- CHOICES FOR YOUR PLANT
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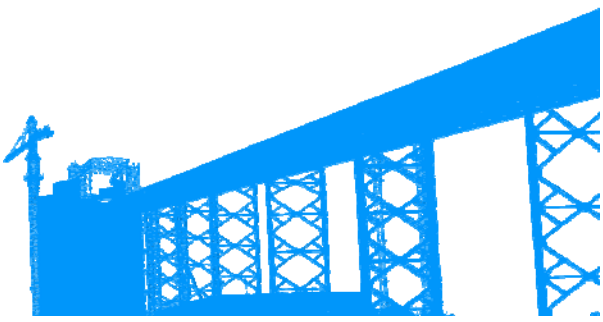
MBE EWB Ltd.

Ash & other bulk material handling



Technologies for better life

MBE EWB Ltd.

SHORT HISTORY OF MBE EWB LTD

MBE EWB Ltd is originated from Erőterv Power Plant Engineers. It was initially a Government company, entrusted with the setting up of power plants on turnkey basis in Hungary and other European countries. Ash Handling Division of Erőterv started working in around year 1955. Since inception this division, executed many ash handling plants of different types in major thermal power station in Hungary, Germany, Austria, Czechoslovakia, Greece, Turkey, Yugoslavia, Bulgaria, etc.

In the year 1990, Waagner-Biró, Austria a well known company of Europe acquired 50 % equity of the ash handling division of Erőterv. From this year the name of the company changed to Erőterv-Waagner-Biró Ltd. Since then, Erőterv Waagner-Biró continued ash handling business by implementing many more ash handling projects in Europe and Asia.

Gradually Waagner-Biró, Austria increased their stake in the company ending up with 90% holding of equity by the year 2000.
From 1997 McNally Bharat Eng. Co. Ltd was in exclusive collaboration with EWB for the Indian Market up the year 2000. In 2001, when Waagner-Biró put up its equity for Sale, McNally acquired the same through a global competition.
Being satisfied McNally Bharat increased its equities to 100% with effect from 24 Sept.2003.

At this moment MBE EWB Ltd . is one of the few companies in the world able to supply all kind of Ash Handling technologies and other Bulk Material Technologies.

We are ready to supply systems on turn-key basis or give Engineering and supply the key components of the ash handling systems.

This brochure in the next pages is giving an overview about EWB technical capability and reference showing number of technologies developed and executed by us in the field of Ash Handling and other Bulk Material Handling.

Karoly Horvath
Managing Director
MBE EWB LTD

MBE EWB Ltd.

EWB ASH HANDLING TECHNOLOGIES CAN COVER ALL REQUIREMENTS

MBE EWB Ltd . has developed different kind of Ash Handling technologies suitable for Pulverized Coal Fired Boiler as well as Fluid Bed Boiler application.
The selected technology we are offering for the collection, transportation and storing of the ash depends on many factors such as:

- Type of boiler
- Numbers of Units
- Size of the Units
- Type of coal or other fuel
- Quantity of ash
- Particle size and chemical composition of ash
- Numbers of ESP hoppers
- Plant arrangement
- Requirements against ash disposal side
- Distance of ash disposal area
- Silo distance from the Units
- Special requirement e.g. utilization of fly ash

For the fly ash collection and transportation we can design and supply different pneumatic transportation system such as:

- Airslide-Airlift system
- Dense phase pneumatic transport
- Vacuum type pneumatic transport
- Mechanical ash collection & transport
- High concentration ash slurry disposal system
- Positive pressure lean phase pneumatic transport.
- Silo technologies

We offer always the more suitable technology or their combination depending on factors listed above.

AIRSLIDE-AIRLIFT SYSTEM

The Airslide-Airlift material transport is usually used together.
It is a simple and well proven design and suitable to transport large quantities for short distances.
Typical application when the fly ash has to be collected from the large number of ESP hoppers and has to be transported into a near-by fly ash storage silo.

Airslide channel

Technical parameters:

- Standard transport capacity 1 - 500 t/h
- Standard transport distance 10 - 200 m
- Specific air demand 100 - 500 $m^3/h/m^2$

Advantages of the application

Low investment and operating costs, operational safety, simplicity, flexibility and high transport capacity depending on channel size. It has no moving part and transports the material with low speed, in a protecting operating mode.

