New Coal Preparation Facilities at Cook Colliery-Australia*

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1.0 INTRODUCTION

In May, 1983, Coal Resources of Queensland Pty. Ltd. purchased the leases and assets at Blackwater, Central Queensland, Australia of B. H. P. Co. Ltd. Until that time coal produced from Cook Colliery had been processed in a Baum Jig, mainly for use in that Company's steelworks.

The new owners recognised the need to upgrade the quality of the product in order to compete on the export market. It was decided that the new washery should be a two product plant capable of producing a 7% ash coking coal and 12.5% ash steaming coal. Recognizing the superior coking properties of the finer fractions of the coal, the raw coal input was to be screened at 16 mm and only that portion passing through this screen was to be treated in the coking coal section of the plant thus ensuring a superior product.

Following the evaluation of competitive tenders, an order was placed with Bulk Materials (Coal Handling) Services Pty. Ltd. of Sydney, Australia, in October 1983 for the turnkey supply of new coal handling and preparation facilities fully integrated with the existing facilities and with an overall capacity rating of 250 t/h.

The new plant, comprised the existing Baum Jig for large fraction steaming coal production, two stage DSM dense medium cyclone plant for intermediate fraction coking and steaming production and coal spirals for fine coking and steaming coal production. Besides the coal spirals, the plant also includes other equipment items new or relatively new to the Bowen Basin Coal fields. These include Orion Heavy Slurry Pumps, and Enviro-Clear highrate tailings thickener, and a MMD sizer for product crushing.

The first product coal was produced ahead of schedule on 27th June, 1984. Since then, the plant has operated continuously on a three shift basis, at feed rates up to 300 t/h and meeting all product specification.

2.0 MINING OPERATIONS

Cook Colliery is an underground mine operating in the Rangal Coal Measures of the Bowen Basin in Central Queensland.

Mining is carried out using continuous miners at a depth of approximately 200 metres from the surface.

Coal as mined is transported to the surface by a belt conveyor system and there stockpiled.

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It is subsequently loaded by front end loader into motor lorries for transport to the Coal Preparation Plant, a distance of 14 kilometres.

Since May 1983, output from the mine has been progressively increased and is currently at a rate equivalent to 800000 tonnes per annum. The capability exists to rapidly increase further to the nominal rated capacity of the Coal Preparation Plant which is 1.25 million tonnes per annum.

3.0 BACKGROUND TO COAL PREPARATION PLANT CHANGES

The Baum jig washery installed and operated by B. H. P. to produce coking coal for their captive steel plants suffered from the following disadvantages:

- 1) It was capable of producing coal with a minimum ash in the range 9.0 to 9.5%, and with a crucible swelling of 5 to 6. Such a coal was difficult to market in the oversupply situation existing at present.
- 2) The jig was inefficient in treating the wide size range of the raw coal (150 mm $\times$ zero) and a large percentage of the fine coal was lost with the reject. A separate section to treat the fine coal did not exist. Washed coal yield from the plant averaged 75%.
- 3) Throughput of the plant was limited to approximately 3000 tonnes per day.

On purchasing the operation from B. H. P., Coal Resources of Queensland committed itself to upgrading the coal preparation facilities with the following objectives:

- 1) To be able to produce coking coal at 7% ash or even lower if the market required.
- 2) To be able to produce washed coal with a maximum fluidity of at least 3000 D. D. P. M.
- 3) To provide plant capacity equivalent to 1.25 million tonnes per annum.
- 4) To maximise overall product yield by producing a secondary thermal product of ash 13.0% and specific energy approximately 7,100 K cals/Kg.

Excellent base data existed in B. H. P.'s records to enable such a plant to be designed and built.

4.0 RAW COAL QUALITY

4.1 Seam Characteristics

The predominant seams at Cook Colliery are the Castor and Argo, of which only the Castor is being mined at present. The properties of both seams had been thoroughly investigated by the previous owners. Their method of approach for treatment of the coal did not however fully exploit the characteristics of the Castor Seam Coal.

