# FGD Byproduct Fixation and Stabilization Alternatives with Ash Systems

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## INTRODUCTION

Utilities are seeking alternative approaches related to the water balance of the various systems and many need to reduce the water demand for the plant and eliminate waste streams that require further treatment and/or discharge permits.

The options that plants employ to decrease water consumption will be dictated by multiple factors including not only the existing plant processes but physical layout, water discharge quantity and chemistry, and the ability of the water to be stored should the generation or use processes be intermittent.

The focus of this paper is to present case studies for two plants and demonstrate how these sites are using dry fly ash to safely and responsibly eliminate FGD waste streams that reduce the overall water demand for the plants and eliminate the costs associated with treatment of these waste streams.

## CAST STUDY 1: FGD BYPRODUCT AND BLOWDOWN WASTE WATER FIXATION

Case Study 1 is for an existing Midwestern plant burning high sulfur Illinois Basin coal, and using a wet scrubber (“FGD”) to remove $SO_2$ emissions. The FGD system includes the capability to dewater the FGD byproduct for disposal to a landfill on the plant site. When landfilled directly, this FGD byproduct is permeable and leachate at the landfill is an issue. The original fly ash systems at this site were wet systems, with the fly ash conveyed to the pond as a slurry for disposal.

With pending Effluent Limitations Guidelines (ELG), the plant made the decision to convert the existing fly ash systems from wet to dry, eliminating any fly ash contact water. As an extension of this conversion, the plant implemented a fixation system using the dewatered gypsum, fly ash, lime and scrubber waste water. The existing gypsum dewatering equipment was replaced and a new building was constructed to house the fixation equipment. The system is designed to handle material from multiple units.

