What Does CRS Do?

- Support plant operators
- Design and supervise laboratory and plant trials
- Supply customised flotation reagents
- Develop and customise automatic reagent dosing systems
Safety of our people and those of our customers is paramount.

All CRS brand reagents have a flash point in combustible liquid range or above.

We specifically avoid the use of low flash point chemicals.

Raw materials are readily available from a number of local suppliers.

Products are relatively easy to blend.

Products have good shelf life.
Fine Coal Recovery Facts

- Most fine coal will float but response varies
- No two flotation plants perform the same
- There are no “silver bullets” but certain reagents are suited to particular plants
- Reagent cost is minor compared to the value of the coal recovered
- Simple but very successful reagent dosing systems exist and are in operation
- Overdosing can have disastrous effects
- Underdosing results in coal loss
Automatic Reagent Addition

Three stage system:
- Primary dose rate based on a feed forward control mechanism
- Secondary reagent dose rate controlled by both feed forward and “weak link” monitoring
- Third stage constant set point with on – off control based on “weak link”
Benefits of Automatic Reagent Addition

- Reagent dose rate continuously adjusted to meet “real time” plant conditions
- Flotation performance optimised within froth handling capacity of the plant
- Reduced chemical wastage through minimisation of overdosing
- Improved plant safety with elimination of operator exposure to hazardous substances
Primary Reagent Dose Relationship

Feed (tph)

Primary Dose (cc/min)
Tailings Thickener
Bulli Seam Flotation – August 2004

Feed Mass % vs. Size Fraction (mm):
- Plus 1.0 w
- 1.0 w x 0.5 w
- 0.5 w x 0.5
- 0.5 x 0.25
- 0.25 x 0.125
- 0.125 x 0.075
- Minus 0.075
Bulli Seam Flotation – August 2004

Feed Ash %

Size Fraction (mm)

Plus 1.0 ww

1.0 ww x 0.5 ww

0.5 ww x 0.5

0.5 x 0.25

0.25 x 0.125

0.125 x 0.075

Minus 0.075
Bulli Seam Flotation – August 2004

Yield

Size Fraction (mm)

Plus 1.0 ww
1.0 ww x 0.5 ww
0.5 ww x 0.5
0.5 x 0.25
0.25 x 0.125
0.125 x 0.075
Minus 0.075

30% 40% 50% 60% 70% 80% 90% 100%
Bulli Seam Flotation – August 2004

Size Fraction (mm)

Efficency Index

Plus 1.0 ww, 1.0 ww x 0.5 ww, 0.5 ww x 0.5, 0.5 x 0.25, 0.25 x 0.125, 0.125 x 0.075, Minus 0.075
Bulli Seam Coal Preparation Plant

Flotation Yield (10 day moving average)

August - September 2004
Supply Process Alternatives

- Use Diesel and MIBC or other chemicals – direct purchase from supplier
- Casual supply of customised blend or blends of reagent - supplied on a purchase order number
- Contract customised reagent supply – consignment stock arrangement
- Supply Alliance - outcomes agreed and based on sharing risk in good faith
Supply Alliance Process

- The customer and the reagent supplier agree outcomes based on principles of good faith and trust and establish processes for:
  - Determination of common objectives and outcomes
  - Candid sharing of information, knowledge and skills
  - Proportioning costs and sharing profit
  - Achieving gains through innovation
  - Efficient use of expertise and resources available
  - Development of mutual trust and respect
Contributions to the “Alliancing” Process

- Technical Support
  - Select reagent/reagents best suited to the process and to the coal being treated
  - Provide reagent dosing strategy, including development of innovative automatic real time dose response techniques
  - Support plant operators – risk minimisation, training, process optimisation
Contributions to the “Alliancing” Process

- Plant Operator
  - Supplies all hardware, including storage tanks, pumps etc to appropriate site standards
  - Negotiates directly with chemical suppliers with assistance from the technical support
  - Provides sampling and testing resources
  - Maintains plant performance records for review and assessment
Alternative Fine Coal Recovery Process

A process to treat waste streams containing ultrafine coal particles

- High intensity pretreatment process
- Enhanced conventional flotation
- “Low cost” heavy oil type reagent
- Relative high reagent dose rate
- High rate of coal fines capture
- Handleable product results
- Barren tailings produced
Fine Coal Recovery
Small Scale Plant Trial Results

- Feed Ash % (adb) 56.7
- Feed Pulp Density (%w/w) 3.5
- Flotation Tails Ash % 76.0
- SBC Product Moisture % 30.2
- SBC Product Ash % 12.3
- SBC Centrate Ash % 88.0
- Flotation Yield % 32.1
- Integrated Process Yield % 30.3
- Combustible Recovery % 61.4
Concentrate Laser Sizing

Cumulative % passing vs. Size (microns)
Dewatering Benefit
Bench Scale Testing

Moisture %

Form Time (secs)

1 10 100 1000 10000

Conventional Froth Concentrate
Oil Pretreated Froth Concentrate
Summary

- A proven simple and effective automatic reagent dosing system is available that has produced consistent high operating efficiencies over an extended period.
- Effective flotation reagent products exist and a number of supply methods available.
- Fine coal recovery process is enhanced with use of high intensity pretreatment of flotation feed at pilot plant scale.
Is Flotation Yield Improvement Worth Chasing?

Consider Benefits of “Real Time” Reagent Dose Response