Next-generation ash management in coal ash starts with a holistic view of how operations can run more reliably, safely, and productively. Whether to capture and stabilise at the earliest opportunity or to remediate and reclaim ponds. We think about every step as part of a process versus a stand-alone function to help customers deploy and maintain an advanced integrated solution, controlling both cost, risk and eliminating reliance on water usage.

Currently plants face a number of challenges when converting to an alternative ash management system due to few economically viable options being available. Conventional practice is commonly called “ash sluicing” management, current management for transport and disposal to an impoundment or landfill typically involves the use of water to approximately 80 percent to be able to pump the slurry long distances into designated ash ponds.

Traditional management typically involves handling and moving the ash multiple times. Each transfer of the ash adds more risk. Even after ash is spread and compacted, it can be easily mobilized by wind if allowed to dry. It also exhibits relatively high hydraulic conductivity, which translates into high rates of leachate production.

In addition to these technical challenges of fugitive dust and increased leachate production, traditional ash management is costly. The costs of transferring the ash to ash/water mixing facilities – together with the capital and operating costs of the facilities themselves – are high. Pumping systems, pipe infrastructure and maintenance, fuel management, heavy equipment operations and maintenance, continual dust suppression, lighting and security plus associated labor further reduce the appeal of dry ash handling. Lastly, the continual operation of equipment significantly increases safety risks.

Edos Global Ash Management Technology in collaboration with CHT Australia offers an integrated approach to coal ash management. It offers advantages that will enhance the ECONOMIC, TECHNICAL & environmental standing of plants with a proactive compliance to EPA rules and guidelines.

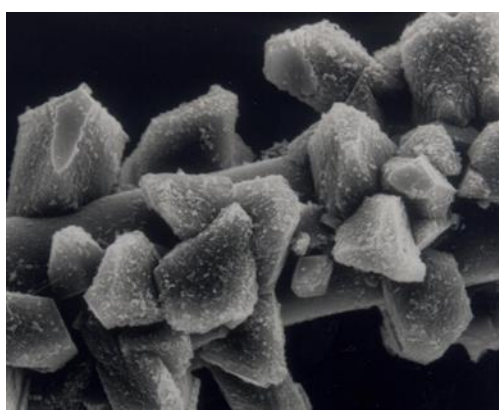
The technology is a high intensity drying & mixing process that combines proven and cutting-edge technology, as an alternative solution to conventional wet bottom ash handling systems. Extracting bottom ash without the need of costly upgrades or further processing. The ash is conveyed to a temporary storage silo before entering the dewatering process via an automatic plate press, excess water is recycled and returned for reuse. Dewatered filter cake is transferred via conveyor to a blending unit where AquaZero is deployed from a silo and blended to produce a dense mixture with stoichiometric use of wastewater which stabilizes the heavy metals pursuant to EPA Guidelines which renders the waste for reuse with multiple applications and can be reused as a by- product in several applications or disposed safely into landfill. Eliminating sluicing and ash ponds completely.

The material hardens within with-in hours and substantially cures within 24hrs. The interstitial crystal growth sequesters water, entrains small particles and inhibits fluid flow. The crystals act as an adhesive that bind the ash particles together.

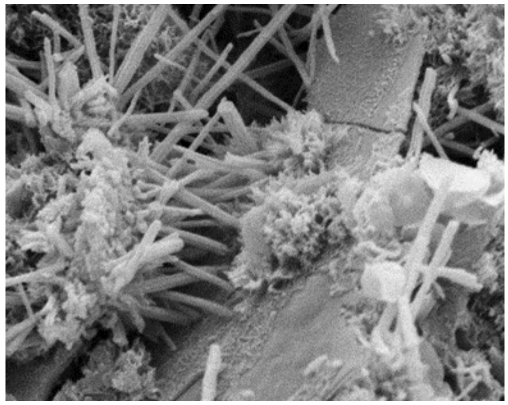
Once cured, the stabilised mass exhibits zero hydraulic conductivity, high compressional strength, no wastewater discharge, no fugitive emissions and enhanced metals sequestration, Neutralized PH levels, thereby rendering the stabilized material for "Beneficial Reuse" thus satisfying EPA guidelines.