There is a stable working point in wide range according to change of the loading, that is, the same channel is able to operate even for a considerably changed material quantities.

1. picture – Airslide distribution under fly ash silos - Obrenovac, Serbia

2. picture – Fly ash collection with airslides under ESP – Agios Dimitrios, Greece

The most frequent application fields:

- fly ash transport systems of power stations
- aeration and discharge of silos
- transportation of bulk, fluidizable materials in industries such as:
- cement works
- lime plants
- chemical industry

Airlift

The Airlift is used for vertical transportation of fly ash, cement and fine-grained materials.

Technical parameters

- Standard transport capacity 10 - 150 t/h
- Standard vertical lifting height 10 - 80 m

Advantages of the application

The Airlift has simple structural constructions, contains no moving part, its operating cost is low and can be operated safety in wide operating range. The airlift has a stable working point and the equipment is self-adjusting.

3. picture – Airlifts - Agios Dimitrios, Greece

The most frequent application fields

In fly ash handling systems, cement works & chemical plants vertical transportation of bulk material in large quantities into large-size silos, intermediate storage tanks.
The fly ash collection with airslide can be combined with dense phase transport.
EWB offer this version for big UNITS (large Nos. of ESP hoppers) when the fly ash storage silo is far from ESP.
The fly ash collected from ESP hoppers via airslide is collected in a small transfer bin. Under the bin transport vessel is put and the material is conveyed by dense phase transportation modus to the storage silo which can be located up to 1500 m far away from the ESP areas.
EWB has numerous references for this arrangement with very good experience.

4. picture – Fly ash airlift – Kangal, Turkey

DENSE PHASE PNEUMATIC TRANSPORT

In the last 15-20 years it is a trend world-wide to use dense phase pneumatic conveying for fly ash collection and transportation.
EWB has developed its own dense phase design and we have a well proven technology with many references.

Why dense phase?

- High material to air ratio, big quantities can be transported for long distances with less air.
- Due to lower velocity less wear
- Long conveying distance in one stage up to 1500 m
- No storage in ESP hoppers, fly ash is collected in the transporting vessels
- No sucking of flue gas, therefore danger of condensation is minimized while filling and during conveying no danger of plugging
- Due to dense phase smaller transport pipes required, consequently less structure and erection works
- Lower power consumption compared to other methods.

5. picture – Pressure vessel under ESP hoppers – Banjarmasin, Indonesia

6. picture – Alumina dust pneumatic conveying vessels - India

Technical description of the system
Depending on the UNIT size, the Nos. of ESP hoppers, ash quantities and plant arrangement (storage silo distance from ESP area) we can offer different arrangement most suitable and economical for the actual requirements.
Typical arrangements we are usually offering:

- Direct, multi dense phase transport from each ESP hoppers to storage silo. This simple solution can be used for silo distance up to 500 m. For this direct transportation system we have developed pair and group operation of the transport vessels. It means that up to 4 Nos. of vessels can be operated simultaneously is such a way that the transport vessels are working onto one common delivery pipeline. It results simpler and maintenance friendly operation

since the number of valves is reduced. This arrangement is usually recommended under the 3rd , 4th and 5th row of the E-precipitator hoppers.

- Two stage dense phase transport. In the first stage the fly ash is collected by individual vessels into a transfer bin and the long distance transportation from transfer bin to storage silo (up to 1500 m distance) is made by Jumbo transport vessel.
- Two stage transportation, where the fly ash collection is done by airslide, mechanical or vacuum system and the long distance transport by single Jumbo transport vessels.

7. picture - Pressure vessel under ESP hoppers – Leykam Gratkorn, Austria

Technical parameters

- Standard transport capacity	2 - 150 t/h
- Standard transport distance	10 - 1000 m horizontal
- Standard vertical lifting height	10 - 80 m

Advantages of the application

The equipment can be operated in wide operating range. Main operating parameters of working point belonging to quantitative and qualitative changes of the material to be transported can be changed, resp., adjusted flexibly.

Low power consumption and operating cost.

