

Exhaust Design

Task:

To design an exhaust for your Schools Marine Challenge entry

Introduction

The exhaust is vital to the reliability and performance of your boat. Not only does it reduce the noise pollution but it also provides extra power to the engine if correctly designed. It also provides fuel tank pressure to help maintain fuel delivery to the carburettor.

Research Section

What factors would influence the different exhaust design features?
 What is the combustion chamber size and fuel is your engine?
 What area should the exhaust vent into? What direction should the gasses take?
 What material should it be made out of? Can it be painted or would the temperature prohibit a finish? Is gas flow vital and if so why? Can you get the calculations and work them out for your engine?
 Will a manifold help and if so why?
 Include any graphs you find to show engine/revs power curves for each design.

Design Section

Collect all the information you will need to enable you to start designing your exhaust and draft a specification. The internet or a local model shop would be two good starting points.
 Scale the design to fit the hull layout.
 Sketch a number of different designs so accommodate various components such as top desk, engine, fuel tank etc.

Initial design

Produce a few freehand isometric sketches of ideas then progress to dimensioned drawings appropriate to your design. Remember these must include all necessary information for someone else to manufacture your exhaust to the correct dimensions and tolerances and using the appropriate materials and manufacturing systems. Work in conjunction with the hull design team so that the fumes can be directed away from the vulnerable areas.

For example you may want to use tubular steel which is easily jointed using heat and can be bent to fit your hull. It will need to have mounting holes and the slot for the exhaust port machined in the correct place. You may want to specify that it has a particular colour or an appropriate finish that copes with the heat.
 Produce full working drawings using the most appropriate system with either manual or a CAD package.

Manufacturing Section

Produce test pieces for any jointing and machining skills e.g. milling, welding, brazing, silver soldering, drilling etc.
 Produce a sequence of operations for manufacturing, from cutting the materials, deburring, joining and applying surface finishes to your exhaust.
 If your design requires fixing to the hull it will need to have vibration absorbing mounts, to reduce strain on the engine, show clearly how they will support your design.

Health and Safety

Carry out a risk assessment on the main process you plan to use to produce the axle. Consider the following; materials, machine, tools, environment, training, protective equipment, and any action you have to take if a problem occurs.
 When in use remember that an exhaust gets hot!

Target Areas

KS 3 or 4

Resistant Materials
 Material properties and processing

GCSE Engineering

Unit 1

Specifications and Engineering drawings

Unit 2

Production planning, Choosing materials, Using processes
 Health and Safety

Unit 3

Investigating Products
 Key Skills
 Communication, Number, IT



a



b

a Standard exhaust pipe as fitted to the engine

b Tuned pipe mounted in our standard hull

Sample design:

Material: Thin wall steel tube
 Expansion box
 35 mm O/D L 50mm
 Pipe
 35 mm O/D tapering to 15 O/D L 75 mm

