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Anil Agarwal Environment
Training Institute

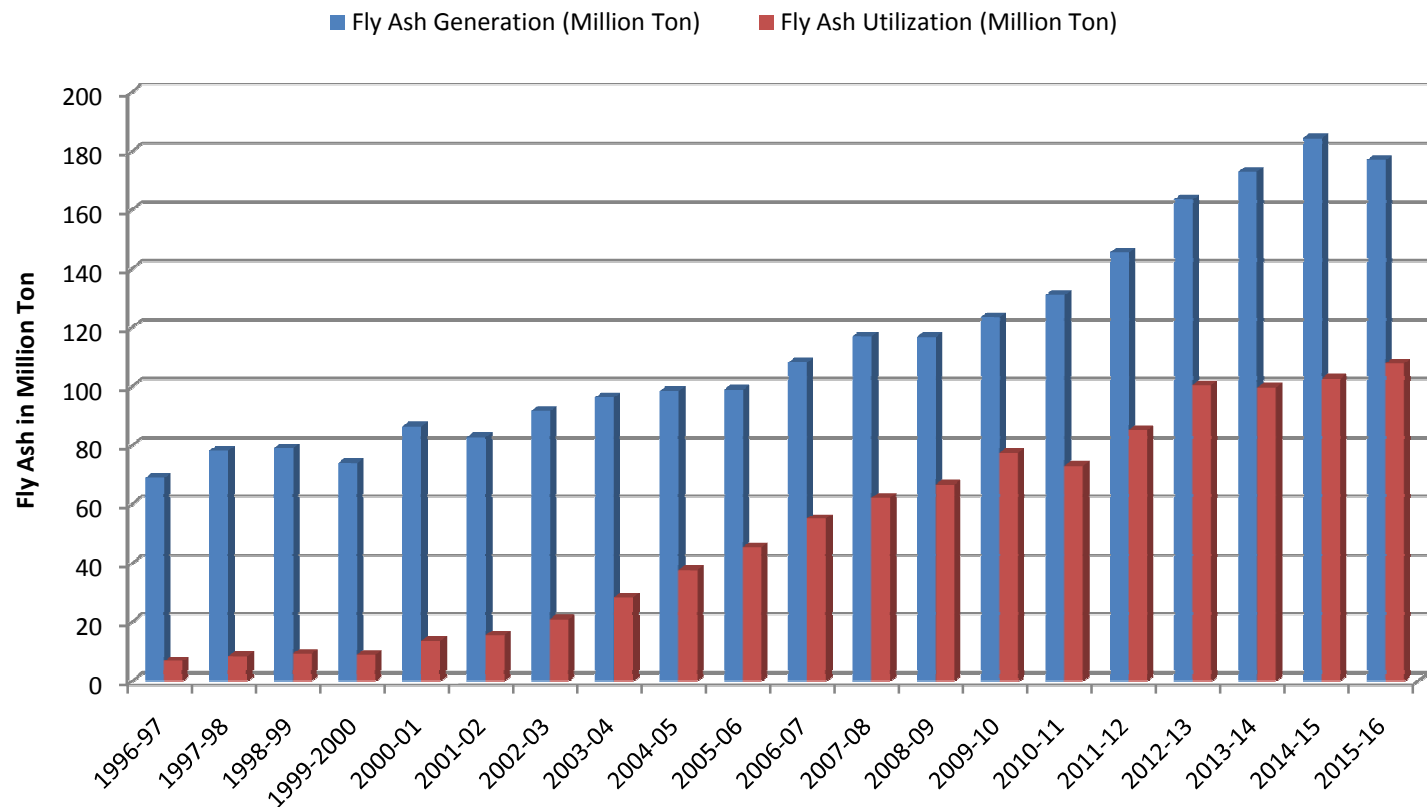
THE RESEARCH,
KNOWLEDGE,
INNOVATION AND
TRAINING CENTRE
FOR THE
GLOBAL SOUTH

Cleaner Fly Ash Brick Production

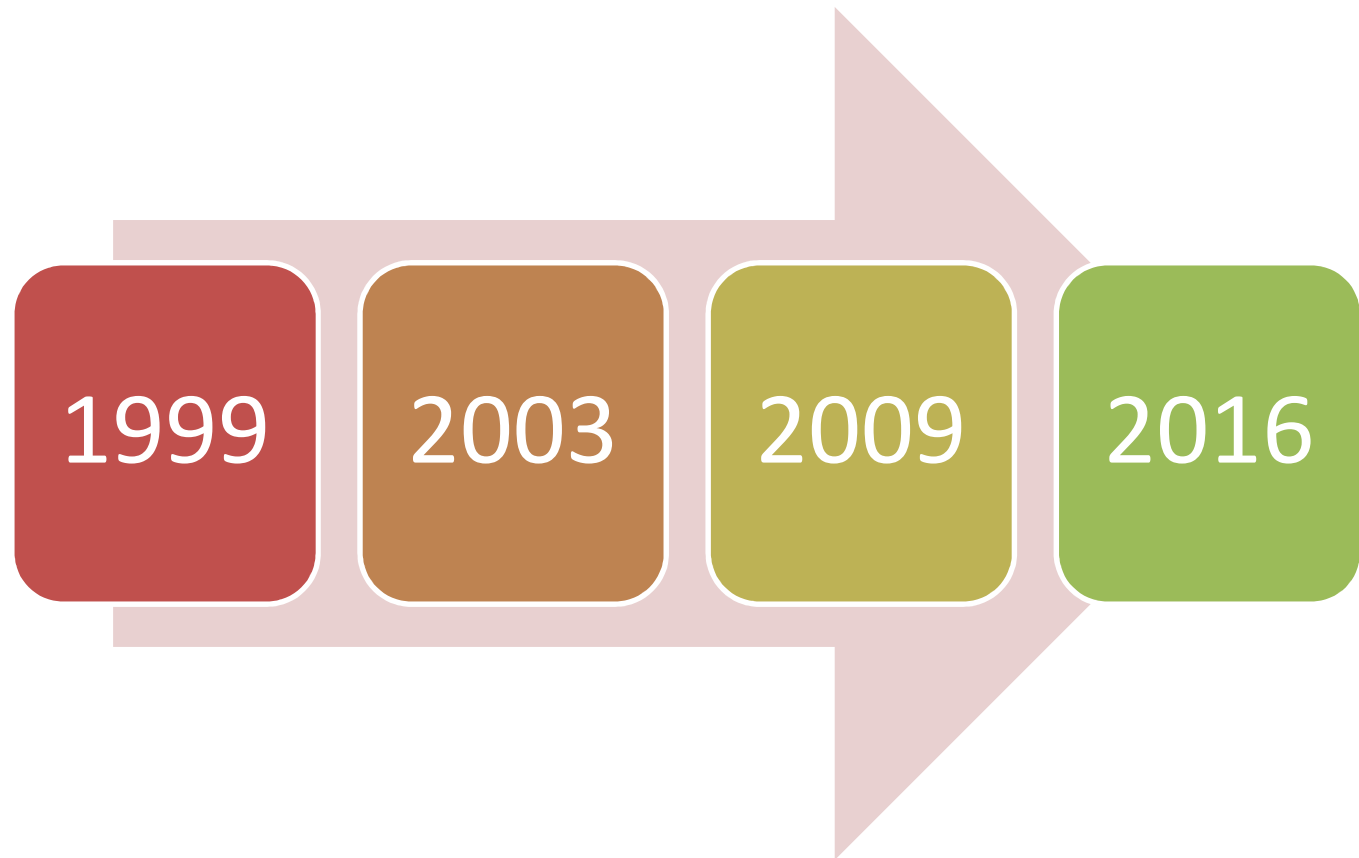


Why Utilization Necessary

- A principle by-product of coal burning plants, is an industrial waste product containing large amount of silica, alumina, and a small amount of un-burnt carbon, which pollutes environment. Responsibility extended to the agencies undertaking either construction or approving the design to ensure compliance.
- Real disposal problems, hence utilization.

