Teetered bed separators—the Australian experience

by R. Drummond, S. Nicol, and A. Swanson*

Synopsis

The fourth Teetered Bed Separator (TBS) has just been installed in Australia, and trials have been run in many sites. There is a growing recognition of the potential advantages of using TBS technology to treat coal in the –3+0.25 mm size range, at cut points below 1.60. From these activities, there has been a substantial growth in knowledge with respect to application engineering and operational functions. The paper briefly describes the installations, including flowsheets, and so provides a background to the potential deployment of TBS technology.

There are a large number of potential applications for TBS technology, including treatment of fine ROM coal in new plants, or in upgrade situations for re-processing of spiral product, or scavenging coal from coarse tailings. As well, cost effective capacity upgrades are possible by using TBS units for treating the sands size fraction.

Issues arising from Australian TBS installations and application engineering are also discussed.

Introduction

Teetered bed separator history

The Teetered Bed Separator (TBS) has been developed from the classical 'Hydrosizer' concept, and the initial designs have been manufactured since 1934. Originally coal was separated on the basis of particle size, but the present day systems have been developed and optimized to separate primarily on the basis of density. This development has enabled cut points as low as 1.35 to be achieved, while maintaining good separation efficiency. The units have been employed for coal recovery from waste piles and tailings lagoons since the 1960s and have been used to treat run of mine coal in the UK since the 1980s.

Today over 200 such units have been installed worldwide, in applications including, run of mine (ROM) coal processing, tailings coal recovery, construction grade sand decontamination, foundry sand sizing, glass sand production, mineral sands processing and haematite processing. Figure 1 shows a typical unit.

Description of the teetered bed separator

Slurry feed enters the unit tangentially into a feedwell and a fluidized, or a teetered bed is built up against an upward current water (UCW) supply. In simplistic terms, when steady state is reached, particles of feed, which are less dense than the average density of the teetered bed, float and report to the overflow stream. Those feed particles of higher density than the teetered bed percolate through the bed and report to the sinks stream via the spigot.

In order for the unit to operate effectively, the average relative density of the teetered suspension within the tank is kept constant. To achieve this, a simple feedback control loop is incorporated in the commercial unit design. A capacitance type differential pressure cell senses the effective density of the teetered suspension. A single loop PID controller receives a 4-20 mA signal from the probe, proportional to the effective density of the teetering suspension above the probe. The effective density is compared to the operating set-point and the spigot valve is actuated to discharge excessive bed solids if the effective density is too high. Conversely, the control system acts to restrict the discharge of the bed solids if the effective density is too low.

Australian case studies

Case I—spiral product upgrading (Stratford Coal[1,2])

Background information

Stratford Coal is located approximately 135 km north of Newcastle, in the Avon Valley, New

* *Advanced Separation Engineering (Pty) Ltd, Carrington, NSW, Australia.*

South Wales. Coal is mined from the Avon and Triple seam which occur in the Avon sub-group of the Permian Gloucester coal measures. The ROM coal is treated in a 550 t/h nominal capacity coal preparation plant to produce a high crucible swelling number (>6) and high fluidity (>5000 dd/min) coking coal and a high ash (18 per cent air dried (ad)) steaming coal product.

Prior to 1997, the Stratford spiral circuit, was configured to produce both coking and steaming fine coal product. The existing spiral circuit, consisting of 7 primary and 5 secondary triple start spirals, was overloaded as a result of incremental increases in plant capacity from its original nameplate tonnage of 350 t/h, with no associated increases in the spiral circuit capacity. In addition to the capacity issue, it was well recognized that the existing spiral circuit was limited to a cutpoint operation of around 1.60, producing a final (dewatered) fines coking coal product ash of between 12 to 14 per cent. This ash level meant that the primary DMC circuit had to run slightly below 1.35 cutpoint to achieve the required total coking coal ash of 10 per cent. Due to the significant amount of near gravity material in the coarse coal circuit, any reduction in cutpoint operation resulted in a significant loss of coarse circuit and total plant yield. This was unsatisfactory from the viewpoint of maximizing coking coal yield and hence revenue.

