

Pursuing the vision of 'driving the development of a knowledge based economy', the Institute for Resource Industries and Sustainability (IRIS) provides multidisciplinary capabilities and expertise specifically structured to meet the business improvement needs of Australian industries and engages in sustainable programs beneficial to the wider community.

The Central Queensland region has a unique blend of challenges. By working cooperatively with government and industry to build on these opportunities and to meet the challenges facing our region, IRIS contributes to the balance of economic, social, and environmental outcomes needed for a sustainable future pursuing the development of new clean businesses and industries. Policies which mandate reductions in environmental impacts and greater social responsibility create both opportunities and challenges for industries, businesses and the region.

IRIS research programs, projects and initiatives are closely linked to priorities identified by industry partners and through a variety of regional development planning processes at local, state, and federal levels.

## What do we offer in addition to research?

IRIS can provide assistance with building a Research and Development program logically linked to organisational goals and objectives and business development programs, in particular:

- Assistance with developing a strategic approach to Research and Development to achieve organisational business, environmental and social corporate responsibility goals
- Assistance with management of research programs and projects, including commercialisation and implementation of research outputs
- Assistance with managing and extracting value from intellectual property owned by your company
- Provision of expertise for an independent review, testing and adoption of new technologies
- An easy pathway to understanding and documenting 'best practice' in similar industries in Australia and overseas

IRIS is also well placed to help industry and government organisations with training and capability building including:

- Flexible training and educational opportunities carefully tailored to address the needs of full-time employed staff
- A source of new research graduates, trained to understand your business
- Postgraduate student placements in your organisation to assist with business improvement
- An opportunity for industry staff to engage in applied postgraduate research with CQUniversity, addressing needs of the organisation, improving performance, and receiving a postgraduate degree by research
- Assistance with building expertise and capacity in areas of strategic importance to your business

## What do our partners and customers say about us?

### Collaboration and Project Management Skills

*"CQUniversity played a central role in collecting the partners together and launching the projects. In addition we have personally appreciated the active role of the University in the coordination of the projects. This kind of attitude (project management) isn't usually expected from the academic world and it was a surprise for me. Also, the technical contribution given to the project was sound and professional."*

**Francesco De Maria, Brake Control and AGT R&D Manager Faiveley Transport**

### Strong Customer Focus

*"As for many horticultural farmers in the current market environment, farming for us involves a seven day workweek. So Dr Bhattarai has done more than his fair share to ensure this cooperative trial is a success. His input has included providing materials and student assistance at several stages of the trial, and undertaking trial procedures on weekends and at odd hours to fit in with the weather and our own availability"*

**Clarrie Higham, Jungle Fruits**

### Impact and Outcomes

*The phytocapping trial suggested by CQUniversity for landfill management is proving very successful. The technology could save ratepayers literally millions of dollars.*

**Craig Dunglison, Waste Services Manager, Rockhampton Regional Council**

# INTRODUCING IRIS RESEARCH AND DEVELOPMENT PROGRAMS

## CLEAN ENERGY

Demand Response and Energy Efficiency Programs: Industrial, Commercial and Residential

Smart Grid including Renewables and Electric Cars

Bio-fuels from Algae, Sugar Cane Waste, Natural Plants, Agave and Bio-char from Green Waste

Energy-efficient Building Design

CQUniversity Sustainability Program

Clean Coal Technologies

Transformation of energy networks from traditional distributors of electricity into 'smart' grids with distributed energy generation is a challenging task that requires multidisciplinary research across different subject areas and successful adoption of new technologies by energy providers and their customers. Methods for accurate and reliable forecasting and use of energy from renewable sources within existing infrastructure, assessment of new energy storage options and the development of tools and products for demand management are among energy challenges being addressed by IRIS research.

Voltage fluctuations in the network can be potentially damaging to consumers' appliances. That is why improvement of reliability and quality of electricity supply to customers is another focus area for IRIS. New voltage stabilisation method developed by researchers has shown promising results in early tests and is now subject to full-scale field testing by Ergon Energy.

The climate and unique natural resources of Central Queensland provide attractive opportunities for investigating the feasibility of new bio-fuel stocks not competing with food production. Beauty leaf, agave and native algae species being investigated by IRIS researchers all have potential to become economically feasible bio-fuel sources contributing to the development of new emerging industries in the region.

While adoption of clean coal technologies is vital for low energy prices and ongoing export of Queensland coal, many of them are still at the 'proof of concept' or development stage, and mistakes of picking non-winners could be very costly. Assessment of the technical and economic feasibility of clean coal solutions is a new area of research where IRIS is looking to establish expertise and capabilities and to work closely with industry partners in making the 'clean coal' vision a reality.