The Castor seam is characterised by two distinct seam sections, a relatively dull seam section comprising predominantly noncoking fusinites, and a bright seam section with high vitrinite content. There is a marked correlation between the brightness of the lumps, their hardness and their density. The bright high vitrinite coal is more friable and generally concentrated in the finer size fractions and in the very low density fractions of the coal.

Experimental studies indicated that if the finer brighter sizes were treated separately from the coarser duller sizes, a saleable coking coal could be produced that was prime coking with log fluidities commonly near 3.3 and a reflectance in oil ranging from 1.0 to 1.17 and vitrinite contents average about 60%.

4.2 Raw Coal Sizing

Different raw coal sizing analyses have been carried out over an extended period of time and they

Table 1

Size Fraction mm		Mass %	Cum. Mass % Retained
150	× 31.5	16.6	16.6
31.5	× 16	19.0	35.6
16	× 0.5	53.0	88.6
0.5	× 0.075	7.4	96
0.075	× 0	4.0	100.0
		100	

reveal a relatively stable sizing distribution. The following sizing distribution was used as a basis for design of the new washery.

This size distribution is plotted on Rosin Rammler Plot—Figure 1

4.3 Washability Characteristics

Typical washability analyses for the size fractions given in Section 4.3 are plotted on washability curves—Figure 2.

4.4 Swelling Characteristics

The swelling characteristics of the different size fractions is shown in Table 2 below:

Figure 1 Size Analysis-Cook Colliery, Castor Seam.

Figure 2 Castor Seam Sample A Washability Curves

- Legend
- Curve 1 Floats/Ash
 - Curve 2 Floats/R.D.
 - Curve 3 Near Gravity Material

Table 2

Size Fraction mm	C.S.N. For Different Rd. Of Coal		
	F1.30	S1.30–F1.35	S1.35
–150 + 63	4 1/2	1 1/2	1
–63 + 31.5	5	1 1/2	1
–31.5 + 16	6	1 1/2	1
–16 + 8	7	4	1
–8 + 4	8	4 1/2	1
–4 + 2	8 1/2	5	1
–2 + 0.5	9	5	1
–0.5mm (froth Flotation Test)	8		

5.0 PLANT DESIGN

5.1 Basis for Design

The design of the new washery was based on taking fully advantage of the seam and washability characteristics described in Section 4.0. As a result, the new plant was designed to produce a relatively low ash steaming coal from the coarser size fraction and a low ash strongly coking coal from the finer size fraction. To maximise the recovery of coal, a steaming coal fraction would also be extracted from the remaining fine coal after recovery of the coking coal fraction.

The design allows initially for the coking coal to be produced from the minus 16 mm size fraction only. However, allowance is made to alter this size to 20 to 25 mm in the future to maximise the coking coal yield if circumstances warrant it.

The new washery had to be integrated with the existing plant which comprised the Baum Jig and associated equipment.

5.2 Product Specifications

Nominal product specifications for the coking and steaming coal products are as follows:

The design of the new washery allows however for considerable variation in ash levels of both the coking and steaming coal products to meet changing market conditions.

5.3 Plant Capacities

The design capacity for the total plant is as follows:

Nominal Capacity: 250 t/h

Maximum Capacity: 300 t/h

The plant is designed to achieve the nominal 250 t/h capacity over a wide range of feed sizings and product specifications. Capacity limitations for the different washery circuits are noted in Section 5.4 following.

5.4 Process Selection

5.4.1 Coarse Fraction Steaming Coal ($-150\text{mm}+16\text{mm}$)

This size fraction is washed in the original 2 m wide $\times$ 5 compartment Baum Jig. This jig has a nominal capacity of 175 t/h.