Table I

Stratford acceptance testing data after 1997 fines circuit upgrade

	Ash %	
	Normal Blend	Stockpile 3
Primary spirals feed	21	30
Primary spirals product (average before desliming)	13	23
TBS feed (average after desliming)	12	21
TBS product (average)	9.5	11
TBS fines centrifuge product	8.5	9
TBS reject	40 to 50	40 to 50

Process developments to current operating practice

As part of the flotation circuit upgrade commissioned by Bateman Kinhill in 1997 a 2.1 m TBS machine was installed to rewash the primary spiral product to reduce the overall fines coking ash level. With the inclusion of the new Jameson Cell flotation circuit it was decided to split fines feed at around 0.35 mm, and increase the fines top size to 1.2 w/w mm. Hence the spiral/TBS circuit treated the nominal –1.2 w/w+0.35 mm fines and the –0.35 mm fraction was sent to flotation. The new fines circuit redeployed the existing secondary spirals starts to increase the capacity of the primary spiral circuit. The primary spiral product was sent to thickening cyclones (to increase the TBS feed pulp density to around 50 per cent) and then, by gravity, to the new TBS machine. The TBS product was thickened in an existing dewatering cyclone and dewatered in the existing fine coal centrifuge.

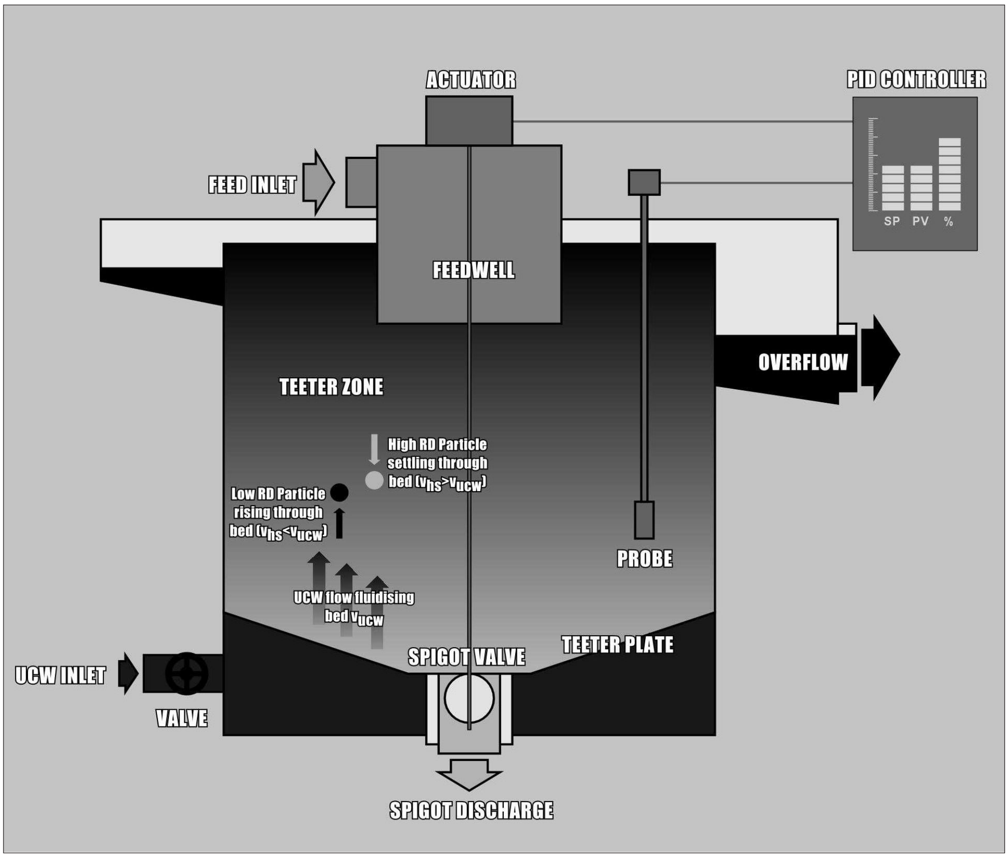
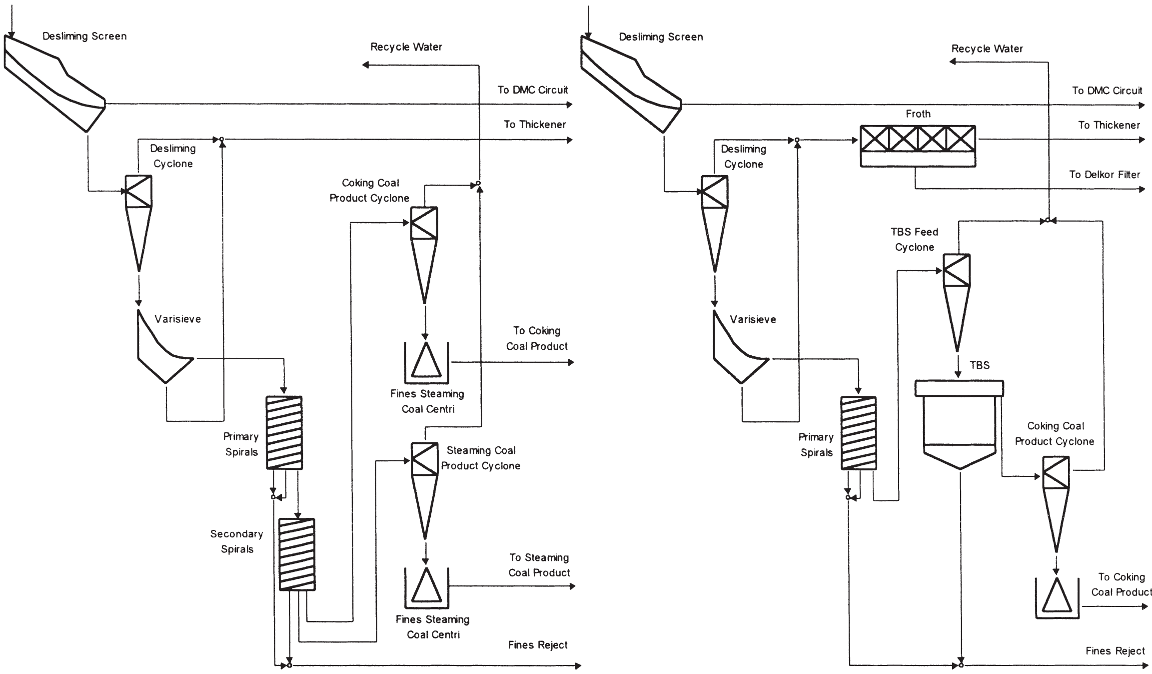


