COAL GRAIN ANALYSIS IS IMPROVING RESOURCE EVALUATION, OPTIMISING PLANT YIELD AND BOOSTING REVENUE

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Coal characterisation techniques, such as petrography, have been used extensively in Australia to predict coal properties and behaviours. In the early 2000s, researchers began investigating more accurate and fundamental techniques in order to advance resource evaluation and optimise coal recovery and usage.

Over the past 17 years CSIRO has collaborated with QCC, University of Newcastle, Jenkins Kwan Tech, University of Queensland, University of New South Wales, Basacon Services and Steel River Testing, to develop coal grain analysis (CGA) into an analytical tool that supports resources-to-product coal quality management. This innovative and game-changing commercial product has been licensed to ALS Coal and significant industry uptake is emerging.

Industry target

- Advance coal characterisation
- Improve prediction and optimisation of coal processing
- Maximise plant yield
- Reduce losses to tailings
- Improve process efficiency
- Improve technical support to marketing.

ACARP industry investment

$1.38 million on 13 projects over 17 years.

Research results

- The development of CGA, an optical reflected light imaging and analysis system, which provides reflectance and composition information on individual coal particles (grains).
- CGA collects high resolution colour microscope-magnified images and stitches them together. Advanced software analyses the detailed (micron level) information for large numbers of particles within a representative sample.

- Differentiation of grains is done automatically via specially designed software.
- CGA can be used to:
  - Characterise coal and reduce the costs of resource definition while increasing the specificity of the data generated (improved application of the *Australian Guidelines for the Estimation and Classification of Coal Resources*, produced by the Coalfields Geology Council of New South Wales and the Queensland Resources Council)
  - Estimate coal preparation plant (CPP) feed washability
  - Provide an alternative means for CPP unit process auditing, optimisation and modelling
  - Improve understanding of utilisation performance and coking characteristics
  - Quantify environmental dust composition (% of coal dust in airborne particulates).
- Researchers have also:
  - Established an image library of approximately 60 different types of coal minerals (such as clays, quartz, calcite, siderite, pyrite and apatite) and dust particles (such as coal, soot, diesel particles, metal particles, paint aerosol droplets, and insect and plant detritus)
  - Developed image viewing software that enables dust sample images to be viewed and components identified.

ACARP

- In 2017, one-day workshops were held in Brisbane, Newcastle, Emerald and Sydney to provide wider industry knowledge and understanding of CGA and its applications:
  - 54% industry participants; 46% services/researchers
  - Positive feedback
  - Downloadable webinar series developed to enhance understanding of CGA and its diverse applications
  - Workshops expected to drive greater uptake of CGA and market demand for commercial operators to implement CGA analytical capability

  These workshops led to development of a *CGA Applications Handbook* which will be published in 2019.

Return on investment

- Advanced commercial coal characterisation technique being used widely across the Australian coal industry
- Greater certainty and flexibility options in evaluation of JORC resources and reserves
- Optimised coal recovery
- Increased revenue due to increased amount of usable coal and reduction in losses to tailings
- Improved precision of determining coal in urban dust which is assisting the industry to address community concerns about coal dust around ports
- A range of potential future applications of CGA

Importance of ACARP

- Ensures an integrated and holistic approach to research, thereby providing solutions applicable across the industry
- Gives researchers a 'whole of industry' perspective that helps to facilitate practical project outcomes
- Provides a mechanism through which issues that concern the industry can be addressed