5.4.2 Intermediate Fraction Coking Coal ($16\text{mm}\times 0.5\text{mm}$)

To produce a product ash of 7 to 7.5%, cutpoints of less than 1.40 RD. are required. The only

Table 3

	Coking Coal	Steaming Coal
Ash (adb)	7.5% Max	12.5%
Inherent Moisture (adb)	1.4%	1.4%
Total Moisture (as received)	8.0%	8.0%
Volatile Matter (adb)	25.0%	25.0%
Crucible Swelling Number	7.0%	Below 1.5
Gray King	G7	—
Log Fluidity	3-3.32	—
Dilatation	95-110%	—
Carbon (dmmf)	88.2%	88.2%
Organic Sulphur (dmmf)	0.4%	0.4%
Specific Energy (dmmf)	36.2 MJ/kg.	36.2 MJ/kg.

suitable process is dense medium cyclones and these have been utilised. The primary dense medium cyclone plant is based on two 650 mm D.S.M. cyclones with a total sectional capacity of approximately 160 t/h.

5.4.3 *Intermediate Fraction Steaming Coal* (16 mm × 0.5 mm)

Two options were available for rewashing the primary dense medium cyclone underflow. This material could be recirculated back to the jig feed and be washed with the coarse fractions, or it could be retreated separately in a new secondary dense medium cyclone circuit.

It was decided that a dense medium cyclone circuit would provide more flexibility in terms of relative cut-points and in capacity. A secondary dense medium cyclone plant based on one 600 mm D.S.M. dense medium cyclone was chosen with a nominal sectional capacity of 50 t/h.

5.4.4 *Fine Fraction Coking/Steaming Coal* (0.5 mm × 0.1 mm)

Traditionally in Australia, fine coal of this size range has been treated in either froth flotation or water washing cyclones. A recent development in Australia has been the introduction of spirals specifically designed for the cleaning of coal fines. These spirals feature lightweight construction of polyurethane coated fibre glass, new trough profile design, new splitter design and the elimination of washwater requirements as compared to traditional heavy minerals spirals.

Froth flotation was not considered for this duty. The final selection was between two stage water only washing cyclones and three product spiral washers. Although theoretical performance in terms of E_p 's (probable errors) are similar, the spiral washers have proved to be more reliable and more accurate in a real plant situation, and were selected for the Cook Washery.

The advantages of the spirals over the water washing cyclones may be summarised as follows:

- Spirals operate at a higher feed density, 30 to 35% solids compared to 15% maximum for water washing cyclones. As a result, recirculated water quantities are reduced by approximately 60%.

- The relative density cut-point in a spiral washer is very easily changed by simply adjusting the position of the product and reject cutters. This can be done by hand, and hence by a supervisor rather than relying on tradesmen/union labour. For a nominal 50 t/h fines plant, we would estimate that the product and reject cutters could be adjusted in 15 to 20 minutes, whereas adjusting vortex finders/apex nozzles in water washing cyclones would almost certainly take more than one operating shift utilising two maintenance staff.

The final result is also much more positive in a spiral as one can visually note the effect of any change.

- Spirals are a very low wear/low maintenance item. Conversely, the water washing cyclone is a high wear item unless exotic materials of construction are used. Performance of the water washing cyclones can also vary considerably over the life of the wearing parts.

- There is less coal degradation in a spiral circuit.

As a result of the difficulties described in setting up and maintaining performance in water washing cyclones many plants operate at far below the maximum operating efficiencies.

A single stage three product spiral circuit was chosen, based on 16 twin start Reichert Mark 10 spirals. These spirals have a nominal capacity of 1.5 t/h/start giving a total fines washing capacity of 48 t/h. This is equivalent to a maximum of 25% of the total feed material reporting to fines compared to 12 to 15% indicated by the available sizing information.

The installed spiral plant is shown in Figure 3 while a close-up of the product cutters is shown in Figure 4.

Figure 3 Bank of eight Mark 10 spirals

Figure 4 Splitter Arrangement

5.5 Plant Flowsheet

A simplified plant flowsheet is given on Figure 5. This flowsheet shows the major items of equipment and major product flows. A detailed plant description is given in Section 6.

5.6 Equipment Selection

5.6.1 General

The new Cook Washery, although rated at a modest 250 t/h nominated capacity boasts washing equipment with a total rated capacity of approximately 460 t/h, four independent washing circuits, plus a combination of established and relatively new equipment types.

Equipment installed in the Cook Washery Includes the following:

5.6.2 Dense Medium Cyclones:

All dense medium cyclones are of D.S.M. design.

