



NCB NEWS

JUNE 2020



Ballabgarh-Head Office



Hyderabad-Unit



Ahmedabad-Unit



Bhubaneswar-Project Office

HEADLINES

- **In-Focus:** Ongoing R&D highlights
- **Networking with industry**
- * Assocham webinar
- * Application of XRD, DTA/TGA & Optical microscopy
- * NPC workshop on Counter-measures of plastic litter in India
- * Webinar on Solidia clinker & cement
- **Important days celebrated at NCB**
- * National Tech. Day
- * WED 2020 (Webinar on AFR)
- * Accreditation Day
- **Interaction with Academia** (PG Diploma in Cement Tech.)
- **Internal Competency Building**
- **Adieu**
- **Homage**

Editor: Sh Saurabh Bhatnagar
Ms Richa Mazumdar
Designed by: Sh Imtiaz Khan

From the desk of Director General

Dear Readers,

As the pandemic accelerates, we have entered into a phase where countries want to open up their societies and economies. In such times, when the virus is spreading fast, we call on people to exercise extreme vigilance. Keeping hands clean, wearing a mask and continuing maintaining distance are the *mantras* to keep away from the disease till our health experts find a permanent solution. I assure that at NCB, we are leaving no stone unturned to ensure safety of our employees and their families by keeping strict monitoring through regular meetings.

The pandemic has certainly dented the prospects of Indian Cement Sector as it gears up to face challenges like less demand, workforce disruptions, upcoming monsoons, hike in prices, lack of funds and uncertainty in job market. As a result of this, sustainability program initiatives might be postponed for a few months, but not forever.

This is the time to turn challenges into opportunities. 'Atmanirbhar Bharat Abhiyan' is one such step by our Hon'ble PM in this direction. Fast tracking infrastructure projects and initiating new projects by Govt. will help cement demand gain momentum and this will have a chain reaction on production, reaching as far as increased employment.

This version on NCB e-news covers a gist of webinars organized and attended by NCB, apart from other interactions and brief details on the research activities currently being carried out. I'm sure they'll invoke keen interest in readers' on latest on-going activities in the industry. At NCB, we are committed to work on achieving sustainability in cement & concrete sector. In times to come, we look forward for support and to live up to the expectations of our stakeholders by delivering key sustainable ideas to help businesses and society grow.

I also take this opportunity to invite you for the upcoming webinar on Alternate Fuels & Raw Materials organised by NCB in third week of July 2020 which promises fruitful take-aways for all the participants of this webinar.

I look forward to receive you over the web and sincerely hope that you find this edition of NCB e-news quite interesting. Wishing you all happy, healthy and innovative future!



Dr. B N Mohapatra

NCB WEBINAR ON MAXIMIZATION OF AFR UTILIZATION IN CEMENT INDUSTRY
Coming soon in July 2020, Timings: 1000H to 1730H (Indian Standard Time)

Presentations from the Subject Experts and Views from the Policy makers **REGISTER TODAY**

Topics coverage: AFR Inventory & Co-processing guidelines, Characterisation of AFR, System design aspects, Process impact assessment and optimization, Quality Control and Quality Assurance requirements, Technology showcase and Environment aspects.

Registration fee ₹ 2000/- + taxes as applicable per participant (spot registration facility available)

Register through Google form: <https://forms.gle/9mLaFKFW3ycVjBgr7>

For details contact: Sh K P K Reddy (Deputy Manager) Mob:+91-7982929996; E-mail: cceb@ncbindia.com

E-certificates will be issued to all participants

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS

(Under the Administrative Control of Ministry of Commerce & Industry, Govt. of India)
34 KM STONE, DELHI-MATHURA ROAD, BALLABGARH-121004, HARYANA. INDIA
Ph: +91-129-4192222 / 2242051 Fax: +91-129-2242100 E-mail: nccbm@ncbindia.com

Website: <http://www.ncbindia.com>

NCB NEWS is exclusively electronic and for internal circulation only

HIGHLIGHTS OF ONGOING RESEARCH

New R&D projects

During the 72nd Research Advisory Committee meeting held at NCB-B, 12 new projects were approved. These are:

- **Process design & integration of RDF Gasification in cement manufacturing process.**
- **Solar thermal calcination of phosphor gypsum for cement manufacture.**
- **Design & Development of Transfer Chute to Handle Alternate Fuels & their Mix in Indian Cement Plants.**
- Studies on Mechanical & Durability properties of High Strength Geopolymer Concrete.
- Study of Carbonation & Carbonation induced reinforcement corrosion in new cementitious system.
- Cathodic Protection (CP) of RCC structures to enhance service life of new & existing structures using three systems (Sacrificial anode, ICCP & hybrid system).
- Studies on mechanical and time dependent properties of Very High Strength Concrete (100 to 130 MPa) and Ultra High Strength Concrete (130 To 180 MPa).
- Utilization of Coarser Fly ash (having fineness b/w 250 m²/kg to 320 m²/kg) in Concrete as a cementitious material
- Investigations on Fly Ash based Geopolymer Coarse Aggregate.
- Investigations on Utilization of Coarse Flyash (200-250 m²/kg) in Cement.
- Development of new clinker system using industrial by products and low limestone content.
- Investigations on role of Particle Size Distribution (PSD) on performance of blended cements and concrete.

In this edition, we bring to you a brief on the highlighted projects.

Formation of “Expertise Groups” at NCB

Executive Committee of NCB headed by DG constituted inter-departmental **Expertise Groups** with mandate to carry out research on issues significant to the industry & demanding further attention, paving a way for the sustainability of the industry. It is envisioned that scientists & engineers in these groups will apply their knowledge & experience to work specifically on conflicting tasks such as lowering clinker factor, increasing production efficiency, improving performance, enhancing renewable energy usage and cutting CO₂ emissions using low carbon technologies & carbon capture.

GROUP CODE

NAME OF EXPERTISE GROUP

MIM	Mineralogy and Microstructure
NCS	New Clinker Systems
LCC	Low Carbon Cement
HTT	High Temperature Technologies
XRS	XRD & XRF SRM
AAT	Advance Analytical Techniques
AFR	Alternate Fuel & Raw Materials
ACP	Advanced Comminution & Particle Technology
PYR	Advanced Pyro-processing
ECN	Energy Conservation
REN	Renewable Energy
CCU	Carbon Capture & Utilization
POW	Power Systems & Instrumentation
SDS	Structural Design & Seismic Evaluation
GPC	Geo-polymer Concrete
RMR	Repair Materials & Rehabilitation
ACC	Advance Concrete Composites
RCP	Reinforcement Corrosion - Prevention and Mitigation
CDM	Concrete Durability and Microstructure
BND	BND & SRM
LAM	Lab Accreditation Management
ILN	Institutional Linkages & Networking

Solar thermal calcination of Phospho Gypsum (PG) for cement manufacture

The objective of this project is to utilize PG for cement manufacture by calcination of PG using Concentrated Solar Power (CSP). The assured end product for the cement manufacturers will be partial/full replacement of mineral gypsum by PG. The expected benefits will be environmentally sustainable cement production, reduction in import of mineral gypsum, enhancing competitiveness of Indian cement industry by adopting renewable energy sources and overall reduction in Greenhouse Gas emissions.

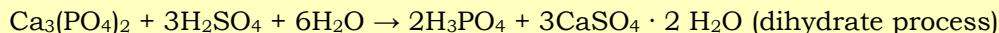
In 2015-16, about 10.3 million tonnes indigenous gypsum (all types) was consumed in Indian cement industry. Out of total Gypsum consumption, 4 million tonnes of mineral gypsum was imported from countries like Oman, Pakistan and UAE. Table below highlights quality of various types of gypsum.

Parameter	Mineral	Gypsum		
		As by product		
		Phospho	Chemical	Synthetic
Source	Natural	Fertilizer industry	Chemical industry	FGD of power plants
Purity	50-60 % (Indian) 85-90 % (Imported)	88-90 %	80-85 %	80-88 %
Moisture	< 3 %	15-20 %	10-15 %	10-12 %
Nature	Neutral	Traces of acidity		

PG generation in India is about 11 Million Tonnes per annum.

Phosphogypsum (PG) refers to the calcium sulfate hydrate formed as a by-product of the production of fertilizer from phosphate rock.

HIGHLIGHTS OF ONGOING RESEARCH



Phosphogypsum is produced by a single-step (dihydrate) as well as a two-step (hemihydrate-dihydrate) route. PG produced by dihydrate process contains higher amount of P_2O_5 .

Impurities in phosphogypsum

Phosphates: H_3PO_4 (if present), $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$, $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$, and $\text{Ca}_3(\text{PO}_4)_2$

Fluorides: NaF , Na_2SiF_6 , Na_3AlF_6 , Na_3FeF_6 and CaF_2

Traces of radioactive material (like radium, uranium), traces of heavy metals namely arsenic, cadmium, chromium, lead and fluoride.

The **problem with usage of Phosphogypsum** is that it retards the setting time and decreases the compressive strength of cement.

Setting Time

The retardation of setting time is due to presence of water soluble impurities $\text{Ca}(\text{H}_2\text{PO}_4)_2$, H_2O , $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ and Na_2SiF_6 .

Water-soluble fluorides retard the setting to a relatively greater extent.

Compressive Strength

Strength is considerably reduced at all ages on using unprocessed PG in place of mineral gypsum. The decrease in strength is due to impurities in PG forming a protective coating ($\text{Ca}_3(\text{PO}_4)_2$, CaF_2) on surface of cement particles.

High heat treatment of PG removes the impurities.

H_3PO_4

at 215°C: $\text{H}_3\text{PO}_4 \rightarrow \text{P}_2\text{O}_5 + \text{H}_2\text{O}$

at 360°C: P_2O_5 evaporates

$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$

$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ (140-200°C) $\rightarrow \text{CaHPO}_4 \cdot 0.5\text{H}_2\text{O} + 1.5\text{H}_2\text{O}$

$\text{CaHPO}_4 \cdot 0.5\text{H}_2\text{O}$ (430 °C) $\rightarrow \text{CaHPO}_4 + 0.5\text{H}_2\text{O}$

CaHPO_4 (500 °C) decomposed to $\text{Ca}_2\text{P}_2\text{O}_7$

$\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$

$\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$ (110 °C) $\rightarrow \text{Ca}(\text{H}_2\text{PO}_4)_2 + \text{H}_2\text{O}$

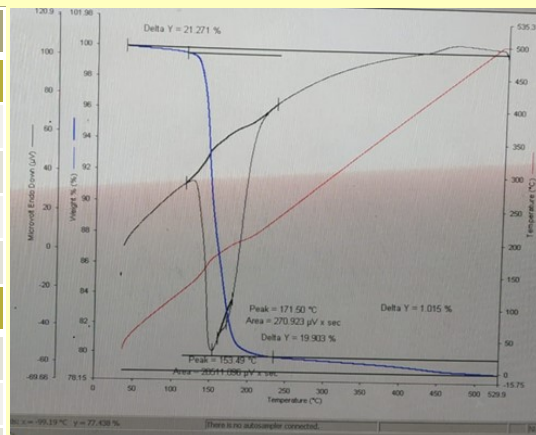
$\text{Ca}(\text{H}_2\text{PO}_4)_2$ (450-600 °C) $\rightarrow \text{Ca}_2\text{P}_2\text{O}_7 + \text{P}_2\text{O}_5$

$\text{Ca}_3(\text{PO}_4)_2$ melts @ 1670 °C

Literature study reveals that both CaHPO_4 and $\text{Ca}(\text{H}_2\text{PO}_4)_2$ becomes inert by converting into $\text{Ca}_2\text{P}_2\text{O}_7$ at 500°C.

