STATUS OF FLY ASH GENERATION AND UTILISATION & STRATEGIES TO ENHANCE ITS USE

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Fly ash mismanagement

- Over 80% increase in coal consumption and fly ash generation since 2009-10; low grade coal
- Unused fly ash and bottom ash transferred to ash ponds; requires large tracts of land for disposal; leads to significant pollution
- Major ash dyke breach incidents and unsafe disposal of ash reported from many regions between 2010 and 2020
Residual ash stocks

Average ash utilization percentage b/w 2009 and 2019 – **62%**

~**60 million tonnes** of fly ash on an average remained unutilized every year

Huge gap between fly ash generation and utilization every year, indicate piling up of unused ash; progressive accumulation in ash ponds

**Legacy ash** is roughly **1.65 billion tonnes**

50% plants in non-compliance of meeting 100% target
States with huge ash backlog

- High generation coupled with low utilization % - indicate pile up
- Chhattisgarh and U.P. accumulated the most ash in last decade
- Fly ash utilization rate ranged from 35% to 98% across different states
  - Chhattisgarh (46%); M.P. (44%); Odisha (54%); U.P. (51%), A.P. (64%), Maharashtra (66%)
  - Jharkhand, Punjab and Rajasthan utilization rate of 90–100%
- Fly ash generation doubled in a decade - Chhattisgarh, Maharashtra, Madhya Pradesh, Odisha and Uttar Pradesh

Note: Data for the period 2010–11 to 2018–19
Source: CSE analysis, data sourced from CEA annual reports
## States with huge ash backlog

<table>
<thead>
<tr>
<th>State</th>
<th>Total ash generation (million tonnes)</th>
<th>Total ash utilization (million tonnes)</th>
<th>Total residual ash (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chhattisgarh</td>
<td>198.66</td>
<td>90.93</td>
<td>107.74</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>211.83</td>
<td>108.22</td>
<td>103.61</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>126.92</td>
<td>55.48</td>
<td>71.43</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>152.94</td>
<td>98.18</td>
<td>54.76</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>153.92</td>
<td>101.49</td>
<td>52.43</td>
</tr>
<tr>
<td>Odisha</td>
<td>112.74</td>
<td>61.92</td>
<td>50.82</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>441 (76%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bihar</td>
<td>52.94</td>
<td>18.83</td>
<td>34.11</td>
</tr>
<tr>
<td>West Bengal</td>
<td>157.74</td>
<td>131.64</td>
<td>26.11</td>
</tr>
<tr>
<td>Karnataka</td>
<td>38.57</td>
<td>18.64</td>
<td>19.93</td>
</tr>
<tr>
<td>Haryana</td>
<td>51.39</td>
<td>36.62</td>
<td>14.77</td>
</tr>
<tr>
<td>Telangana</td>
<td>25.48</td>
<td>11.94</td>
<td>13.54</td>
</tr>
<tr>
<td>Gujarat</td>
<td>54.14</td>
<td>42.24</td>
<td>11.89</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>70.66</td>
<td>59.78</td>
<td>10.88</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>56.79</td>
<td>51.96</td>
<td>4.82</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>53.92</td>
<td>52.4</td>
<td>1.53</td>
</tr>
<tr>
<td>Punjab</td>
<td>29.26</td>
<td>28.87</td>
<td>0.39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>138 (24%)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Serious health issues and pollution problems

- Chhattisgarh, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu top the list of coal ash accidents and its adverse health impacts

- **Ash piling up in dry form and wet form**
  - **Dry form** – air borne; significantly affects air quality, pulmonary illnesses due to Long-term exposure to fly ash in the air
  - **Wet form** - Non-utilization and improper disposal;
    - Burden on existing wet storages; ash pond overflows or leakages
    - Several cases reported of contamination of nearby agricultural fields, surface water bodies and groundwater due to
    - Accumulation of heavy metals beyond permissible limits in the contaminated water bodies

**Consistently utilize 100% ash; clear backlog of previous years**

To clear the huge stockpile of legacy ash, urgent interventions —in terms of policy measures, technologies and practices—are needed to enhance fly ash utilization
## Two decades of fly ash regulations

<table>
<thead>
<tr>
<th>Year</th>
<th>Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td></td>
</tr>
</tbody>
</table>
| ○ Progressively utilise 100% ash within a period of nine years (by 2009)  
| ○ Mandatory use of fly ash bricks by construction agencies within 50 km |
| 2003 |  
| ○ Radius for mandatory utilisation of fly ash increased from 50 km to 100 km  
| ○ Focused on demand side; 100% use of fly ash bricks by construction agencies by 2007 |
| 2009 |  
| ○ Revised and extended the timeline for achieving 100% utilisation to 2014  
| ○ Made obligatory for all construction agencies within 100 km radius to use fly ash-based products; if fly ash not available certificate to be provided from TPP |
| 2016 |  
| ○ Fly ash mandatory utilisation area extended from 100 km to 300 km  
| ○ Every construction agency engaged in the construction of buildings within a radius of 300 km from power plant was required to use only fly ash-based products  
| ○ Timeline to meet 100% utilisation extended to 31st December 2017  
| ○ Till 100 km power plants will bear the cost, b/w 100-300 km it should be shared equally |
| 2020 Draft |  
| ○ Introduces polluters pay principle – for annual unused ash, legacy ash, user agencies  
| ○ An extension of 10 years given to progressively utilize legacy ash.  
| ○ Extends the target year for achieving 100 per cent fly ash utilisation to another three to five years |
## NGT Orders post 2017 Deadline breach