AquaZero addresses all of the challenges with a single process.

- Combined stabilization of ash and wastewater,
- Reduction of water use by 90 percent compared to traditional practice,
- Zero discharge of transport water,
- Significant reduction of plant-wide wastewater,
- Low hydraulic conductivity (10-4 to 10-10 cm/sec),
- High compressional strength
- Enhanced metals sequestration,
- No risk of liquefaction or spills associated with liquefaction,
- Elimination of leachate volume,
- Elimination of fugitive dust emissions,
- Enhanced land-use efficiencies.,
- Reduced energy consumption,
- Ability to mix multiple CCRs and wastewaters in the mix.



Cement only stabilization- low crystal interlocking connectivity



AquaZero-high crystal interlocking connectivity

Figure 1 Loy Yang B Brown Coal bottom Ash before and after submersed in water for 30days with no physical changes, preliminary, universal indicator tests presents a neutralized PH level between 6-7.

Attached Certificate of analysis from ALS Environmental.

Figures 1A and 1B show cured slurry product made with 60 percent of the PRB fly ash depicted in Table 3 and 40 percent water. After six weeks of curing, the low reactivity of the ash resulted in very little cementation. The regions where ettringite crystals have grown are shown in Figure 1B.

The cured product exhibits a porosity of about 50 percent, as evidenced by the dark regions of empty space in this image. After curing, this sample exhibited compressional strength of 48,263 Nm-2 (7 psi) and the hydraulic conductivity measured 3 x 10-5 cm/sec.

In order to assess how the performance of the mix made from the Loy Yang B ash can be improved, another sample was prepared which consisted of 80 percent fly ash a natural moisture content of 20% and 4 percent specially blended AquaZero by weight.

Figure 2 is an electron microprobe image of the cured product after 6 weeks of curing. This image clearly shows a significant reduction in the porosity compared to the product in **Figures 1A and 1B.**

The porosity of the solidified ash without AquaZero is about 50 percent compared to the ash with AquaZero which is about 6 percent. The hydraulic conductivity of the cured sample containing the additive is 3.4 X 10-6 which is an improvement of about one order of magnitude. The compressional strength also increased to 1,296,214 Nm-2 (188 psi) which is an improvement by more than an order of magnitude.

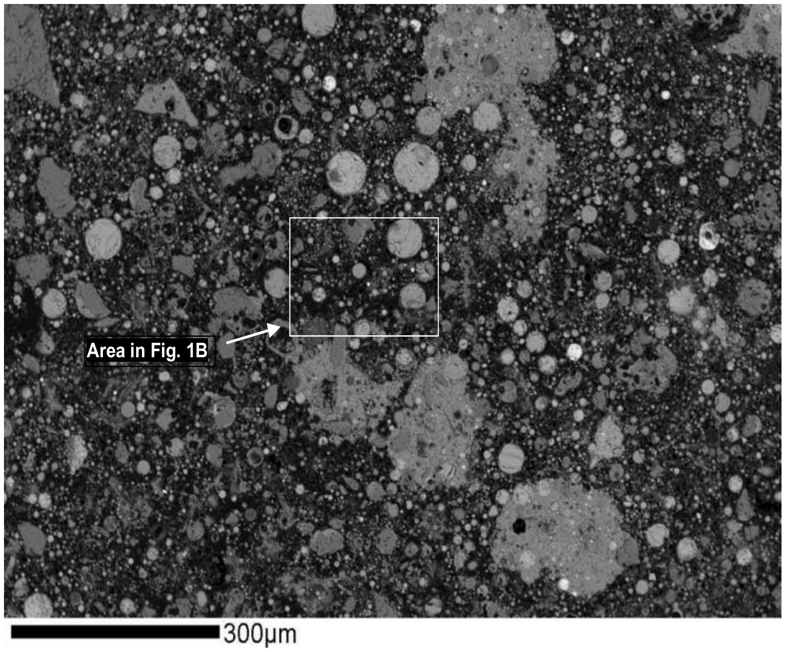


Figure 1A. Low-magnification electron microprobe image of poorly cemented slurry product.