During pre-project activities carried out at NCB, **PG was heated in a furnace.**

S. No.	Test Name	Base sample	250 °C	500 °C	800 °C	1000 °C
First set of analysis						
1.	P_2O_5	1.29%	0.99%	1.01%		
2.	LOI	21.69%	3.56%	1.88%		
3.	SO_3	43.24%	52.92%	53.61%		
4.	Combined water	19.38%				
Second set of analysis						
1.	P_2O_5	1.29%	1.25%	1.04%	1.07%	1.24%
2.	LOI	21.69%	19.18%	20.58%	21.0%	21.42%
3.	SO_3	43.24%	52.9%	53.28%	56.35%	56.51%



DTA & TGA of PG

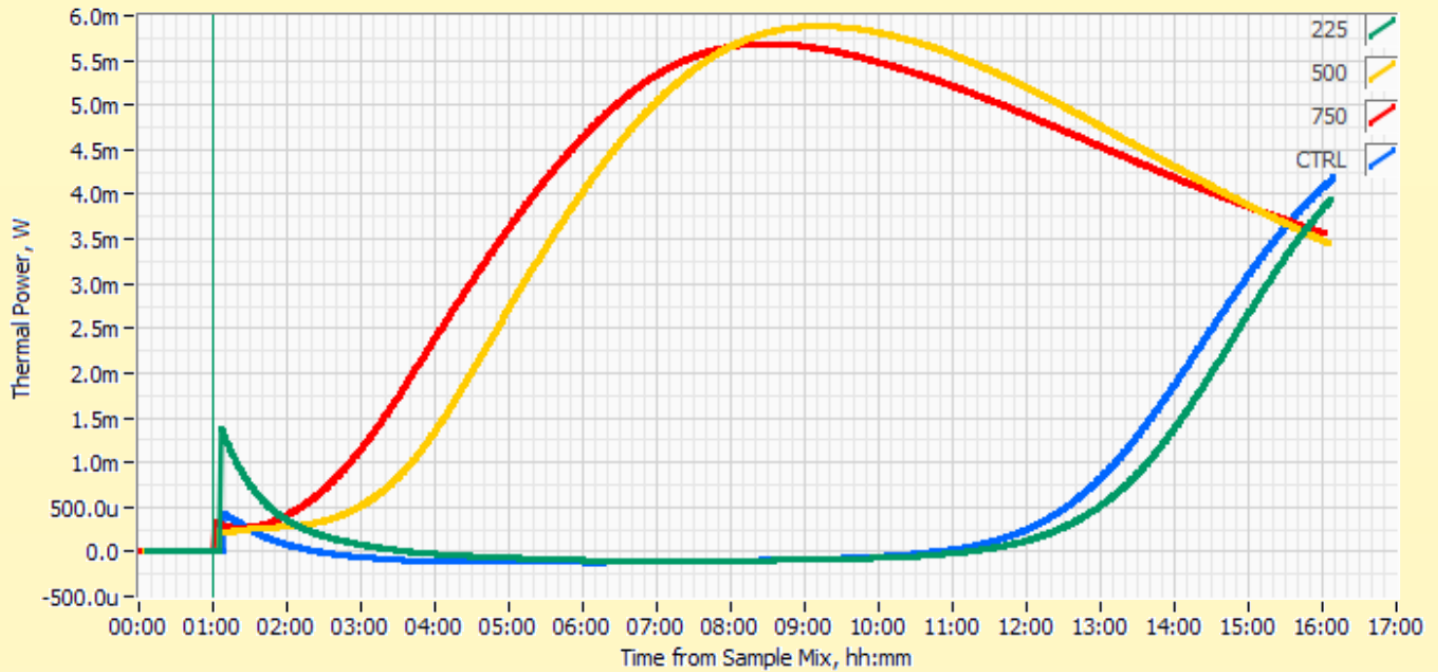
During **open heating**, PG was heated to a temperature of 1200°C in glass bead machine. Two different samples were made 1 with fuse material to make glass bead for XRF testing another was direct heating (w/o fuse material) for chemical testing.

S. No.	Test Name	XRF	Chemical
Open heating at 1200 °C			
1.	P_2O_5	1.59%	1.458%
2.	LOI		24%

Elevated temperature produced an anhydrite, in which phosphate & fluoride impurities became inert. Some literary sources state that even after PG being calcined at high temp. (up to 1000°C), phosphatic impurities influence the hydration & hardening processes of anhydrite independent of phosphatic impurities state.

Isocalorimetry Experiment was carried out for PG where 2 kg clinker was grounded to 3000 cm^2/gm Blaine. 4 sets of samples with a mix of 30 gm clinker (95%) and 1.5 gm PG (5%) prepared at ambient, 225°C, 500°C and 750°C temperatures. Samples were kept in Isothermal Calorimeter for 16 hours.

HIGHLIGHTS OF ONGOING RESEARCH



Setting time for the samples at 500 and 750 (yellow and red curve) occurs 9 hours before the setting time for samples at ambient and 225 (blue and green curve).

2 cement samples were prepared with 1 sample having 5% Untreated PG and another sample having 5% treated PG at 500. These two samples were tested for setting time. The results are given below:

Particular	Cement with mineral gypsum	Cement with Untreated PG	Cement with treated PG
I.S.T(min)	120-180	390	140
F.S.T(min)	245-265	450	190

Testing at National Institute of Solar Energy

350 grams of PG was heated at 320°C by using Scheffler dish. The sample was placed in a cylinder with agitator and exposed directly to the focus. The observations of experiment are tabulated below:

Particulars	Observations
Test start time	01:57PM
Initial temperature	55 °C
Quantity of PG	350 g
Solar radiation (avg.) during test period	800 W/m ²
Thermocouple used	2 No's
Ambient temperature	18.8 °C
End time	3.25PM
Final Temperature	325 °C

Currently, COVID-19 pandemic has limited the project progress to desk based study for detailed study of solar technology available for calcination application. Literature is being explored for thermal treatment and chemical kinetics of PG. This exercise will be fruitful for supporting parametric study whenever conditions are congenial to resume laboratory experiments.

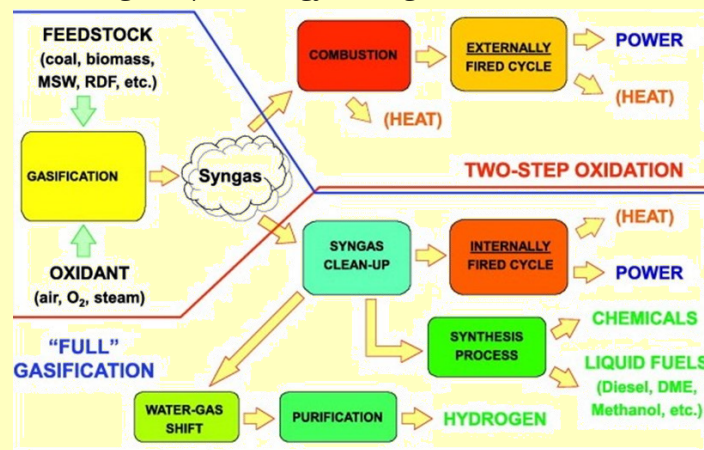
NCB's REPRESENTATION IN NATIONAL STANDARDS BODY

42 engineers & scientists of NCB are serving BIS Committees, Panels and Working Groups a few of which are Civil Engineering Divisional Council, Cement & Concrete Sectional Committee, Panel for revision of Handbooks, Cement, Pozzolana & Cement additives sub-committee, Panel for revision of Cement Standards, Concrete sub-committee, Panel for Revision of Indian Standards on Test Methods for Concrete, Structural Safety Sectional sub-committee, National Building Code sectional committee, Panel for fire protection, Panel for Building Materials, Environmental protection & Waste Management sub-committee, Environmental Management sectional committee, Construction Plant & Machinery sectional committee, Solid Mineral Fuels sectional committee, Coke/ Coal sub-committees and Working Group on Technical Sector of Standard Promotion & Consumer Affairs department.

HIGHLIGHTS OF ONGOING RESEARCH

Process design & integration of RDF Gasification in cement manufacturing process

Municipal Solid Waste (MSW) generation is growing tremendously in India with the rise in population of the country & urbanization. Net generation of MSW annually in India is around 65 million tonnes & it is expected to be 130 million tonne by 2030. MSW disposal is still an issue of concern in India despite enactment of various legislations. Thermochemical treatment of waste has become an integral part of waste management system worldwide. The main advantage is reduction in waste of mass and drastic saving of land for landfill. The combustibles of MSW consisting of paper, textile, polythenes, sanitary napkins, rags, leather, rubber, non-recyclable plastic & other non-biodegradable fraction is processed into Refuse Derived Fuel (RDF). RDF can be utilized in different forms for the production of electricity or for process heat for industrial use by 3 main thermo chemical conversion processes of combustion, pyrolysis and gasification. RDF gasification is a process of converting RDF to syngas (a mixture of CO, H₂, CO₂, CH₄ and N₂) by combustion in oxygen deficient environment. It is witnessed that there is a boom of small scale gasification for Combined Heat & Power (CHP) applications in Europe during past 5 years having over 1500 facilities in operation. The share of global syngas output in terms of feedstock is 61% from coal, 29% from petroleum, 7% from gas, 2% petcoke & only 1 % biomass. But gasification of waste and other difficult materials like sewage sludge, RDF etc. has also gained momentum in the recent past. Gasification can be used for different applications like waste management, biofuel production (e.g. FT kerosene), hydrogen production, refinery integration purpose etc. Combination of thermal gasification with other renewables like the wind power or PV offers new possibilities for electrical grid balancing and/or energy storage.



Indian cement industry is aiming at 25 % Thermal Substitution Rate (TSR) by 2025 and RDF has been identified as one having potential to achieve high TSR. But issues like heterogeneity, high chloride, high moisture, inconsistent particle size and a suitable economic model are some of the real challenges faced by cement industry. In view of above, NCB has taken up this R&D project. Purpose of project is to study detailed RDF characterization, experimental studies at different operating conditions in a lab scale downdraft gasifier along with process design. Techno Economical analysis of RDF gasification shall be done in collaboration with a cement plant. It is expected that the research undertaken would help overcome limitations of RDF combustion currently being practiced by Indian cement plants. Since, Indian cement industry has not used alternate gaseous fuel so far, this research may take a step further in that direction & help cement plants to utilize RDF in large quantities. Indian Government has set a target to gasify around 100 million tonnes of coal by 2030. 4 projects have been identified in this regard worth 20 thousand crores. This will further give impetus to gasification technology in India.