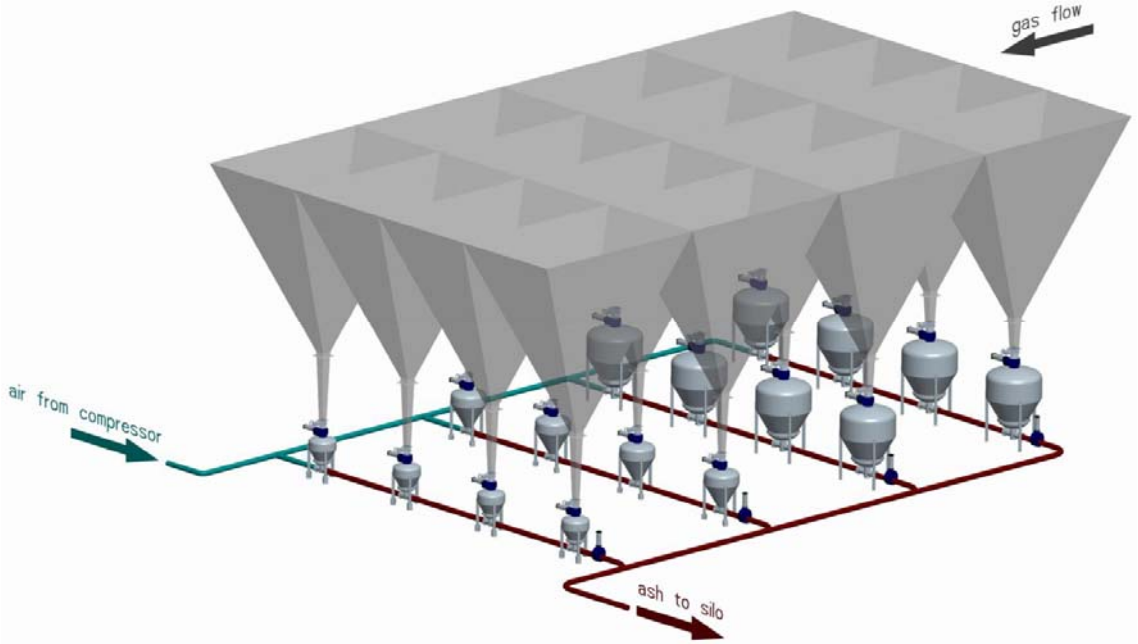
With PLC control, full automatic operation of the transport equipment of transport vessel can be realized. Because of the low delivery air demand, on venting of the receiving silos we need filters of substantially less size instead of filters customary to the conventional, thin-phase flow pneumatic transport equipment.

Additional advantages against vacuum type systems in case of big fly ash quantities: The fly ash is collected in the transporting vessel, therefore ESP hoppers have no storage function, consequently the plugging of hopper outlet is eliminated.

Several transport vessels can be connected to a common pipeline, thereby a possibility is afforded to construct more complex systems as well.

The most frequent application fields

- Fly ash transportation in pulverized coal fired power stations.
- Fly ash, bed ash, limestone & sand transportation for fluid bed boilers.
- Transportation of cement and clinker dust in cement works.
- Transportation of foundry sand.
- Transportation of dusty materials in chemical-, food industry and agricultural plants, as well as in pharmaceutical factories.



8. picture – Tipical arrangement of fly ash pneumatic transport with individual pressure vessel for each ESP hopper