## ENVIRONMENTAL PROTECTION

Environmental monitoring, Air Quality and bio-remediation programs

Industrial Ecology

Industrial and Waste Water Monitoring and Treatment Systems

Great Barrier Reef and Bio-diversity Management

Industrial and municipal 'Waste to Profit' Projects

Environmental compliance is an important part of any mining project, and IRIS researchers have a proven track record in assisting the mining industry with managing environmental risks. As environmental monitoring may be a significant cost to industry partners, researchers have identified cost saving opportunities via a partnership approach.

The CQUniversity campuses span industrial ports, mining areas and agricultural heartland, and IRIS research in the area of environment protection reflects this diversity. Research outputs help resource industries and the government to protect native flora and fauna and agricultural crop production, manage aging landfills and remediate mining land. Better understanding of animal behaviour and environmental bio-markers as an outcome of IRIS research will contribute to the successful preservation of unique natural resources of the region.

For Australia, as a dry continent, sustainable water treatment and recycling solutions will always be of major importance. IRIS PhD student research has resulted in the development of a patented Zetos™ water treatment system. Today, the student has commercialised the award-winning Zetos system to successfully provide water treatment services to several communities and for specialist events. Early tests show this technology has real potential for processing contaminated coal seam gas water and making it suitable for agricultural and grazing industry applications. IRIS continues to investigate this exciting opportunity working closely with our student's company 'Midell Water' and CSG industry partners.

## IMPROVING INDUSTRIAL PERFORMANCE

Engineering Asset Management

Material fatigue and Failure Prevention and Analysis

Operational Efficiency

Supply Chain and Network Capacity

Condition Monitoring Programming and Systems

Workforce Development and Industrial Safety

Improvement of productivity and operational performance of resource manufacturing and supply chain industries is an important area of research, training and consultancy services provided by IRIS.

Growing demand for resources has put increasing pressure on our rail network capacity. Reliability and safety of rail services are paramount. With trains getting longer and heavier, a derailment can cost rail customers up to \$70 million per day. A world first train monitoring system being developed by IRIS researchers in partnership with QR National and Faiveley Transport will reduce derailments, reduce in-service failures, thereby improving the reliability of rail services and delivering tangible and significant benefits to the mining industry.

Maintaining and managing ageing assets is a common and significant challenge for many industries in Central Queensland including power generation, energy distribution, railways and mining. Optimisation of maintenance strategies can save customers millions of dollars annually. IRIS researchers assist industry to solve problems of metal fabrication and fatigue processes on the useful life of engineering assets. IRIS worked with Berg Engineering to optimise manufacturing processes and develop a new valve repair process resulting in a significant extension of the useful life of valves. Similarly, a study of the effectiveness of rail lubrication allowed researchers to optimise maintenance regimes used by rail network owners and achieve cost savings. Training programs in Asset Management, Rail Operation and Signalling provide industries with a vital knowledge for improving organisational performance and asset utilisation.

## SUSTAINABLE AGRICULTURE

Tropical Horticulture and Food Production

Tropical Plant Science

Urban Agriculture

Irrigation Systems

Agricultural challenges for Central Queensland include climatic changes, new legislative imperatives, and the development of new crops and breeds. IRIS research in the areas of plant and water sciences has always had a strong focus on delivery of new products and practices for improving productivity in the agricultural sector and delivering return on investment. A joint R&D project undertaken by researchers jointly with Integrated Spectronics resulted in the development of a handheld device capable of delivering a quick assessment of mango crop maturity to aid harvesting. Working with Colour Vision Systems, another product was developed which can assess quality and sweetness of fruit passing on a packline at up to 10 fruit per second. Refining 'to market' processes, improving produce selection and minimising agricultural wastage are among other challenges being addressed by IRIS agricultural research.

Identifying and assessing opportunities for growing new species and varieties of plants in Australia can deliver tangible benefits to the agricultural sector. A study of the commercial viability and a successful application to the food safety regulator (FSANZ) for use of Stevia, a natural sweetener now used in production of healthy food in Australia, is an example of research undertaken by IRIS in this area.

