

ADVANTAGE

Giving Your New Product the Best Chance of Success

Development of any new product inevitably means a considerable investment of money, time and effort. The success or otherwise of the product may also affect the reputation, credibility, and even the financial future of the company involved.

It is therefore important that any new product be thoroughly assessed and reviewed against a wide range of criteria. These include functional and technical requirements, safety, ease of use, durability, maintainability, and ergonomics. If these features are all of a high standard, the product has a much better chance of success in the most competitive market.

Gilmore Engineers Pty Ltd has many years of experience in reviewing new products under development, or innovations that are made to existing products.

The company takes a holistic approach with the key components of the service being concept review, technical assessment, human engineering review, and safety. This service is available for any product or process, and can be utilised at any stage of development, from initial concept through to marketing.

Concept Review

This review is not concerned with technical detail, but is intended to assess whether the product will meet the functional expectations of the potential customer or end user. As part of the review process Gilmore Engineers' staff use lateral thinking techniques to generate innovative and creative variations on the original design. These are then evaluated against the initial concept. The aim is to help the client develop the most practical, and potentially most cost-effective product on the basis of the initial concept. Where appropriate, focus groups are used to help define the needs of the end user.

Technical Assessment

This stage of the review is undertaken to ensure that the design, engineering, materials, and other components of the product or process, satisfy the requirements of strength, durability and fitness for the purpose.

Gilmore Engineers Pty Ltd makes use of many advanced analytical techniques including Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD), as well as having extensive experience in failure analysis.

The combination of using advanced analytical equipment and professional engineering judgement, means advice can be given on the development of a product that will meet all International technical and safety standards, in the most cost-effective way.

Human Engineering Review

This involves ensuring that human considerations such as the ease of use, ergonomics and functionality are integrated into the product or process. A typical human engineering review would involve evaluating the product or process against the physiological and psychological capabilities and limitations of a human operator. It may also be necessary to take account of the likely operating conditions and the effect these will have on the operator and the product itself.

As part of the product review, Gilmore Engineers Pty Ltd is able to undertake experimental and theoretical assessment of the effect on the human body of factors such as noise, vibration, intense light and specific loads of various kinds.

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Reducing the Risk in New Designs

When staff at Rotec Design Pty Ltd developed an idea for a modification to make a conventional piston engine produce more power with less pollution, there were two obvious questions.

Would it work, and would it place too much stress on an existing engine?

The idea, known as Auxiliary Drive Air Piston Technology (ADAPT) is the addition of an air pump which allows a four-stroke engine to operate as a two-stroke, thus doubling the number of 'bangs' or power strokes, for every revolution.

The user then has the option of operating the engine normally, or nearly doubling the power output. However, because of the likelihood of increased stress on engine components, it was important to carry out an extensive range of tests and analysis to reduce the risk of damage to components, injury to operators, and damage to the reputation of designers and builders.

Rotec Design therefore engaged Gilmore Engineers Pty Ltd to review the design and undertake a durability test of an ADAPT prototype to find out if it performed to expectations without problems.

Gilmore Engineers began with a technical feasibility study of the engine, which included an engineering analysis of key

components, and the weight, strength, deflection and lubrication of these components.

While such an analysis provides valuable information, the best way of evaluating the performance of a product and its components, is to test it under working conditions. It was also important to have some data against which the performance of the ADAPT and the engine to which it was attached, could be measured.

Since the ADAPT is seen as being of potential use on the engines of standby generators, it was against data from one of these that the ADAPT unit was evaluated.

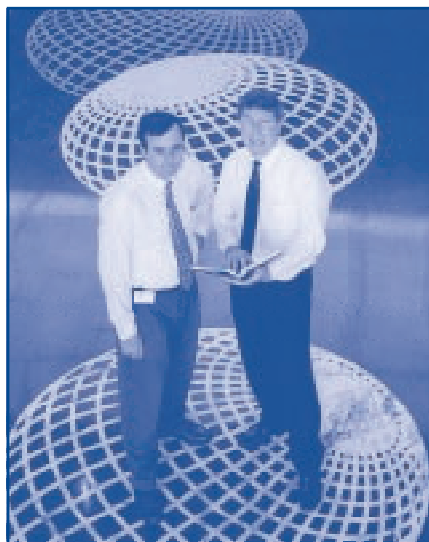
However, before the test began the prototype was completely disassembled and key components examined, with similar examinations being undertaken after the test, and the results were compared.

