RGS WORCESTER

Engineering A class Act

Welcome to the first in an occasional series of case studies looking at Engineering in Schools and Colleges. Engineered artefacts and products seem to have a distinctive difference with many D&T derived projects in that they really do have to demonstrate fitness for purpose. These well engineered products are worth a closer look. To that end this case study looks at the excellent work of students at Royal Grammar School – Worcester.

Featured are three carefully considered outcomes that are the result of quality A level teaching that ensures success criteria are met not just in the portfolio work but are embodied in the detail and application of finished products – all too often good design activity at GCSE and A level is compromised by weaker making skills. Sometimes they are replaced entirely by modelling skills that really do little to bring the student closer to understanding the materials and fostering a truth to the materials.

The students here have produced not just outstanding designs but advanced prototypes that are pretty much close to market ready. Each has exploited the qualities and opportunities presented by the materials selected and all of the outcomes fulfil a real, rather than a perceived, need.

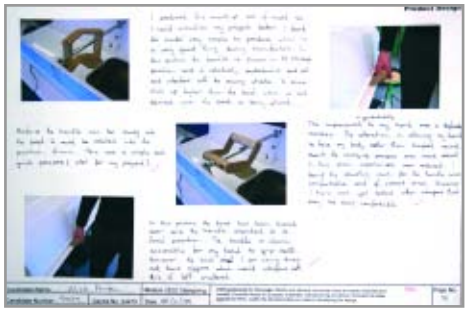
Our thanks to Dave Cottrill and special thanks to the students formerly at RGS, Worcester, for providing the folios the products and the images used in this feature.

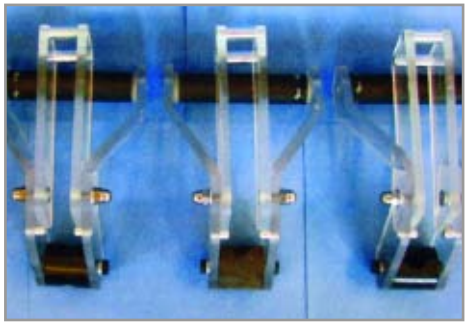
What stands out for us is the range of making skills and techniques exploited and demonstrated to such good effect from initial modelling and prototypes through pattern making, casting, turning, drilling and milling machining processes as well as CADCAM, accurate bench fitting and assembly.

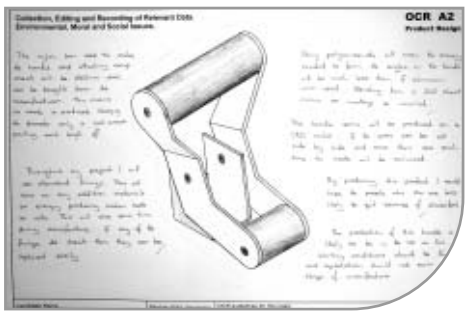
If you have good engineering examples you would like to feature in the series please contact: nickbaldwin@enterprise.net

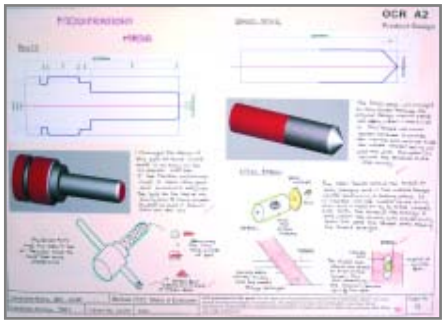
Nick Fenton's folding handle for transporting rowing 4/8's on first glance could easily be missed as an excellent example of engineering experience. Competition rowing boats are high performance-high value items that are difficult and awkward things to carry from trailer to waterside and need turning over too before launching. With glass fibre and honeycomb construction, as well as extreme size, they are easily damaged and not the easiest things to carry with only limited hand holds. The market for a suitable product that meets such needs is vast in the UK and abroad with such a popular and growing sport there is a need to protect such high value items from damage.