5.6.3 Screens:

All new screens are Allis Chalmers. The existing classifying dewatering screen is an Acco Super Vibro and the fine coal slurry screen is a Fordertechnik.

5.6.4 Centrifuges:

There are three centrifuges on site.

Steaming Coal	—Subtechnik 1100 Vibrating Basket
Coarse Coking Coal	—Humboldt 1300 Vibrating Basket
Fine Coking Coal	—Humboldt Screen Bowl

5.6.5 Pumps:

Original pumps are Warman.

All new pumps are ORION Heavy Duty Slurry Pumps.

5.6.6 *Classifying Cyclones:*

All classifying cyclones are by Linatex Australia.

5.6.7 *Tailings Thickener:*

The tailings thickener is an Enviro-Clear high rate thickener.

5.6.8 *Clean Coal Crusher:*

The clean coal crusher is an MMD sizer.

5.6.9 *Magnetic Separators:*

Magnetic separators are of Eriez Concurrent design.

5.6.10 *Spirals:*

Spirals are Reichert Mark 10 twin start

6.0 PLANT DESCRIPTION

Refer to Simplified Flowsheet—Figure 5.

6.1 *Raw Coal Handling*

Run of mine coal is delivered from Cook Colliery by road to a raw coal dump hopper. Raw coal is then transferred via a raw coal feeder to the raw coal feed conveyor. The raw coal conveyor feeds onto a triple deck classifying screen. Plus 150 mm material from the top deck is diverted from the washery to the ground.

Oversize from the second (25 mm) and third (16 mm) decks report to a transfer conveyor while undersize from the 16 mm deck reports to the desliming sieve bend in the new dense medium cyclone plant.

6.2 *Coarse Fraction Washing—(Steaming Coal)*

150 mm × 16 mm raw coal from the transfer conveyor reports to the Baum Jig which was recommissioned to produce a 12% to 13% ash steaming coal product. Product is dewatered on a static screen and double deck classifying/dewatering screen. Oversize from the top deck reports to the coarse steaming coal product conveyor and crusher before being transferred to the steaming coal stockpile via the steaming coal conveyor and steaming coal radial stacker.

Fine steaming coal product from the bottom deck of the classifying/dewatering screen reports to the fines steaming coal conveyor and is then further dewatered in the vibrating basket steaming coal centrifuge. Product from the centrifuge joins the coarse steaming coal product on the steaming coal conveyor.

Underflow of the jig static screen and classifying/dewatering screen is collected in the jig sump and pumped to the desliming sieve bend and screen.

Reject from jig is collected in the two reject elevators and discharges onto the reject conveyor before being collected in the reject bin.

6.3 *Intermediate Fraction Washing (Coking Coal)*

Minus 16 mm raw coal from the raw coal classifying screen together with water from the jig sump is deslimed at a nominal 0.5 mm on a single desliming sieve bend screen combination. Sieve bend/screen oversize (16 mm × 0.5 mm) reports to the dense medium cyclone feed sump while undersize (0.5 mm × 0) reports to the new fines washing plant.

From the feed sump, medium and raw coal is pumped to two 650 mm D.S.M. dense medium cyclones. Cyclone overflow which contains the coking coal product reports to two drainage sieve

Figure 5 Simplified Flowsheet

bends and two drainage and rinsing screens where medium is recovered from the coal product. Product from the two drainage and rinsing screens reports to a vibrating basket centrifuge where the product is further dewatered before being collected on coking coal product conveyor.

Dense medium cyclone underflow comprises feed to the second stage dense medium cyclone circuit, so complete drainage and rinsing is not required. Underflow reports to two drainage sieve bends mounted in tandem configuration.

6.4 *Intermediate Fraction Washing (Steaming Coal)*

16 mm $\times$ 0.5 mm rejects from the primary dense medium cyclones reports after drainage on the tandem sieve bends to the secondary dense medium sump. Medium and coal is then pumped to a single 600 mm D.S.M. dense medium cyclone. Cyclone overflow which contains the steaming coal product reports with the underflow which contains the rejects to a partitioned drainage sieve bend and partitioned low head drainage and rinsing screen. Medium from the underflow and overflow products is recovered from the products on the sieve bend and screen.