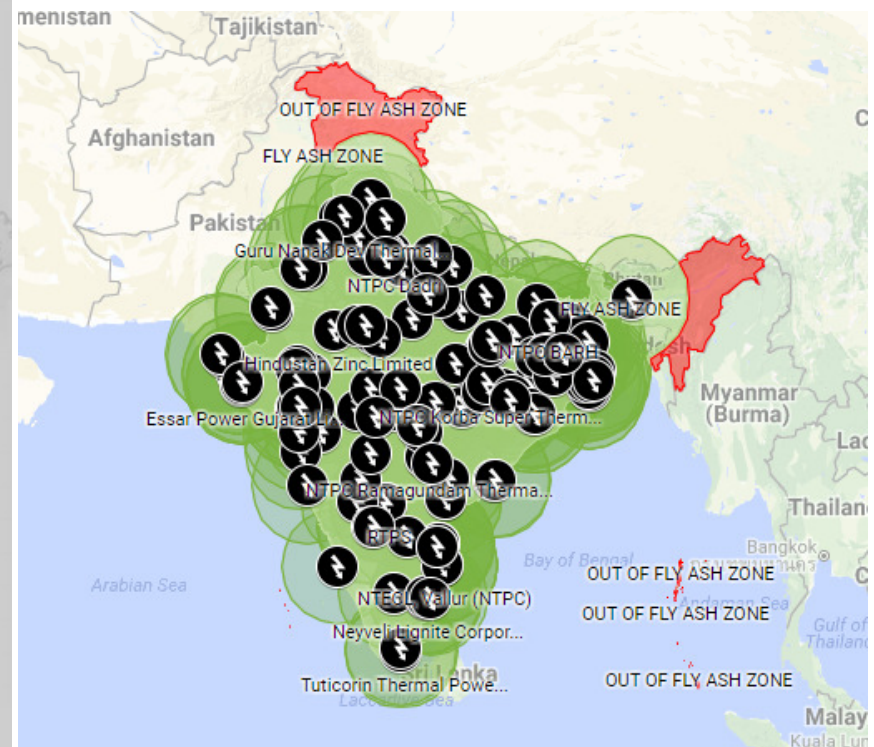
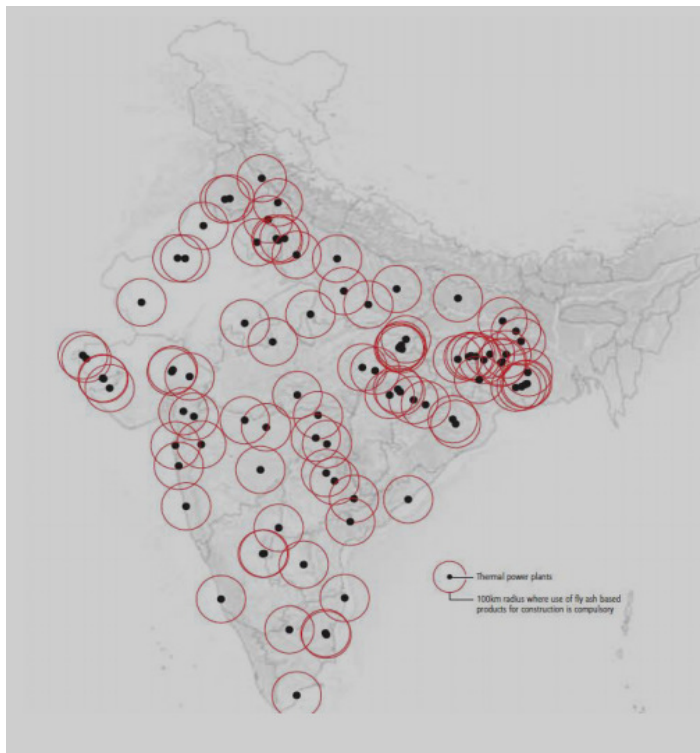


Utilization of Fly Ash from Thermal Power Plants (Ministry of Environment & Forest Notifications)



Mandatory Fly ash Utilization

- Use of fly ash based products in all construction activities, Applicable to all