Design and Development of Transfer Chute to Handle Alternate Fuels (AFs) and their mix in Indian Cement Plants

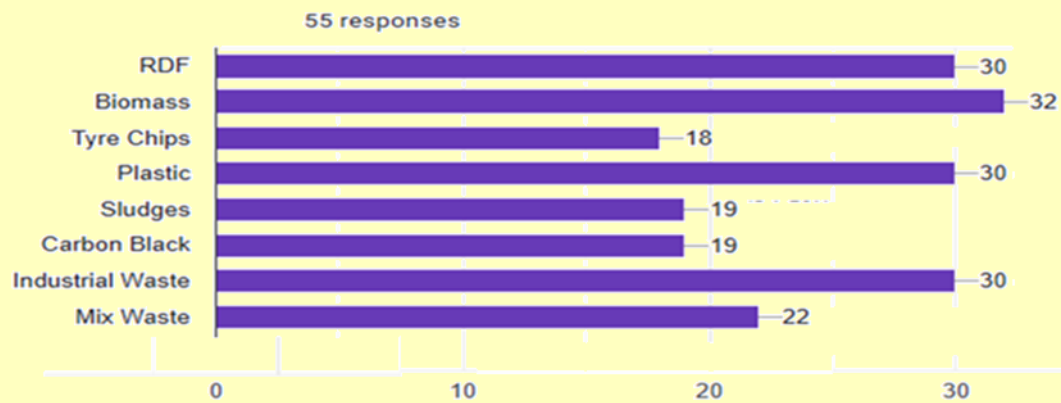
To achieve high TSR, Indian cement manufacturers are adopting all possible AFs according to their geographical availability and economic viability. The basic requirement of cement plants today is to have an AF system that handles maximum type of AFs with single system. Current TSR of AFs is ~4% mainly by utilization of available solid wastes like RDF, tire chips, biomass, plastic, solid hazardous waste etc. Indian cement industry is now, well aware about the various equipment available for AFs and technical knowhow which is required for selection of right equipment at right place. Plenty of work has already been done to assess the impact of AF on process and main equipment. The current challenge in system design is to achieve high TSR. For this, it is required to explore the fuels with wide range of variation in physical properties as such characteristics only lead to frequent jamming in chutes. At present, chutes made of conventional design are adopted which cannot withstand the wide range of variation in physical properties of AF. These variations are mainly in Bulk Density (0.10 to 1.5t/m³), Moisture (dry to 20%), particle size, wall friction angle, cohesiveness/ adhesiveness of material and other flow properties.

HIGHLIGHTS OF ONGOING RESEARCH

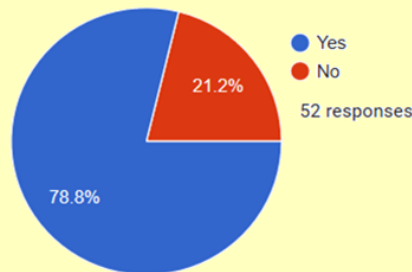
In this project, it is proposed to design and develop a Transfer Chute to handle AFs & their mix in Indian Cement Plant with the use of Computational Fluid Dynamics (CFD). It is also proposed to fabricate a prototype model at NCB-B to carry out the physical experiment and verify the developed design.

In a recent survey carried out for the Indian Cement plants located in cement clusters like M.P., A.P. & Rajasthan, it was found that around 80% cement plants face problem at transfer chute during transportation of AFs.

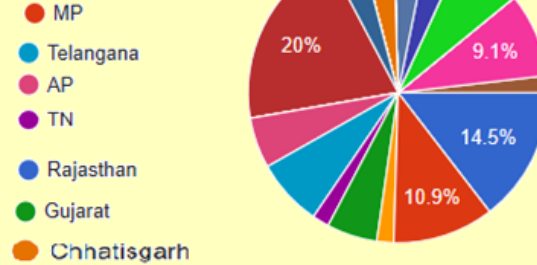
Main Type of Solid Alternative Fuels



Are you facing any problem at transfer chute during transportation of AFs

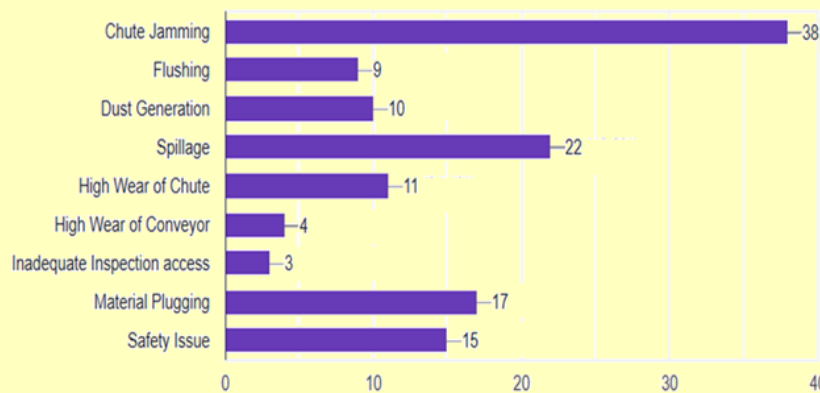


55 responses



If Yes, What Kind of Problem you are facing in transfer chute

45 responses



Out of the 55 responses received, 38 plants informed that chute jamming was a major problem faced by them. Preliminary literature review reflects the various modeling methods for a specific material only. However, no literature has been found thus far reflecting handling of different characteristics material (especially AF) with common chute and hoppers.

Different CFD model have been used for the simulation and analysis of bulk material flow in transfer chute like: Discrete Element Modeling (DEM), Discrete Particle model (DPM), Eulerian, CFD-DEM modeling.

However, it has been found that combination of CFD-DEM modeling is more accurate. Different software have been used for simulation and analysis of bulk material flow in Transfer chute like Rocky DEM, Star CCM+, EDEM, LIGGGHTS, Fluent etc.

Literature review also indicates that a number of studies have been done to check the suitability of transfer chute for a particularly specified bulk material, even for biomass in some cases. DEM have been used as an effective tool for modeling but so far, no attempt has been made to develop design of transfer chute which can handle multiple AFs and their mix available in India. It is expected that the project will benefit the cement industry by providing a readymade design for inline selection of expected alternative fuels, least shutdown/stoppage due to jamming of hoppers/chutes and safe & environmental friendly operation.

NETWORKING WITH INDUSTRY

Assocham Webinar on Impact of COVID on Indian Cement Industry

DG-NCB gave a special address on Impact of COVID-19 on Indian Cement Industry in the Webinar held on 1st May 2020 by Assocham amongst eminent personalities from cement industry like Sh Mahendra Singhi (MD & CEO-DCBL, President CMA & Chairman-NCB), Sh V R Sharma (MD-JSPL), R Saravanabhavan (SRO-NITI Aayog, GoI), Ms Lopamudra Sengupta (VP-Tech, JSW Cement) and Sh Deepak Sharma (Director & Co-founder, Kanvic Consulting). He reiterated the fact told by other distinguished speakers that impact of COVID-19 pandemic on Indian economy & cement industry has been hugely disruptive. However, he professed that the economic and industrial growth of the country will pick up

at much faster rate post COVID and cement industry will witness higher capacity utilization of existing installed capacity and new capacity additions. He told that innovations, optimizations, new manufacturing techniques & products & alternate sources of energy coupled with Government's focus on ease of doing business and other promulgated schemes will be the driving factors for the futuristic growth of the industry.

He informed that NCB has done enormous churning on upcoming futuristic challenges of the industry in the country and has geared itself to take up assignments in the field of sustainability, enhancing waste utilization, application of cleaner technology and low carbon footprint. He emphasized on the need to re-design the operating ways through innovation & research, making efforts for digitization and remote operation of industrial facilities. He acknowledged that by adopting state-of-the-art technological interventions, innovative production techniques & climate-resilient resource optimization measures, cement manufacturers in India are integrating sustainability within their growth aspirations. The opportunities to mitigate climate change for Indian cement industry includes: increased usage of blended cement/new cement, increase in mine life due to reduction in clinker factor, availability of waste for utilization as AFR, use of mineralizers, energy efficient technology, achievement of PAT targets, lower cost of renewable energy and AF as compared to conventional fuel. He opined that incentivizing schemes may be started by government for companies making efforts in mitigating climate change. He also told that NCB is currently doing research on new Portland Limestone Cement & Portland Composite Cement (*Fly ash & Limestone based*).

Circular economy is an integral and catalytic parameter for advancement and strengthening of Global economy and India is not an exception as it is eyes to become a \$5 trillion economy by 2025. The cement industry is poised to play vital role in building economic superstructure of astronomical magnitude in India. Cement manufacturing process, by virtue of its raw materials & high kiln temperatures will be converted into waste based scavenging stream of the economy more prominently in India. This concept of circular economy, if developed appropriately, shall be a solution to diminish environmental impact of various industrial sectors thereby reducing burden on natural resources. He told that by improving energy consumption patterns during production process to increased use of AF by recovering energy from range of waste streams, use of C&D wastes & alternate materials in construction, the industry is gradually positioning itself to be at the heart of a circular economy. The industry has been utilizing wastes from different industries like fly ash from TPPs, steel slags from steel plant, Copper Slag from Copper industry, Pb-Zn slag from Zinc industry and Leather Sludge from tanneries. He pressed upon the need to chalk out and disseminate the benefits associated with circular economy to all stakeholders to enable them reap its benefits to its fullest extent.

As India eyes to achieve 900 million tonnes mark by 2030, the centre point will revolve around availability of basic raw materials like limestone and offshoots such as AFR, Geo-polymer, Solar energy will gain momentum. These opportunities will gradually turn the cement industry from grey to green. He pointed few areas which shall boost the industry in these tough times like support in utilizing Phospho and FGD Gypsum to reduce dependency on imported gypsum, fast tracking infra projects, construction of concrete roads on BOT basis, speeding up on-going projects and initiating new projects. He opined that such actions will speed up development & create employment opportunities. He also informed the gathering that concrete roads ensure better quality, durability and longevity of critical infrastructure and also is fuel-efficient during transport of goods as compared to traditional bituminous roads. He welcomed cement plants to get in touch with NCB for knowledge integration through digital media and thanked the Govt. and related sectors for their untiring efforts in handling the pandemic situation.



NCB is equipped with state-of-the-art testing equipment for physical, chemical & mineralogical analysis of Raw Materials, Cement & Concrete in its advanced laboratories located at Ballabgarh (NCR), Hyderabad (Telangana) and Ahmedabad (Gujarat).

