GOVERNMENT OF INDIA
SCIENCE AND TECHNOLOGY
LOK SABHA

UNSTARRED QUESTION NO:2503
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TECHNOLOGY FOR FLY ASH
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Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether the annual Fly Ash emitted from Thermal Power Plants in India is enormous;

(b) if so, whether the Council of Scientific & Industrial Research, New Delhi has developed a number of technologies to utilize Fly Ash and convert it into value added building materials like bricks, concrete agglomerates etc;

(c) if so, details of various developed technologies by CSIR?

Answer

MINISTER OF STATE (INDEPENDENT CHARGE) OF THE MINISTRY OF SCIENCE AND TECHNOLOGY AND MINISTER OF STATE (INDEPENDENT CHARGE) OF THE DEPARTMENT OF OCEAN DEVELOPMENT (KAPIL SIBAL)

(a) The fly ash production is reported to be over 110 million tonnes in 2004-05.

(b) Yes Sir. CSIR laboratories namely, Central Building Research Institute (CBRI), Roorkee; Central Fuel Research Institute (CFRI), Dhanbad; Central Glass & Ceramic Research Institute (CGCRI), Kolkata; Central Road Research Institute (CRRI), New Delhi; Regional Research Laboratory (RRL), Bhopal; and Regional Research Laboratory (RRL), Thiruvananthapuram have developed technologies for producing value added products utilizing the fly ash.

(c) Technologies developed by CSIR laboratories for utilization of fly ash are enclosed in a statement placed below.

Statement giving details of the technologies developed by CSIR

A. Bricks

Fly ash clay burnt bricks: The process utilizes upto 70% of fly ash. The novel features are: water absorption -15.25%; colour - light crimson red; finish - smooth uniform surface; firing shrinkage - 4%; bulk density - 1.6 g/cc; apparent porosity - 30-40%; compressive strength - 110-150 kg/cm2; and reduced cost of mortar in masonry work and plastering.

Red mud − fly ash clay burnt bricks: The brick utilizes 40-50% red mud and fly ash each with clay. The compressive strength is 10-150 kg/cm2 while water absorption is of the order of 15.25%. They possess apparent porosity of 30-40%.

Red mud − fly ash hydraulically bonded bricks: It has been developed using lime or cement, is hydraulically bonded and cured in mortar. Have a compressive strength of 80 to 100 kg/cm2 (7 days) & of 100-140 kg/cm2 (28 days).

Clay fly ash bricks: The process developed saves not only precious top soil but also reduces consumption of coal in making conventional clay bricks. Requires minimum changes in existing set up at kiln sites and is not much susceptible to quality of ash.

Fly ash sand lime bricks: Produced by mixing lime and fly ash and are chemically bonded bricks, suitable for use in masonry just like common burnt clay bricks. They possess adequate crushing strength as a load bearing member; have cement colour in appearance, are uniform in shape and smooth in finish and require no plastering; and are lighter in weight than ordinary clay bricks. Generally, dry fly ash available from power plants meets the properties specified in IS: 3812 and is suitable for manufacture in accordance with the requirements of IS: 12894.

B. Blocks and Tiles

Flux bonded fly ash bricks blocks and tiles: The process has been developed in association with TNO TPD, The Netherlands. It is based on the formation of low melting fluxes at the firing temperature, which partly react with the fly ash and form a high temperature reactive glass binder phase. The bricks, tiles and blocks are brick red in colour, but a variety of colours can be made by changing the initial composition.

Fly ash based hollow blocks: These utilize upto 50% fly ash with one hole, four holes and nine holes by extrusion process. Have compressive strength of the order of 90-140 kg/cm2.

Fly ash based hollow concrete blocks: These blocks replace use of cement by nearly 20% in the product without compromising the

strength. The novel feature include: size of the block - 225 x 200 x 100 mm; weight of the block - 6 kg; apparent porosity - 14-15%; bulk density - 2.2 g/cc; compressive strength (solid cube); 7 days - 160 kg/cm2, 28 days - 218 kg/cm2; and compressive strength (hollow cube) 7 days - 87 kg/cm2.

Fly ash clay ceramic tiles: The fly ash clay based glazed and unglazed ceramic tiles utilize maximum of 60% fly ash. They could be produced in variety of shades. The tiles have passed IS: 2838-1964 standard.

Red mud − fly ash clay tiles: These could be produced in both unglazed and glazed form. The process developed utilizes two industrial wastes i.e. fly ash and red mud. They are as per IS: 2838-1964 standard.

Fly ash based abrasion resistant tiles: The highly dense, impenetrable and hard abrasion resistant tiles have been produced from fly ash and alumina. Their novel features include: hardness (Moh's scale) - 8-9; bulk density - 2.8-3.2 g/cc; compressive strength - 1,000 Mpa; apparent porosity - 0.5%; and abradability index - 8-20.

C. Aggregates

Fly ash based synthetic refractory aggregate: The refractory aggregate produced from fly ash by reaction sintering with alumina consists of mullite bonded corundum material. It possesses high temperature properties suitable for refractory application. Use of such composite aggregate in high alumina castable composition improves the thermo − mechanical properties significantly. The material thus developed has potential application in iron & steel, petrochemical, cement and other allied industries.

Sintered light weight aggregate: Sintered Light Weight Aggregate is produced by pelletisation or nodulisation of fly ash (75-90%) and sintering of the pellets or nodules at a temperature of 1000Âº-1300ÂºC. It can be used for various purposes such as in the manufacture of structural light weight concrete and pre-cast light weight concrete building units for use as load and non-load bearing elements etc.

D. Others

Fly ash pozzolana cement: The process for fly ash pozzolana cement has been developed in non-sintering route. It has fineness − above 4000 cm2/g and compressive strength (7 days) - 130-150 kg/cm2 and for 28 days - 240-270 kg/cm2.

Fly ash based ceramics: Fly ash can be used to produce wear resistant Ceramics of various shapes. The extremely dense, hard, and impenetrable ceramics have superior resistant to abrasion and can be extensively used as a lining in material handling equipment. Use of such ceramics substantially decreases maintenance cost and increases the life of components to almost 8-10 times that of metal.

Manufacture of artificial / synthetic wood: A 100% wood substitute product named R-Wood has been developed and know-how transferred. R-Wood is based on the use of industrial wastes such as red mud from aluminium industries and fly ash from thermal power plants. Central Public Works Department (CPWD) has banned the use of wood in its works from April 1993 and subsequently approved R-Wood products as a substitute for timber. The Building Materials Technology Promotion Council (BMTPC) under the Ministry of Urban Development, Government of India, has supported the project. M/s Roy Research and Technology, Calcutta has also carried out work in this area.

Use of fly ash in land reclamation: Pilot scale experiments have shown that fly ash could also be used for land reclamation and soil modification.