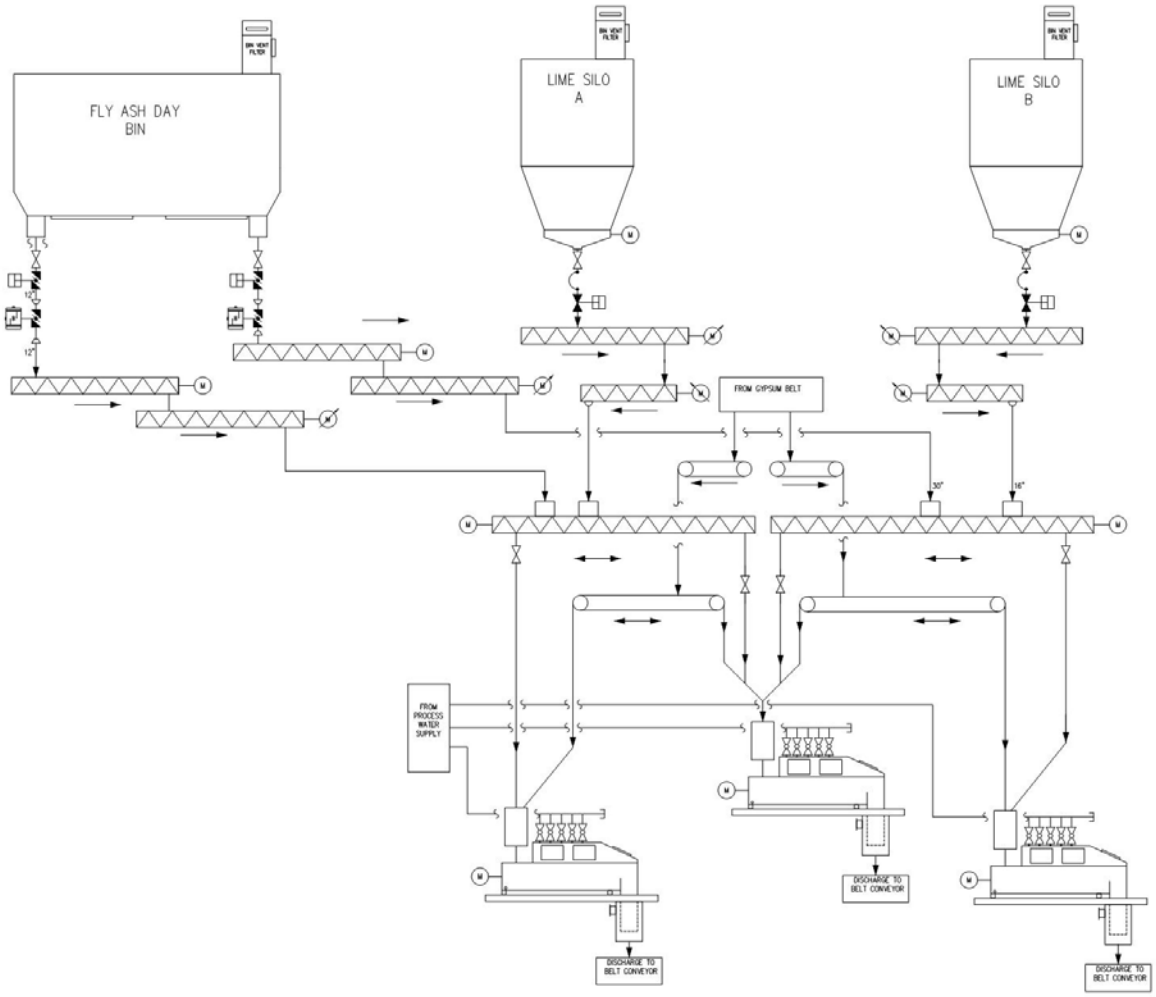


Illustration 1. FGD Fixation System

The equipment included with the overall project included:

- Scrubber fixation building;
- New gypsum dewatering equipment;
- Weigh belt and transfer belt conveyors for dewatered gypsum;
- Fly ash transfer/conveying system with day bin;
- Fly ash discharge feed (weigh and transfer) equipment;
- Lime unloading and storage (silo);
- Lime discharge feed (weight and transfer) equipment;
- Paddle Mixer/Unloader with liquid feed valves;
- Discharge belt conveyor(s) and dust venting equipment;

Photo 1. Fixation Mixer/Unloader

The fixate product is discharged via radial stacker to a pad and stored 2-3 days before being transferred to the landfill. Alternatively, the fixate product can be used for beneficial reuse, such as embankment construction or landfill cap. The fixate product is relatively impermeable and leachate issues at the landfill are mitigated.

Photo 2. Radial stacker discharge to pad.

CASE STUDY 2: FGD BLOWDOWN WASTE WATER DISPOSAL

Case Study 2 is for an existing Midwestern plant burning high sulfur Illinois Basin coal, and using wet scrubbers ("FGD") to remove $SO_2$ emissions. The plant is implementing a new ZLD wastewater treatment facility that will generate a high concentration brine. Although there are systems available to "solidify" this brine for disposal, the plant has elected to dispose of the brine by mixing this material with fly ash.

There are multiple units at this plant site, and fly ash from all units is currently conveyed to a common storage area. From there, the plant either conveys fly ash to a FGD stabilization system (one unit), or offloads ash for sale or landfill disposal. Accordingly, ash is available for mixing with the brine concentrate to provide a low cost method for disposal of the brine.

The brine concentrate is added to the fly ash during conditioned unloading, in place of normal service water, and ash is then hauled directly to landfill for disposal. The mixer can accommodate from 0 – 100% brine, depending on the brine availability. This project included a corrosion resistant Pin/Paddle Mixer/Unloader design to accommodate the 100% brine concentrate.

