Greening the Building Sector-Brick by Brick

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Brick holds a position of prominence in S Asian Economy

- South Asia’s brick industry contributes major share of global brick production.
- India, Pakistan, Bangladesh and Nepal along with China and Vietnam are among the top six brick produces of the world.
- These six countries also represent 75% of the Asian population and home to close to 60% of world’s poor
What ails the brick industry- the technology

- Characterized by traditional firing technologies; low mechanization rate; dominance of small-scale brick kilns; dominance of single raw material (clay) and product (solid clay brick)

- The most commonly used technology is Bull Trench Kiln (BTK) & Fixed Chimney Kiln (FCK) that are extremely resource inefficient and highly polluting

- Industry is gradually switching over to Zig-Zag Kiln, Vertical Shaft Brick Kiln (VSBK), Hoffman’s kilns that are marginally better, but are still highly polluting with far reaching social, health and environmental issues
Depletion of agriculture land threatening food security

• India produces 200 billion bricks per year, consuming 520 m tonnes of soil- equivalent to 30,000 ha agricultural land

• With the growing brick demand, these countries are fast moving towards severe food shortages in the foreseeable future
High Energy consumption and Emissions

- Bricks fired at 700 - 1100 °C, requiring a large amount of fuel
- In India, Brick kilns consume 25m tonnes of coal per year - among the highest industrial coal consumers.
- CO₂ emission is 50m tonnes accounting for 4.5% GHG emissions in India
- Coal usage leads to SPM emissions - brick making accounts for approximately 60% of black carbon emissions from the industrial sector

<table>
<thead>
<tr>
<th>Kiln Type</th>
<th>Coal per 100,000 bricks (t)</th>
<th>Particulates (mg/m³)</th>
<th>CO₂ emitted per 100,000 bricks (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCK</td>
<td>20-22</td>
<td>1,000 +</td>
<td>50</td>
</tr>
<tr>
<td>Zigzag</td>
<td>16-20</td>
<td>500-1000+</td>
<td>40-45</td>
</tr>
<tr>
<td>Hoffmann (Natural gas)</td>
<td>16,000 m³</td>
<td>&lt;100</td>
<td>30</td>
</tr>
</tbody>
</table>
Socio Economic issues

- Brick kilns provide seasonal employment and poor wages
- Children generally accompany parents instead of attending school as the brick kilns are located away from human settlements and the families are mostly migratory
- Families and children work and live in harsh conditions (exposure to extreme heat, GHG and SPM emissions) that lack of basic facilities
Opportunity for ‘cleaning’ the brick industry

• FaL-G Brick (Fly ash- Lime-Gypsum) technology provides the solution

• FaL-G produces bricks without firing, so it results in: Zero coal; Zero top soil & Zero Emission

• Provides ideal venue for circular economy: fly ash (unwanted residue from coal power plants) is mixed with two other industrial by products: Lime and Gypsum

• Fly ash-lime reactions take a long time to offset. Adding gypsum at the threshold level aids setting avoiding the need for press and autoclave. Tropical climate further supports this reaction.

• As a result, the characteristic strength of fly ash-lime is maximised to as high as 3 to 5 fold, giving opportunity to achieve the same or higher strengths as conventional bricks and at comparable costs.

• FaL-G technology can also bind a number of materials as fillers or aggregate in the brick, thus providing options to gainfully utilize other wastes, besides fly ash
Advantages of FaL-G

- FaL- G provides effective alternate to burnt clay bricks
- Reduces plastering cost by 30% and consumption of cement mortar by 60%
- High compressive strength eliminates breakages/wastages during transport and handling
- Brings down operational energy in buildings as they have low thermal conductivity
- Suited for flood & earthquake prone area and range of infrastructure projects
- Manufacture a range of products - bricks, blocks, mortar, roofing and paving tiles and as concrete of comparable or higher strength
- FaL-G plants can be set up with investment of USD 5500

**Contribution per Million FaL-G Bricks**

- Conservation of top soil: 3500 ton
- Conservation of Coal: 200 ton
- Abatement of CO$_2$: 270 tonne
- Net profit ratio: 15 %
- Average Rate of Return: 38 %
Experience of fly ash brick technology in India

Pro-active policy measures and technology support have led to:

• Over 18,000 FaL-G brick plants are now in operation throughout India
• Fly ash bricks account for about one sixth of India’s annual brick production
• FaL-G plants use over 25m tons of fly ash, helping tackle its environmental menace
• Providing workers stable year-round livelihood nearer their homes and allowing their children to attend regular school, giving them reason not to migrate to cities
• FaL-G plants are getting carbon revenue -spent on welfare of workers’ communities
• A sizeable number of women entrepreneurs are setting up FaL-G brick plants
Spreading the innovation to Bangladesh

• FCK tech has recently been banned and has to be phased out by next year
• Bangladesh Govt. has commissioned few large coal based thermal power plants that would produce large quantities of fly ash creating major environmental concern
• Textile sector, which is a backbone of country’s economy produces large quantity of solid waste/ sludge
• FaL-G can help in gainful utilization of fly ash and use of textile sludge as aggregate to produce bricks of higher quality – while saving forests, agricultural land and preventing emissions
• Bangladesh is highly vulnerable to floods and disasters – FaL-G ideally suited for water logged conditions and earthquake regions
• IIP in partnership with UK-DFID is supporting the pilot and scale up of FaL-G technology in Bangladesh
Spreading the innovation to Bangladesh

• Project is supported by Bangladesh Department of Environment and Bangladesh Brick Manufacturers and Owners Association (BBMOA)

• Initial awareness generation for brick entrepreneurs through exposure visits, workshops and roundtables

• Piloting technology at strategic locations in Bangladesh to show the range of products (bricks, blocks & concrete), their quality/ strength and application

• ‘Supply side’ push through technology assistance, capacity building and government policies that incentivizes adoption of such technologies

• ‘Demand side’ pull through favourable public procurement policy that promotes sourcing of resource efficient brick by construction/ building companies and through a well-designed awareness campaign for educating public at large
Thank You

Queries, Suggestions and inputs welcome at:

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