



CTRC

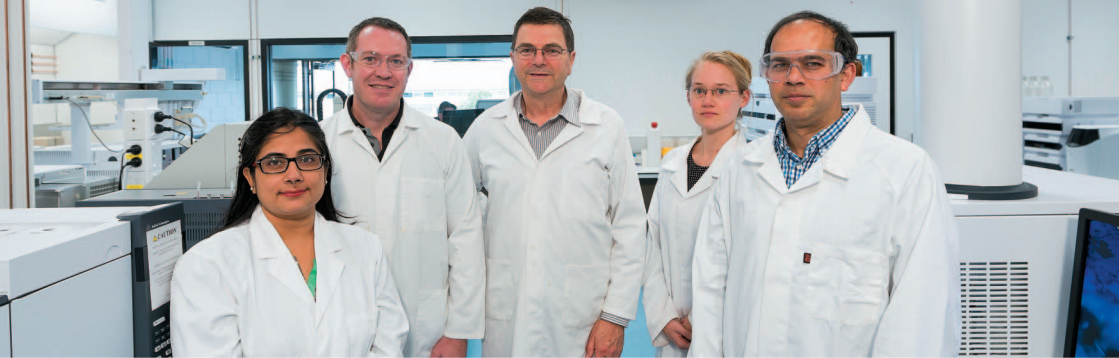
## Carbon Technology Research Centre



Located at Federation University Australia's Gippsland campus the Carbon Technology Research Centre (CTRC) has recently been upgraded having received \$2.3M in Education Investment Fund (EIF) funding for carbon capture research and training. The Centre's capability and speciality lies within the brown coal space.

The facility is able to undertake a wider range of high level analytical projects applying our combined 40 years' experience in chromatographic and spectroscopic techniques to the most challenging matrices and problems. As an example, the analysis of aqueous amine capture solvents and their degradation products is challenging for many reasons including reactivity and concentration differences between major versus minor components impacting on separations. Techniques have been developed to reliably perform these analyses.





CTRC's focus is in providing high-level tailored analytical support for carbon capture and coal to products projects.

Our niche is working with complex samples such as ; difficult matrices (e.g. high toxicity), odour impact, multiphase, reactive targets (e.g. amines), identification of unknowns, and method development. We also specialise in trace analysis – (if the target is known); speciation and what form the element is in; reverse engineering – product comparison and process by-product streams; deposits; emissions; odours.

This core analytical capability underpins the Centre's research capacity in lab and pilot production activities.

### Partnerships & Networks

We have a strong collaboration with the CSIRO Energy Low Emissions Technology group. Through this collaboration, we have also worked with the Netherlands Organisation for Applied Scientific Research (TNO).

Our partnership with the CSIRO provides them with access to specialised analytical skills, research students and well-equipped and licensed laboratories. FedUni also benefits from its connection with CSIRO by having access to their cutting-edge lab research, pilot technology, development expertise, and industry and international collaboration.

### Recent Grants and Awards

The CTRC have been recently awarded (April 2015) a Victorian government grant to investigate upgrading coal based liquid fertiliser products for Omnia Specialities (Pty Ltd). This continues our long association with local industries in value adding to coal products.



Multi detector Bio-inert HPLC



LC-QTOF system with UHPLC



High sensitivity GC QQQ MS

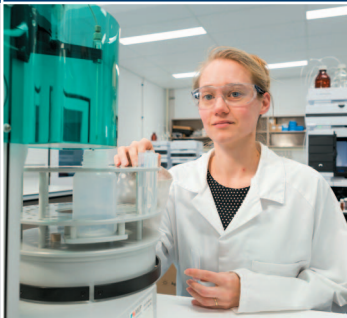
## Research facilities

**Laboratory:** CTRC has established an analytics laboratory and a workshop to carry out a broad range of brown coal and interseam and overburden materials testing.

**“A great team working on reducing the cost of capturing CO<sub>2</sub>”**

Adeel Ghayur, HDR Student with CTRC

ICP MS including GC interface for speciation



Ion Chromatograph



High resolution QTOF MS

## Projects Undertaken

- » Develop method for the analysis of chemical tag compounds used to monitor the electrical generator core associated with 500MW turbine
- » Process water characterisation from a coal HTD plant
- » VOC analysis of sealants as part of an OH&S assessment in communications cabling
- » Evaluate emissions associated with drying options for brown coal
- » Coal derived fuels – analysis of trace oxygen and sulphur species
- » Trace gas analysis of stack samples
- » Condensates and tars from biomass pyrolysis – target compound analysis
- » Co-mingled municipal waste to biochar – characterisation of chemical changes with production temperature
- » Pilot / Demonstration plant support
- » Minerals and Energy – coal to products, biomass, gas, fuels,
- » Pulp and paper – taints and odours, foreign inclusions
- » Environmental – pollutants characterisation
- » Waste water – specialise in industrial process waters

## Exemplar Projects

The CTRC have just completed a project with a major power industry client on generator core condition monitoring via the use of thermal tags. The project involved method development using chromatographic analysis to monitor specific chemical tags.

CTRC are recognized as expert in the area of reactive gas absorption, amine degradation and the handling of flue gas impurities, and have been invited to contribute chapters to 'Absorption-Based Post-Combustion Capture of Carbon Dioxide', edited by Dr Paul Feron, CSIRO, Australia. This book is in preparation at Elsevier and will be published as part of the Woodhead Publishing Series in Energy. The CTRC team includes several internationally-recognised experts who will be contributing chapters in their areas of expertise that reflect the current state of the art, thus ensuring the best possible presentation of the topic for the reader.

## Our Researchers

**Dr Vincent Verheyen** PhD, University of Melbourne

Vincent has a long history in working within the brown coal space having undertaken research with Herman Research Laboratories and the CCV before commencing at Monash University and now Federation University Australia.

Vince's research specialities lie within capture system degradation – liquid capture agents, selective membranes and solid sorbents; Industrial ecology associated with commercial carbon capture plants; Heterogeneous chemical reactions; Combined capture of SO<sub>x</sub> and CO<sub>2</sub>.



Vince has experience with:

- » Chromatography
- » Spectroscopy / spectrometry
- » Forensic Investigation: Environmental / Industrial
- » Fugitive emissions e.g. odours, taints, deposits
- » Gas / liquid /solid
- » Reverse engineering

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**Dr Alicia Reynolds** PhD, Monash University

Dr Reynolds specialises in analytical method development involving hybrid chromatographic and spectroscopic techniques.



### Faculty of Science and Technology

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**Andrew Percy** PhD University of New England

Andrew has undertaken a number of projects connected with modelling and simulation in particular with:

- » Carbon capture from brown coal power plants
- » All-wheel steer vehicles and cooperative redundant steering systems
- » Biological modelling – tree rot, host and parasite