construction agencies of central or state or local government and private and public sector.
- Responsibility extended to the agencies undertaking either construction or approving the design to ensure compliance



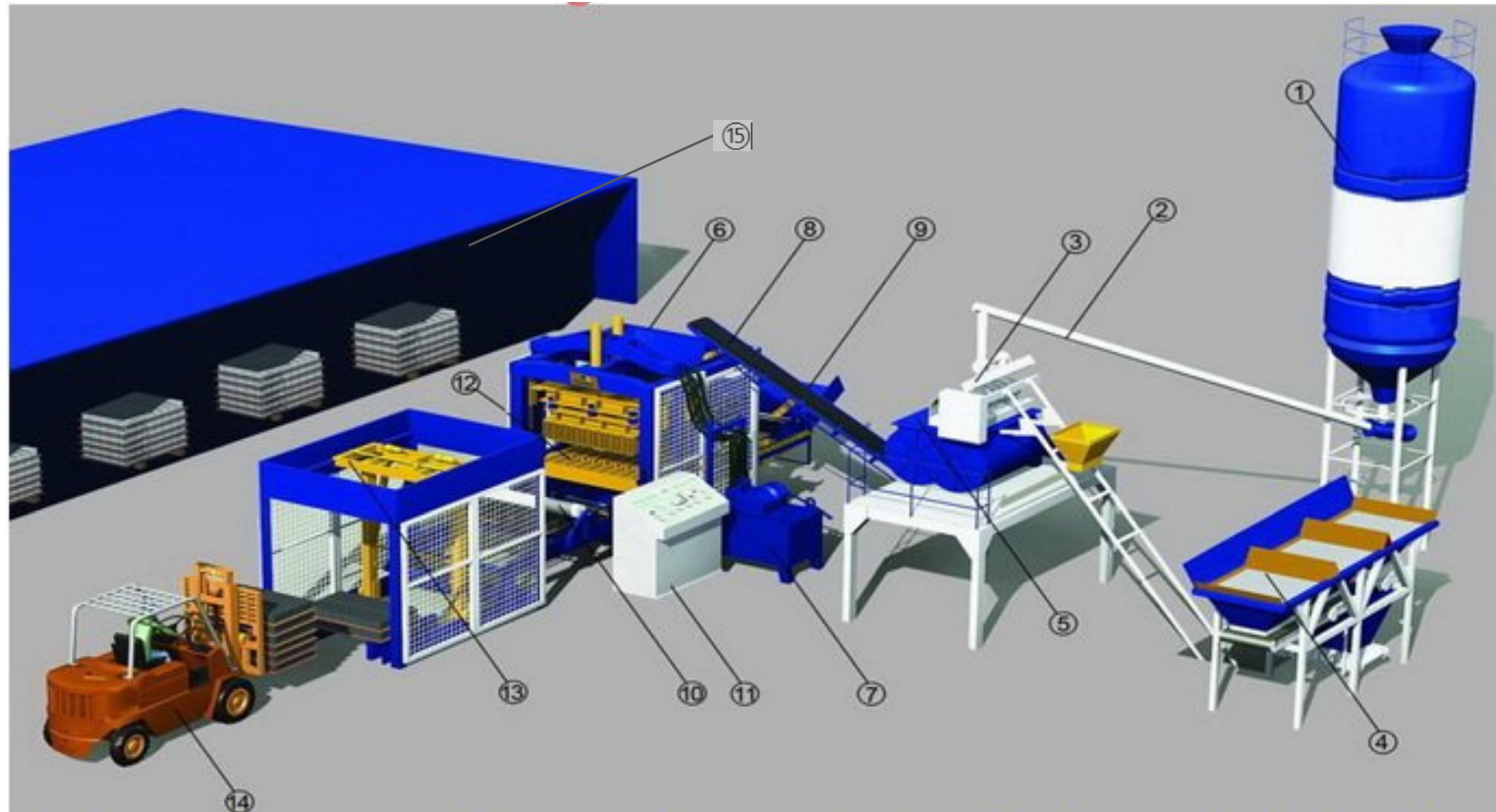
State Level Initiatives to Promote the Industry