The steaming coal product is discharged onto the fines steaming coal product conveyor prior to dewatering in the steaming coal centrifuge. Reject is discharged onto the tail of the reject conveyor which was extended to allow collection of this product.

6.5 *Medium Recovery Circuits*

Each dense medium cyclone circuit has its own independent correct medium circuit, its independent primary dilute medium recovery circuit, but share the dilute medium sump and secondary medium recovery circuits.

6.5.1 *Primary Dense Medium Cyclones—Correct Medium Circuit*

Correct medium (medium which has not been diluted with water) is recovered from the underflow of the product sieve bend, the 1.2 m drainage section of the drainage and rinsing screens and the rejects tandem sieve bends. This medium is returned at basically the correct operating specific gravity to the dense medium circuit.

6.5.2 *Secondary Dense Medium Cyclone—Correct Medium Circuit*

Correct medium is recovered from the underflow of the partitioned sieve bend and the 1.2 m drainage section of the partitioned drainage and rinsing screen. This medium returns via a U-Tube and level control splitter box to the secondary dense medium circuit.

6.5.3 *Primary Dense Medium Cyclones—Primary Magnetic Separator Circuit*

Medium adhering to the coking coal products is rinsed from the coal by primary and secondary sprays on the 3.6 m long rinsing section of the drainage and rinsing screens.

The resulting diluted medium reports direct from the screen underpan to a magnetic separator. Concentrated medium is returned to the dense medium circuit. Effluent from the magnetic separator reports to the dilute medium sump.

6.5.4 *Secondary Dense Medium Cyclone—Primary Magnetic Separator Circuit*

Medium adhering to the steaming coal and rejects is rinsed by primary and secondary sprays from these products on the 3.6 m long rinsing section of the partitioned screen.

The resulting diluted medium reports direct from the screen underpan to a magnetic separator. Concentrated medium is mixed with the correct medium from the drainage sieve bend and screen and is returned via the U-Tube to the secondary dense medium circuit.

Effluent from the magnetic separator joins the effluent from the primary dense medium circuit and reports to the common dilute medium sump.

6.5.5 *Dilute Medium Circuit*

Dilute medium is pumped from the dilute medium sump to a dilute medium classifying cyclone which classifies coal at approximately 200 micron and magnetite at approximately 40 micron. Cyclone underflow which contains all coarse coal and magnetite particles, mixed with some cyclone overflow, is then fed to the secondary magnetic separator. Magnetite is recovered and reports to the primary dense medium cyclone circuit. Secondary magnetic separator effluent which contains misplaced coal particles then reports to a splitter box which is activated by the level controller in the dilute medium sump. Sufficient effluent is returned to the dilute medium sump to maintain the liquid balance, while the remainder which is equivalent to the total of all external influxes to the dilute medium circuit is bled away to the fine coal circuit via the jig sump.

The remaining dilute medium classifying cyclone overflow is recirculated as primary spray water to the drainage and rinsing screens.

6.5.6 *Magnetite Make-Up/Spillage System*

Fresh magnetite or magnetite spillage is collected in a magnetite floor sump and pumped to the dilute medium sump for recovery in the dilute medium circuit. The secondary magnetic separator has been generously sized to accept this additional load.

6.6 *Fine Fraction Washing*

6.6.1 *Primary Classification*

Minus 0.5 mm underflow from the desliming sieve bend and screen is collected in the primary classifying cyclone feed sump.

From this sump, fine coal is pumped to four extended feed box classifying cyclones which deslime at a nominal d50 of 75 micron. Cyclone overflow reports to an overflow tank from which part of the flow is recirculated to the jig washbox while the remainder overflows to the tailings thickener.

Cyclone underflow which comprises feed to the fine coal spiral plant discharges direct to the spiral feed dilution mixing tank.

