According to the World Coal Association, total global production reached a record level of 7822.8 million t in 2013. Coal slurry quantities continue to rise: it is estimated that 6 – 8 billion t of fine coal are stored in waste impoundments or gob piles in the US alone.

The US Mine Safety and Health Administration (MSHA) oversees more than 700 active freshwater and slurry impoundment structures. These structures are regulated by federal and state agencies, which generally direct companies to reduce or eliminate the volume of material in the impoundments for safety reasons, such as alleviating breakthrough concerns, to extend impoundment life, to reclaim land and to recover the energy available within, particularly through the recovery of coal fines (generally less than 1.6 mm) as a fuel source.

Coalview has over two decades of experience in the design, development, construction, management and operation of coal fines recovery plants. These plants are designed to provide recovery and environmental solutions for mining property owners. The company specialises in the removal and processing of waste materials and is the only firm with a sample extraction technique, an in-house laboratory, design and operating techniques to handle an entire project from start to finish.

Case study

The Centralia, a Washington-based fine coal recovery plant, is a flagship project by Coalview (Figure 1).
company has been engaged by TransAlta Centralia Mining to collect, transport, process and dispose of waste coal slurry created during the operation of the Centralia coal mine from 1971 to 2006. The fine coal recovery plant is built to collect waste coal slurry from certain impoundment ponds at the coal mine, to treat the waste, to recover usable coal fines and to dispose of the remaining waste in compliance with state and federal requirements. First coal was produced from the plant in early December 2014. The plant has finished construction and started operations as planned.

Project management from start to finish
Coalview is equipped to finance, design, engineer, construct, install and operate recovery projects globally. The company uses sample extraction techniques and an in-house laboratory to perform the analysis and classification of slurry waste material. In addition, Coalview is able to design the processing system to provide the optimum recovery from the slurry to produce a higher-grade coal product. Coalview can develop the processing plan to extract the slurry, reduce reclamation costs, operate the recovery...
plant and handle the entire project from start to finish.

Sample extraction and analysis to quantify waste facility reserve
The impoundment structures to be cleaned and evacuated at the Centralia coal mine site are part of a system of five structures known as the Series 3 Ponds (Figure 2). The combined impoundments contain approximately 18 million t of slurry, based on TransAlta Mining records and third party calculations using topographical mapping.

The project began with extracting samples of slurry from various points within each of the ponds. Coalview is able to perform sample testing and analysis of coal slurry impoundment in-house. The company uses a drilling technique, known as vibracore extraction, to take the samples. This process has developed over the course of hundreds of successful slurry pond drilling projects. The company developed an eight-wheel drive, low-ground-pressure, all-terrain, amphibious drill rig that is capable of drilling quickly, accurately and cost effectively (Figure 4).

The samples were analysed at the Coalview Recovery Group (CRG) laboratory in Somerset, Pennsylvania, to include a determination of size distribution, float/sink analysis, froth flotation release analysis and percentages of ash, sulfur and moisture, as well as Btu values. CRG is able to provide sampling and analysis of all configuration of coal slurry refuse impoundment structures, such as bermed impoundments, incised impoundments and valley fill impoundments.

Coal fine recovery plant construction
Coalview started plant construction in Centralia in January 2014. The primary contractor for the project, Rock and Coal Construction, was brought in. Rock and Coal is a West Virginia-based contractor specialising in installation of coal preparation and aggregate. They were an active participant in the build and design process (Figures 3 and 5).

Coalview’s collection, processing and disposal system for slurry consists of four major components: dredge feed, sizing and processing, product dewatering and refuse treatment/paste production.

Dredge feed – the recovery feed system
The dredging system (Figure 6) used to transport the slurry was designed by Coalview in conjunction with Rohr-Idreco Sludge Systems of Richmond, Wisconsin. Coalview has worked with Rohr-Idreco on other projects dating back more than
15 years. Dredging is the best way to handle the material because it is too wet to transport through conventional means, such as excavators or trucks.

The project uses a two-dredge system. The all-electric hydraulic coal dredge uses a water jetting head, which loosens materials before they are delivered to the suction: a more effective means to handle the slurry. The dredge has a feed rate of 200 tph. The slurry is then pumped to the project facility through an HDPE pipeline with a 10–14 in. dia. The dredge cells, having low or no yield, are identified and then transported by a secondary dredge to the paste thickener system (described below), for final deposition into a dedicated pond known as 3E. The dredging units and pipelines are relocated from impoundment to impoundment as the operations proceed.

Each pond is divided into a series of dredge cells (Figure 7). The dredge cells are established around the points where samples are taken, with a sample point as the centre of each cell area. The quality of each dredge cell is determined by interpolating the quality between each sample point to establish the overall average quality for the dredge cell. As the dredging continues to greater depths of the pond, additional samples will be extracted and new dredge cells/quality standards established. This pattern will continue to the maximum depths of the ponds.

Technologies and equipment

The recovery system is designed using reliable time tested equipment, as well as the latest technologies in advanced coal processing. The specific technologies used in the recovery system are:

- Compound coal spiral used in the process design to reduce the ash content of the +100 mesh fine coal product.
- A Stack Sizer screen system designed to reduce and remove the fine clay and non-coal particles from the fine coal product.
Screen-bowl centrifuge, used to reduce the moisture content.

Paste thickener technology used to convert the non-coal slurry to a ‘paste’ material that is less susceptible to dispersal when deposited in an impoundment (Figure 8).

**Sizing and processing**

Initial sizing of the higher-quality slurry, which is transported to the project facilities, is accomplished with a sieve/vibrating screen separating system, with larger material discharged from the system. The remaining material is then sized in primary classifying cyclones, processed through a compound spiral system, with material less than 200 mesh to be discharged by the non-coal slurry treatment system. The product is then pumped to the deslime cyclone.

The overflow material will re-circulate to the primary classifying cyclone, while the underflow product will be washed and screened through the Stack Sizer screens, before delivery to the screen-bowl centrifuge used for dewatering. The material passing through the screens is discharged to the non-coal slurry treatment system.

**Dewatering**

The screen bowl centrifuge is the primary dewatering unit, which removes the majority of surface water from the coal product. Two discharges occur from the screen-bowl centrifuge: the water effluent, which is pumped to the non-coal slurry treatment system; and the screen effluent, which is recirculated. Finally, dewatered clean coal product is discharged to a conveyor, weighed and conveyed directly to TransAlta’s power plant.

**Refuse disposal and reclamation**

Coalview not only recovers fine coal from slurry, but also considers the reclamation of the slurry impoundment site. All unusable non-coal slurry is pumped through HDPE pipelines to a two-state thickener system. The refuse is first treated through a 250 ft dia. static thickener, while the refuse underflow is pumped to a deep cone paste thickener to produce clarified water and a paste material. The clarified water is used within the project or discharged to other locations, as needed. Finally, paste material is delivered into a dedicated pond for final deposition. The recovery operations enhance the site reclamation and are known to reduce ultimate reclamation costs.