Figure1—TBS machine—principles of operation



Figures 2 and 3—Stratford fine coal circuit flowsheets before and after flotation circuit upgrade

The new fine coal circuit has been a major success, allowing not only a closer approach to constant incremental ash washing but recovering coal that was previously sent to waste from the spirals. The recovery of low ash coking coal was thus maximized. The effects of the TBS circuit are indicated by the average ash levels through the circuit, shown in Table I. Ashes are for two feed types, the first being lower ash with little slimes (the normal feed blend), while the second is poorer quality feed (stockpile 3) with higher slimes levels within the fines system.

Figures 2 and 3 illustrate the Stratford fine coal circuit prior to, and following the 1997 flotation circuit upgrade.

Case II—Raw coal processing (Bayswater Colliery[3])

Background information

Bayswater Colliery Co. Pty Ltd (BCC) operates Bayswater No. 3 mine and Bayswater coal preparation plant (CPP), located 10 km south of Muswellbrook in the Upper Hunter Valley of NSW. The mine is a multi-seam truck and shovel operation producing 4.2 million tonnes of saleable coal annually. Products are treated through two separate streams, the coal preparation plant and a by-pass or crushing process, each of which processes 2.5 million tonnes of ROM coal annually. Prior to 2000 the BCC plant processed approximately 500 t/h of raw coal, treating the nominal +8.0 mm coal in two Baum jigs, the –8.0+0.5 w/w small coal in a two-stage water washing cyclone circuit, and the –0.8 w/w+0.125 mm fines in a bank of mineral deposits LD7 spirals.

During 1996 and 1998 two separate pilot TBS studies were undertaken to examine the applicability of the TBS technology to the existing BCC operation, especially with respect to reducing the solids loading on the existing WWC circuit, which was widely regarded as the most inefficient process in the existing plant and a processing bottleneck. As a secondary consideration BCC management were very keen to assess the TBS machine as a potential candidate for inclusion in the design of the new Mount Arthur North CPP, due to be commissioned in 2003.

