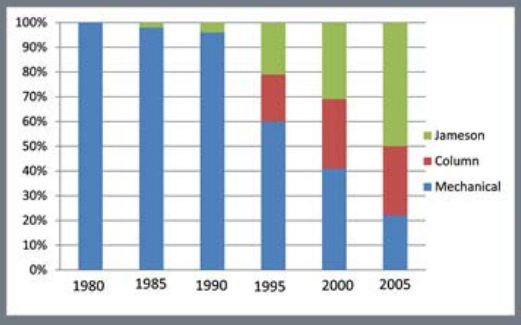
ACARP MATTERS

COAL FLOTATION ... IT'S NOT AS SIMPLE AS 1, 2, 3

Despite the Australian coal industry's quest for a simple, inexpensive method of fine coal processing, effective coal flotation cannot be achieved using a one-step process. A plant circuit needs to be designed with an understanding of the feed coal and the value of the product (the cost: benefit).

This is the conclusion of a research project undertaken by coal processing expert Bruce Firth, who has worked on the development of coal flotation in Australia for more than 30 years. In this project Bruce compared column, 'flash' flotation and mechanical technologies, and recommended future projects that could be undertaken to identify the best technology to use for particular coal types.



Installed Flotation Equipment in Australia (from Euston, 2010)

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The key findings of this project are:

- All three flotation technologies can provide similar technical performance given optimal operation;
- However, the complex nature of the feed in coal flotation, broad size distribution and differing material type, makes it virtually impossible to obtain optimal results from a single-step process;
- Single-step Microcel and Jameson cells invariably have problems with residual frother and poor residence time distribution in large cells, leading to sub-optimal operation;
- Operating any machine beyond its maximum carrying capacity will result in decreased yield, particularly for coarser particles;
- There is a need for improved (non-blocking) wash water systems;
- There is scope for improved instrumentation and control approaches and the capture of information required to achieve this;
- Improved understanding of the impact of slurry subdivision and froth transport is needed.

Bruce recommended that work be undertaken to:

- Identify the conceptual design of a multi-step flotation process along with experimental investigations;
- Explore the link between residence time distribution and staged reagent addition and the recovery of both fast and slow floating particles;
- Identify maximum carrying-capacity and the controlling factors, including froth movement and launder design;
- Explore wash water systems to improve distribution and maintenance;
- Develop new instruments and control approaches accompanied by the subsequent education of end-users.

ACARP industry monitor Dave Osborne said although Jameson and Microcel technologies had dominated the Australian market, they had shortcomings. This had been recognised and studied via several ACARP projects, contributing to their improvement and adaptability.

"Mechanical cells proved most successful when connected together as several successive stages. Column cells were initially installed with two stages to ensure the best outcome but succumbed to cost pressures and they were reduced to single-stage in many cases," he said.

"The most lucrative avenues for R&D and subsequent plant trials have been improving feed consistency, reagent control and feed systems, designing to realistic carrying capacities and using wash-water sprays to reduce carry-over of gangue. The introduction of improved instrumentation and control approaches and the capture of information required to achieve this has also been high on the list."

Dave said Bruce's review of coal flotation methods was long overdue.

"While much has been achieved and many significant improvements are evident there has been a growing need to review this progress and piece together the various parts of the jigsaw to provide the industry with a clear picture of what has been achieved and what still needs to be done," he said.

"This 'roadmap' research will then be of great value to the Australian industry in providing the direction for design, selection and optimisation of flotation circuits as well as developing improvement strategies for existing plants.

"Education and training must be a key area for raising awareness and creating the improvements that are needed. This research can be used as the starting point for such initiatives."

ACARP industry monitor Frank Mercuri said through his industry knowledge and interrogation of current practices, Bruce Firth had put a long overdue focus on the direction of flotation technology application and operation.

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"As coal resources become more difficult to beneficiate, the importance of correctly specified flotation technology is becoming increasingly important to optimise yield of the total resource. Consideration of individual maceral kinetics and how to best cater for this variance in simple low-cost, multi-stage processes has the potential to provide opportunities for improved performance in existing or newly designed infrastructure," he said.

"Allowing existing flotation technology to operate under 'optimum' conditions can be somewhat of a challenge particularly where downstream unit processes are unable to effectively handle the volume or particular material properties.

"Understanding of flotation products and their corresponding material properties is a key area of opportunity to ensure plant design is correctly specified in order to meet throughput and yield requirements."

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