

ADVANTAGE

think TANK

Approach to New Ideas

The philosophy that "many heads are better than one" is central to problem solving and product development at Gilmore Engineers.

Utilising the considerable experience and expertise of his staff, Duncan Gilmore has developed a "ThinkTank Division" that has established a reputation for achieving practical solutions for a wide range of design, manufacturing, commercialisation and problem-solving challenges.

"Clients approach us for a variety of reasons ranging from product failure, to developing a new concept or design, or assessing the commercial viability of a potential product.

"After assessing what the client wants us to achieve we then decide on the types of expertise necessary to contribute to that outcome - that is, who can make the most worthwhile contribution to the ThinkTank," said Company President Dr Duncan Gilmore.

And Gilmore Engineers has plenty of expertise that can be called upon.

Duncan Gilmore has more than 25 years experience in product research and development in academia and industry, technical project management and product commercialisation, and engineering failure analysis. He has worked as a consultant to governments, and manufacturing, defence, aerospace, energy, transportation and mining industry sectors.

He has also assembled a team of engineers with wide-ranging but complementary skills.

Nicholas Agnew is a specialist in thermodynamics and fluid mechanics, and advanced engineering analysis including computer simulation of systems. He gained valuable experience while working at Texas A & M University in 1992, where he complemented his University of Queensland PhD studies in computational and experimental fluid mechanics.

Philip Teakle specialises in product design, mathematical modeling and product analysis. He has a particular interest in new approaches to product development and problem solving and has contributed a chapter to be published in an international mechanical

engineering handbook. Philip gained his Masters degree in new product design and has worked at the Centre for Design Research at Stanford University, California.

Ray Hope has expertise in product development, computer-aided design and manufacturing, and rapid prototyping and tooling. He gained his PhD and an internationally-recognised award by developing a new rapid-prototyping technology. His research and broad experience has enabled him to achieve innovative solutions to difficult manufacturing processes and prototyping of large objects.

However, while the diverse skills, experience and interests of Gilmore Engineers' staff provide considerable scope for the cross-fertilisation of ideas and the development of lateral approaches to problem solving, the ThinkTank is not limited to their input.

When appropriate, Gilmore Engineers can co-opt experts in many other fields including medicine, biotechnology, physiology or food technology.

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CASE STUDY SNAPSHOTS

New Product R & D and Commercialisation

The success of the Think Tank approach to problem solving and product development has been demonstrated in the outcomes achieved for both commercial and government clients with a diverse range of products.

>> **The Maxi Muncher Garden Shredder** <<

Rover Mowers Limited, part of the Australian GWA Group of Companies engaged Gilmore Engineers in 1990 to design and develop a 1.8 kW electric garden waste shredder - now marketed as the "Maxi-Muncher". The process began by benchmarking competitive machinery from Australia, West Germany, and the USA. It was then possible to design and develop a superior product (within budget) that has achieved sales beyond expectations.

>> **Lawn Mower Cutting Performance** <<

A second project undertaken for Rover Mowers involved improving the performance of rotary mowers to ensure all types of grass were cut cleanly. As well as undertaking a theoretical analysis of the cutting mechanisms and performance, a visual analysis was made possible by installing see-through acrylic windows at strategic points.

As a result changes were made to a number of components including the blades, which resulted in improved cutting performance. This range of mowers is currently exported to the USA and Germany as well as being sold in Australia.

>> **Exhaust-powered Tipper for Pick-up Trucks** <<

Gilmore Engineers had considerable success with the development of a collapsible textile bag to provide a fast-lifting system for loads of up to 1.5 tonnes on the tray of pick-up trucks. The company patented a product that overcame persistent problems of fibre crimping as the bag collapsed, and followed this with development of a very compact bag system for the USA market in 1992. Further design and development continued and the unit was exhibited at a large Dallas Motor Show in 1996.

>> **Robot Vehicle for Mine Searches** <<

Australia's Commonwealth Scientific Industrial Research Organisation (CSIRO) commissioned Gilmore Engineers to design and construct a robotic head for a mobile vehicle, designed to carry out underground investigations, following coal mine explosions. The robotic head contained three TV cameras, lights and a microphone. It pivoted on two

axes and was operated by remote-control from outside the mine. The successful prototype of the vehicle was tested extensively in Queensland coalmines.

>> **Sun Screen and Lotion Applicator** <<

One of the more unusual projects for which Gilmore Engineers was retained was to review the preliminary concept for a sun screen applicator. The ThinkTank produced around 70 new ideas which were finally narrowed down to six that had the required features including compactness, reliability and convenience. Funds are currently being sought for development and commercialisation of the project. While the initial concept could be regarded as a novelty, the healthcare product is seen as very important for the application of sterile creams and lotions on burns victims, as well as sun screens for everyday outdoor life.