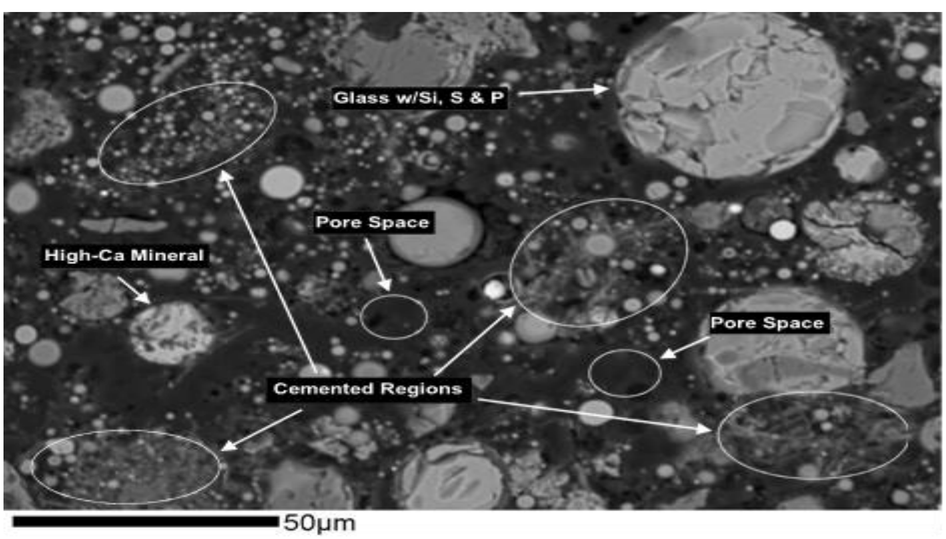


Figure 1B. Electron microprobe image showing pore spaces and limited cementation.

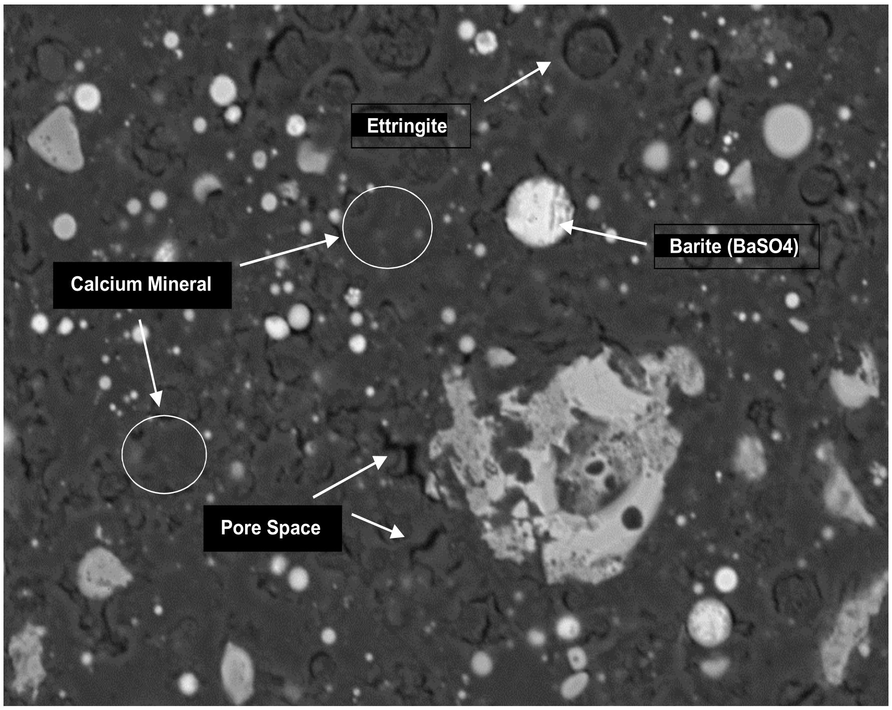


Figure 2. **Electron microprobe image of additive-added sample showing how hydrated minerals have filled pore spaces and bound ash particles together**.