6.6.2 *Distribution and Washing*

From the dilution mixing tank, the 0.5 mm $\times$ 0.075 mm spirals feed is pumped at a nominal 30% solids by weight to a distribution system. The distribution system comprises a 4-way primary pressure distributor followed by 4 off 8-way secondary pressure distributors. Each 8-way secondary distributor feeds a bank of 4 twin start spirals, resulting in a total of 32 spiral starts. Separation of the raw coal into a clean coal, middlings and reject product is accomplished on the spiral, with cutters being used to determine the actual splits.

Each of the products is collected in an appropriate launder and transferred to product dewatering plant.

6.6.3 *Fine Coking Coal Dewatering*

0.5 mm $\times$ 0.075 coking coal product from the spirals plant is thickened and deslimed in a clean coal classifying cyclone.

Cyclone overflow is returned to the jig as wash water. Cyclone underflow reports to a splitter box and then to a screen bowl centrifuge which dewateres the fine clean coal product. The splitter box is controlled by operating torque of the screen bowl. If the screen bowl becomes overloaded, the torque signal will divert part of the feed to a fine coal dewatering screen. Control of the splitter box is via a three term P.I.D. controller.

Product from the screenbowl centrifuge and fine coal screen discharges onto the coking coal

conveyor downstream of the coarse product from the dewatering centrifuge.

6.6.4 *Fines Steaming Coal Dewatering*

Middlings from the spirals reports direct to a rapped sieve bend. The dewatered product discharges onto the fines steaming coal product conveyor prior to centrifuging.

6.6.5 *Fines Reject Dewatering*

Rejects from the spiral plant report direct to the thickener feed sump where it is mixed with screenbowl centrifuge, fines dewatering screen and middlings rapped sieve bend effluent. This effluent is then pumped to the tailings thickener.

6.6.6 *Water Clarification Plant*

Overflow from the primary classifying cyclone overflow tank together with effluent from the thickener feed sump reports to the Enviro-Clear tailings thickener. Prior to entering the thickener, the feed is deaerated.

An automatic flocculant mixing and manual dosing system is provided. Solids settled in the thickener are automatically removed to the tailings dam by a variable speed underflow pump which is controlled by the sludge bed level in the thickener.

Clarified water overflows the thickener into a clarified water tank and is pumped to a clarified water head tank in the washery building.

From the head tank, clarified water is supplied to secondary sprays on the drain rinse screens, density control water to the dense medium circuits, make-up water to the sumps and process water to the jig.

6.7 *Storage & Loading of Products*

6.7.1 *Coking Coal*

Coking coal from the intermediate and fines plant is collected on coking coal conveyor CC1, transferred to CC2 and discharged onto the new coking coal stockpile.

6.7.2 *Steaming Coal*

Steaming coal product from the coarse and fines product conveyors is transferred via the crusher and centrifuge to the steaming coal conveyor, the radial stacker and the steaming coal stockpile.

6.7.3 *Train Loading*

Either coking coal or steaming coal from their respective stockpiles is reclaimed by the existing rotary ploughs onto a reclaim conveyor onto the train loading conveyor and then into the train loading bin.

7.0 PLANT CONTROL & INSTRUMENTATION

7.1 *Plant Control*

Plant control is based on hard wire and relay. To integrate the new plant with the old, the control/switch room was extended and a second motor control centre was installed. For sequence start-up and shutdown, the operator is required to move back and forth between the two switchboards on several occasions, but due to the close proximity, this was not an operational difficulty.

The extensive fault identification features of the modern PC controlled plant is not available, and must be considered a disadvantage, but the compact nature of the plant does make fault finding easier than in a larger plant typical of that locality.

7.2 *Instrumentation*

Instrumentation in the plant was limited to essential control functions. These included density

indication (nucleonic density gauges) and control for both primary and secondary dense medium systems, level indication and control for the secondary dense medium sump and dilute medium sump, and bed level control in the Enviro-Clear thickener.

Level control in the fine coal sumps is by mechanical ball float valves only. Density control of spirals feed was manual only, accomplished adjusting make-up water to the spiral feed.

8.0 COMMISSIONING

The plant was commissioned over an approximately 2 week period, with the first coal being washed two weeks ahead of the contractual completion date. No major problems were encountered although some inevitable minor modifications were required.

