



Education Series – EDDYPump.com

Coal Ash Slurry Pumping 101 - Pump Selection Help

How to Pick Slurry Pump for Coal Ash and Power Plant Applications. Education Series.

What is a Slurry?

A slurry is a mixture of solid particles suspended in a liquid medium (coal ash). In most industrial applications, the suspended solid particles are denser than the liquid. Slurries can therefore be categorized as non-settling or settling slurries based on the solid particle size. Settling slurries are unstable mixtures with coarse particles that tend to settle at the bottom. They have high wearing properties that necessitate careful selection of slurry handling equipment. Non-settling slurries contain very fine particles that can remain suspended in the liquid medium for extended periods. These slurries have a lower wearing effect but still require careful selection of handling equipment as their behavior varies from that of normal liquids.

Slurries are often used in the industry as a convenient method of handling solids in bulk. They behave somewhat like thick fluids that can flow under gravity and may be pumped using suitable pumping equipment. Slurry pipelines offer economic benefits overland transport and are more environment-friendly, particularly in remote areas. They find applications in steel processing, mining, foundries and power generation.

EDDY Pump has been part of various environmental cleanup projects. Our pumps are uniquely positioned for sensitive projects because of the ultra low turbidity created. The best pumps for contaminated waterway cleanup.

About Coal Ash: AKA Fly Ash and Bottom Ash

Coal-fired power plants generate more than fifty percent of the world's electricity. In doing so, they burn hundreds of millions of tons of coal. In the United States alone, more than 470 coal-fired electric utilities burn over 800 million tons of coal every year. Combustion of coal produces several different types of residuals. A very fine powdery material, known as fly ash, is driven out of the boiler with the flue gases. Coarse ash particles that are too large to be carried up with the smoke collect at the bottom of the

boiler and are called bottom ash. Together, fly ash and bottom ash are known as coal ash. Modern coal-fired power plants, in compliance with environmental regulations, use particle filtration or electrostatic precipitators to capture the fly ash before the flue gases are exhausted into the atmosphere. The chemical composition of coal ash can vary considerably based on the type and source of coal being burned. Fly ash is composed of silicon dioxide, calcium oxide and aluminum oxide while bottom ash contains high concentrations of heavy metals including mercury, lead, chromium selenium and arsenic. These substances are hazardous to health and the environment and require careful handling and disposal.

Coal power plants in the US generate about 110 million tons of ash and residuals annually. About 30% of the coal ash is disposed of as dry ash in large on-site or off-site landfills. Another 20% is stored in wet form in large surface impoundments known as ash ponds while 40% is recycled and used in various industrial applications such as manufacturing of cement, wallboards, bricks and pavers.



Coal Ash Storage at a Power Plant. Tailings Pond Aerial View.

Ash Storage, Pumping and Transportation

An ash pond is a structure specially engineered for the wet disposal of bottom ash and fly ash. The size of a coal ash pond depends on the capacity and disposal needs of the power plant with some ponds covering as much as 1,500 acres. Ponds are filled with coal ash slurry and the water is allowed to drain and evaporate over time. Storage of

wet coal ash in ponds is subjected to strict Environmental Protection Agency (EPA) regulations as contaminants may leach into the ground water and pose health risks to communities nearby. These regulations are the result of a fly ash slurry spill from a 40-acre coal ash storage pond at the Tennessee Valley Authority's Kingston plant in December 2008. The spill damaged 40 homes, contaminated the Emory and Clinch Rivers and cost \$1 billion to clean up. The new regulations specify structural standards for coal ash surface impoundments including liner requirements to protect the groundwater.

Fly ash and bottom ash collected from the power plant boiler is commonly transported as a slurry through pipelines to specially designed ash ponds. Ash that is generated dry is often mixed with water to facilitate transport. Fly ash is heavy and abrasive with a tendency to harden and compact which makes it difficult to pump. Moving wetted ash to ponds or hoppers using slurry pumps exposes the pumping equipment to extreme operating conditions including a highly abrasive environment, large particles, high pressure, temperature and vibration. This makes the slurry pumps susceptible to failure, causes unplanned downtime and leads to high operating costs. Correct pump selection is therefore of paramount importance in ensuring continuous, trouble-free operation.

Pump Selection Considerations and Durability

Suitability of the coal ash pump depends on the type of slurry that needs to be transported. Pumping principle, impeller/rotor design, pump construction material and discharge configuration, all need to be carefully considered in selecting a suitable pump. Hot fly ash pits present one of the harshest conditions for the deployment of a slurry pump in power plants. They are served by rainwater sumps that may contain slurry with very high solids. Conventional sludge pumps and submersible sewage pumps have historically been used as fly ash pumps. These pumps however, are prone to clogging and wear from grit and scum and have a high failure rate. Traditional centrifugal pumps use a rotating impeller to impart kinetic energy to the slurry. Centrifugal pumps also fail frequently, especially when dealing with slurries containing large objects that cause clogging.

Our Dredge Pumps Move Ash Better

EDDY pumps have been used successfully and reliably as sump pumps for pumping coal ash slurries. An EDDY pump is not a centrifugal, vortex or positive displacement pump. It has a patented design that harnesses the power of a tornado. A geometrically designed, spinning rotor creates a synchronized eddy current that lifts and pumps the slurry. This design enables the EDDY Pump to efficiently handle material previously deemed cost prohibitive. The unique design produces higher suction without clogging and without the critical tolerances of other pumps. EDDY pump technology delivers significant maintenance cost reductions and the ability to reliably pump slurries with large solids. Flexibility of varying rotor options makes these pumps suitable for high solid, highly abrasive, corrosive, high viscosity and high specific gravity slurries. Available in sizes of up to 12", EDDY Pumps are excellent at moving heavy materials through long pipelines. They create a turbulent flow that prevents settling and helps keep the heavy materials in suspension as the slurry moves down the pipeline. EDDY

pumps offer mounting options that allow installation as a vertical pump or a horizontal pump. Submersible pumps and immersible EDDY pump models are also available. Settled ash is removed from an ash pond at a power plant by coal ash dredging. As discussed earlier, new environmental regulations by the EPA require that all ponds be suitably lined to prevent heavy metal contamination of ground water. Poly liners, clay liners and concrete liners are generally employed for this purpose. Bottom and fly ash dredging of lined ponds presents a challenge as conventional dredging equipment can easily damage the liner causing an environmental catastrophe. EDDY pumps T3 coal ash dredge has been designed for liner safe application in the most sensitive dredging projects. The dredge incorporates a swinging ladder and 5-cable deployment which negates the needs for spuds. The unique design with precision load cell technology and the patented EDDY Pump allows dredging operation on clay, concrete and poly liners with no damage to the liner.



Excavator Pump Attachment

This dredge pump is ideal for fly ash ponds. It mounts to your existing excavator or a rental.

Gain flexibility to work where traditional barges can't.

Conclusion: Summary Of Coal, Fly, Bottom Ash Pumping

Coal ash slurries require special handling in power plants. They are difficult to transport using conventional pumps and require specialized pumping equipment designed to handle this tough job. EDDY Pump offers a unique solution to this problem with its patented pump design that harnesses the power of eddy currents. EDDY pumps deliver high performance over long periods in pond pumping applications to minimize the total cost of ownership. These high-performance pumps have been incorporated in fly ash dredges as dredge pumps suitable for safely removing ash from lined ponds without causing punctures or leaks in the liner. Investment in suitable slurry pumps can minimize expensive maintenance shutdowns and reduce the risk of leakage from lined ash ponds.

Liner Safe Dredge Pumps and Options for Tailing Ponds





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