Sequestration of Water

As mentioned above, mineral growth that takes place during curing sequesters significant quantities of water. This is important because the proposed solution eliminates the need of sluicing. The process exhibits zero discharge of fly ash water.

To assess how much water is sequestered in the curing process, samples were tested. The slurry consisted of 60 percent fly ash and 40 percent water by weight. Samples were prepared with 2, 4 and 8 percent AquaZero added (as well as with no AquaZero added) in order to correlate the amount of water sequestered with the concentration of AquaZero. The samples were molded into 100mm x 120mm plastic tubes and left to cure. The captured leachate was periodically poured back through the curing product. The samples and drained water were kept in a closed system to prevent evaporation of water.

AquaZero shows that water is rapidly segregated during the curing process. The dense slurry containing 4 percent AquaZero segregates all free water almost immediately during the hydration process. Thus, the risk of leachate is controlled at the hydration process over time because the water that infiltrates has more time to react as it percolates through the curing product. These continuing reactions enhance the performance of the impoundment over time by progressively reducing hydraulic conductivity and increasing compressional strength.

The hydration reactions that occur during curing coupled with evaporation result in zero discharge of fly ash transport water.

Testing

Because physical and chemical properties of ash and water vary from plant to plant, these materials need to be tested at each site to determine the best 'recipe' for stabilizing CCRs. Testing can be conducted at any location using a pilot-scale processing system.

Prior to the pilot test, samples of combustion products and wastewater must be analyzed to determine their chemistry and particle size distribution. The pilot-scale system can then be used to process several promising recipes. Dense slurry from each recipe is cured and testing is conducted at 7,14,28, 56 &90 days respectively.

GHT 1500 Filter Press, can be mobolised from storage facility in Geelong Victoria to facilitate the remediation of ash ponds and beneficial reuse of ash at Bayswater Power Plant .

Proposed Recirculation System

converts a wet sluice system into a dry ash system in the shortest amount of outage time. The Recirculation system use separating tanks to clarify ash sluice water that is usually sent to the ponds with the ash. The first tank, called the dewatering bin, collects and dewaters bottom ash solids to the desired moisture content. The clarified water is stored in a surge tank and reused during the conveying cycle. The ash is then unloaded into blending tank and blended with the stabilising material then conveyed to the compaction system without compromising the plant's operations.