## REGIONAL AND COMMUNITY DEVELOPMENT

Social and Community Impacts of Resources-based Industries

Regional Development Strategies

Targeted Education to meet Local Demand

Linking Business, Government and Community

CQUniversity has a proven track record in providing advice to state and local governments about sustainable regional development. University researchers are also among the leaders coordinating innovation, 'Beyond Carbon' and other regional initiatives and working closely with local businesses and communities. While Central Queensland has been marked as the region to be hardest hit by a carbon tax, environmental challenges create unique opportunities for the economic development of the region.

Sustainability of industrial production, waste management, and protection of environmental and energy security are issues high on agendas for Australia and the rest of the world. The need to reduce greenhouse emissions creates challenges for the ongoing existence and competitiveness of power generation, coal mining and mineral processing industries located in Central Queensland. In order to survive and stay competitive, traditionally operational industries are being pushed to improve sustainability of their production processes via adoption of new 'clean' technologies. The demand for 'Cleantech' expected in the near future creates opportunities for linking regional businesses and institutions with overseas technology providers, building local technology supply chains, diversifying regional economy and facilitating regional development. The Institute is committed to working closely with state and local governments pursuing the creation of a knowledge-based economy in the region.

IRIS comprises a diverse range of Research Centres and Groups within CQUniversity with complimentary expertise and capabilities.

### **CENTRE FOR ENVIRONMENTAL MANAGEMENT (CEM)**

CEM is well known for undertaking research and consultancies for large and small businesses and government organisations in areas related to environmental management, regional economics and social development. Areas of expertise include: ecotoxicology and industrial water quality; terrestrial, freshwater, marine and coastal ecology; and environmental economics, and sustainable regional development.

### **CENTRE FOR PLANT AND WATER SCIENCE (CPWS)**

CPWS is a recognised provider of expertise and training in the areas of bioengineering and treatment of drinking, rain and wastewaters; subsurface irrigation systems; quality food and integrated horticultural production systems including non-invasive product quality assessment; biological farming and new crop opportunities; revegetation of industrial sites and landfills; and biofuel production.

### **CENTRE FOR INTELLIGENT AND NETWORKED SYSTEMS (CINS)**

CINS has staff with extensive expertise in the development of ICT and control solutions for the transportation, manufacturing and resource industry sectors. Some of these areas of expertise are networked control systems, robotics systems for industrial applications and scheduling applications; automation of distributed power systems, virtual reality based training and data mining.

### **CENTRE FOR RAILWAY ENGINEERING (CRE)**

This internationally recognised Centre has broad expertise covering all major areas of the railway industry and undertakes both engineering and human factors research. The Centre has capabilities and expertise in the development of industrial and commercial ready products and technologies.

### **PROCESS ENGINEERING AND LIGHT METALS CENTRE (PELM)**

With a team of internationally respected research personnel, and advanced analytical and experimental facilities, PELM specialises in materials reliability, engineering asset management, and industrial processes. PELM also undertakes consultancies including corrosion testing, fracture and fatigue analysis, metallurgical assessment; air quality analysis and odour testing, fluid mechanics and multiphase flow, rheology and material flow characterisation, and management and thermo-fluid process and transport.

### **POWER ENGINEERING RESEARCH GROUP (PERG)**

PERG works with our industry partners to shape the future of electricity generation, transmission and distribution in its many forms such as smart grid technologies, renewable energy systems, power quality, electrical asset management, and seeks the improvement of existing generation, transmission and distribution systems.

### **BUSINESS RESEARCH GROUP**

The Business Research Group is driven by industry needs to secure access to adequate human and other resources, suppliers, and new markets to remain competitive. Areas of expertise include valuations of financial assets including land and property; emerging markets, finance and investments; accounting issues for resource industries; regional labour markets, workforce development and human resource management; regional business development; and research into the planning, implementation, and effectiveness of marketing strategies (including social services, events, tourism, and international marketing).

*Being an expert in collaboration and partnering, IRIS will ensure that the best team is working on your solution bringing together experts and intellectual property from relevant Australian and international universities and business organisations.*

## **DELIVERING TANGIBLE BENEFITS TO INDUSTRIES AND COMMUNITIES**

### **Intelligent Train Monitor**



### **Zetos™ Water Treatment System**



### **Mango Harvesting Aid (Integrated Spectronics)**



### **Oxygation irrigation system for drip irrigated crops**



## **CONTACT DETAILS**

CQUniversity Australia  
Building 70, Bruce Highway  
Rockhampton QLD 4702  
AUSTRALIA

Phone: 07 4923 2372  
Enquiries email: [iris@cqu.edu.au](mailto:iris@cqu.edu.au)  
[www.iris.cqu.edu.au](http://www.iris.cqu.edu.au)