates use straight edges to test for alignment, straight edges and belt tension gauges to check for tension.**

**This exercise is completed for single belt drives, dual belt drives and timing belts.**

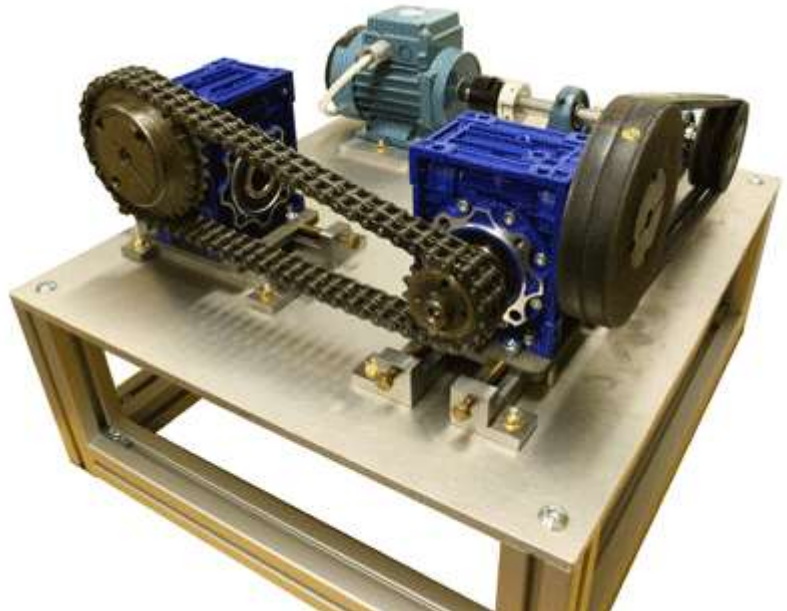




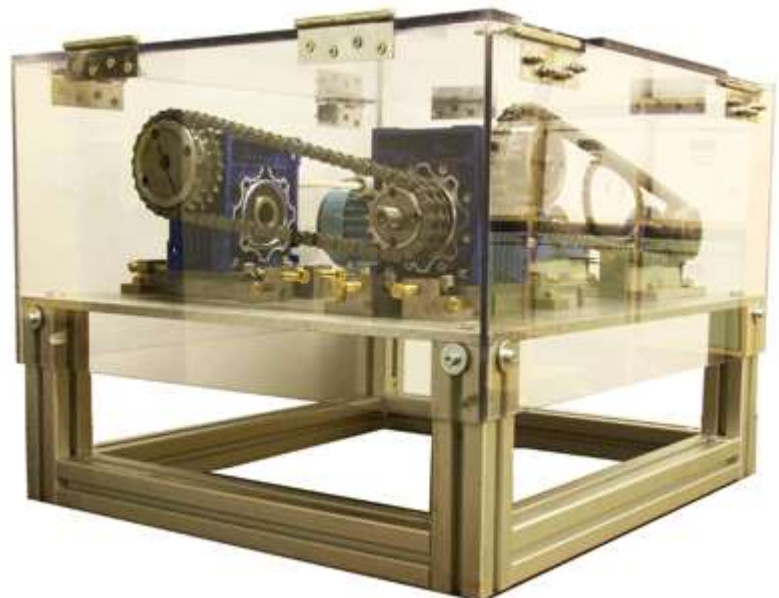
**The Chain Drive Tension and Alignment Exercise.**

**Candidates need to select the appropriate sprockets and fit them correctly to the drive shafts. They use straight edges to test for correct alignment and tension.**

**This exercise is completed for simplex chain drives and duplex chain drives.**



**Candidates install the machine guard prior to energising the machine for safety reasons.**



**The candidates utilise industry standard lock out tag out (LOTO) procedures to ensure safe isolation of the machine.**



Candidates practice adjusting the length of simplex and duplex chains by adding or removing links.



**Candidates are provided with a range of chains - they insert or remove links using special tools**



**A range of sprocket drives, taper-lock bushes and pulleys are used to teach candidates how to detect for wear, how to ensure correct fitting, etc**

Wheels and pulleys are fitted to shafts using keyways, taper-lock bushes and flanges. The correct methods of removal and refitting are demonstrated and candidates practice these skills to gain sufficient understanding.

Candidates are given a range of industrial pumps and gearboxes to examine and repair once faults have been diagnosed.

**One of the pumps used by candidates to practice examination and repair of devices**



These faults are introduced by the instructor so that a practical assessment can be made of the candidate's progress.

Once the above exercises have been completed, the candidates can explore how to replace, refit and re-track a conveyor belt. In order to do this, they have to complete a safe isolation procedure (for mechanical maintenance purposes) using a motor isolator in accordance with industry best practice.



**One of the isolators used to explore the correct isolation procedures necessary for safety**



**The conveyor unit used on the course**

**If you would like to see some of the equipment used on the Mechanical Maintenance Skills course for yourself, then please call us to arrange a visit to our offices in Kent. Alternatively, we can visit you anywhere in the British Isles.**



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