NETWORKING WITH INDUSTRY

Webinar on Application of XRD, DTA/TGA & Optical Microscopy for Process & Quality Optimization



NCB organized the International Webinar on 18th May 2020 which was attended by 85 cement professionals including over 35 participants from different countries like Angola, Argentina, Bhutan, Iran, Kosovo, Myanmar, Oman, Saudi Arabia, Slovakia, Tanzania, UAE and Zimbabwe. More than 40 participants from major cement companies in India like UltraTech Cement Ltd., Wonder Cement, J K Cement, J K Lakshmi Cement and Sanghi cement also participated in the webinar. DG-NCB who is a subject expert gave a presentation on the topic which was well received and applauded by the participants.

Thank you very much Dr. Mohapatra for presenting wide application of XRD.

Very informative presentation. We are looking forward to next presentation from you...

**Dr. Hilal Al-Dhamri,
GM-Manufacturing,
Oman Cement Company**

I would like to thank NCB for the excellent webinar on the application of XRD/ TGA on process improvement.

Very seldom we get such exposure to learn these details and appreciate DG-NCB for his excellent ppt. We look forward to organize more such online courses for our Tech team.

**T V S Chidambaram,
COO, Star Cement
UAE (UltraTech)**

The webinar was presented in very enthusiastic way, it's always pleasure to hear Dr. Mohapatra, an authority on cement and building materials in India. Great style with precise examples, which led to a really informative session. Looking forward to attend more webinars from Dr. Mohapatra.
**Siddhesh R Kamat,
DGM-QCP, Alcolab
India**

This is the excellent program and the question answer session also good.

**Chandrasekaran N,
Dangote Cement,
Tanzania**

The presentation delivered was excellent & very informative.

Thanks to NCB team especially for arranging a very good webinar.

**Manoj Rathi, JK Cement, Quality Head,
Fujairah UAE**

NCB's SUPPORT TO INDUSTRY FOR ACQUIRING FIRST LICENSE ON ALL INDIA BASIS FOR MICROFINE ORDINARY PORTLAND CEMENT AS PER IS 16993 & ULTRAFINE GROUND GRANULATED BLAST FURNACE SLAG AS PER IS 16715



MUMBAI BRANCH OFFICE-1
(Bureau of Indian Standards)

Our Ref: MUBO-I/2020-21/1

24 June 2020

Press Release

BIS Grants first license on All India basis for 2 products

BIS (Bureau of Indian Standard), is the national standard body of India established under the BIS act 2016 for the harmonious development of the activities of standardization, marking and quality certification of goods and for matters connected therewith or incidental thereto. BIS has been providing traceable and tangible benefits to the national economy in a number of ways- providing safe reliable quality goods, mitigating health hazards to consumers, promoting exports and imports substitutes, control over proliferation of varieties etc. through standardization, certification and testing.

BIS has granted first license on the All India basis for manufacturing "Microfine Ordinary Portland cement and ultrafine ground granulated blast furnace slag. The standards for above products are IS 16993:2018 and IS 16715:2018 respectively which have been published, recently. The licenses for above products have been granted to M/s Counto Microfine Pvt Ltd, Pissurtem Industrial Estate, Goa.

Microfine ordinary Portland cement is used in special applications like rock grouting, grouting concrete structures and underground construction for leak prevention, soil stabilization etc. while ultrafine ground granulated blast furnace slag is a by product of steel industries which is used as a supplementary cementitious material which not only reduces the usage of cement but also improves the porosity performance of ordinary Portland cement concretes.

Grant of licenses for these products will ensure the availability of certified goods to the common consumers, which bring with them quality and efficiency along with reliability.

P K Kandoi

Sc-F & Head(MUBO-I)

Message from Plant Head, Counto Microfine Products Pvt. Ltd. Goa

Respected Sir,

We wish to inform you that BIS has granted us (*Counto Microfine Products Pvt. Ltd. Goa*) "**First License On All India Basis**" for Microfine Ordinary Portland Cement as per IS 16993 & Ultrafine Ground Granulated Blast Furnace Slag as per IS 16715 on 24.06.2020. Both standards are published recently & testing methods are also different from cement.

BIS Mumbai approached NCB for testing of both products in your NABL accredited laboratory but few tests were not under NABL accreditation. NCB team accepted the challenge under your dynamic leadership & developed/ standardized the testing facilities as per new standards. NABL accreditation is also processed. We submitted samples of both products to NCB, which were collected & sealed by the BIS inspecting officer at our plant. The NCB team worked hard for standardization of testing facilities & NABL accreditation process. Finally, product confirmation test reports of both the BIS samples of our CMPPL, Goa plant were uploaded on Manak online portal.

We are very much thankful for your kind support in the challenging situation. We all know that NCB team is working on different projects of National interest with limited manpower therefore it's your greatness to prioritize our new product samples for testing. We really appreciate the remarkable job of the NCB team especially Dr S.K. Chaturvedi, Dr Devendra Yadav, Dr Pinki Pandey, for completing NABL process & timely testing of samples and uploading test results on the Manak online portal.

We also observed very good coordination between Industry & NCB team on experience sharing, support & always positive response. We are sure that NCB's dedicated team & cement industry together will contribute to the mission of "**Atmanirbhar Bharat**". Once again best wishes to the entire team of NCB!

NETWORKING WITH INDUSTRY

National Policy Workshop Webinar on 'Countermeasures for Riverine and Marine Plastic Litter in India'



National Productivity Council (NPC) organized National Policy Workshop (Virtual) on Countermeasures for Riverine and Marine Plastic Litter in India. The broad topics covered during the session were: (i) Insights from the Countermeasure project, (ii) Methodology and standardization for plastic hot spotting & plastic leakage scenario to adopt counter measures in an urban setting in India, (iii) Collection & channelizing plastic bottle recycling via Deposit Refund System (DRS), (iv) Innovations occurring towards plastics substitutes and alternatives and product design regarding conservation in applications of plastics & polymers, (v) Strategies to fight plastic trash-formulating sound national policy and robustly implementing it, (vi) Existing status of single use plastics bans in India and recommendations in SUP policy, (vii) Strategy & facilitation to encourage co-processing of plastic waste in cement kiln, (viii) Plastic free rivers and seas for South Asia.

During the workshop, DG-NCB gave presentation on '**Strategy & Facilitation to encourage Co-processing of Plastic Waste in Cement Kiln**' in Webinar on **Scenarios to Counter Plastics Litter by Overcoming Barriers and Identifying Enabling Measures** held on 22nd May 2020.



Around 10 million tonnes per annum plastic waste is generated in India out of which 60% is recycled. Remaining 4 million tonnes is uncollected, littered and ends up in landfills, oceans or clogs drains. The littered plastic gets mixed up with other waste to form MSW. Average plastic generation is about 7% of MSW.

Cement kilns are a suitable option for co-processing of plastic waste due to high flame temperature, long residence time, alkaline environment, oxidizing atmosphere, complete scrubbing of exhaust gases, inclusion of the ash and residual metals within clinker structure, kiln lines are equipped with APCEs, intense contact between solid and gas phases, destruction and removal efficiency of ~99.9% and no waste is generated after subsequent disposal. Unsegregated/ unprocessed waste sent to landfills cannot be directly used by cement plants for co-processing.

Cement plants in India are getting plastic waste having a Calorific Value (CV) of 2500 – 3500 kcal/kg from local bodies. The pre-requisites for plastic co-processing are: NCV>2500 kcal/kg, Feed Size<20 mm for burner & <50 mm for calciner, Ash content<15%, Moisture content<20% Chlorine content<1% and Sulphur content<1.5%. The plastic wastes can be fed at the main kiln burner inlet/ outlet, pre-calciner or in mid-kiln in long/ wet kilns. Some process parameters monitored during co-processing of plastics are: Waste consumption, Kiln feed, conventional fuel consumption, burning zone temp., kiln inlet temp., O₂, CO, NO_x, pre-heater exit temp., O₂, CO, shell radiation temp. in burning zone, clinker temp. in cooler exit, kiln speed/ torque, pre-heater fan speed and specific thermal & electrical energy consumption. The quality parameters of clinker that should be monitored whilst using plastic waste are free lime, C₃S, C₂S, C₃A, total SO₃ & alkalis and percentage of chloride. The quality parameters in PPC cement that should be monitored are fineness, initial/ final setting time, compressive strength, total SO₃ & alkalis and % of chloride. Apart from this, test should be carried out for quantifying KCl, NaCl, CaCl₂, K₂O, Na₂O and leachability as these compounds have effect on the setting time & strength of concrete.

Plastic waste should not be used during kiln start up and kiln shut down conditions. Feeding plastic waste should be initiated only after kiln attains stable operating conditions. The Feeding of plastic waste should be discontinued in case the continuous emission monitoring system (CEMS) is not connected with CPCB & SPCB servers. Cement plants must ensure that the emission parameters are monitored as per prescribed monitoring protocol provided by regulatory bodies like CPCB, SPCB/PCC and MoEFCC. It is anticipated that 6% TSR can be achieved by co-processing uncollected/littered plastic by Indian cement industry. However, some cement plants have reported to achieve more than 15% TSR through AFs.

The constraints faced by cement industry are lack of effective pre-processing facilities like shredding, high chlorine content, high moisture content, impurities present in plastic/littered plastic, firing through kiln main burner is one of the major constraint, unavailability of plastic waste on consistent basis and large investment to operate at a TSR level of about 15%. For encouraging co-processing of plastic waste in cement industry the perception of co-incineration as a dump-yard for any kind & size of waste should be changed and plastic waste specifications must be formulated. Local bodies should establish Material Segregation & Recovery Facilities (MSRF) for pre-processing littered plastics as majority cement plants don't have such facilities. Extended Producer Responsibility should be implemented and a strong database of types of plastics and their composition and region wise availability should be provided. The facilities required for encouraging the use of plastic waste for co-processing in cement industry are: segregated plastics handling & storage facility nearby cement plants cluster, viable Economic model to be developed for transportation of pre-processed plastic waste, E-CERTs based system for % TSR, linkage of cement industry, plastic manufacturers, municipalities, & research bodies. Cement plants also needs to upgrade their co-processing systems for firing in kiln & calciner if good quality plastic waste is ensured in the vicinity.

Development of Plant Specific Standard Reference Materials for XRF Calibration

XRF is an integral part of modern cement plant and its application ranges from mining to end product. Accuracy of XRF predominantly depends on standards used for calibration. NCB provides services on development of Plant Specific Standard Reference Materials and has successfully completed several projects in India and abroad. NCB offers this service at cheaper cost comparative to other service providers.

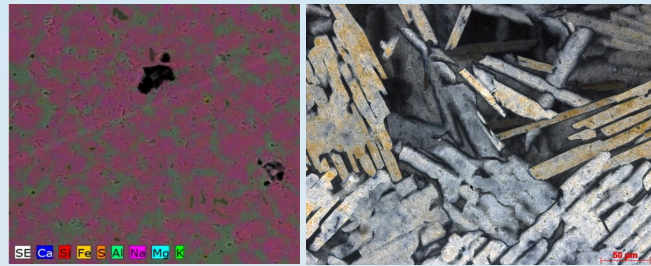
NETWORKING WITH INDUSTRY

NCB Webinar on 'Solidia Clinker and Solidia Cement'



On 23rd May 2020, NCB organized a webinar on Solidia Clinker and Solidia Cement (SC). The overview on this technology was given by Dr. Sada Sahu, Principal Scientist, Solidia Technologies USA.