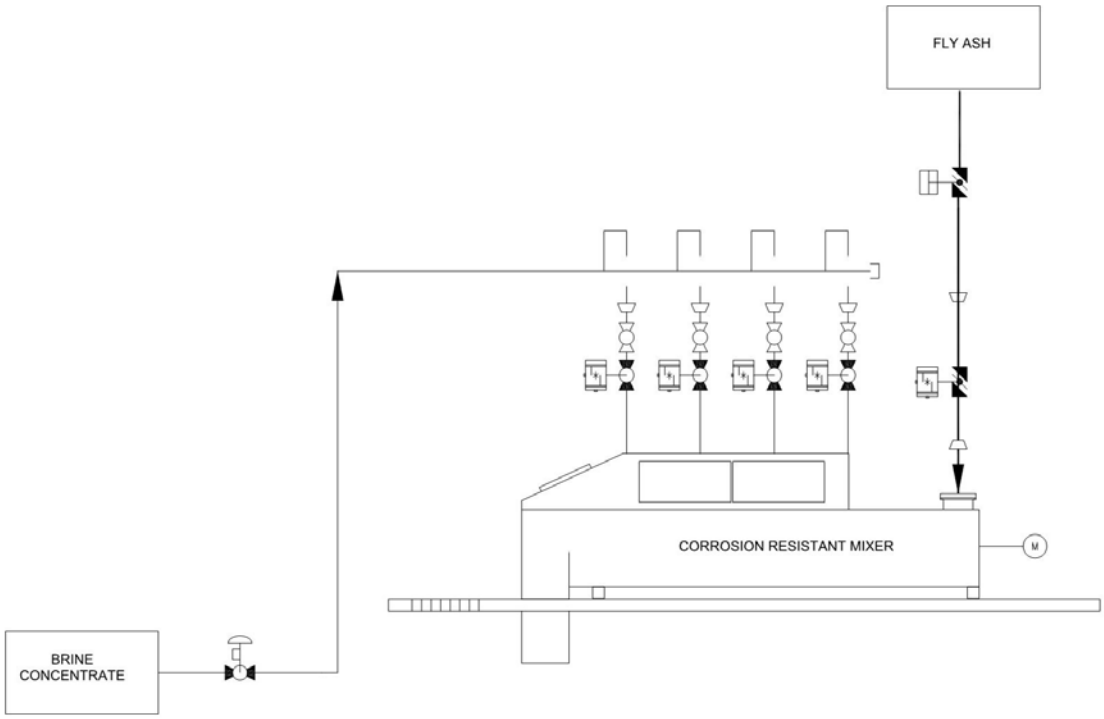


Illustration 2. Brine Concentrate Mixer/Unloader

The design concentration of the brine for this site exceeds 100,000 mg/l. Typical FGD blowdown concentrations are in the range of 10,000-25,000 mg/l.

Table 1. FGD Wastewater Characteristics for Typical FGD Blowdown vs. Design for Brine Concentrate (ZLD)

| | Unit | Typical | Brine Concentrate |
|---|---|---|---|
| Suspended Solids (TSS) | mg/l | 250 - 20,000 | 20,000 |
| Total Dissolved Solids (TDS) | mg/l | 15,000 - 35,000 | >300,000 |
| pH | | 4 - 6 | 7 - 10 |
| Chloride (Cl) | mg/l | 10,000 - 25,000 | >100,000 |
| | | | |

The handling of waste water with extremely high chloride content requires special materials of construction for the components. Materials of construction will vary based on the concentration, and include the following typical design features:

- Fiberglas or rubber lined tanks and pumps for storage and transfer of brine to mixer area;
- Fiberglas reinforced plastic (FRP) or high-density polyethylene (HDPE) piping;
- Perfluoroalkoxy alkanes (PFA) lined, Stainless Steel, Hastelloy, or Monel valve construction;
- Corrosion resistant Pin Paddle Mixer/Unloader design including HDPE liner and Hastelloy shafts;

Photo 3. Corrosion Resistant Pin Paddle Mixer/Unloader

When adding the FGD blowdown or concentrate to the mixer, the liquid by weight will typically range from 10-15% of the fly ash material. Once absorbed into the ash, the overall effect of the brine concentrate on corrosion is significantly reduced.

It is also possible to add FGD blowdown slurry directly to the mixer for disposal. With a higher concentration slurry (> 45% solids), the mixer can handle significantly higher quantities of liquid (slurry) and still provide adequate discharge material.

## SUMMARY

With the release and implementation of new ELG guidelines, plants will be challenged to dispose of fly ash and FGD contact water. Inherent characteristics of fly ash materials make them an excellent choice for fixating and stabilizing both FGD byproduct and waste water. Various options are available for handling the waste water at relatively low cost in comparison to additional waste water treatment equipment.