- **Orissa:** Waived tax on fly ash products and also on machinery meant for the production of ash-based products.
- **Uttar Pradesh:** Declared sales tax incentives with a rebate of 25% on goods having fly ash between 10%-30% by weight and a rebate of 50% on goods with fly ash content exceeding 30% by weight
- **Punjab :** Established one of the longest ash conveying systems in Asia, installed at Ropar at a length of 1.6 km. From the Guru Gobind Singh Thermal Power Station about 360 thousand tonnes of fly ash is transported to Ropar, where it is consumed for the production of the PPC and fly ash bricks & Blocks. The government has facilitated this by offering land, concessional power, and other fiscal incentives.
- **Andhra Pradesh:** Sent out directives to its departments to progressively increase, in three phases, the use of the fly ash blended PPC (Pozollona portland cement) and fly ash bricks, to reach 100% in five years.
- **Madhya Pradesh:** Bharat Oman Refinery Limited (BORL), based in Bina, Madhya Pradesh is also involved in Fly Ash Brick making, also encourages entrepreneurship in the area and educates people about fly ash bricks. The government is providing with loan incentives to such entrepreneurs.
- **Chhattisgarh:** Financial incentives for adopting clean technology or upgrading to it with interest subsidy, margin money scheme (e.g. as per KVIC). A Tax holiday is also there for production of “GREEN BRICKS”.
- **Bihar:** Incentive policy to encourage the brick kiln owners to convert to fly ash brick manufacturing unit.
- **Kerela:** Exempted tax on the PPC and fly ash products in order to encourage its use.

Advantages of Fly Ash Bricks

- Reduces Evacuation of Clay
- High Compressive Strength
- Lower Water absorption
- Dimensional Accuracy through Uniform shape
- High Strength to weight Ratio
- No emission of green house gases during Production
- Zero Efflorescence
- Consumption of less Mortar
- Reduced Fuel Requirement
- No plastering Required
- Cost Effective
- Environment Friendly

Fly Ash Unit (Automatic)



