

Potential Impacts of the Draft Amendments to the Fly Ash Regulation, 1999

Part 1: Is the quantity of available fly ash sufficient to meet brick demand in the country?

Regulatory Impact Analysis :
Draft Fly Ash Notification, 2019: Part 1

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Ministry of Environment, Forest and Climate Change (MoEFCC) through a notification dated 25th February 2019 has proposed amendments in the existing regulation (S.O. 763(E) dated 14th September 1999) to promote utilization of fly ash in the country. The Ministry will consider any objections or suggestions received during a period of sixty days on the draft amendments in the regulation.

This is the first article of a series in which the Brickguru team would be analyzing the potential impacts and feasibility of the various provisions of the proposed amendments in the fly ash regulation. The purpose of these articles is to facilitate an informed debate on the proposed amendments. In this article we examine the proposed amendment from the point of fly ash availability to meet the demand for bricks in the country.

What is the availability and utilization of fly ash from thermal power plants?

As per the latest data provided by Central Electricity Authority (CEA) [1], India generated 196 million tons (MT) of fly ash from thermal power plants in 2017-18 out of which 131 million tons (67% of the total fly ash generated) was utilized. As shown in Table 1, fly ash has emerged as a key resource for cement manufacturing, roads and flyovers construction, agriculture, mine filling, apart from bricks and tiles production. The annual fly ash generation is expected to go up marginally in future to 230 MT (2021-22) and 275 MT (2026-27) [2] before plateauing out and potentially decreasing.

Table 1 Modes of Fly Ash Utilization during 2017-18

S. No.	Mode of Utilization	Quantity of Fly Ash Utilized	
		Million tons (MT)	Percentage (%)
1	Cement	50.3	25.6
2	Reclamation of Low lying area	20.6	10.5
3	Bricks, Blocks and Tiles	17.7	9.0
4	Mine Filling	12.5	6.4
5	Ash Dyke raising	13.6	6.9
6	Roads and Flyovers	6.7	3.4
7	Others (Concrete, Hydro power, etc.)	10.6	5.4
8	Unutilized Fly Ash	64.6	32.9
	Total	196.4	100.0

What are the main proposed amendments to the Fly Ash Regulation, 1999?

The proposed amendments are focused towards increasing the fly ash utilization in the production of bricks and blocks. India currently produces around 25,000-30,000 crore bricks per year, out of which around 80% of the production is of burnt/red clay bricks, and less than 10% is contributed by fly ash bricks and blocks. The demand of bricks is expected to double to 60,000-65,000 crore bricks/year in the next 10 years [3]. The amendment aims at replacing the majority of burnt/red clay brick production in the country with fly ash bricks and blocks (having minimum 50% fly ash by weight). To achieve this objective, the draft has two main proposals.

a) Mandating red clay brick manufacturing units to shift to fly ash brick manufacturing

The regulation proposes that within a 300 km radius of a coal or lignite based thermal power plant, no new red clay brick kiln shall be installed, and all existing red clay brick kilns located within 300 km shall be converted to fly ash brick or block manufacturing unit within one year. If we draw a 300 km radius around thermal power plants on a map of India, it practically covers the entire country (barring some parts of North-East India and the Himalayan region). Thus, in practice the regulation proposes that 150,000-200,000 existing red clay brick making units (having annual production capacity of 20,000-25,000 crore bricks/year) should change their manufacturing technology and shift to fly ash brick and block manufacturing within one year.



Source: Centre for Science and Environment, New Delhi

b) Mandating thermal power plants to supply fly ash to fly ash brick manufacturing units

As per CEA data, in 2017-18, around 9% of the annual fly ash generation was supplied to bricks and blocks manufacturing units and resulted in production of around 1,300 crore fly ash bricks and blocks. One of the main problems being faced by the existing small-scale fly ash brick and block manufacturing units is in getting adequate, affordable and uninterrupted supply of fly ash. In a bid to address these supply side issues, the draft regulation proposes mandatory requirements on power plants:

- Thermal power plants to make available at least 20% of dry ESP fly ash to units manufacturing fly ash bricks, blocks and tiles.
- Thermal power plants to supply fly ash at almost zero price (@ Rs 1/ton) as well as to bear the full cost of transportation of fly ash to fly ash brick manufacturing units located up to 300 km from the power plant.

Analysis of fly ash brick production potential under various scenarios

The following analysis examines fly ash brick production potential under various scenarios and the feasibility of replacing burnt clay bricks by fly ash bricks and/or blocks.

Scenario 1: 20% of the total annual fly ash generation is utilized for the production of bricks

This is the most realistic scenario; as per the draft amendment in the fly ash notification, it is proposed that *“at least 20% of dry ESP fly ash shall be made available to units manufacturing fly ash bricks, blocks and tiles fly ash products on priority basis over other*

users at the rate Re 1 per ton. This shall apply even if, the Thermal Power Plant has achieved 100% utilisation in previous years”.

