

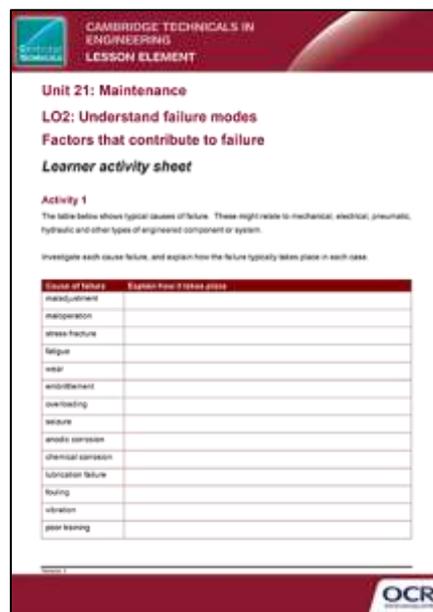
Unit 21: Maintenance

LO2: Understand failure modes

Factors that contribute to failure

Instructions and answers for teachers

These instructions should accompany the OCR resource 'Factors that contribute to failure' activity which supports Cambridge Technicals in Engineering Level 3.



The Activity:

For Activity 1 learners should investigate the causes of failure listed in the table, providing a brief statement of what occurs in each case.



This activity offers an opportunity for English skills development.



This activity offers an opportunity for maths skills development.

Suggested timings:

1 hour

Activity 1

For Activity 1 learners should investigate the causes of failure listed in the table, providing a brief statement of what occurs in each case.

Learners might use the internet to undertake their investigation. Typical responses are given below, although learners may find alternatives.

Cause of failure	Explain how it takes place
maladjustment	Maladjustment refers to a component or system being in a condition or state in which it cannot perform the desired function or operation. Adjustment to prescribed parameters may correct this condition.
maloperation	Maloperation refers to a component or system not being used for the purpose for which it was intended, or being used deliberately outside its normal operating parameters.
stress fracture	A stress fracture in a material is a fracture caused by repeated mechanical stress.
fatigue	Fatigue is caused when a material, component or system is subjected to repeated loading and unloading, and is more severe when the loading is outside the normal operating range.
wear	For mechanical components wear is erosion or deformation that takes place between two moving surfaces in contact. It may cause components and systems to eventually perform incorrectly.
embrittlement	Embrittlement is when a material becomes brittle. This may be due to structural changes to the material caused by heating, cooling, stress etc. Materials that become brittle may fail.
overloading	Overloading is the condition in which a component or system is operated outside of its normal parameters.
seizure	Seizure is the failure of a mechanism caused by touching parts, which should move relative to each other, becoming locked together preventing movement. Seizure commonly affects components such as bearings and gears.
anodic corrosion	Anodic corrosion refers to part of the process that occurs during galvanic corrosion. It is a form of electrochemical corrosion process in which dissimilar metals in contact with each other (in an electrolyte) form an anode and a cathode. One metal acts as an anode which corrodes, and deposit collects on the cathode.
chemical corrosion	Chemical corrosion refers to the destruction of materials (usually metals) due to a chemical reaction with their environment or when in contact with other chemicals.
lubrication failure	Lubrication is the application of an oily or greasy substance in order to reduce friction between moving parts. When lubrication fails overheating will occur leading to damage or failure.
fouling	Fouling refers to dirt, impurities or foreign matter/objects in a system that causes it to function incorrectly or fail.

Cause of failure	Explain how it takes place
vibration	Vibration refers to a shaking movement in a system, which might be periodic or otherwise. Vibration may cause a system to function incorrectly, or may lead to failure.
poor training	Poor training in the context of maintenance refers to poor training of an operator in the operation of a system or equipment, and to poor training of maintenance personnel.

Activity 2

The following table gives examples of where common causes of failure may occur in a car. Learners may find alternative solutions.

Cause of failure	Examples for the car
maladjustment	<ul style="list-style-type: none"> • Brake or clutch pedal • Switches e.g. brake light switch
maloperation	<ul style="list-style-type: none"> • Driving consistently in incorrect gear • Over-revving engine • Towing load outside recommended limits
stress fracture	<ul style="list-style-type: none"> • Fracture in critical component e.g. suspension arm, chassis component, engine mount
fatigue	<ul style="list-style-type: none"> • Loading and unloading of suspension component e.g. damper
wear	<ul style="list-style-type: none"> • Wear of brake pads in normal operation • Wear of clutch plates in normal operation
embrittlement	<ul style="list-style-type: none"> • Embrittlement of rubber engine mounts • Embrittlement of radiator or brake hoses
overloading	<ul style="list-style-type: none"> • Driving uphill in incorrect gear • Exceeding maximum car load capacity
seizure	<ul style="list-style-type: none"> • Engine seizure due to poor lubrication • Seizure of brake callipers
anodic corrosion	<ul style="list-style-type: none"> • Corrosion to car bodywork • Corrosion to structural components e.g. chassis
chemical corrosion	<ul style="list-style-type: none"> • Corrosion caused by bird lime • Corrosion caused by local environment e.g. acidic rain, salt spray
lubrication failure	<ul style="list-style-type: none"> • Engine failure (seizure) caused by poor lubrication
fouling	<ul style="list-style-type: none"> • Fouling caused by seized component e.g. water pump • Fouling of water cooling system caused by blockage
vibration	<ul style="list-style-type: none"> • Unbalanced rotating component e.g. wheels, engine pulley or flywheel
poor training	<ul style="list-style-type: none"> • Poor driver use of car • Poor servicing at garage

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