The ADAPT prototype was connected to a dynamometer and data on torque and engine speed recorded once every minute throughout the 150 engine hours it was under test.

Information was also recorded on coolant and oil temperatures, oil consumption, fuel consumption, and the quality of the oil at the beginning, middle and end of the test.

Results

This intense program of testing and analysis has provided Rotec Design Pty Ltd with valuable information that will allow it to continue with further development of the concept with increased confidence. And importantly, the test results can also be used to reassure investors of the technical, mechanical and practical viability of the ADAPT concept.



Dr Duncan B Gilmore, President and Director of Gilmore Engineers (right) and Mr Scott Loose, Executive Director of the Queensland Manufacturing Institute (QMI) confer on a project.

Partnerships

The two organisations have found that by combining the world-standard engineering expertise of Gilmore Engineers with the advanced computer design and analysis capabilities of QMI, they are able to extend the range and standard of services they offer their respective clients.

Services include engineering design, product development and analysis, computer-designed prototypes, product stress analysis, and 3D model development using advanced water-jet cutting technology.

Worth a look:

Department of Foreign Affairs and Trade (Australia)
<http://www.dfat.gov.au/>

World Solar Challenge
<http://www.wsc.org.au/>

Plastics Resource Centre
<http://www.plasticsresource.com/>

Plus our own web site is
<http://www.uq.net.au/gileng/>
which is linked to the Australian Government Directory
<http://www.agd.com.au>

Engineering Detective

When specialists from Gilmore Engineers set out to find the reasons for an engineering failure in a product, the process is something like a detective searching for clues.

It begins with an inspection of the failed component, either on-site or in the laboratory if the item is transportable. Photographs are taken to obtain a detailed record of the critical parts, and arrangements are made for specialised testing which may include chemical or metallurgical analysis, microscopy, weighing of components, or the use of sophisticated techniques to identify fatigue cracks.

Searches are done through technical libraries or via the Internet to establish if there are records of similar failures, or for any other information which may provide clues as to why the particular failure occurred. Checks are also made on whether the failed item conformed to International technical standards. If necessary, engineering calculations are done to assess whether the failed component was strong enough.

When investigations are completed, a written report is prepared which explains all the procedures and techniques used, the findings from the analysis, and conclusions as to the reasons for the failure. Where

appropriate, recommendations are provided on how to prevent further similar failures.

Expert engineering investigations and a comprehensive technical analysis can be undertaken on any physical system or process which has failed, or where difficulties are being experienced.

These can range from mechanical or structural components in motor vehicles, aircraft, cranes or large machinery, to small items including electric hand tools which have disintegrated, chairs which have fractured, or motor vehicle tyres which have delaminated. Investigations have also been carried out on building and machinery fires, floor surfaces which have caused slips and falls, and workstations that must be proved to meet ergonomic requirements.

Specialist staff at Gilmore Engineers have up to 25 years experience in investigating, analysing and documenting engineering problems, and in recommending solutions to these problems. Their services are regularly used by major Australian companies, legal firms, insurance groups and individuals requiring independent investigations and reports on problems of many kinds.

The human evaluation is undertaken in the context of relevant International standards or regulations.

Safety

To minimise the risk of damage, injury or economic loss to the consumer or user of a product, safety features must be included as fundamental requirements right from the concept stage of any new product or process.

Gilmore Engineers Pty Ltd has broad experience in the fields of workplace health and safety, personal injury, and product liability. The company is in a position to evaluate likely risk factors of any new or existing product resulting from poor design, or the type of materials or components used.

Products are assessed on the probability of failure, and the potential consequences of any failure. Physical testing of specific components of a product is often undertaken to substantiate theoretical evaluation.

Safety evaluation is also related to relevant International standards, and state and federal legislation.

Anyone developing a new product or process who does not seek the type of review and evaluation which can be provided by Gilmore Engineers Pty Ltd, is jeopardising their investment and possibly putting themselves at risk of litigation if the product causes damage, loss or injury to someone in the future.