Overall product ash specifications were easily achieved with minimal attention to the spiral plant. It was found necessary to use only 75% of the installed spiral capacity.

9.0 PLANT OPERATING PERFORMANCE

Since commissioning the plant has consistently achieved expectations for capacity, reliability and product specification.

Fine control of medium gravity has enabled consistent production of coking coal of the following characteristics:

Total moisture	9.0%
Inherent moisture	1.5%
Volatile matter	27.0-27.5%
Fixed carbon	64.0%
Ash	7.0%
Sulphur	0.38%
Swelling Index	7 to 8
Maximum fluidity	5,000 D.D.P.M.

A secondary thermal coal at 13.0% ash and specific energy 7,100 K cal/Kg has been maintained.

Overall plant yield has been in the range 87-90% with approximately an equal split between coking and thermal coal.

All section of the plant have performed well providing efficiency of separation well within guaranteed performance. The spirals in particular have proved trouble free and easy to operate.

The plant modifications have enabled the Cook mine to offer for sale a coking coal with properties which lift into the sphere of prime quality with an extremely high degree of market acceptability.

REICHERT MARK 10 SPIRAL

FOR THE BENEFICIATION OF FINE COAL

RS Mk 10/9'83

Coal Preparation Circuits using Mark 10 spiral concentrators to treat fine coal offer the following major advantages over conventional processes.

ADVANTAGES

- lower capital and operating costs than other processes.
- lowest energy requirements of all processes.
- no reagent requirements.
- the spiral can treat up to 3mm size particles. This permits dense medium cyclone plants to treat a coarser size fraction with significantly reduced medium losses and lower capital costs.

FEATURES

- spirals supplied as single or double start units.
- simple operation with only one set of splitters per spiral.
- constructed in strong, lightweight fibreglass and polyurethane covering for corrosion and abrasion resistance.
- feed systems and product laundering systems available.

Bank of eight Mark 10 spirals

Splitter Arrangement

MINERAL DEPOSITS LIMITED

Mineral Technology Division

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Cables: Mindeposit Bundall Queensland. Telex: AA40438. Telephone: (075) 39 9055

資 料

REICHERT MARK 10 SPIRAL FOR THE BENEFICIATION OF FINE COAL

APPLICATIONS

The effective size range for coal spiral operation ($-3\text{mm}+0.075\text{mm}$) coincides largely with the size range between that most effectively treated by heavy media cyclones and froth flotation. It therefore follows that the principal areas of application for coal spiral separators are:

- (i) substitution for fine heavy media cyclone separation.
- (ii) substitution for coarse froth flotation.
- (iii) substitution for water washing cyclones.
- (iv) scavenging of reject or waste streams containing appropriately sized fine coal, and
- (v) retreatment of fine coal dumps.

DESIGN DATA

HEAD FEED (PER START) Single and double start units available

Capacity: up to 3TPH solids depending on application
 Pulp Density (w/w): up to 45% solids
 Size Range: 0.075 — 3.0mm
 Pulp Volume (max.): $5.0\text{m}^3/\text{hr}$

REFUSE REMOVAL (PER START)

Rate: up to 1.5TPH solids
 Pulp Density: 30-60% solids w/w

DIMENSIONS OF SPIRAL BANKS

(Refers to double row banks, single row available)

MK 10 SPIRALS PER BANK	DIMENSIONS IN MILLIMETRES					INSTALLED MASS (kg) (see note below)
	A	B	C	D	E	
2	865	3080	700	NA	NA	368
4	1625	3080	700	1050	905	596
6	2385	3080	700	1210	985	814
8	3145	3220	840	1385	1050	1028

NOTE: Weight refers to double spirals

DIMENSIONS: Use dimensions as guide only. Certified drawings will be provided on receipt of order. all dimensions in millimetres.

SHIPPING DETAILS: Spiral banks are packed for shipment mounted on a wooden pallet 100mm (4") high. Ancillary equipment is packed in separate containers. Single spirals are shipped in tri-wall containers.

DISTRIBUTOR