>> **Technofast Industries** <<

From the minute detail of a lotion applicator to the problems of tensioning huge bolts on equipment associated with the Japanese Nuclear Power industry, no project is beyond the scope of Gilmore Engineers. Over the past seven years the company has periodically been engaged to provide design and testing expertise for an innovative

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rotec.com.au
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hydraulically-activated fastening device for bolts of up to 150mm diameter, where traditional fastening and tensioning methods are not applicable. Gilmore Engineers has undertaken extensive stress analysis for this Australian Company and continues to work closely with Japanese engineers on further design, development and testing.

>> Access to Masonry Walls <<

In 1998 Gilmore Engineers undertook work for a private client to develop a simple system to allow easy access to masonry wall cavities for inspection, pest treatment, or maintenance of concealed services. The ThinkTank approach resulted in more than 50 new ideas being developed from the initial concept, with two of them finally selected for further development and possible commercialisation. As well as the obvious benefits of the system, the concept was designed to meet building industry guidelines which are expected to be introduced in the future.

>> Predictive Maintenance Systems <<

Gilmore Engineers has been involved in the commercialisation of technology to predict the residual life of large machinery systems. The technology has been developed by the Department of Mechanical Engineering at Monash University in Melbourne, Australia, in conjunction with Bankers Trust Australia and other investors. It has potential application in major industrial systems including power generating plants to enable operators to plan more accurately for major maintenance operations or to budget for replacement.

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As a result, the ThinkTank is able to generate solutions that frequently go beyond current conventional thinking while remaining feasible and practical.

Duncan Gilmore believes the ThinkTank approach offers numerous benefits for the client, with the obvious one being the introduction of fresh ideas and approaches.

- Any company can become set in its ways and lose the ability to develop new and broader approaches to the way it operates. The ThinkTank encourages participants to move beyond conventional and obvious approaches and to generate fresh ideas that may give the company an edge in its particular field.
- ThinkTank members are able to draw on their wide-ranging experience and expertise to suggest innovative commercial uses for new or existing technologies, materials or methods. This can improve the commercial potential for new and existing products or ideas.
- The ThinkTank process can help identify new products that can be easily incorporated into an existing product range, thus increasing the revenue generated by existing facilities, skills and equipment.
- It can help improve the profitability of existing products by reducing costs, and improving performance.
- A ThinkTank can generate a range of concepts and designs for new products and processes. The client then has access to the best ideas and an advantage over competitors.
- It is a fast and cost-effective means of developing solutions to problems in design, manufacture, materials, equipment and processes, safety, packaging and transportation.

The ThinkTank approach allows Gilmore Engineers to work on one specific aspect of a project, or to be involved from initial concept and design right through to manufacture and commercialisation.



ADVANCED TECHNOLOGY EXPO

Gilmore Engineers took advantage of the Advanced Technology Expo, held during Queensland Science Week 1999, to display computational and physical models resulting from the company's research and development.

Technology-based organisations exhibited work including robotics, 3-D graphics, satellite and aerial imaging, internet conferencing and information services, electricity control and 3-D printers.

YALE GRADUATE GAINS EXPERIENCE

Yale graduate Eduardo Gonzalez has been gaining industry experience with Gilmore Engineers after completing his Master of Engineering Science degree last year. Other industry experience since graduating has included an internship with Hewlett-Packard where he worked in the Optoelectronics division, and time with United Technologies where he worked in the Advanced Propulsion Division.

Eduardo is now spending three months with Gilmore Engineers where he is gaining valuable experience in new product development, design review, stress and strain analysis of components, and research into composite materials for industrial applications. He is also contributing to the ThinkTank on projects including the design and manufacture of a long conveyor belt component for use with coal or minerals.

On his return to the USA, Eduardo will begin work in the Metallurgy Division of Sikorsky Aircraft.

NEW STAFF MEMBER

Gilmore Engineers have welcomed a new staff member, Clinton Hinze who is a mechanical engineering graduate from the University of Queensland, specialising in design.

Computational Fluid Dynamics (CFD) Modeling of An Air Autogenous Mill

Gilmore Engineers has recently been involved in a fluid dynamics analysis of an air autogenous mill - a grinder used to reduce sand to extremely fine particles to allow easier extraction of minerals such as gold and titanium.

The patented mill, which utilises an inter-particle collision technique to break up mineral sands, has been developed over a long period and has been assessed by both the CSIRO and the Julius Kruttschnitt Mineral Research Centre at the University of Queensland.

Working in conjunction with the Queensland State Development Technology Diffusion Program and the Centre for High Performance Computing, Gilmore Engineers began by digitising the mill's geometry and taking pressure measurements within the tube at various fan speeds. This data was used to generate a computational fluid dynamics (CFD) model which demonstrated the air-flow activity most likely to be responsible for breaking up the sand particles.

Particle tracking was also undertaken to determine the likely trajectories of sand particles of varying sizes, their densities, the factors that influenced their shape, and the degree of shape irregularity.

The next stage of the project, also involving CFD, will be a feasibility study of a much larger prototype of the mill. This will be necessary in order to refine design features before a commercial version can be built.

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