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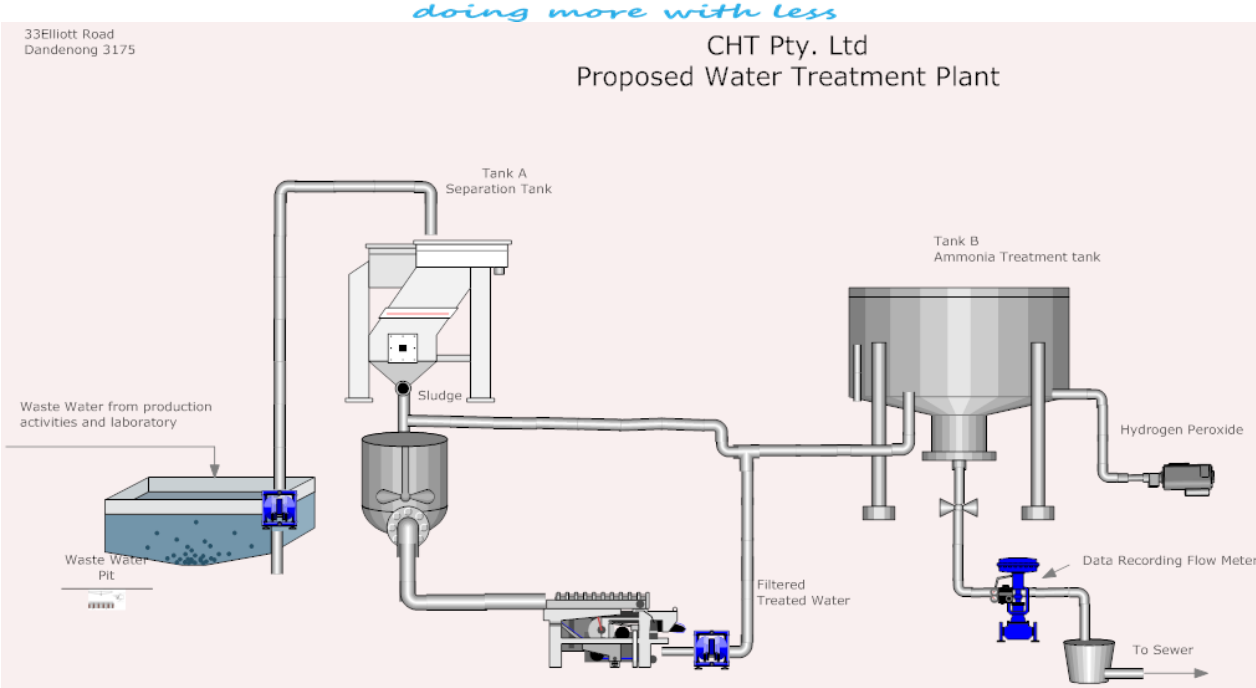
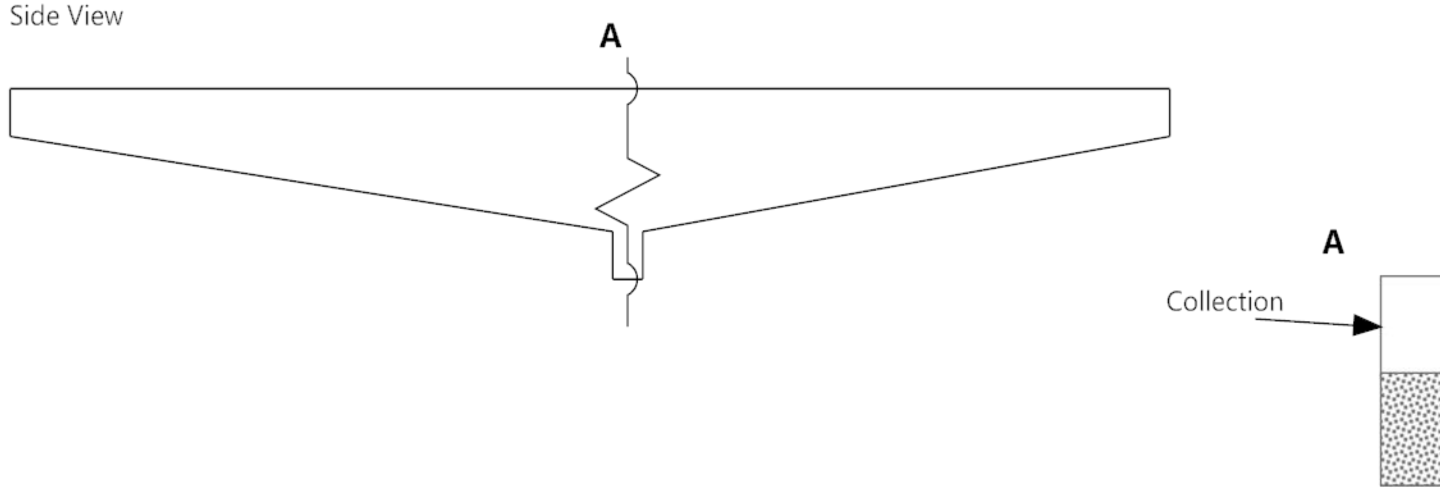
Sustainable Solutions
doing more with less