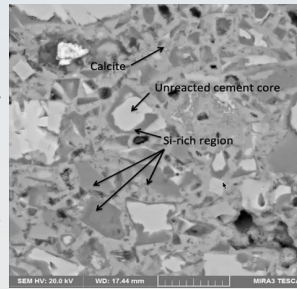
The webinar was attended by over 40 top cement professionals from UltraTech Cement, Dalmia Cement (B) Ltd., Ambuja Cements Ltd, ACC Ltd., The India Cements Ltd, JSW Cement, J K Lakshmi Cement, J K Cement, My Home Industries Ltd, Birla Corporation, Prism Johnson Ltd., Star Cement and Engineers & Scientists from NCB.



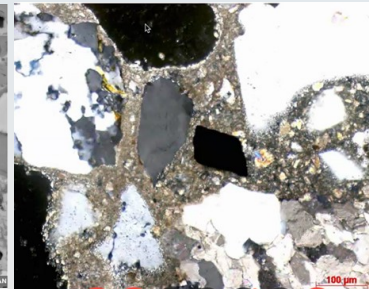
Solidia Clinker & its microstructure

Dr. Sahu told that OPC production on an average emits 810 kg of CO₂/t of clinker. Out of this 540 kg of CO₂ is produced from decomposition of limestone & rest is produced by combustion of fossil fuels to heat the cement kiln. The Raw mix composition of SC contains 28-32% CaO, 30-35% SiO₂, <5% Al₂O₃ & Fe₂O₃, <1% MgO & 25-30% LOI. When compared to OPC, SC has only 46-47% CaO against 63-64% of OPC. The phase composition of SC has C₂S of 1-9%, C₃S₂ of 10-20%, CS of 20-51%, C₂AS syn. of 5-30% and 20-30% amorphous by weight. The CO₂ emissions during limestone decomposition and fossil fuel combustion in

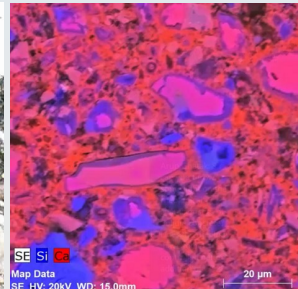
production of Solidia clinker comes out to be 375 and 190 kg/t of clinker which is 245 kg CO₂/t of clinker less than that produced during the production of OPC. In Solidia concrete, carbonation of low calcium silicate phases takes place. The curing begins only when SC, CO₂ & H₂O(l) are simultaneously present in system and sequesters up to 300 kg of CO₂/t of SC. Solidia Cement reduces CO₂ emissions whereas Solidia Concrete consumes CO₂ gas. Dr. Sahu also showed and discussed about the mixture proportions, mechanical properties, air void parameters, freezing/ thawing, ASR & Sulfate resistance test results of Solidia Concrete. He summarized by telling that Solidia is sustainable as it reduces 30% CO₂ emissions during cement production and utilizes 20-40% CO₂ during curing of concrete. He concluded by telling that mechanical properties of Solidia Concrete are equivalent or better than OPC concrete with shorter curing period.



Carbonated Concrete



Polarized light microscopy



SEM X-ray map

Select feedbacks from the industry on the Webinar

- Very interesting & informative talk by Dr Sahu, we all need such research-based technologies both for use of low -grade materials as well as reduction of carbon footprint. Also thanks to Dr. Mohapatra for organizing the Webinar and providing this opportunity.
-**S K Wali, Whole Time Director, J K Lakshmi Cement**
- Congratulations to Dr. Sahu for an excellent presentation. As research is going on the carbonation problem and in-situ placement, once these issues are taken care, this will become the technology of future for reaching the goal of zero carbon footprint. I would also like to congratulate NCB for organizing such an excellent event.
-**Sh Ashwani Pahuja, Chief Sustainability Officer, Dalmia Cement (B) Ltd**
- Thanks Dr. Sahu for increasing our knowledge on this product. This research & innovation will help cement industry reduce its CO₂ emissions. It is very important for industry to know what is happening outside India. Thanks to Dr. B N Mohapatra for organizing the webinar and bringing this research topic to India:
-**Sh Raju Goyal, CTO, UltraTech Cement**
- Thanks to Dr. Sahu for excellent presentation and thanks to Dr. Mohapatra & NCB for organizing such a thought provoking webinar. Solidia is the future technology and some of things can be taken in today's perspective to reduce carbon footprint.
-**Dr Manish Karandikar, VP-Product Quality, ACC Ltd**
- Excellent webinar by Dr. Sahu. He has vast knowledge, expertise and delivered admirable presentation. We have learned so much from it regarding reduction of CO₂ emission.
-**Head (QA & QC), JK Cement**
- Thanks Dr. Sahu for nice presentation and presenting new kind of cement. Very encouraging results! When it will come for commercial production, it will help in using low grade of limestone. Thanks for enriching our knowledge. Also, thanks to Dr. Mohapatra and entire NCB team for organizing the webinar.
-**Dr A K Singh, Corp. Quality Head, UltraTech Cement**
- Thanks Dr. Sahu for such a nice presentation. Hope there will be fundamental research to make it mainstream going forward.
-**Sh Vivek Agnihotri, CEO, Prism Johnson Ltd**
- Interesting product, CO₂ reduction is need of the hour.
-**Sh Pankaj Kejriwal, Director, Star Cement**
- Thanks Dr. Sahu for such a nice presentation.
-**Sh Hariprasad Rao, JSW Cement**
- Excellent Lecture! Greetings to Dr. Sahu for excellent presentation. A promising subject put across the industry as a thought provoking one. Congrats to Dr. Mohapatra and NCB team for very interesting questions. I must say this was the best webinar I attended so far for clear 2 hrs.
-**Dr S K Handoo, Consultant, My Home**
- Great innovation! Excellent carbon sink for precast concrete elements! Best wishes to Solidia.
-**Dr Sujit Ghosh, ED-NP, Dalmia Cement (B) Ltd**

IMPORTANT DAYS CELEBRATED AT NCB

National Technology Day 11th May 2020

On National Technology Day, NCB organized two webinars on “**Application of XRD & Optical Microscopy for Process and Quality Optimization**”. DG-NCB, author of a book on the “Application of X-Ray Diffractometry in Cement Quality Control System” and an expert in this subject delivered the webinar lectures.

The first webinar was attended by more than 200 cement professionals of M/s UltraTech Cement Ltd. and the second webinar was attended by 80 professionals from various cement companies like ACC Ltd, Ambuja Cements Ltd., JK Cement, Dalmia Cement (B) Ltd., Shree cement, JK Lakshmi Cement, JSW Cement, Star Cement, Prism Johnson Ltd. and Max Cement.

A webinar on same topic was also held on 09th May 2020 and was attended & well appreciated by Senior officials from Process & Quality departments of 15 cement companies having multiple cement plants/ grinding units.

The feedback from the participants about the session has been extremely gratifying and each one of them have appreciated the effort. The program content was very informative, relevant and useful to the participants

–Kashyap Thorve, VP-Head, Business Centre of Excellence-L&D, UltraTech Cement Ltd.

Thank you for a great course and would like to extend my warm thanks to Dr. Mohapatra for organising an amazing webinar uses of XRD which is presented in an enthusiastic way & really enjoyable and informative.

–Prakhar Shrivastava, Head (QA & QC), JK Cement

The contents of the presentation were excellent. Our entire team enjoyed the program a lot. The Webinar gave a couple of ideas in understanding the XRD application in cement industry.

–Manish Singh, Technical Head, Prism Johnson Ltd.

Thanks Dr Mohapatra for nice presentation and in-depth mineral analysis through XRD and their impact on quality and process.

–Dr A K Singh, Corp Quality Head, UltraTech Cement

World Environment Day 05th June 2020



NCB celebrated World Environment Day on 05th June 2020. The theme of this year’s World Environment day was “**Celebrate Biodiversity**”. On this occasion, special plantation drive was undertaken by DG-NCB along with other officials.

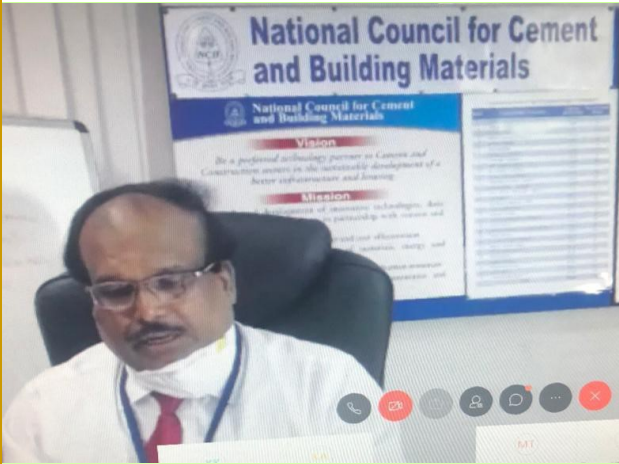


Sapling Plantation

On the occasion of World Environment Day 2020, special plantation drive was undertaken near front gate of NCB by
Dr B N Mohapatra, DG-NCB;
Dr S K Chaturvedi, Secretary – NCB;
Sh A Saxena, HOS-HRS/HOC-CME;
Dr D K Panda, HOC-CCE
and other officials/staff

IMPORTANT DAYS CELEBRATED AT NCB

DG's address on WED 2020



Through a virtual meeting DG-NCB addressed 140 engineers and scientists on the World Environment day. The World Environment Day is a reminder to express our gratitude to Mother Nature, which sustains all forms of life. Its main aim is to raise awareness to protect our nature and look at various environmental issues that are growing day by day.

World Environment Day 2020 focussed on *Biodiversity* was hosted in Colombia in partnership with Germany. This year the theme of World Environment Day 2020 was **“Celebrate Biodiversity”** with slogan **“Time for Nature”**. With 1 million species facing extinction, there has never been a more important time to focus on biodiversity.

Ecology and Biodiversity are integral to the ethos of India. The Atharva Veda says - *‘Mata Bhumi Putroham Prithivyah’* which means *‘Earth is my mother, I am her son’*.