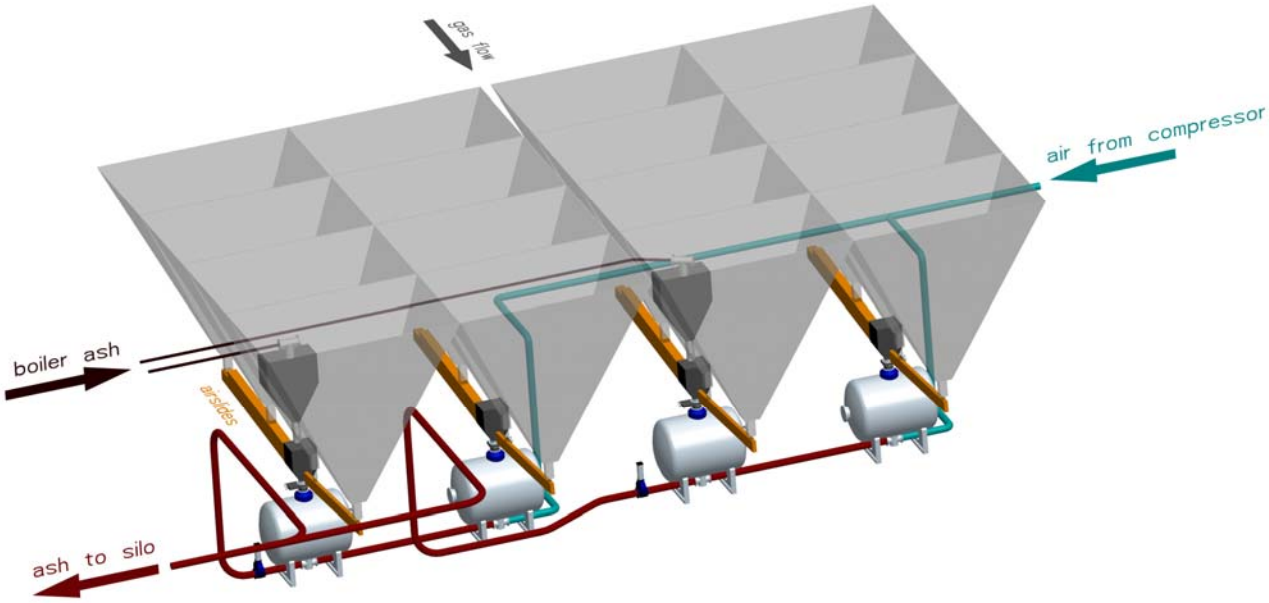
9. picture – Pressure vessels for Klinker dust – Lábatlan, Hungary

10. picture - Pressure vessel for boiler ash – Dae-Gu, Korea

COMBINATION OF AIRSLIDES AND PRESSURE VESSEL SYSTEM

For power plants over 300 MW where big size ESP-s with large number of hoppers are required and silos are far from units there is an alternative solution to individual pressure vessels. This is combination of airslides and pressure vessels.
A typical 600 MW unit with two ESP including 32 NOS of collecting hoppers each working as follows:

- From the four hoppers belong to one path, fly ash is conveyed by airslide into big size conveying vessels instead of 4 NOS of smaller ones. Resulting eight (8) pressure vessels instead of thirty-two (32).
- Out of the total eight (8) pressure vessels two (2) or four (4) can even receive boiler ash via short distance pneumatic conveying, making easier to transport the boiler ash to long distance by mixing it with the finer fly ash from ESP.
- Moreover four pneumatic conveying vessels belong to one ESP can be connected to one common ash conveying line in such a way that two-two vessels can be coupled and connected to one common ash outlet valve forming conveying pairs.



11. picture – Tipical arrangement of airslide and pressure vessel combination under the ESP hoppers

12. picture - Vessel under the airslides - Obrenovac, Serbia

13. picture – Coupled vessels under the ESP – Obrenovac, Serbia

14. picture - Collecting airslides under the ESP – Kolubara, Serbia

15. picture – Coupled vessels under the ESP – Kolubara, Serbia

VACUUM TYPE PNEUMATIC TRANSPORT

Vacuum type pneumatic transport widely used for fly ash collection in power plants.
EWB has developed its own vacuum type pneumatic ash handling system.
Vacuum system is preferred to use in the following cases:

- Large Nos. of ESP hoppers
- Low elevation of ESP hoppers outlets
- Relative short conveying distance and one common receiver silo
- Light, low bulk density material

16. picture - Vacuum system under ESP for oil ash - Shoaiba, Saudi Arabia

17. picture - Vacuum system under ESP for oil ash - Shoaiba, Saudi Arabia

Vacuum system has limitation in the conveying length, therefore this system is usually combined with pressure system.
Fly ash is collected from ESP hoppers into transfer bin with vacuum system while long distance transport is done by dense phase pressure vessels.
Vacuum system is very simple at the ash intake points therefore only low ESP hopper elevation is sufficient.

Critical items of the system:

- Ash intake valves
- Ash segregating valves
- Cyclone-filter separator with double feeder to silo
- Vacuum generating equipment

EWB has developed its own equipment listed above while vacuum generating equipment are commercial products.
Two types of equipment are used for air delivery:

- Roots type blower for low vacuum demand
- Water ring seal vacuum pumps for high vacuum demand

Technical parameters of vacuum transport:

- Standard transport capacity: 2-50 t/h
- Standard transport distance: 10-150 m
- Standard vertical elevation: 10-40 m

Special application

Vacuum system special application is pneumatic handling oil ash.
Flue gas of Heavy Fuel Oil (Buster oil) fired boilers contains relative big amount of fly ash. ESP is required to install to keep emission limit. Oil ash collected by ESP has a very special property.
EWB has developed complete ash handling system for oil ash handling.