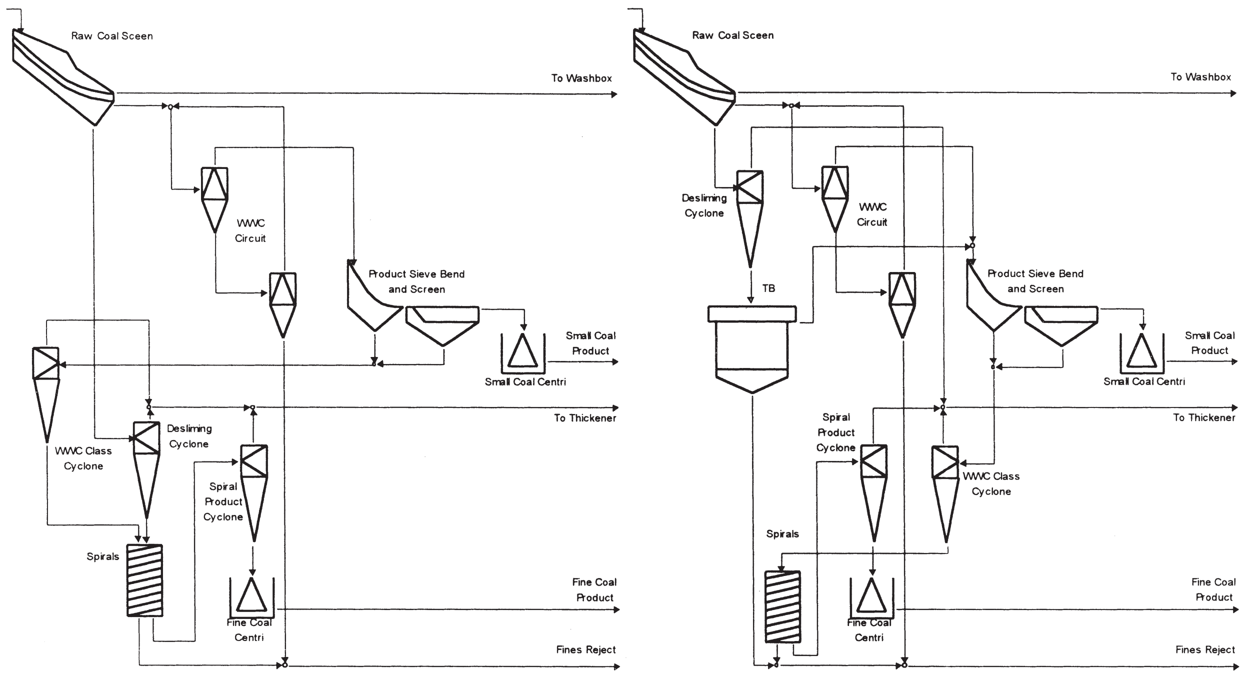
The findings from the pilot studies and subsequent simulation studies indicated that the optimum plant configuration from a standpoint of increased plant yield and production capacity was to increase the raw coal screen aperture to 2.0 w/w mm (installed 2.4 w/w mm), process the –2.0 w/w+0.125 mm fines through a 3.0 m TBS machine, screen the TBS overflow product utilizing the existing WWC product sieve bend and screen, and divert the TBS overflow fines through the existing fines classification stages to the existing spiral circuit for re-processing.

Process developments to current operating practice

An EPCM contract to upgrade the BCC fine coal circuit to incorporate a 3.0 m TBS and ancillary equipment was awarded to Bateman Engineering in November 1999. Figures 4 and 5 illustrate the Bayswater small and fine coal circuit prior to, and following, the 2000 plant upgrade.

The TBS upgrade of the BCC plant was achieved with minimal interruption to plant operation and within a reasonable time. Based on the five-year plan the following benefits are realizable:

- ➤ *Increased plant yield*: An overall 2 per cent yield increase representing an additional 52,400 t/y of product.
- ➤ *Increased plant throughput rate*: The increase in plant feed of 100 t/h was achieved, increasing plant capacity by 20 per cent to 600 t/h. This will enable increased CPP feed, or alternatively, a reduction in overtime operating hours.



Figures 4 and 5—Bayswater fine coal circuit flowsheets before and after TBS upgrade

- *Reduced CPP operating hours*: To achieve the same plant product tonnage a reduction of 50 operating days/year is achievable. This results in 5 washing days instead of the present requirement of 6 days a week.
- *Increased plant feed and washed product tonnage:* The opportunity exists to take advantage of both the plant yield and plant feed increases. By maintaining the same scheduled operating hours the opportunity exists to process an additional 500,000 t/y, producing an additional 375,000 t/y of export quality coal.

Table II provides some of the data gathered from acceptance testing at Bayswater Colliery.

Other TBS raw coal processing studies

Subsequent to the BCC installation, a number of plants in NSW have registered interest in using the TBS in a similar processing scenario as employed at BCC. This interest has culminated in a 3.0 m machine being installed at Bloomfield Colliery (about 5 km east of Maitland NSW) during December 2000. The Bloomfield installation is very similar to the BCC upgrade, with the main difference being that the TBS product undersize is re-processed in the existing froth flotation circuit rather than spirals as in the BCC case. Table III outlines some of the data gathered from acceptance testing at Bloomfield Colliery.

Other pilot studies have also been carried out at coal preparation plants located on the south coast of NSW. These trials were undertaken to determine whether the TBS could be incorporated into the existing plant to process raw fine coal feed, and increase the overall plant capacity without any concomitant loss in total plant yield. At one plant, the feed size range tested was the –2.0+0.5 mm size fraction of which most was being processed in an existing heavy medium cyclone (HMC) circuit.