Large Moulds and Models Made More Cheaply

Large 3-D moulds and models can now be produced inexpensively by Gilmore Engineers using a system developed by product development engineer Ray Hope.

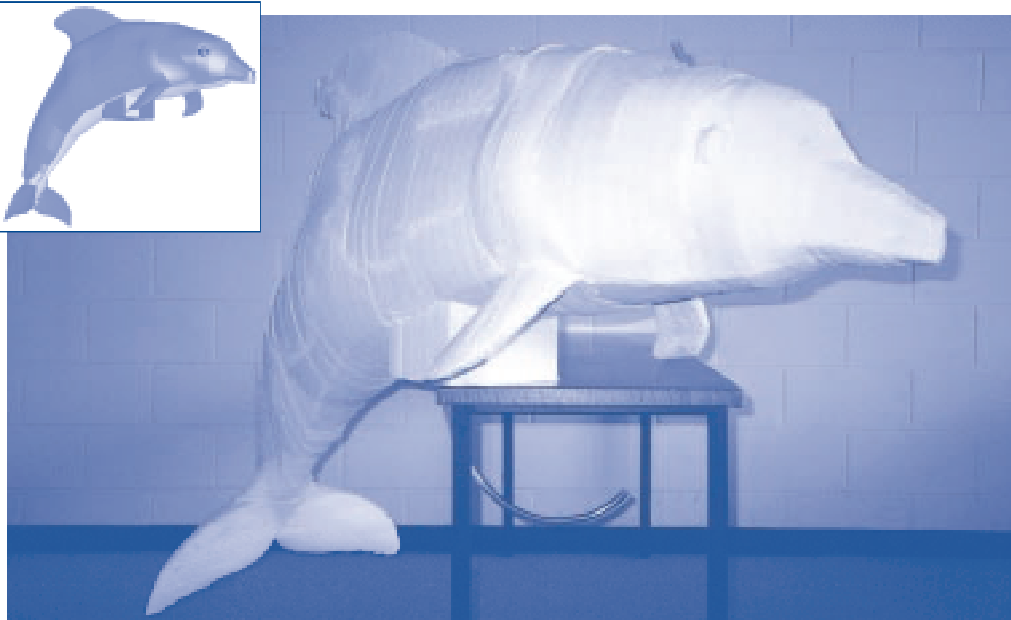
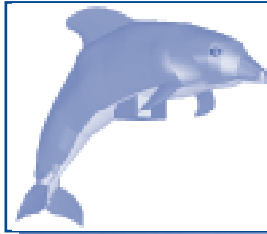
The system, TruSurf 98, can produce large physical objects in almost any material, quickly and accurately from 3-D computer models. The process combines layered manufacturing techniques (building the model up with a series of thin layers) with five axis cutting to produce profiled layers.

TruSurf uses a unique method of 'slicing' the CAD model so the data can be used to automatically select the thickness and design of layers being cut from material such as styrofoam, timber or even granite. This unique process even allows individual layers to be cut with sloping side surfaces so that the final physical model has a surface close to that of the original CAD model.

The TruSurf 98 technique has already been used by Gilmore Engineers to produce a number of large physical models, including a life-sized dolphin with the vital statistics of 1700mm x 660mm x 1300mm. It was constructed by Ray Hope as part of his Doctoral thesis to prove the effectiveness and versatility of the TruSurf technique.

To produce the dolphin, 142 layers were cut from sheet material with a five axis water jet cutter. Actual cutting time was around four hours and it took one person about three hours to assemble the model.

The Queensland Manufacturing Institute has estimated that constructing a similar solid model



A lifesize dolphin rapid prototyped using the TruSurf 98 system

in a Stereolithography machine would take about 10 days and cost around \$24,000. The construction cost using the TruSurf 98 technique was about \$1200.

TruSurf 98 has a wide range of potential applications including:

- Patterns and moulds of any size;
- Constructions for theme parks, shopping centres, or architectural objects;
- Props for film, theatre or entertainment centres;
- Hulls for marine and leisure craft;
- Life-size or scaled reproductions of people, animals or other objects for displays or museums;
- Prototypes; or
- Sculptures.

The range of possibilities is virtually limitless, and Gilmore Engineers is happy to discuss potential projects and costs with anyone requiring a model or a mould.

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