POSITIVE PRESSURE LEAN PHASE PNEUMATIC TRANSPORT

In case of smaller material quantities and shorter transportation distances EWB can offer a more simple ash removal methods with lower investment cost compare to dense phase.

Pneumatic jet pump

The pneumatic jet-pump is an equipment suitable for lean-phase pneumatic transport of fly ash and fine grained bulk materials up to 10 mm grain size range.
Above the jet pump a simple rotary feeder is arranged, or in case of high temperature material a pneumatic operated gate valve of feeder is put.

18. picture – Boiler ash conveying with pneumatic jet pump – Steyrermühl, Austria

19. picture – Perlit conveying with pneumatic je pump – Martfű, Hungary

Technical parameters

- Standard transport capacity 1 - 8 t/h
- Standard transport distance 10 - 100 m horizontal
- Standard vertical lifting height 0 - 30 m
- Suitable for high temperature operation.

Advantages of the application

The equipment is simple, has small space requirement, and contains no moving part.
It has long life if fitted with wear-lining elements.
Its investment cost is low.

20. picture - Perlit conveying with pneumatic je pump – Martfű, Hungary

The most frequent application fields

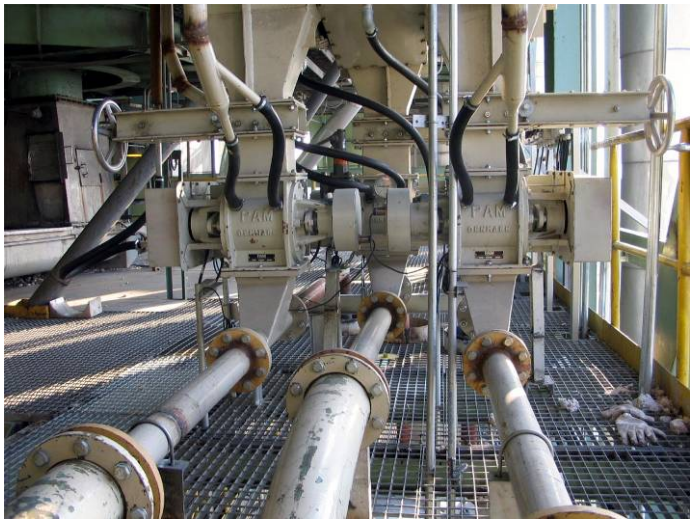
It can be used excellently at separate dust-collecting places of power station fly ash transporting systems, for example, under stack, for removal of fly ash being produced at Ljungström-, resp., ECO-hoppers, in addition at fluid bed boilers for injecting limestone necessary for desulfurisation of flue gas into the furnace combustion chamber. First of all, this equipment is competitive with the conventional, mechanical transport equipment for low transport capacities.

As a special application field: transportation of high temperature dusts.

21. picture – Boiler ash conveying with pneumatic jet pump - Agios Dimitrios, Greece

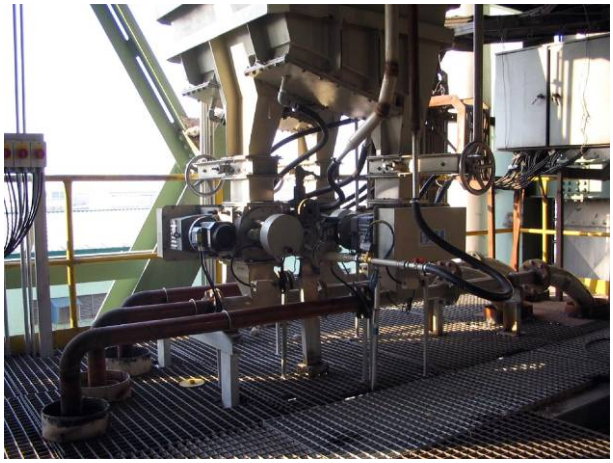
Feeding shoe with rotary feeder

Alternative solution to jet pump is a simple feeding shoe. Advantage is that the pressure of the blower is fully utilized for the material conveying but for material feeding into the air stream a special rotary feeder (air-lock feeder) is required which is able to feed the material against overpressure.