### Jan 2018:
- Directed states to submit action plans for fly ash use
- Directed MoEF&CC to monitor compliance

### Sep 2018:
- States sought further extension of time for 2-5 years up to 2023

### Nov. 2018:
- Order passed on imposing penalty on defaulters
- Penalty slabs imposed – (≤500 MW – 1 crore; 500-1000 MW – 2 crore; >1000 MW – 3 crore); interest of 12% per annum on failing to submit penalty

### Feb. 2019:
- SC stayed the orders of imposing fines
- Plea mentioned – end user industries reluctant to take fly ash

### Feb. 2020:
- Directed all plants to take prompt steps for fly ash disposal
- CPCB issued penalty notices to several non-compliant plants

### Sep. 2020:
- SC stayed the orders of imposing fines
- Plea mentioned – disruption due to covid; env. compensation not determined on a case to case basis
- 102 out of 112 power plants sought exemption from paying compensation
Modes of utilisation

Note: Showing average utilization for last 10 years

- Cement: 25.06%
- Mine filling: 6.00%
- Bricks & Tiles: 7.30%
- Reclamation of low lying area: 8.45%
- Ash dyke raising: 6.07%
- Roads & flyovers: 3.60%
- Agriculture: 1.00%
- Hydro-power: 0.004%
- Concrete: 0.51%
- Others: 4.69%
- Unutilized Fly Ash: 37.31%
## Fly Ash Use In Cement

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Fly ash utilisation from power sector (million tonnes)</th>
<th>Fly ash supplied to Cement sector (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16</td>
<td>108</td>
<td>43</td>
</tr>
<tr>
<td>2016-17</td>
<td>107</td>
<td>41</td>
</tr>
<tr>
<td>2017-18</td>
<td>132</td>
<td>50</td>
</tr>
<tr>
<td>2018-19</td>
<td>168</td>
<td>58</td>
</tr>
<tr>
<td>2019-20</td>
<td>188</td>
<td>58</td>
</tr>
</tbody>
</table>

Fly ash use from power plants - 25%

- Installed capacity – 545 million tonnes, PPC Production – 217 million tonnes expected to double by 2030
- 210 large cement plants (97% capacity) +350 small plants – largely concentrated in southern and northern region
- Per capita cement use – India (235 kg), China (1000 kg), World average (520 kg)
- BIS specification namely IS 1489 (Part-1) permits the addition of fly ash up to 35%;
- **Raw material saving – clinker and coal, fly ash recycling, energy savings, GHG reduction** - Increase of 1% fly ash in blended cement reduces about 9.5 kg CO₂ per tonne of cement.
## Fly ash use in roads and highways

<table>
<thead>
<tr>
<th>Year</th>
<th>Fly ash supplied in roads and fly-overs from TPP (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16</td>
<td>5.00</td>
</tr>
<tr>
<td>2016-17</td>
<td>6.19</td>
</tr>
<tr>
<td>2017-18</td>
<td>6.67</td>
</tr>
<tr>
<td>2018-19</td>
<td>9.72</td>
</tr>
<tr>
<td>2019-20</td>
<td>20.97 (9%)</td>
</tr>
</tbody>
</table>

- **Avg. utilisation percentage – 3.6%**
- Recent Government focus in budget 2021 on aiming to lay down another 11,000 kms of national highway infrastructure
- 10,855 kms of highways were constructed in the year 2019 and 9,829 km in 2018
Fly ash use in Brick Manufacturing

- **Utilisation percentage** – 7.3%
- Rising demand for bricks – immense potential for fly ash use
- Mandatory use of fly ash-based products for construction activity within a radius of 300 km from power plant
- Power plants to bear transportation cost of fly ash up to a radius of 100 km. Beyond the radius of 100 km (up to 300 km), transportation cost shall be borne equally by fly ash users and power plants
- Made use of fly ash bricks compulsory in construction near coal power plants, and mandated use of fly ash bricks in construction of government buildings.

- *Fly ash availability for brick manufacturers*
- *Transportation of fly ash from power plants to brick units and costs involved in transportation*
Barriers in Utilisation

- Non-availability of fly ash to user agencies
- Cost involved in transporting fly ash from power plant to distant locations
- Limited provision for extraction and storage of entire fly ash in dry state
- Scarcity of cement units, brick units, regional cement players, MoEF&CC 2017 committee, lesser capacity utilization of cement plants
- BIS specification limiting fly ash use upto 35%
- Proper enforcement of regulations lacking
- Weak monitoring regime to ensure regulations are being adhered to by both power plants and user agencies within 300 km radius
Way Forward

• The sector has missed the Dec. 2017 deadline set by MoEF&CC of achieving 100% utilisation target

• Utilisation of ash is not happening at the pace it needs to

• Some have acted and taken the lead – BUT there are many laggards as well

• The question is, what should be done?
Agenda

- **Challenges and issues** faced by **power plants** in achieving 100% fly ash target
- Critical review of the **current BIS standards** for fly ash use in cement
- **Strategies to enhance fly ash use cement and construction activities** – what are the roadblocks and what strategies should be adopted to tackle it?
- Why **fly ash brick sector is not growing** and what should be that way ahead to enhance production?
- What further **initiatives** Government can take to **enhance** fly ash use?