In this case, it was noteworthy that the pilot TBS machine was able to process the –2.0+0.5 mm fines at an efficiency level (Ep of 0.06) similar to that of the existing HMC circuit (Ep of 0.07). A more detailed examination of the respective washability data from this trial indicated a propensity of the HMCs to misplace a significantly higher amount of fine coal to reject than demonstrated by the TBS. This larger misplacement of the CF1.60 coal fraction to reject in the HMCs compared to the TBS is reflected in a 5 per cent lower yield for the HMCs (–2.0+0.5 mm) at comparable Ep levels.

Table II

Bayswater acceptance testing data after 2000 plant upgrade

Size Fraction (mm)		D_{50} (-)	Ep (-)
- 4.0	+ 2.0	1.34	0.032
- 2.0	+ 1.0	1.40	0.085
- 1.0	+ 0.5	1.66	0.100
- 0.5	+ 0.25	2.08	0.165
- 2.0	+ 0.5	1.55	0.110

Table III

Bloomfield acceptance testing data after 2000 plant upgrade

Run	BDSP (-)	Q_{UCW} (m^3/h)	-2.0+0.25 mm	
			D_{50}	Ep
1	1.30	100.0	1.49	0.094
2	1.35	100.00	1.71	0.145
3	1.40	100.0	1.91	0.220

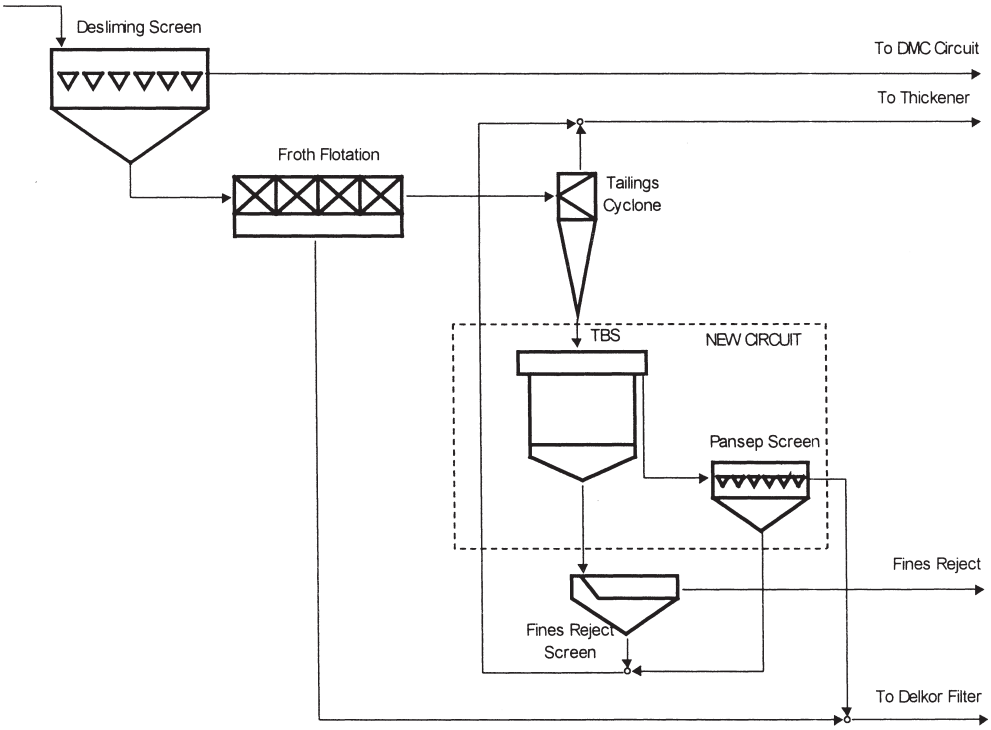


Figure 6—Goonyella/Riverside No. 1 CPP froth flotation circuit upgrade

Table IV

Misplaced material from NSW South Coast pilot TBS trial

	TBS (-2+0.5 mm)			HMC (12.0+0.5 mm)		
	27 Apr	15 Jun	Average	27 Apr	15 Jun	Average
S1.60 in product %	0.9	1.9	1.4	0.6	0.7	0.7
CF 1.60 in reject %	3.4	2.2	2.8	22.2	27.4	24.8
Total misplaced %	1.1	1.9	1.5	3.5	3.9	3.7

This observation serves to question the coal industry's heavy weighting of Ep data for equipment selection purposes.

A summary of the misplaced material data from this trial is provided in Table IV.