22. picture – Limestone feeding with rotary feeder & feeding shoe into CFB combustion chamber – Chang Shu, China

One of the most frequent application is limestone feeding into combustion chamber for flu gas desulphurizing purpose. The rotary feeder is equipped with frequency converter. The injected limestone quantity is adjusted to the actual SO_2 quantity.



23. picture - Limestone feeding with rotary feeder & feeding shoe into CFB combustion chamber – Chang Shu, China

24. picture - Limestone feeding with rotary feeder & feeding shoe into CFB combustion chamber – Hodonin, Czech Republic

HYDRAULIC ASH DISPOSAL SYSTEMS

EWB can design & supply different kind of hydraulic ash handling technologies such as:

- thin slurry mixing and transport with hydraulic jet pump for fly ash and bottom ash
- thin slurry transport fly ash and bottom ash with centrifugal slurry pumps, mixing ratio 1:3 – 1:10
- dense slurry mixing technology for fly ash and bottom ash and connected dense slurry conveying with series of centrifugal slurry pumps, mixing ratio 0.9-1.1 kg solid / kg water

The thin slurry mixing technology was widely used for coal fired power plants in the past ű, but due to high water demand for the hydraulic conveying, this technology has disadvantages such as:

- large pound area required
- pollution of ground water

This thin slurry transport now basically used for bottom ash transport only.
There is a trend worldwide that the thin slurry transporting systems (fly ash + bottom ash) are replaced by dense slurry disposal systems.

For big lignite fired plants with unit size over 300 MW large amount of ash is generated. Utilization of fly ash is preferable but limited. For transportation of ash to disposal area there are two practical solutions:

25. picture – Branching pipe & top of premixer Obrenovac, Serbia

Fly ash conditioning and transport to disposal area with belt conveyors

This is very much used in many power plants, but if disposal area is over 2.0 km it is becoming uneconomical.
Another disadvantage of this transport method is that on the disposal side numerous machineries are required for spreading the ash. Maintenance cost is very high.

26. picture – Top of conditioner tank Obrenovac, Serbia

High concentration ash slurry disposal system

This is the only practically good solution in case of large ash quantities if disposal area is more than 3.0 km away form unit(s).

EWB mixing technology consists of premixer and connected conditioner tank.
The proper mixing is ensured by two ways:

- continuous recirculation of the

27. picture – Conditioner tank & recirculation pump Obrenovac, Serbia

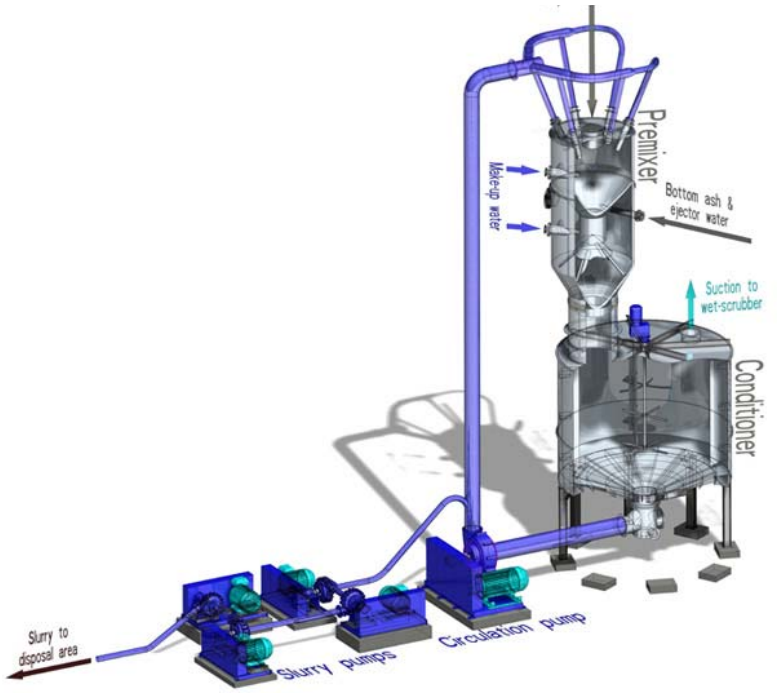
slurry from bottom of conditioner to the premixer
- continuous mixing by mechanical stirrer inside conditioner tank

For pumping of dense slurry normally 2-3 slurry pump connected in series are required.