India is recognized as one of the mega-diverse countries, rich in biodiversity and associated traditional knowledge. With just 2.4% of the land area, it accounts for nearly 7% of recorded species even while supporting almost 18% of the human population. India has 23.4% of its geographical area under forest and tree cover and more than 47,000 species of plants & 1,00,000 species of animals recorded so far. It holds tenth position in birds with 69 species, fifth in reptiles with 156 species and seventh in amphibians with 110 species. The country's share of crops is 44% as compared to the world average of 11% and has more than 50,000 genetically different strains of rice and 1,000 varieties of mango. It ranks first among the world's milk producing nations with huge biodiversity of 43 indigenous cattle breeds and 13 Buffalo breeds over 100 years. The four biodiversity hotspots in India are: **Himalayas, Indo-Burma region, Western Ghats and Nicobar group of Islands.**

The effects of COVID—19 remind us of importance of nature to our lives. The lockdown has given us opportunity to introspect the rich biodiversity around us. Much of the avian fauna which had disappeared due to sound & air pollution can be seen again and now after years we can once again listen to their melodic chirping.

Indian Cement Industry has been proactively implementing measures at its integrated cement plants and mining sites to ensure that local biodiversity is not disturbed. Many cement groups have initiated a water positive programme around mining sites to minimise the water requirement from natural resources. Numerous studies have demonstrated that quarries, gravel pits, and other open-pit mines can be valuable for environmental protection, for they offer undisturbed habitats for rare and protected species.

Sustainable mining practices protect and enhance the landscape and biodiversity value of the area around the mines of cement plants. Green belts developed by cement plants in and around the plant and mine areas, have transformed the land around mining sites to greener habitats. The green belt counteracts the negative impact of mining by reducing dust pollution and absorbing carbon emissions. Check dams constructed by cement plants in nearby villages help in recharging the ground water table and also preserves the biodiversity of the region.

Over the last few years, Indian cement industry has shown its commitment on various fronts like energy, quality, environment and sustainability. India is among those countries which are working hard to achieve national targets set to address climate change under Paris Agreement. The contribution of Indian cement industry in this regard is noteworthy and has got global acknowledgement on being environment friendly business operation. However, the major issues and challenges faced by the industry are depletion of cement grade limestone, availability of fossil fuel, generation of huge quantity of industrial waste and its utilization, lower utilization of fly ash, high energy consumption, high carbon footprint and control of gaseous emissions during cement production.

To overcome the above challenges, new cement systems using various varieties of waste are being explored extensively in India. NCB, being a premier R&D organization is devoted to environmental sustainability and is carrying out several studies for development of low lime and low energy cements to mitigate carbon footprint during cement production and conservation of natural resources by exploring alternate raw materials and unconventional SCMs in development of blended cements. By celebrating World Environment Day, we remind ourselves and others of the importance of caring for our environment. This is the responsibility of each of us to take part in this initiative of preserving our environment and is also a day for people from all walks of life to come together to ensure a cleaner, greener and brighter outlook for themselves and future generations.



What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another

Mahatma Gandhi

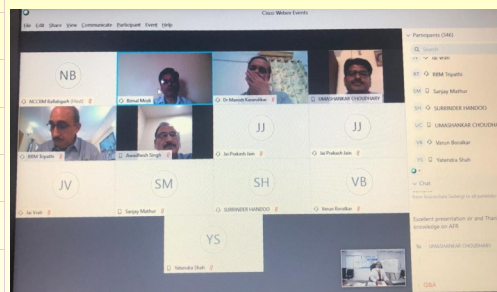
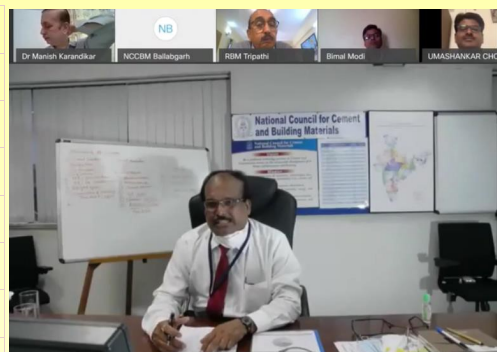
IMPORTANT DAYS CELEBRATED AT NCB

Webinar on Utilization of Alternate Fuels & Raw Materials: An Overview on the occasion of World Environment Day 2020

On the occasion of WED 2020, DG-NCB gave a comprehensive presentation in webinar to about 450 participants from major cement companies of India and abroad. The topics covered by DG-NCB & his multi-disciplinary team during the webinar were: Inventory of AFR in India, CPCB guidelines on co-processing of AFR, Characterization of AFR, System design requirements for using AFR, Process problems experienced due to enhanced usage of AFR and further optimization techniques, Environmental monitoring aspects to be covered, Impact of AFR on cement and concrete properties and Problems related to clinker quality and mineralogy while using AFR.

After AFR presentation, DG-NCB had a short interactive session with experts from the cement industry on status of AFR utilization in Indian cement industry & further steps that can be taken to increase AFR utilization. Experts like Sh Sanjay Mathur, Dr. A K Singh & Bimal Modi from M/s UTCL, Dr. Manish Karandikar & Sh J P Jain from ACC Ltd., Sh Varun Boralkar from Geocycle, Sh S K Handoo from My Home Industries, Sh R B M Tripathi & Uma Shankar Choudhary from J K Cement Works shared their valuable views and suggestions. DG-NCB thanked all panelist for sharing their valuable thoughts and experience on AFR. He assured that NCB will continue to support Indian cement industry in various aspects of AFR utilization & of continued interaction between NCB & industry. He informed that NCB is preparing a compendium on AFR and requested all plants to share data on AFR.

Organisation	Number of attendees
UltraTech Cement Ltd.	181
Dalmia Cement (B) Ltd.	55
ACC & ACL Ltd.	12
Shree Cement	14
J K Cement Works	62
J K Lakshmi Cement	13
The India Cements	5
My Home Industries	5
Prism Johnson Ltd.	7
Other plants	30
Foreign participants	7
Consultants	14
Academia	5



Views from the Panelists



The technical issues were covered in the presentation. However, an important part lies on the commercial challenges that needs to be addressed. Cement sector will use AF, provided that there is some kind of economic gain/ sense of using AF. NCB can work on the availability of AF cluster wise so that the logistics cost can be minimized. Because of economic non-viability, AF cannot be utilized. From this we can get data on how much is available in the cluster and how much is required. To reach the target of 25% TSR in the next 5 to 10 years, there should be a clear roadmap on what kinds of wastes will be required to be handled, technical challenges, availability and CAPEX required to utilize all the future wastes. Industry has done a lot in terms of investing of systems of utilizing alternative fuels, using waste plastics. NCB can work to provide a roadmap as the target of 25% TSR is a very aggressive target.

Dr. Mohapatra, the presentation was very comprehensive, fantastic and covered the entire spectrum of AFR which is very critical for cement industry in India.

- **Sh Sanjay Mathur, Head-SIG, UltraTech Cement Ltd.**

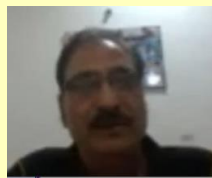


The way to maximise AFR with 10% TSR initially and 25% later: There are some challenges of availability in terms of volume. Consistent quality of fuel is required for enhancing AFR utilization. Thank you Dr. Mohapatra on utilization of AFR. Highly Technical presentation on World Environment Day. Congratulate you and NCB for covering the importance of trace elements as well as covering the importance of ash characterisation and impact on concrete. One of the best presentation on Alternate Fuels.

- **Dr. Manish Karandikar, VP-PQ, ACC Ltd.**

IMPORTANT DAYS CELEBRATED AT NCB

Views from the Panelists



There is a huge quantity of MSW available in all cities of India, opportunity for co-processing is huge but present utilization is very low. In this area, a task force should be there incorporating industries, govt. agencies and NCB can play a very important role. There should be a win-win situation. This is the need of today for clean environment and also the vision of PM. Thanks to Dr. Mohapatra for presentation on an important topic on World Environment Day. Nice presentation and all are enlightened by the presentation.

- **Dr. A K Singh, Corporate Quality Head, UltraTech Cement**



Congratulate & appreciate Dr. Mohapatra's efforts for organising remarkable & informative webinar which will benefit all cement plants working in this field. If it becomes economically viable the % TSR target of 25% is achievable. Utilizing AFR is pain more than gain. Commercial challenges and economic viability needs to be addressed. The cement industry should also show positivity and commit ourselves in utilizing AFR. By this attitude, we can achieve up to 15%.

- **Sh RBM Tripathi, Unit Head, J K Cement Works**



The cement manufacturing provides a unique way of disposing waste in an environment friendly manner. Polluter Pay principle is very much required for economic viability. Inventory of AFR has to be updated. I congratulate Dr. Mohapatra for organising the webinar and taking this initiative to connect the industry.

- **Dr. S K Handoo, Consultant, My Home Industries**



Indian cement industry has a long way to go in AFR usage compared to developed countries. This is the opportunity to serve the society, to reduce costs and protect environment. NCB and cement industry collaboration can go a long way in addressing the problems related with AFR utilization. The major quantum of AFR may come from MSW, the technical problems are there & known but economic model is completely missing. There should be a win-win situation for society, municipalities & cement industry. I request Dr. Mohapatra for making the AFR usage economically viable. For this, "Polluter Pay" principle needs to be implemented as it is in all developed countries.

Complimenting Dr. Mohapatra for organising the AFR webinar and wonderful presentation in which all aspects related to AFR in cement industry were discussed. The insights given by Dr. Mohapatra on various aspects of AFR like pre-processing, minor elements, trace elements, process quality will definitely help in understanding the subject and developing plans accordingly.

- **Sh Bimal Modi, Head-ADR, UltraTech Cement Ltd.**



The waste utilization at our plant started in 2017. The % TSR at our plant was 1 to 2 %. With the help of NCB we are able to install feeding system and process team highlighted the bottlenecks. The system was installed to handle all types of AFR. Last year, % TSR at our plant was 10% and now even during Corona effect, we have achieved 10-15% TSR. We are in touch with NCB regarding RDF gasification. In future we'll provide data to NCB on % TSR and waste utilization.

- **Sh Umashankar Choudhary, Technical Head, J K Cement Works**



The target is achievable. Our plant is going to achieve 20% TSR. The main challenge in co-processing of waste is to handle the waste with safety. For achieving 25% TSR target in India level, there should be SOPs on safe handling of waste. Pre-processing facilities like Geocycle are very much required for handling and pre-processing the waste. Very insightful & in-depth presentation on the different aspects of AFR and impacts of AFR on cement & concrete.

- **Sh J P Jain, DGM-QC, ACC Ltd., Wadi**

Wonderful presentation. Outlined all the most complex technical matters in simplest manner. Due to co-processing of waste, the benefit that cement industry will get is a lot less than the benefit it will have to environment and public health. In terms of environment issues, if you have more and more co-processing of multiple wastes in a single kiln, the emission points are reduced. Reduction in land use is also reducing for disposal of waste. The APCE installed in cement industry can never be installed in any other thermal processes. So from environment point is no issue for AF utilization. Du to overall waste management, public health and hygiene will improve. Waste management industry will also benefit by partnering with cement industry. Without Polluter Pay principle the waste management infrastructure cannot be set up. Viable economic models are required. Chlorine will become major challenge in 25% TSR target, we will have to extract kiln dust which is already calcined, how to utilize kiln dust will also be an issue when we go for 25% TSR.