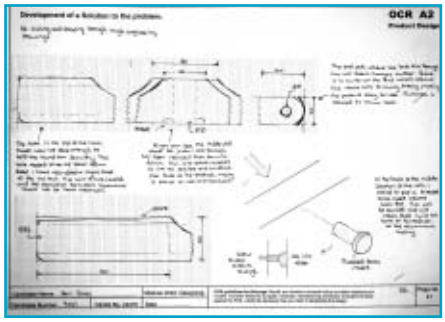
Having explored a range of unusual alternatives Nick's design proposal for a handle tended towards a folding and cranked design that lent itself to easy fastening to the hull and provided a semi-permanent arrangement. The lifting handles used in combination fold unobtrusively into the hull when not in use and also 'lock' into a rigid stand when inverted providing the dual function of a boat stand as well! Final modifications and machining were completed in acrylic, the choice of material determined by the limitation of industrial plastics processes in the department. This presented some additional challenges in terms of machining and line bending the cranked arms. The finished product is not only an effective and elegant product but a great idea.

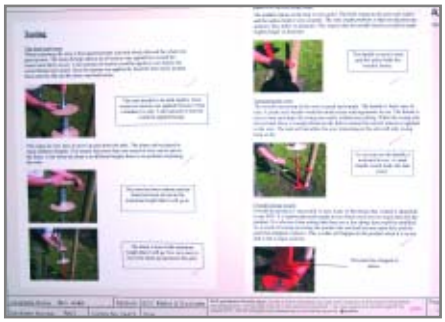


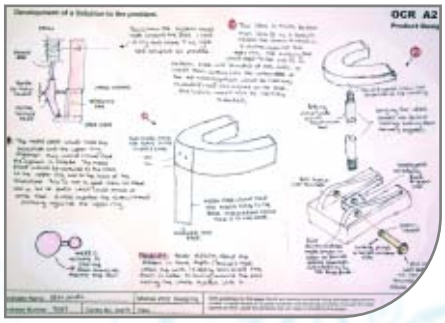












Tom Poole's near industrial quality project is worth a close look. We first saw the adjustable vehicle stand at the final of the TDI challenge in 2006. Finished with a high gloss industrial red it matched cleverly the semi-professional trolley jack that it works in combination with. Consider the situation - home mechanics jacking up a car one corner at a time and placing axle stands underneath is at best a fairly precarious process. It requires deft positioning and adjusting of axle stands on two and sometimes all four separate corners of the vehicle. Tom's radical alternative was, and is, to combine the lifting action of the trolley jack with the 'auto positioning' and fixing of the stand and the safe lowering and removal of the jack. Featuring an adjustable lift pad and cross brace the stand pivots into position and then with the main spar located by pins in slots drops into position and the user can swing the cross brace into place. Clearly forging or fabricating using other techniques for this fully working prototype was not possible but it demonstrates clearly a wide range of construction techniques.

Ben Jones produced this excellent piece of equipment to meet the needs of agricultural and contract fencers. They need an adjustable and yet simple way of tensioning wire as well as stock fences at both the bottom and top of fence posts. The body of work centres on the design and connection of a series of castings and components – easily described, rather more difficult to achieve. What is clear is the strong developmental approach in modelling and prototyping that is shown and the confident and organic annotation as the project folder evolves almost as a journal of the design journey. CNC and CAD elements feature in Ben's practice. The excellent wooden pattern making featured webs and (taper) draft to facilitate strength and ease of casting. What really stands out for Ben, and of course all the students featured, is the sheer wealth of worthy folder work that explores all the options and records testing, calculations and modifications in detail.

All three students featured are now following engineering degrees and have amply demonstrated many of the key elements of level 3 engineering activity including: engineering drawings, functional maths, working prototypes, extensive workshop practice, first principles and of course quality outcomes that are all key features of his type of engineering approach at A level. For many schools like RGS Worcester they are already making engineering happen inside the existing curriculum