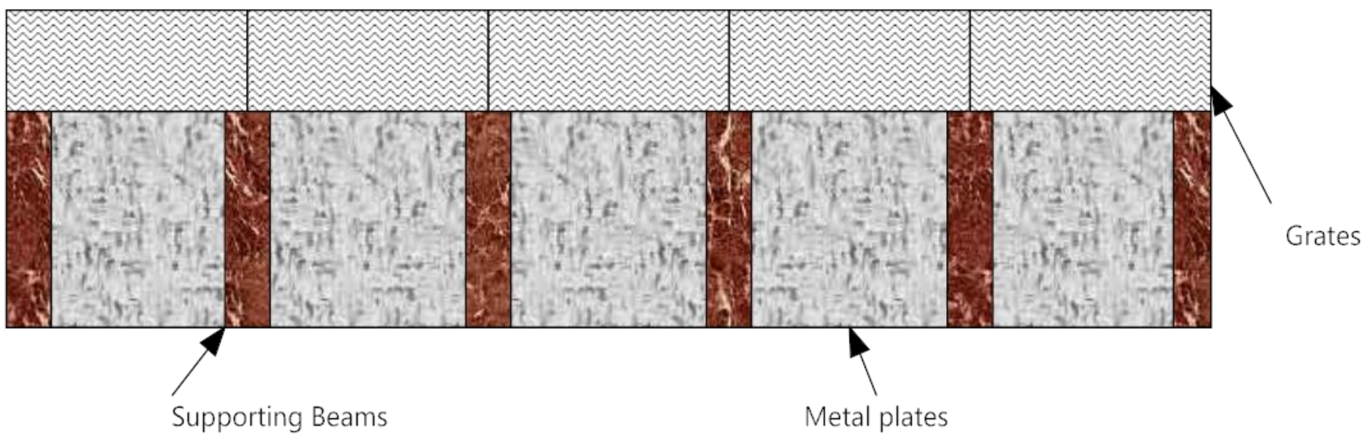
CHT
SMART CHEMISTRY
WITH CHARACTER.

Waste Water Pit Modification Proposal

Side View



Top View



Waste Water Pit.

1. water is collected from production activities and laboratory into the waste water pit.
2. The pit is divided into a collection section and storage section by a concrete wall developed with the technology.
3. The collection section is fitted with grates capable of supporting fork lift traffic.
4. The storage section of the pit accepts water from the collection section through a gate fitted with a removable filter for cleaning purposes
5. Storage section is covered by metal plates capable of supporting fork lift traffic. This is made poissible by changing the supporting beams from horizontal to vertical as represented in the drawing above.

6. The storage section is also equipped with an agitation system to prevent sludge from settling in the pit.

Seperation Process

1. Water is pumped from the storage section of the pit into a seperation tank over a set of clarifier plates where chemicals are being added to achieve flocculation.
2. The clear water is diverted into ammonia treatment tank.
3. The seperated ash is pumped into a holding tank-dewatering process.

Ammonia Treatment Tank.

1. Treated water is tested for ammonia levels (spec 50ppm)
2. Hydrogen Peroxide added (if required) to maintain specified levels.
3. Total N specification is 500ppm
4. pH and tempreture is measured and if within prescribed limits water is reused in the ash process or discharged into sewerage system at the prescribed rate via flow meteres as required.

Batching and Stabilisation Plant

The dewatered ash cake is transported to the batching and stabilisation plant by either conveyor or front end loaders to the blending stage of the system. Outlined below is a typical block processing facility.

The final process is stabilised product that has multiple reuse applications ie precast modular building system, road base aggregates.

Edos Global
Sustainable Solutions
doing more with less

1.Fully Automatic Line

2.Semi Automatic Line

3.Simple Automatic Line

The Hercules Honcha Group is specialized on individual plant configurations. We are able to customize your requirements by providing from simple production line to fully-automatic production line.

1.Batching station
2.Cement silo
3.Mixer
4.Transport of mixture
5.Block making machine
6.Elevator/Stacker
7.Curing room
8.Lowerator/Distacker
9.Cubing
10.Product transport
11.Finger car
12.Cross transport

Curing room

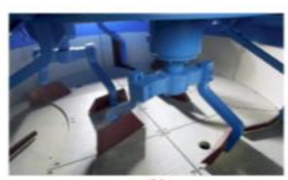
Wrapping machine

Pallet magazine

Finger car

Elevator \ Lowerator

Batching hopper



Mixer

Dry side

Pallet turn over

Auto cuber

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