1: Silos

2: Covered Conveyer

3: Scale

4: Batching Plant

5: Mixer

6: Brick Machine

7: Hydraulic Unit

8: Conveyer Belt

9: Pallet Feeder

10: Brick/Block Conveyer

11: Control Unit

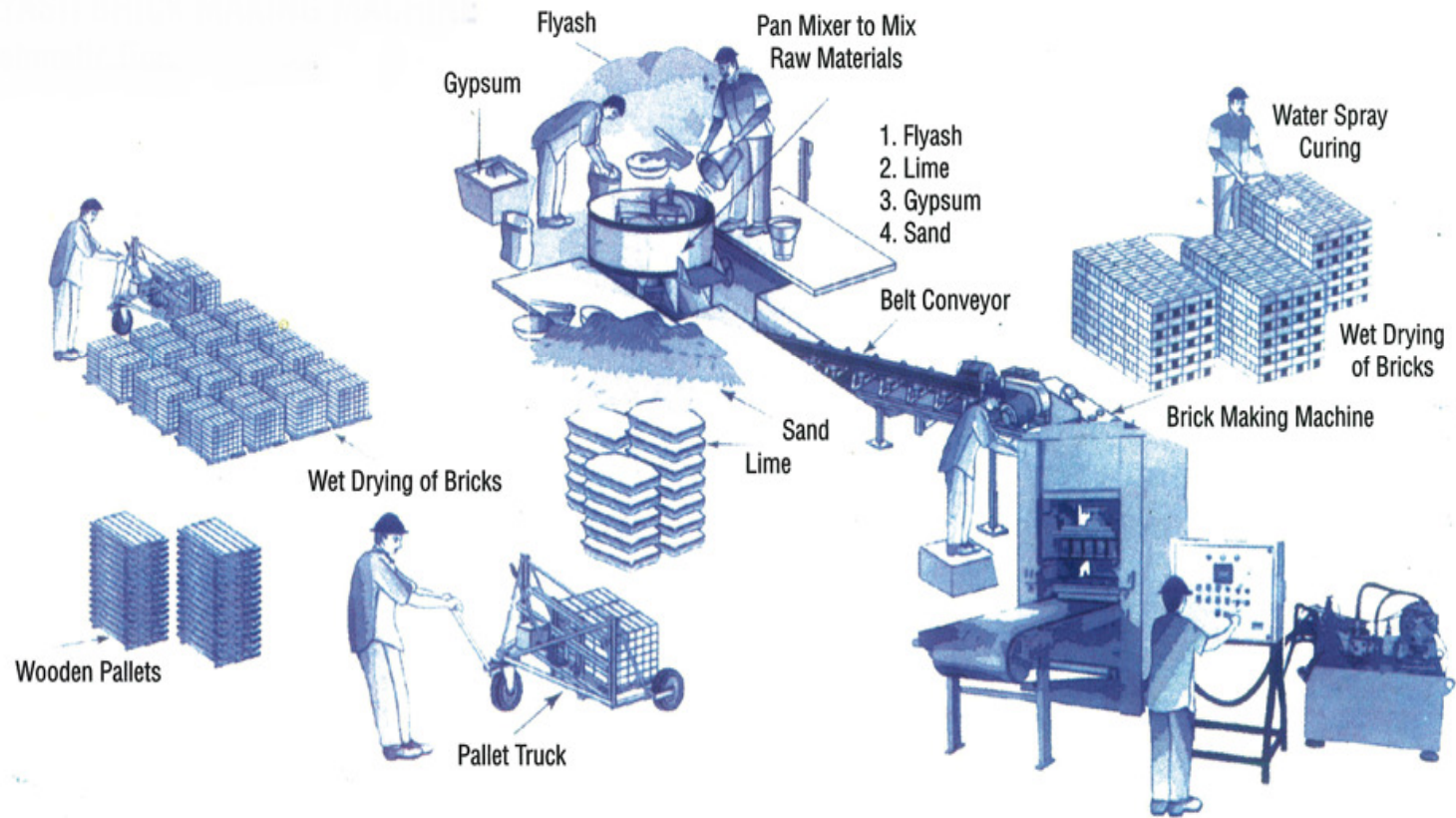
12: Mould

13: Brick/Block

14: Fork Lift Stacker

15: Drying/Storage

Semi- Automatic



Raw Materials Required

Fly Ash: Dry Fly Ash; Bottom Ash; Pond Ash

- Obtained from Thermal Power Plants

Lime : Hydrated lime or Sludge Lime

- 2 major sources of lime: Lime mines and waste from the production of the acetylene gas plant

Gypsum : Chemical Gypsum and Mineral Gypsum

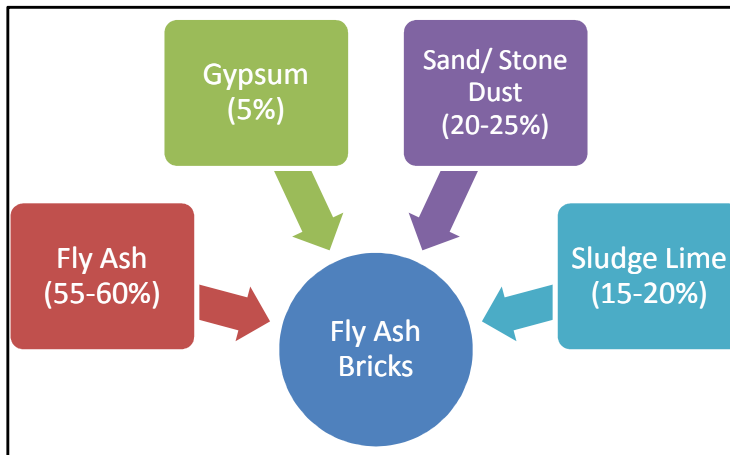
- Chemical gypsum obtained as a waste from industry & Mineral Gypsum