Case III— Flotation tailings re-processing (Goonyella/Riverside CHPP 1)

Goonyella/Riverside Mine located on the western flank of the Bowen Basin coal fields approximately 200 km southwest of Mackay Qld and is managed by BHPBilliton on behalf of BHPBilliton Mitsubishi Alliance (BMA). The mine produces 9.0 Mtpa of washed coking coal from the Moranbah coal measures. The coal is mined through a multi-seam open cut operation and washed at both of the two coal preparation plants on the mine lease. The flotation circuit of CPP 1, (formerly known as the Goonyella CPP) was upgraded in 1995, replacing the existing 4 coarse (-0.5 w/w+0.125 mm) and 4 slimes (-0.125 mm) Wemco hog-trough froth flotation cells with 4 primary, 2 secondary Jameson cells treating the combined -0.5 w/w fine coal fraction.

It was noted during the regular plant auditing process, that although the total flotation tailings ashes and yields were around the 60% and 70% levels respectively (1999 average), the tailings ash levels and fractional yields of the coarser –0.5 w/w+0.35 mm size were oftentimes appreciably lower (<50% ash) compared to the total stream ash values. It was understood that any deficiency in the flotation process due to factors such as increased fines loadings, insufficient reagent demands or a deterioration in the coal floatability impacted to a greater extent on the coarser feed fractions (+0.35 mm) than the slimes or finer coal fractions, resulting in yield losses and lower coarse end tailings ashes.

A more detailed flotation tailings sampling programme and subsequent simulation study indicated that there was an economic quantity of 9.5% ash coarse coal (-0.5 w/w+0.35) in the classified flotation tailings stream to warrant recovery by a re-processing circuit.

A pilot TBS study was undertaken to prove up the concept and the proceedings from the pilot study validated the results from the earlier simulation study. It was also demonstrated during this pilot study that it was possible to achieve a very high processing efficiency at a low operating cutpoint (Ep < 0.05, D50 < 1.45 of –1.0+0.35 mm fraction) treating the high ash fines flotation stream.

Process developments to current operating practice

A design and construct contract was awarded to HATCH Associates Pty Limited during March 2001, and the tailings re-processing circuit featuring a 3.0 m TBS machine was commissioned during July 2001. The basis for the contract was that the tailings re-processing circuit would produce an additional 8.0 t/h of fine coal product at an ash level of 9.5%, with a circuit combustibles recovery of at least 35%.

Although final acceptance testing has not yet been completed due to downstream product treatment problems, the limited data available from the plant suggests that the TBS machine will meet performance expectations.

Once proven, through detailed acceptance testing, this implementation of the TBS as a low cutpoint, tailings re-processing option will find a niche in plants subject to non-optimal flotation performance. Further, this option will provide the operators with additional flexibility to run flotation 'lean', and reduce the flotation product ash levels whilst not suffering a severe yield penalty, as any lost coal to flotation tailings will be recovered in the tailings re-processing circuit.

The capital justification for this type of circuit is very favourable, because all mining and processing costs have been incurred, and any additional product tonnes on the belt give rise to revenue increases with little additional operating expense. As well, this material would have normally been sent to tailings, incurring the associated tailings disposal costs.

Figure 6 illustrates the Goonyella/Riverside No 1 CPP froth flotation circuit with the tailings re-processing circuit outlined.

Operational issues

A preferred approach to TBS utilization, is to treat the deslimed fine coal stream directly. The product stream will then be classified at around 0.3 mm with the undersize stream processed by spirals or flotation. This process option also has the advantage of reducing overall flotation reagent requirements and, in some circumstances, the higher capital cost of additional flotation cells. A key aspect of the entire project is the effective desliming of the TBS product in the classification or dewatering steps. The presence of small amounts of slimes can greatly boost product ash levels, both in TBS and spiral operations.

In obtaining optimum conditions for TBS processing, two operational variables can be adjusted. Generally, the UCW is set for the best results and the day to day variation in cut point adjustment is via the bed density. Bed density is automatically maintained by variation in refuse removal rate in line with measured bed density.

The only issue with the TBS installations in Australia to date is the process disturbance caused by oversize tramp material in the TBS feed. In all cases, holing of desliming screens and splash into underpans has resulted in this tramp material upwards of 10 mm in size reporting to the TBS. Apart from the coal loss issue, this material can adversely affect the closed loop density control circuit, causing a cyclical type of density response as measured by the probe.

As this tramp material falls through the bed, it will tend to gravitate towards the spigot valves. If there are sufficient quantities of large tramp oversize, this material will occlude the spigot valve aperture limiting the normal discharge of fines from the spigot. As the spigot discharge rate drops the bed density will increase and the controller will try to correct by opening the spigot valves further (increasing the stroke length and displacing the spigot ball further away from the seat). Eventually the valve will open sufficiently to discharge the oversize material, but as the aperture now is much larger than it should be, and some of the fines constituting the 'teeter' bed will be lost to tailings. As the bed density drops, following the correction, the spigot valves will close, increasing the likelihood of tramp oversize retention, leading to a repeat of the process. This observed discharge pattern is more of an annoyance than an operational issue as the magnitude of the disturbance is only of the order ± 0.01 density units. However, removal of this cyclical discharge pattern can only serve to improve the observed processing efficiency of these installed machines.