If one fly ash brick (size: 230 x 110 x 70 mm) is assumed to have a weight of 2.8 kg and consist of 50% by weight of fly ash, then the quantity of fly ash that will get consumed in producing one fly ash brick will be 1.4 kg. If 20% of the total annual fly ash generation in the country i.e. 39 million tons (in 2017-18) is utilized for the manufacturing of bricks, the total number of bricks produced using fly ash would be 2,800 crore bricks/year. As 9% of the fly ash is already being utilized resulting in production of 1,300 crore fly ash bricks, the additional fly ash brick production would be 1,500 crore bricks. **This additional production would result in replacement of only around 6-7% of the current production of red/burnt clay bricks by fly ash bricks.**

Scenario 2: 100% of the unutilized annual fly ash generation (or 33% of the total annual fly ash generation) is utilized for the production of bricks

Going beyond the proposed regulation, if we assume that the entire unutilized annual fly ash generation (or 33% of the total annual fly ash generation i.e. 65 million tons in 2017-18) is used for the production of bricks, it would result in production of 4,600 crore additional fly ash bricks. **This additional production would result in replacement of only around 20% of the current production of red/burnt clay bricks by fly ash bricks.**

Let us explore this scenario further, by doing an analysis for some big states. Table 2 shows the analysis for four states. The analysis shows that in states having large production of burnt clay bricks, only a small fraction can be replaced even if all the annual unutilized fly ash generation is utilized for manufacturing of fly ash bricks and blocks.

Table 2 Fly Ash Generation, Utilization and Potential for Fly Ash Brick Manufacturing by Utilizing the Unutilized Fly Ash

State	Fly Ash Generation 2017-18 (million tons)	Fly Ash Utilization 2017-18 (million tons)	Unutilized Fly Ash 2017-18 (million tons)	No. of Fly Ash Bricks produced by utilizing the entire quantity of annual unutilized fly ash (crore bricks/year)	Estimated Burnt/Red Clay Brick production 2017-18 (crore bricks/year)	% of Burnt/Red Clay Brick production that can be replaced by Fly Ash Bricks (%)
Bihar	7.38	3.16	4.22	300	2,000	15
West Bengal	17.58	15.11	2.47	180	2,500	7
Uttar Pradesh	25.25	13.84	11.41	820	5,000	16
Maharashtra	20.89	14.21	6.68	480	1,700	28

Scenario 3: Utilization of Pond Ash

Till now we have analyzed the utilization of the annual fly ash generation/ dry ESP fly ash available as the draft amendment is only concerned about this. In addition to annual fly ash generation, pond ash (fly ash and bottom ash stored in ash ponds) is also available and several stakeholders may have an interest to know the potential of fly ash brick production using this pond ash. Without going into the technical feasibility of utilizing pond ash and the additional energy and resources that may be needed to make this pond ash suitable for making bricks, let us examine the production potential if pond ash is utilized for making bricks.

CEA has been publishing data on annual generation and utilization of fly ash since 1996-97. By adding the yearly data on unutilized fly ash over the period 1996-97 to 2017-18, the quantity of pond ash available is estimated at 1,397 million tons. Out of this, almost 50% is available in thermal power plants located in remote locations in central and eastern India, from where transporting fly ash or fly ash bricks will be exorbitantly expensive. If it is assumed that 50% of the total available pond ash will be made available for making fly ash bricks it would result in the production of around 50,000 crore bricks or equivalent to 2 years production of burnt/red clay bricks for the country.

Conclusions

The draft amendment intends to shift the entire red/burnt clay production to fly ash bricks and blocks in 300 km radius of thermal power plants. The analysis shows that the quantity of fly ash that could be made available for the units manufacturing bricks, will be sufficient only to replace a fraction (6 to 20%) of the current burnt/red clay brick production in the country. Even reaching these replacement levels will be challenging due to regional disparities in the availability of fly ash and demand for bricks. Steady increase in demand for bricks till 2050 and stagnation in coal based thermal power generation in the near future may make meeting these replacement levels even more challenging.

In the light of the above findings, the proposal that “No new red clay brick kiln shall be installed within the 300 km radius from a coal or lignite based thermal power plant after publication of this notification. The existing red clay brick kilns located within 300 km shall be converted into fly ash based bricks or blocks or tiles manufacturing unit within one year” does not seem to be a feasible option. A more comprehensive and inclusive approach to conserve clay required for brick manufacturing, which on one hand increases utilization of fly ash and other waste materials and on the other hand promotes manufacturing of hollow and porous bricks and blocks is needed. We will be presenting some thoughts on such an approach in later articles in this series.

(In the next article we will be exploring the energy and environment impacts of transporting fly ash. Any comments on this article can be sent to mailbox@brickguru.in and sameer@qkspl.in).

References

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3. BMTPC, 2018. *Building Materials and Housing Technologies for Sustainable Development (Editors: Shailesh Kr. Agarwal, S.K. Gupta and Dalip Kumar)*. *Proceedings of the National Seminar on Emerging Building Materials and Construction Technologies, February 22-23, 2018, New Delhi organized by the Building Materials and Technology Promotion Council – BMTPC (pp 294-306)*.