Stone/Sand Dust

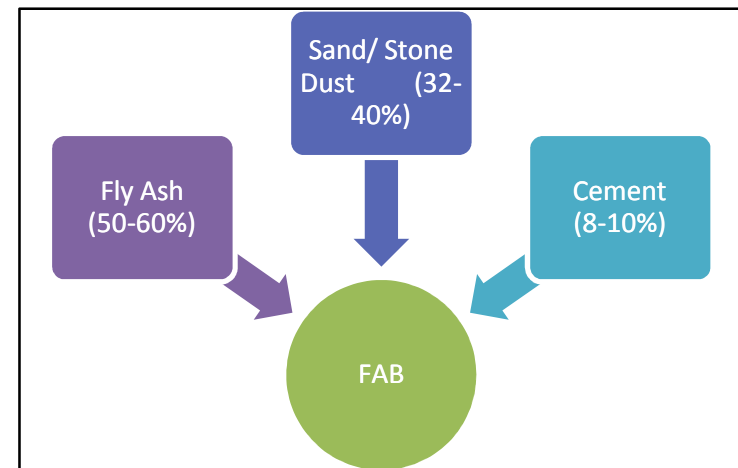
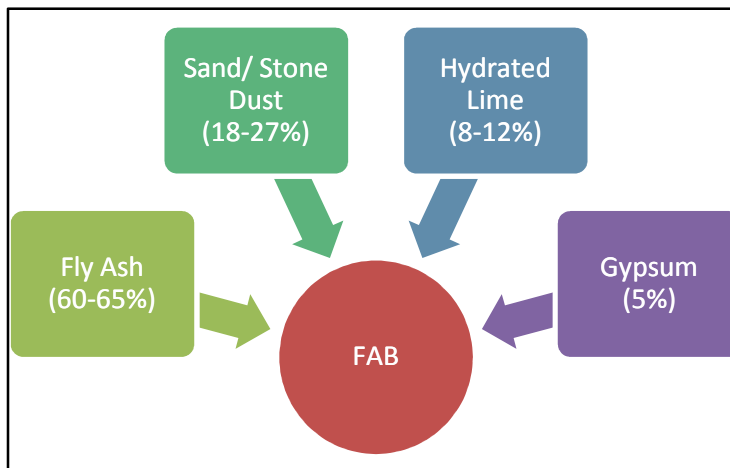
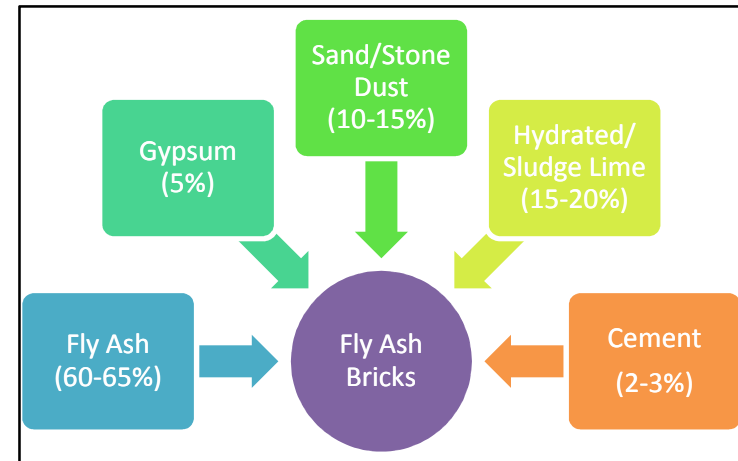
- Stone Crushing Units