The obvious solution is to put in place some oversize protection to ensure that any particles larger than 4 times the nominal topsize are screened out prior to the TBS machine. Where this has not been possible replacement of the spigot ball with a dart profile has proved to alleviate the problem.

As shown in the Goonyella/Riverside CPP 1 efficiency data, it is possible to achieve very low Eps when treating high ash (flotation tailings) fines. The effect of bed density and particulate solids relative density on processing efficiency of the TBS has been documented in a recent paper by Galvin et al.[4]. It is proposed that the efficiency of existing TBS installations may be improved by bleeding a high ash fine reject stream into the TBS feed. This study or concept has yet to be proved, however funding has been sought to investigate this observation with a view to improving the efficiency of the process.

Application engineering

Since ASE commenced investigating the potential for TBS applications in the coal industry, a significant range of expertise has been gained from pilot trials, design studies and installations. As a result, the optimum deployment of TBS technology can be readily established for a particular processing situation.

Based on extensive pilot and operational data, comprehensive efficiency models have been developed to support plant simulations. Partition data have been developed as a function of particle size; this is of vital importance given the influence of size on process outcomes. Thus, given detailed washability and sizing data, full plant simulations are undertaken to determine the optimum TBS utilization. Preliminary designs and costings can then establish the financial viability of installing a TBS unit.

Pilot testing can be carried out to confirm the suitability of TBS processing, but there is a now a high degree of confidence that operational outcomes can be reliably projected.

From past considerations, there are a number of general situations in which TBS units can be profitably employed.

- ➤ For fine coal processing involving low product ash levels, lower cutpoints and/or high levels of near gravity material, TBS often shows advantages over the use of spirals.
- ➤ TBS units have demonstrated excellent levels of efficiency for –2.5+0.3 mm material, and there appears to be benefits for inserting TBS technology between dense medium cyclones and froth flotation.
- ➤ When –0.5 mm w/w is being treated by flotation, there are many instances in which coarse particles are not recovered efficiently; TBS can effectively recover such

lost material and act as insurance against adverse flotation outcomes.

- ➤ A cost-effective capacity upgrade can be achieved, by increasing desliming screen apertures and using a TBS to treat the sand sized fraction.

There is usually a range of options with regard to the insertion of a TBS unit and the subsequent treatment of product streams. However, using a combination of experience and simulations the optimum application can be readily identified.

Acknowledgements

There has been significant input by various plant personnel during TBS trials and installations. Their assistance and provision of data is greatly appreciated, in particular CPP management and staff at Stratford, Bayswater, Bloomfield, Goonyella-Riverside and Westcliff Mines.

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BES provides Home Care Management system for TEBA*

Business Edge Systems (BES) has provided TEBA LTD, a private company that provides employment support service to labour intensive industries, with a Home Based Care Management system that enhances TEBA's service to the mines by providing better care to injured and sick mine workers.

BES is an enterprise solutions company, which delivers and sustains Internet-based business application systems.

TEBA's clients are predominantly mining houses to which it provides infrastructure and labour services. The South African gold mining industry, for instance, has mandated TEBA to serve as its agent for the industry's rural development initiatives in southern Africa. Through its inherent 'TEBA Cares' campaign, the company has reinforced its relationship with rural communities and miners through the provision of various streamlined and supportive services and professional customer care. The company performs all administrative and support functions relating to the engagement of employees, the provision of transport home for seriously injured or ill employees and re-integration into their families.

BES's Home Based Care Management system, originally known as the Spinal Cord Injury system, facilitates the entire administrative function relating to injured mine employees, providing TEBA with important details pertaining to patients, such as their medical records and requirements. These records assist TEBA in monitoring patients and providing them with adequate care. The system notifies TEBA representatives in the rural communities when scheduled visits to patients are due. The TEBA representatives then check on the patient and update the information on the system. The system maintains a history of all visits, results of these visits and the medical requirements of the patients. It also allows TEBA and its representatives to check the status of an order for medication. All information is accessible from TEBA's centralized database for management information.

According to Karen Malkin, account director at BES, the mines take care of their workforce and TEBA provides the services and infrastructure to support this care. 'The Spinal Cord Injury system is an excellent example of TEBA's commitment to providing better service to their clients by upgrading the systems that support these services,' she says. 'In fact, TEBA recently extended the Spinal Cord Injury system so that it can be used for other ailments such as TB and pneumonia—supporting a wider range of home care requirements.'