- **Sh Varun Boralkar, GM, Geocycle**

IMPORTANT DAYS CELEBRATED AT NCB

Select feedbacks from the participants on AFR webinar organized on WED 2020

Nice and very informative session. But impact of barium bearing mineral has to be explored. We face serious productivity issue at MCW, due to barium containing limestone. Jaiprakash Vrati, Head-QC, Ambuja Cement

Excellent presentation, described all the aspects of AFR that can be used in cement industry. Yatendra Shah, The India Cements Ltd.

Excellent presentation & covered most of the areas...Thanks a lot...V Sundararajan, Regional Quality Head, DCBL

It was definitely an informative webinar. Thank you. Pankaj Sood, Dy G M, Holtec Consulting

Very good preparation and presentation material. Dr Arunachala Sadangi, UltraTech Taluja

Many thanks Dr. BNM sir for the wonderful and insightful presentation on the different aspects of AFR quality as well as it's effect on the clinker and cement properties. Dr. Manish Kuchhya, UTCL

It was very good presentation which was mainly focussed on how to improve the TSR % in India by using AFR materials in substitute to conventional fuels so that we can save the conventional fuel materials as well as we can also use the waste products/ by-products from various industries. Dr. Mukesh Kumar Mishra, Dalmia Cement Research Centre, Chennai

It was excellent presentation taking care of pre and co-processing and also quality. Gaurav Patel, Dalmia Cement, R&D

World Accreditation Day 09th June 2020



NCB celebrated World Accreditation Day on 10th June 2020. World Accreditation Day is celebrated every year on 09th June. It is a global initiative by ILAC and IFA to promote the value of Accreditation. This year's theme focused on "**How Accreditation improves food safety**". On this occasion, DG spoke about importance of accreditation, its benefits and how NCB has shown commitment to quality & excellence by ensuring accreditation of its various testing & calibration laboratories as per relevant IS standards. He also emphasized that NCB is also an accredited PT provider, accredited Third Party Quality Inspection agency & is soon going to be accredited Reference Material Producer. He asked scientists and engineers to ensure commitment to quality and adhere to the requirements of various standards. Sh PN Ojha, Head-CDR, Sh Panduranga Rao, Unit In-charge, Bhubaneswar and Sh Amit Trivedi, Head-CQC & MMS also spoke about significance of accreditation at the event.

NCB congratulates Cement Manufacturers' Association (CMA) on its 59th Founder's Day

DG-NCB congratulates entire team of CMA on their founder's day for rendering yeoman service to cement industry, society and to the nation at large. It was a matter of pride & accomplishment when one ponders the kind of service CMA is giving particularly in helping the Govt. of India for enhancing the ease of doing business in field of cement and construction. The various initiatives undertaken by CMA in tandem with Govt. of India initiatives such as the recent one of co-processing of plastic waste in cement kilns and the role played by CMA was exemplary and lauded by one and all. National Council for Cement and Building Materials and CMA are closely working together for the development and growth of Indian cement industry. While NCB is conducting frontline research and development activities, CMA as active partner of NCB plays a catalytic role in promoting research outcomes from NCB research programs to the user industry. Some important projects of NCB include new clinker system for cement industry, high MgO clinker for blended cement, composite cement based on fly ash & limestone, Portland Limestone Cements, CCU, solar energy utilization and so on.

CMA provides an effective interface with various Govt. departments such as DPIIT, MoEF & CC, CPCB, BIS, MORTH, Ministry of Mines, railways, coal ministry, etc. for helping the cement industry on various issues. Under the able guidance of Sh Mahendra Singhiji as Chairman and Ms Aparna Dutt Sharma as Secretary General, CMA is poised for a still bigger role to play in the times to come particularly post COVID 19 period. NCB wishes CMA and its entire team a grand success in all its endeavours.

INTERACTION WITH ACADEMIA

NCB welcomes new students of BITS-Pilani for Industrial Training

NCB, a well-established Practice School Station, recognized for internship by BITS welcomed 20 number of fresh interns in its campus on 19th May 2020 to carry out their industrial training projects. DG-NCB welcomed the students for their industrial training assignments and told that the institute adheres to a sense of values which makes it unique in its field of endeavor. NCB is committed to provide services of highest quality to its clients and come out with novel, viable and sustainable solutions, not only for good of their business but also for the society at large. He briefly explained various on-going R&D works currently being carried out at NCB. He also wished some of such projects would bring out much interest in younger generation.

Project allocation was done after carrying out discussions, according to discipline and interest. Students shall be working on projects like: (i) Utilization of coarse fly ash in cement manufacturing, (ii) Cement manufacturing, economy, specifications & its correlation of characteristics, (iii) Energy efficient manufacturing of clinker using alternative raw materials and economic analysis, (iv) Mechanical properties of structural light weight concrete, (v) Compressive Behavior of High Strength Reinforced Concrete Columns, (vi) Implementation of pre-cast/ pre-fab technologies in housing sector, (vii) Study of low cost housing using sustainable glass fibre reinforced gypsum technology, (viii) Fresh, hardened and durability performance evaluation of concrete made with Portland Limestone Cement, (ix) Effect of aggregate on fresh and hardened concrete properties, (x) Thermodynamics & Kinetics of carbon steel reinforcement corrosion in concrete, (xi) Process impact & remedial measures to enhance alternative fuels in Indian cement industry, (xii) Quality Assurance of ELV works at India Trade Promotion Organization (ITPO) Pragati Maidan, (xiii) Thermodynamic calculations of heat balance of cement kiln, (xiv) Thermal dehydration kinetics of phosphogypsum and making usable for cement manufacturing process, (xv) Study and analysis of the optimum ratio of coal and renewable based electrical power generation in India with respect to carbon footprint, (xvi) Simulation of heat flow using python, (xvii) Utilization of Refused Derived Fuel (RDF) in cement industry, (xviii) Cement manufacturing process and developments in kiln burners during their internship at NCB-B.

ADMISSION NOTICE

Post-Graduate Diploma in Cement Technology 2020-21

(Approved by AICTE, Ministry of HRD, Govt. of India)

NCB, an apex body under the administrative control of Ministry of Commerce & Industry, Govt. of India, is devoted to Research and Development, Technology Transfer, Consultancy and Training for Cement and Construction Industries. Applications are invited for admission to One Year (Sept. 2020 to July 2021) Post Graduate Diploma in Cement Technology offered by NCB. **Applications are invited for admission to One Year (September 2020 to July 2021) Post Graduate Diploma in Cement Technology offered by NCB.**

NAME OF COURSE	ELIGIBILITY	ANNUAL FEE
Post Graduate Diploma in Cement Technology	M.Sc. (Preferably Chemistry) or B.E/B.Tech (Preferably Chemical Engg., Cement Technology) with consistently good academic career & minimum 60% marks of equivalent grade in qualifying exam	Self Sponsored candidates ₹ 60,000/- (which includes tuition fee, simulator training & institutional facilities)

Curriculum course includes Theoretical classes, Laboratory & Simulator based training and Cement Plant training. Emphasis given to practical & industry oriented training. Faculties are Scientist and Engineers having vast experience of cement industry. **Recruiters** are leading cement manufacturers. **All previous batch students placed with good salary package. Limited 18 seats** to be filled by Online Interaction, link will be shared with short listed candidates (check our website regularly or contact us). **Session for the year 2020-21 commences from First Week of September 2020.** For more queries, contact: Dr DK Panda:-Head of Centre: 9868795977; Rayees Ahmed: -Course Coordinator: 8700600195; Sh KPK Reddy:-Dy Manager: 8743834993. Office (D) : 0129 4192 245/339/423/338/468/467.

Interested candidates should send application by 15 July 2020, giving personal information including category (General/Sponsored/SC/ST/Others), address for correspondence, contact number, e-mail address, educational qualifications (10th Class onwards), working experience, if any. Reservations for SC/ST & persons with disabilities will be as per Government rules. Certificate from appropriate authority may be furnished for reserved categories. A non-refundable Application Fee of ₹. 500/- (Rupees Five hundred only) for General category & ₹. 125/- (Rupees One hundred twenty five only) for candidates falling under reserved categories, is payable through following payment mode. Filled scanned copy of Application with necessary scanned documents should be mailed to cceb@ncbindia.com. In view of COVID 19 NCB will conduct classes online mode (based on the conditions) and the student selection process based on academic aggregate screening (05th August 2020) and online interview mode (10th August 2020). Results declaration (14th August 2020). Application form is available on NCB website. Candidates are advised to visit NCB website for latest information www.ncbindia.com/ncb-cce-events.php

Details for Online Payment : State Bank of India, CRI Faridabad Branch, Faridabad-121004

<https://www.onlinesbi.com/> → SB collect → Proceed → State of corporate/Institution: (All India) → Type of corporate/Institution: (Govt. Department) → National Council for Cement and Building Materials → Training → Submit

For further queries contact : Head, CCE, NCCBM. E-mail:cceb@ncbindia.com; Website: ww.ncbindia.com

INTERNAL COMPETENCY BUILDING

Web presentations on Supporting future requirement for “Increasing Thermal Substitution Rate (TSR) in Indian Cement Industry”

NCB is committed to achieve the vision laid down by the Indian cement industry of increasing its TSR to 25% by 2025. For ensuring this, a series of presentations were given by group of scientists & engineers at NCB to support and guide the cement manufacturers in their journey to initially achieve 10% and beyond 25% TSR in due course. It was also envisioned by DG-NCB that having an internal discussion on such an important topic will not only help in increasing competency level of scientists and engineers but also aid in preparation of international level training course material which may be used later for knowledge dissemination through CCE training courses. The topics covered through presentations by various groups of multi-disciplinary scientists and engineers during the course of a one week webinar were:

TOPICS	BROAD ASPECTS DISCUSSED
Characterisation and AFR testing	Testing of raw & AFR material and characterisation, AFR Quality Assurance incl. sampling procedures, critical parameters to be tested and frequency of testing.
Clinker chemistry	Importance and impact of AF and minor elements on clinker chemistry.
Clinker mineralogy	Importance and impact of AF on clinker mineralogical properties.
Cement & Concrete quality	Importance and impact of AF on cement chemistry & concrete and mitigation measures.
Process Engineering and Chemistry	Raw mix assessment and design, AFR Quality Assurance practices, impact of minor elements & trace elements and process engineering aspects.
Cement kiln operation for co-processing of AF	Detailed discussion on process requirements, operating parameters, design changes and operating philosophy.
Kiln Refractory	Impact of AF on Refractory in Kiln, Pre-heater & Calciner and mitigation measures against such impacts.
Environment monitoring during co-processing	Critical parameters to be monitored while using various categories of AF, Global practices and stack monitoring requirement.
System design for pre & co-processing of AF	Salient features, design/ selection of AF handling system and limitations in flexibility in system handling various categories of AF.
Safety Aspects	Salient features, design and selection of safety systems

‘Unlocking’ during Lockdown at NCB

The lockdown inspired DG-NCB to initiate the process of unlocking the true power of NCB, the knowledge and expertise in multi-disciplinary fields gained through academics and experiences, residing within every individual working here. He proposed to start online webinar lectures to be given by all engineers and scientists everyday in respective fields of their expertise and share their valuable experiences which they have gained while working in various capacities in different organizations. The webinar which continued for 2 months covered >150 lectures from >70 subject experts on topics ranging from types of cements, limestone classification & mineralogy, raw mix design, pyro-processing & grinding operation & optimization measures, application of XRD and XRF, optical microscopy, iso-calorimetry, SEM, concrete micro-structure durability and mix design, Integrated Management System and ISO implementation, IS 17025:2017, Atomic Absorption Spectroscopy, physical, chemical testing & hydration of cement, alkali activated concrete, uncertainty in measurement, ready-mix concrete applications & self-compacting concrete, distress assessment in mass concrete structures, fire performance of concrete, advances in pyro-processing and grinding technologies, green building concept, 3-D printing, environmental monitoring methods, construction practices, TPQA aspects, CFD applications in cement industry, Solar PV power plant and Safety at construction sites to name a few. Such a knowledge exchange initiative and topics were not only well received but also appreciated by one and all.

