

Question 3 Section B

- a) ^{Ans=} ~~Here~~ Here are the 3 major manufacturing processes
- Injection moulding
 - Casting
 - drop forging

Injection moulding is used to produce the interior plastics for example: the dashboard and the door interior. Very complex 3D shapes can be produced. However, there is a high cost in producing these high ~~initial~~ initial moulds. This is a suitable process where high volume of parts is required it has the added advantage of little finishing for the parts. primarily ABS is used during production this is a thermosetting plastic which currently is difficult to recycle. Thermoplastics are being developed for the use in bumpers and windmirrors. These can be recycled.

Die-casting is suitable for light weight metals (particularly zinc). Zinc is heat until it is molten then pressure forced into a mould in a shape of the part required. This is common in the automotive industry because it provide strength and flexibility and is economical in production. There is a high cost in producing the mould, however, the parts require little finishing and the process is efficient. It is used for chassis parts, transmission components and then the brake system.

Question 3

a) ~~continued~~ - Drop forging is used for a variety of applications. It can be used for a production of steel aluminium or copper parts. Steel drop forging has a high level of production efficiency, policy and cost are efficient which makes it a good choice for creating identical parts in large quantities. ~~The~~ The parts can be used within the engines where strength and stability is required.

Ans =

b) Here are The 3 stage of FMEA:

- first stage of FMEA: Analyse functional requirements of the car. This can be broken down so each ~~area~~ ^{area} of a car can be analysed. This is done to identify the effects of failure. This can include: over heating, noisiness and user injury.
- second stage of FMEA: To determine severity. This is graded from lower severity to highest.
- Third Stage of FMEA: The likelihood of a fault occurring. They are graded from low to very high.

After the ~~stages~~ Stages, the RPN is calculated by multiplying the severity grade by the likelihood of a ~~failure~~ occurrence with the failure detection. Once corrected measures are implemented the RPN is ~~recalculated~~ Recalculated.

c) Ans =

$$D = 10 \text{ mm} = 0.010 \text{ m}$$

$$h = 1.1 \text{ mm} = 0.0011 \text{ m}$$

$$r = 0.5 \text{ mm} = 0.0005 \text{ m}$$

$$M = 55 \text{ N}$$

$$h/r = \frac{0.0011}{0.0005} = 2.2$$

$$h/\rho = \frac{0.0015}{0.010} = 0.15$$

$$\sqrt{h/r} = \sqrt{2.2} = 1.48$$

$$\begin{aligned} i) C_1 &= 0.455 + 3.354 \sqrt{h/r} - 0.769 h/\rho \\ &= 0.455 + (3.354 \times 1.48) - (0.769 \times 2.2) \\ &= 3.73 \end{aligned}$$

$$\begin{aligned} C_2 &= 0.891 - (12.721 \times 1.48) + (4.593 \times 2.2) \\ &= -7.83 \end{aligned}$$

$$\begin{aligned} C_3 &= 0.286 + (15.481 \times 1.48) - (6.392 \times 2.2) \\ &= 9.14 \end{aligned}$$

$$\begin{aligned} C_4 &= -0.632 - (6.115 \times 1.48) + (2.568 \times 2.2) \\ &= -4.032 \end{aligned}$$

$$K_t = 3.73 + (-7.83 \times 0.15) + (9.14 \times 0.15^2) + (-4.032 \times 0.15^3)$$

$$K_t = \underline{4.21}$$

$$\begin{aligned} ii) \sigma_{\max} &= K_t \frac{32 M}{\pi (D - 2h)^3} = 4.21 \times \frac{32 \times 55}{3.14 (0.010 - 2 \times 0.0011)^3} = \underline{1.44 \text{ GPa}} \\ &\text{or} \\ &= \underline{1.44 \times 10^9 \text{ Pa}} \end{aligned}$$

1. b) Bio-fuel will not affect the user. the traditional garage
and
c forecourts but now supply fossil fuel can now be
readily adapted to bio-fuel ~~the~~ delivery.

Electric fuel cars require a designated electrical
outlet socket to charge a vehicle. These will ~~need~~ ^{need}
to be installed at homes or work place.

This may be problematic where users can not
park near their properties. On ~~the~~ street charging
station or local areas/community charging areas
maybe considered. The range of the car also
needs to be considered, planning journeys to ~~go~~ ^{coincide}
with service station with rapid charging station.
This will impact both usability of electric cars and
the outstanding in terms of financially providing the
infrastructure.

Name: Duke Donald Asamoah

Student number: 1706143

Module name: Automotive ~~engineering~~ materials and sustainability

Module number: (ACHA6012)

13th/05/2022

Section A

1. a) Ans = The two types of fuels that could be used are:

- Bio-fuels
- electric fuels

Bio-fuel help reduce greenhouse gases which are methane, carbon dioxide and nitrous oxide. By emitting less pollution. They are made from renewable resources and by growing more plants, they increase more oxygen and they decrease carbon dioxide. This cuts CO₂ emissions which is in line ~~with~~ with European parliament and council. That's 2019 setting CO₂ emission standards.

electric power cars needs a cleaner environment, They emit ^{fuel} greenhouse gases and air pollutants than Petrol or diesel cars.

The next euro standards framework (euro 7) is likely to be introduced in 2025. It is thought that the eu ~~committee~~ commission will ~~be~~ banned combustion car engine production or that the exhaust emission limit will be too strict and that combustion engine manufacturer will not be competitive.