Types of Fly ash Bricks

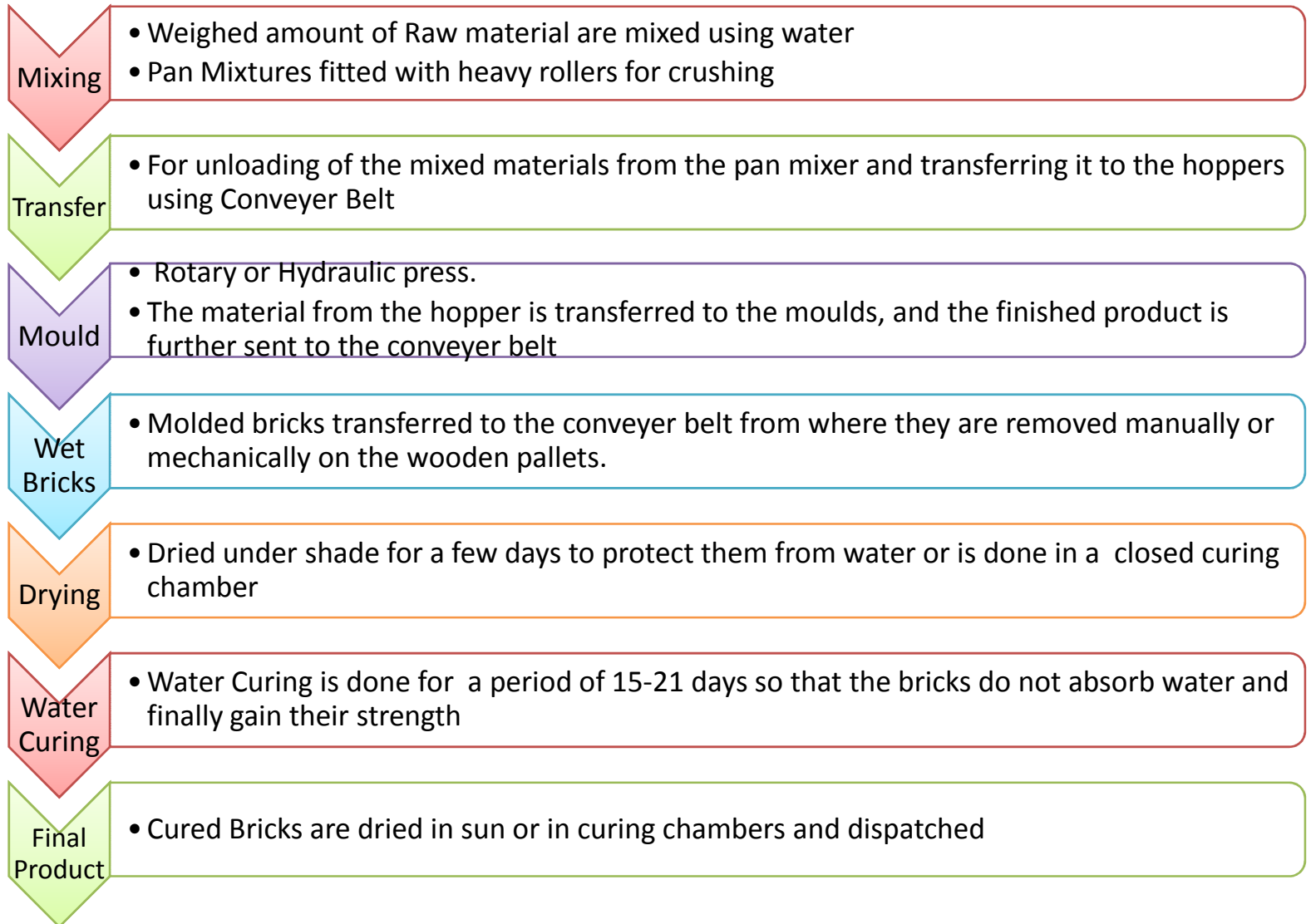
Fly Ash Lime- Gypsum Bricks(Fal-G)



Fly Ash Cement Bricks/ Fly Ash Cement Gypsum Bricks



Process used in the manufacturing of Bricks



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Pan Mixer



Brick Manufacturing Presses



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Curing & Drying



Indian Standards

- IS-12894-2002 : Fly-ash Lime bricks specification
- IS-3495 (Part-I)-1976 : Compressive strength
- IS-3495(Part II)-1976 : Water Absorption
- IS-3495(Part III)-1976 : Efflorescence test
- IS-4139-2011 : Calcium Silicate Bricks & Drying and Shrinkage
- IS-3812-2003 PART 1& 2: Fly Ash Specification
- IS-383-1970: Sand/Stone Dust
- IS-712-1984: Hydrated Lime
- IS-288-1982: Gypsum

Standards Quality Bricks..

Class	Wet Compressive Strength (Not less than) N/mm ²		Size of the Bricks (mm) Length x width x height	Water Absorption (Percent by mass)	Efflorescence	Dry Shrinkage
7.5	7.5 N/mm ²	75 Kgf/cm ²	Modular Size 190x90x90 or 190x90x40	20 % by mass for all types of bricks	Nil	Should not exceed 0.15%
10	10 N/mm ²	100 Kgf/cm ²	Non Modular Size 230x110x70 or 230x110x30 70x110x70(1/3 rd of length) or 230x50x70(1/3 rd of width)			
15	15 N/mm ²	15 Kgf/cm ²				
20	20 N/mm ²	20 Kgf/cm ²				

Fly Ash a White Category Industry: Practically Non Polluting

Criteria for the categorization

- 1) Raw Materials
- 2) Manufacturing Process
- 3) Pollutants expected to be generated

Category	Range of Pollution Index
Red Category	60 & Above
Orange Category	41 to 59
Green Category	21 to 40
White Category	Upto 20

No CTO/CTE

Intimation to SPCB/PCC will suffice

Categorization of Industry

Can be done in 2 ways

- **Based on their Production**

Category 1	Produce
Small Scale	Upto 3.5- 4 lakhs
Medium Scale	4 - 8 Lakhs
Large Scale	8 lakhs & Above

- **Based on Investment**

Category 2	Investment
Small Scale	Upto 50 Lakhs
Medium Scale	50 lakhs – 1 Crore
Large Scale	1 Crore and above

Guidelines Required, Why?

- Fly ash industry a White category industry, therefore No CTE/CTO required
- SPCB has to be notified, but for such small scale units SPCB is not being Notified.
- If the sector has to operate in an environment friendly way they have to follow some guidelines.
- Presence of Fly ash in the environment causes various Health and Environmental Issues
 - **Fugitive Dust Emission:** Causes dust nuisance and poor visibility
 - **Health concern :** Fly ash gets easily ingested through respiration, which causes many diseases such as asthma, neurological disorders.
 - **Agriculture :** Fly ash settles on leaves and crops and reduces crop productivity.
 - **Water pollution :** It pollutes the ground water. From fly ash heavier metals (arsenic, berillium, boron, cadmium, mercury) can leach into ground water thus polluting it

Transportation

Current Practices/ Recommended Practices



Storage of Raw Material

Current Practices



How the working Area Looks like!!