Malkin advises that BES has a long-standing partnership with TEBA. 'BES has developed successful systems for TEBA in the past, including an Invoicing System and a Labour Placement System.' She adds that BES's solutions are designed to meet its clients' specific requirements and to raise their business practices to new levels. According to Wendy Kraemer, manager of Manpower Data Centre at TEBA, 'BES has delivered consistently high quality solutions that enable TEBA to provide enhanced levels of service to its clients and their employees. This has enhanced TEBA's performance and profitability'. ◆

* *Contact: Karen Malkin, BES, Tel: 803-9330,* karen malkin@businessedge.co.za, *Dawne Canning, Emerging Media Communications, Tel: (011) 465-2258,* dawne@emergingmedia.co.za

International Minefill Council announces *Minefill 2004* Symposia*

Meeting to be held in Beijing, China

San Francisco—July 23, 2002—The International Minefill Council is pleased to announce the Eighth International Symposia on Mining with Backfill (*Minefill 2004*) will be held in Beijing, China in the fall of 2004. The 2004 meeting is being hosted by the Changsha Institute of Mining Research, based in Changsha, Hunan Province, China. The Changsha Institute is the largest mining research institute in China. The technical programme is being organized under the leadership of the Non Ferrous Metals Society of China.

Mining plays an important economic role in the Chinese economy. In 1999 mining accounted for 4.5 per cent of the GDP of China. China reportedly has about 80 large-scale mines that use backfill, and another 900 small to medium mines representing 25 per cent of non-ferrous mine production and about 50 per cent of gold mining.

The 2004 Organizing Committee is arranging tours to two of the largest mining districts in China. The Jinchuan District in Gansu Province hosts the Longshou Mine, which is home to the largest paste system in China. The Fankou Lead-Zinc mine in Guangdong Province utilizes cemented rockfill and mechanized vertical retreat mining.

Abstracts for *Minefill 2004* are due by May 1, 2003. Abstracts and submission details can be found at www.minefill.com.

The International Minefill Council is responsible for promoting the Minefill series of symposia in member countries with mining companies, consultants, vendors, researchers and government/regulatory professionals. The council is comprised of 9 member countries including Australia, Brazil, Canada, China, Poland, Sweden, South Africa, United Kingdom, and the United States. ◆

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* *Contact: David Stone, Chairman, International Minefill Council, Minefill Services, Inc., Tel: (425) 486-0992, Fax: (425) 485-5811, email: dave@minefill.com*

Downstream aluminium up and running*

Project Partners of the Downstream Aluminium Pilot Project happily launched the long awaited project at a well attended function at the ZCBF Community Park recently. The Project, initiated by Hillside Aluminium and facilitated by the ZCBF is a fully operational foundry which aims to train potential entrepreneurs in all aspects of a small aluminium foundry's operation, thereby opening doors to formal or self employment.

The foundry is positioned to produce aluminium items for the local and international market thereby ensuring the self-sustainability of the project and allowing trainees to obtain hands on experience in all aspects of a commercial foundry operation

This project has been made possible through generous funding form Hillside Aluminium, Bayside Aluminium, BHP Billiton Development Trust and the Department of Economic Development and Tourism with technical assistance provided by the CSIR.

Funding from the Department of Trade and Industry has made it possible to launch Phase 2 of the Project which entails the establishment of an incubating facility for up to 10 entrepreneurs at a time, who will be able to utilize capital intensive equipment, machinery and support services in a secure environment, for the manufacture of sellable products. After a limited period of time (18 months to 2 years), their operations should have outgrown the incubator and they will be encouraged to leave the incubator and set up their own business.

Last year, at an international aluminium industry conference it was made clear that South Africa could see an explosion in job creation if more downstream beneficiation could be achieved, particularly as it is much more labour intensive: a smelter requires one employee per 500 tons of aluminium produced while a downstream project like this one would require at least one employee per six tons. The conference also highlighted the cost advantages available in South Africa due to the lower cost of skills and duty-free export opportunities.With Richards Bay Industrial Development Zone already in the process of applying for an operator permit, all these benefits become distinctly realizable.

Speaking at the opening function, President and Chief Operating Officer of BHP Billiton Aluminium SA, Mahomed Seedat said: 'this is a project that is very close to my heart. I would love nothing better than to see the product produced by BHP Billiton Aluminium Smelters creating desperately needed jobs in South Africa. ◆

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* *Issued by: Coral Heath, Department of Chemical Engineering, UCT, cheath@chemeng.uct.ac.za*