ADIEU

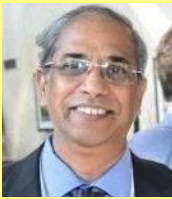
NCB bids farewell to its esteemed employees



Sh Vir Vikram Arora, Joint Director: Sh V V Arora retired on the 29th May 2020 after a long and dedicated service of about 31 years. He joined NCB in 1989. During his long association with NCB, he made significant contribution in Centre for Construction Development and Research (CDR). He was the Unit-In-Charge of NCB-Ahmedabad unit as well as Head of CDR. As Head, he expanded activities and created state-of-the-art facilities for research. Under his able guidance, CDR achieved remarkable performance in research as well as service oriented projects.



Sh M Selvarajan, General Manager: Sh M Selvarajan retired on the 30th April 2020 from NCB after a long and dedicated service of about 34 years. He joined NCB in 1986 and made significant contribution in Centre for Mining, Environment, Plant Engineering & Operation. He performed excellently in the field on Environmental Monitoring and was Program Leader of Environment Management Group. He worked in EIA projects, environment monitoring, noise & groundvibration studies and led the team for COINDS project of CPCB.



Sh S Sridharan, Manager (SEC) & PS to DG: Sh S Sridharan retired on the 29th May 2020 from NCB after a long and dedicated service of about 37 years. He joined NCB (*the then Cement Research Institute of India*) in 1983. He worked with all the Director Generals of NCB and made significant contribution both in Secretariat & DG's Office. He was conferred with Best Supporting Staff Award in the year 1996. He performed excellently in conducting Board, Board Committees and EC Meetings. He received Certificate of Appreciation for his Extraordinary Contribution to NCB from Dr. B N Mohapatra, DG, NCB in March 2019.

HOMAGE TO THE REMARKABLE



Dr. Ajoy Mullick a Cement and concrete technology consultant, had over 45 years' experience in research, design, consultancy, teaching & R&D management, & devoted his life to the propagation of sustainable concrete practices. He successively occupied positions of Director General of NCB; Director (*Research and Technical Services*) of Saurashtra Cements, Mumbai; Chief Technical Adviser, Vasavadatta Cements, Sedam (*Karnataka*); besides being Advisor/ Consultant to Grasim Industries (*Cement Marketing Division*), ELKEM (*India*), BEKAERT Industries (*India*), E.I. DuPont (*India*), SINTEF Building and Infrastructure, Norway, and many other organisations.

Dr. Mullick & his colleagues at NCB did the spadework to usher in the concept & assessment of cement plants in India on the basis of co-efficient of variation. He was at the forefront of advocating the use of fly ash; granulated slag & silica fume in cement & concrete and pave their adoption in Codes of Practices and Specification. Incidence of ASR was established through path-breaking research carried out by him & his colleagues at NCB. His research on ternary cement blends, especially in high performance concrete, is now well accepted in practice in India. He was active in standardization activities of BIS, IRC and RILEM, Paris.

He was chairman of 9th ICCC (*International Congress on Chemistry of Cements*) in 1992; the first person from India invited to deliver Fulton Memorial Lecture in South Africa (1995), and first person invited to deliver Plenary Presentation at 10th ICCC at Goteborg, Sweden (1997). Dr. Mullick was recipient of ICI-FOSROC Award for Outstanding Concrete Technologist (2001). He received ICI Lifetime Achievement Award for 2010 and authored 170 papers, two books, two book chapters and co-inventor of six patents. DG-NCB and the entire NCB family prays that this noble soul rests in peace and gives its heartfelt condolences to his family & friends.

It is a loss to me personally. **Dr S.C Ahluwalia**.
Very sad to know that. We pray for his departed soul. **Mr S.Chatterjee** (*Ex NCB*)
Very sorry to know the sad demise of our Dr Mullick. May his soul rest in peace in heaven. **Dr Ali** (*Ex NCB*)
Extremely sad to know. I have very fond memories of him. May his soul rest in peace. This is shocking. **Dr Lopamudra Sengupta** Vice President, JSW Cement Works.
A great authority on Cement and Concrete Dr. A. K. Mullick passed away yesterday. Om Shanti. **Dr Manmohan Kalgal**, UltraTech Cement Limited.
He was a very knowledgeable & authoritative speaker. **Dr Ramachandran**, UltraTech Cement Limited.
Om Shanti! **Dr Subrato Chowdhury**, Ex R&D Head, UltraTech Cement Limited.
I am saddened as Cement Industry is poorer today with the demise of Dr A K Mullick. RIP. **Dr Shailendra Chouksey**, Ex Chairman NCB.
Sad to know this. Will convey my condolences to his bereaved family. **Mr D.B N Rao**, Ex DG-NCB.
I mourn the sad demise of Dr. Mullick. I was greatly impressed by this storehouse of knowledge. My heartfelt condolences. **Mr Himalaya Bhattacharya** CEO & ED, OCL India Limited
It is very sad to hear about Dr. Mullick's sudden demise. I knew him for many years for his contribution in NCCBM, BIS & other programs. I pray his soul rest in peace. **Mr. C.M.Dordi**
Always had very pleasant & fruitful interactions with him. He was an expert in concrete technology & kept himself updated with developments. We certainly miss him. May his soul rest in peace! **Mr. M Vasudeva** Ex. DG-NCB

- It is a loss to me personally. **Dr S.C Ahluwalia**.
- Very sad to know that. We pray for his departed soul. **Mr S.Chatterjee** (*Ex NCB*)
- Very sorry to know the sad demise of our Dr Mullick. May his soul rest in peace in heaven. **Dr Ali** (*Ex NCB*)
- Extremely sad to know. I have very fond memories of him. May his soul rest in peace. This is shocking. **Dr Lopamudra Sengupta** Vice President, JSW Cement Works.
- A great authority on Cement and Concrete Dr. A. K. Mullick passed away yesterday. Om Shanti. **Dr Manmohan Kalgal**, UltraTech Cement Limited.
- He was a very knowledgeable & authoritative speaker. **Dr Ramachandran**, UltraTech Cement Limited.
- Om Shanti! **Dr Subrato Chowdhury**, Ex R&D Head, UltraTech Cement Limited.
- I am saddened as Cement Industry is poorer today with the demise of Dr A K Mullick. RIP. **Dr Shailendra Chouksey**, Ex Chairman NCB.
- Sad to know this. Will convey my condolences to his bereaved family. **Mr D.B N Rao**, Ex DG-NCB.
- I mourn the sad demise of Dr. Mullick. I was greatly impressed by this storehouse of knowledge. My heartfelt condolences. **Mr Himalaya Bhattacharya** CEO & ED, OCL India Limited
- It is very sad to hear about Dr. Mullick's sudden demise. I knew him for many years for his contribution in NCCBM, BIS & other programs. I pray his soul rest in peace. **Mr. C.M.Dordi**
- Always had very pleasant & fruitful interactions with him. He was an expert in concrete technology & kept himself updated with developments. We certainly miss him. May his soul rest in peace! **Mr. M Vasudeva** Ex. DG-NCB



ABOUT THE COUNCIL

National Council for Cement and Building Materials (NCB), set up in 1962, then known as Cement Research Institute of India, is the apex body in India under the administrative control of Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India, devoted to research, technology development and transfer, education and industrial services for cement, building materials and construction industries. Its multi-disciplinary activities are performed in an integrated and coordinated manner through its units that are located at Ballabgarh (Near Delhi), Hyderabad, Ahmedabad and Bhubneswar. The six corporate centres of the council guide the activities at different units. The centre and their main areas of activity are :

Centre for Cement Research & Independent Testing (NCB-CRT) - Fundamental and Basic Research, Cement and other Binders, Waste Utilization, Refractories & Ceramics and Testing Services.

Centre for Mining, Environment, Plant Engineering & Operation (NCB-CME) - Geology, Mining & Raw Materials, Process Optimization & Productivity Enhancement, Energy Management, Plant Maintenance, Project Engineering & System Design, Environmental Management.

Centre for Construction Development & Research (NCB-CDR) - Structural Optimization & Design, Structural Assessment & Rehabilitation, Concrete Technology and Management.

Centre for Industrial Information Services (NCB-CIS) - Industrial Information and Data Bank, Integrated IT Solutions, Publication, Seminars & Conferences, International & National Linkages, Image Building.

Centre for Continuing Education Services (NCB-CCE) - Long-Term & Short-Term Courses, Special Group Training Programmes, Simulator Based Courses, Workers' Development Programmes.

Centre for Quality Management, Standards & Calibration Services (NCB-CQC) - Total Quality Management, Calibration Services, Development and Supply of Certified Reference Materials.

National Council for Cement and Building Materials

(Under the Administrative Control of Ministry of Commerce & Industry, Govt of India)

34 km Stone, Delhi-Mathura Road (NH-2), Ballabgarh-121 004, Haryana, India

Tel: +91-129-2242525, 4192222, 2242051, 4192401(after office hours)

E-mail: dg@ncbindia.com

Hyderabad Unit

NCB Bhavan, Old Bombay Road,
Gachibowli

Hyderabad-500 008, (Telangana)

Tel: +91-40-23180400,
23180426

E-mail: hyd2_ncbhyd@bsnl.in

Ahmedabad Unit

Smeet Bungalows, B/h. Planet
House-2 (PH-2)

Opp. Shukan Shubh-Labh Aptt.,
Off. Judges Bungalows Road
Boadakdev, Ahmedabad-380 054,
(Gujarat)

Tel: +91-79-26855840

E-mail: brcncb@rediffmail.com

NCB Bhubaneswar-Project Office

Plot No. 145, Zone-B, Shed No.4
IDCO Central Store

Mancheswar Industrial Estate
Bhubaneswar-751 010, (Odisha)

Tel: +91-9010325172

E-mail: ncbodisha@gmail.com