How the working should look like...



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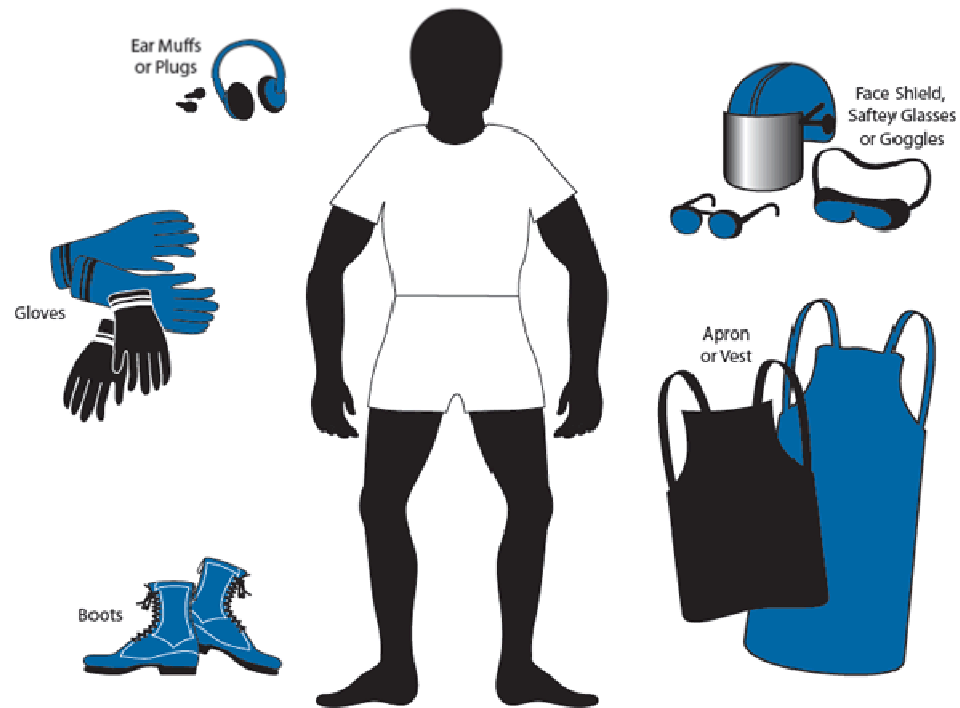


Health & Safety

Current Practices



Recommended Practices



Codes of practice for General maintenance

- Roads inside of flyash user agency should be paved and plantation of adequate width should be done at both sides.
- adequate arrangements for water sprinkling should be made to suppress fugitive dust emission
- All the bunkers and trucks responsible for carrying flyash should have valid pollution under control certificates
- user agencies should make arrangements (two stages) for washing of wheels of the vehicles (Bulkers/trucks) before they leave out for the main road
- Incase of any spillage enroute during the transportation of fly ash, the agency shall ensure that spilled ash is collected and transported to the disposal/usage site immediately
- General awareness / training program should be organized regularly for tanker operating staff like drivers and cleaners on the impact of hazards of fly ash.

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Requirements for Prevention and control of fugitive emission from Potential Sources

S.No Control Measures to be Provided

Unloading Section (Limestone, Ash, Stone Dust, Gypsum & other relevant material)

- 1 Enclosure for all unloading operations, except wet materials. Curtain Type material covering to be used
- 2 Water shall be sprayed on the material prior and during unloading. Water Sprinklers to be used.

Material Handling Section (Including Transfer Points)

- 3 All transfer point locations should be fully enclosed. These Enclosures are to be kept closed during operations. No spillages should be there.
- 4 Airborne dust at all transfer operations / points should be controlled either by spraying water or by extracting to bag filter.

Storage of Limestone, Gypsum, Flyash and other additives

- 5 The storage should be done under covered shed.
The storage silo should be made up of anti-abrasive or anti corrosive material. It is preferred to provide concrete silo/hopper to avoid leakages.
Concretization should be done wherever the materials are stored so that it does not seeps to the ground water table. Minimum of two enclosure walls to be provided.
- 6 Dry Fly ash shall be stored in silos only
- 7 Flyash in the dry form should be encouraged and in wet form can also be used. In case wet flyash is to be used, it may be stored in open temporarily for the purpose of drying with necessary wind break arrangement to avoid wind carryover of fly ash. The fly ash should be removed immediately after drying.

Thank you

What to observe on Site

- How the bricks are manufactured
- Storage of raw materials
- Storage of bricks
- Good practices
- Bad practices
- Environment Concerns
- Health and Safety Concerns
- Transportation
- What did you like the Best