MAKING AN IMPACT

In our work with industry, IRL science and engineering help solve problems and also create opportunities.

SOLVING PROBLEMS

Ensuring correct temperature readings

Infrared thermometers measure temperature without contact and low-cost hand-held versions are widely used in the building industry, in low-temperature processing industries and, in particular, in the food industry and food retail outlets, where correct temperatures and good hygiene are essential. These thermometers work by measuring the infrared radiation emitted by the target object, but there are several other factors that can affect the reading, usually resulting in measurement errors. These factors have been the focus of research by Peter Saunders of IRL's Measurement Standards Laboratory, leading to big improvements in the way the thermometers are used and in their accuracy. "One of the factors that needs to be taken into account in using infrared thermometers is that as well as emitting radiation, objects also reflect radiation from other sources," he says. "The thermometers are designed to compensate for reflections to some degree, but if the reflected radiation is large, then the temperature reading will be inaccurate. What's worse is that the temperature of the thermometer itself, which is usually not known, also affects the reading." His theoretical work was then put to the test by an Auckland firm, Teltherm, which offers an accredited calibration service for thermometers and pressure gauges. "Producers were complaining that their products were being rejected when they were temperature-tested using hand-held infrared devices," Teltherm's Anne Evans says. "In our lab, where we test these instruments, we were also seeing errors that we could not quantitate for all the different makes and models used in New Zealand, but using Peter Saunders' research we can now offer New Zealand industry an accurate IANZ Temperature Report for a fraction of the price that a research lab could." Teltherm also enlisted Peter Saunders' help in educating auditors on how to measure goods using an infrared thermometer and the errors that can occur. "Four months later we are beginning to see the results of that exercise as our customers start asking for ice points (an easily reproduced reference point to check the continued accuracy of a thermometer between calibrations) and seek regular checks on their instruments," Anne Evans says. "Overall, the project has been a remarkable success," she concludes.

Proving plastic blocks work

Customers of Auckland-based power solutions company TransNet were asking if the concrete blocks used to stop power poles developing a lean and eventually falling over could be replaced with something lighter. As power poles are inserted, one block is placed at the bottom of the hole and another at ground level, and between them they prevent the pole being displaced due to the constant tension of the wires. The problem was that the concrete blocks are very heavy and staff installing them were vulnerable to back injuries, especially in an industry where the average age of linesmen is around 50 years. TransNet decided to experiment with plastic blocks. The issue, Managing Director Spencer Winn says, was: Would they work? "There were plenty of doubters who thought the plastic blocks would not be sturdy enough to do the job, including me, but rigorous testing by IRL showed that they would work," he says. "We had the testing done in time for the plastic blocks to go on show at an important trade show in New Zealand and have made our first sales of the new product."

Shock testing for naval equipment

The Royal New Zealand Navy uses IRL's facilities in Auckland to shock test equipment that is being developed or purchased for installation on its ships. The testing ensures any equipment destined for use at sea can withstand shock from a major explosion associated with a mine or missile attack. Commander David Fairweather, the navy's Engineering Change Commander, says being able to access the shock testing facilities at IRL has important benefits. "If this shock testing platform wasn't available to us we would be forced to look overseas for the service, probably in the US or Europe. Having local facilities also allows us to source equipment manufactured locally – rather than having to favour overseas suppliers whose product has been able to be shock tested. It also allows New Zealand manufacturers the opportunity to compete in the international military sales market," he says. "Either way, having this facility saves us time and money."

Hitman™ takes hit and miss out of wood quality decisions

Each day, in plantation forests around the world, foresters use an acoustic sensing tool developed by Mike Andrews and fellow IRL researchers Paul Harris and Russell Petherick that measures the strength of wood by analysing the stiffness of the fibres. Plantation forests have played an important role in the sustainability of the timber industry but because the trees have been traditionally bred for stem straightness, small branches, disease resistance and fast growth, a proportion of the crop is likely to lack the stiffness and strength required for the construction industry. The Hitman™ technology, manufactured and marketed by Christchurch log and wood technology company Fibre-gen, was initially developed at IRL with FRST and industry funding. It gives forestry workers a tool with which they can accurately, and without damage, grade each log for strength before it leaves the forest, and sawmills can use the tool to decide how best to cut up each log. They can now be sure that only logs suitable for structural use will go to structural sawmills and that the lower stiffness logs are being despatched to sawmills making appearance grade products. It is estimated the technology has generated value to the New Zealand timber industry of more than $26m a year and over $100m since the inception of Hitman™.

Kiwi wind blades are tough

A tough testing programme at IRL's Parnell site in Auckland has proved Windflow Technology's 16-metre Windflow 500 blade is one of the strongest in the world. Knowing its products are going to be used in some of the highest winds and most turbulent conditions internationally, Christchurch-based Windflow Technology approached IRL to test the sturdiness of its product to ensure it could meet International Electrotechnical Commission (IEC) certification standards for fatigue life. It took more than five million cycles of vertical flapping to show the blade met the IEC's demanding standards. Windflow Technology's marketing manager, Sheralee MacDonald, says the company's last documentation for the certification was submitted to the independent certification body – Lloyds Register – in July. "Finalising independent certification will open up a multi-million dollar market for the New Zealand designed and manufactured wind turbines here and overseas," she says. "We are Australasia's only wind turbine manufacturer and, with over 90% of the turbine components being sourced from New Zealand, this represents 10 jobs for every turbine sold. When you add this to the fact that each Windflow 500 wind turbine powers approximately 200 average houses, this is good news for New Zealanders."

New Zealand coinage

– IRL undertook research and provided advice to the Reserve Bank when it introduced new, smaller 10, 20 and 50 cent coins in 2006. This work ensured that each coin had a distinctive "electromagnetic signature" and could be identified and accepted by vending machines. IRL also helped assess the production methods and quality control procedures of mints shortlisted for the supply of these coins.

IRL has subsequently assisted with checking that annual production runs of these coins have met quality control specifications.

IRL has also tested some suspect one and two dollar coins to establish whether they were genuine or forgeries.

Vehicle registration labels

– IRL researched and tested materials for the registration labels that all New Zealand vehicles must display. Our researchers also set standards for those materials and for the manufacturing processes to be followed.

New Zealand passports

– new "microchipped" passports introduced in 2004/05 had to meet international durability specifications and IRL developed the instrumentation and the test procedures to ensure New Zealand passports complied.

Pyrotek products for the aluminium smelting and casting industry

– for the past 20 years, IRL materials scientists have been working with Pyrotek to produce materials that can withstand the tremendous heat, and the rapid heating and cooling, of aluminium plants. The collaboration has produced a new patented manufacturing process for a ceramic, known as Sialon, that is made by Pyrotek in New Zealand and incorporated into a range of products for export around the world.