Main technical data:

- Mixing ratio: 0.9-1.1 kg ash / kg water
- Capacity range: 100-300 t/h (dry ash)
- Conveying distance: 3-10 km

28. picture – Long distance slurry pumps – Obrenovac, Serbia



29. picture - Hydraulic ash disposal system

SILO TECHNOLOGIES

Fly ash silo

EWB can supply complete silo technologies including venting, aeration, level measuring equipment and different kind of discharging facilities.
We can provide complete design from small steel silos up to big storage silos with capacity of 5000 m^3 made of concrete.
We have different type design for silo aeration to ensure the proper flow out of the silos. The type and capacity of the aeration system can be different depending on the size of the silo and the shape of the silo bottom such as, traditional conical bottom, flat bottom, inside cone bottom etc.
The discharging arrangement can be also different depending on the shape of the silo bottom portion furthermore how many outlets are required.
Of course the fly ash storage silos have to be equipped with level switches, level measuring equipment, safety devices (overpressure/underpressure valves) etc.

30. picture – Fly ash storage silo – Neyveli, India

Silo discharge facilities

For smaller discharging capacities rotary feeder is widely used. But for the fly ash silos we prefer to offer our fluid discharging system.
This fluid discharging system is a very simple design consists of pneumatically operated cut off gate and manual or motorized flow control gate.

31. picture – Fly ash hopper fluid discharge system – Suralaya, Indonesia

The main equipment for silo discharging:

- dry unloading chute equipped with venting system for the proper dust free loading of tank-trucks, usual capacity range 80-150 TPH

- conditioning unloader for dust free loading of open trucks or belt conveyor

In the inlet chute of the equipment there is a weight balanced feeder arranged to prevent the vapor going counter direction of flow. In some cases if from the aeration system too much air is forced to the conditioning unloader the unloader has to be equipped with additional suction. In this case an additional suction fan and a wet type dust collector has to be provided.

Normal discharging capacity range:

- for twin shaft type conditioning unloader: 40-300 TPH
- for rotary drum type conditioning unloader: 40-450 TPH

32. picture – Fly ash dry unloading - Steyrermühl, Austria

33. picture – 200 TPH double screw paddle mixer - Suralaya, Indonesia

Large ash storage silo station

For big power plants large ash storage capacities are required.
The biggest EWB reference is an ash storage silo complex including 2x5000 m^3 fly ash storage silo and a 2x500 m^3 bottom ash silo with the engineering and supply of the following technological parts:

- flat bottom fly ash silo with expansion chamber equipped with aeration panels and venting pipes
- venting system
- fly ash silo discharge from central distribution box to mixing equipment and dry unloading via flow control device, flow measuring device and airslides
- bottom ash silo with vibration feeder discharging facility

34. picture – Ash silo complex – Obrenovac, Serbia

35. picture – Bottom of silo - Obrenovac, Serbia

36. picture – Bottom ash silo discharge with vibration feeder – Obrenovac, Serbia

LIMESTONE HANDLING SYSTEMS IN POWER PLANTS

Large quantity of limestone is used for the Flue Gas Desulphurization (FGD) of coal fired power stations.

In case of pulverized coal fired units (PC) in most cases wet FGD technology is used where desulphurization takes place in spraying towers. For this propose fine grinded limestone (below 90 micron) is used for slurry.
In case of fluid bed boilers (CFB) the desulphurization takes place mainly in the combustion chamber of the boiler. The grinded limestone is injected pneumatically into this chamber. Particle size of limestone required for this technology is bigger compared to wet FGD systems.

37. picture – Limestone wagon-unloading – Rybnik, Poland

Limestone handling technology for PC units mainly includes:

- Wagon or truck unloading station
- Limestone storage silo, its aeration and venting
- Limestone discharge to slurry preparation tank

38. picture - Limestone wagon-unloading & storage silo – Mátra, Hungary

Limestone handling technology for CFB units mainly includes:

- Wagon or truck unloading station
- Limestone storage silo, its aeration and venting
- Limestone discharge and pneumatic conveying to daily silo(s)
- Pneumatic limestone injection into combustion chamber

EWB has experience and refernce for both system listed above up to power stations size 1000 MW.

39. picture – Limestone unloading – Rybnik, Poland

40. picture – Limestone unloading station – Mátra, Hungary