



Centre for Cement Research and Independent Testing



CEMENTS AND OTHER BINDERS

Services Offered

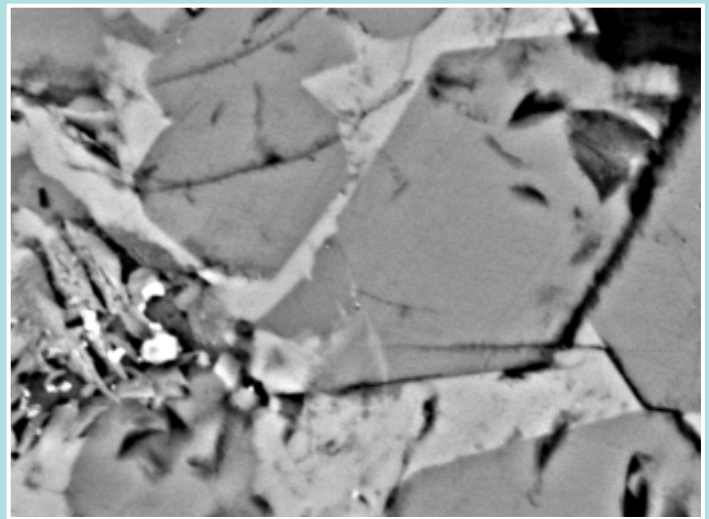
- ☞ Establishing Limestone Consumption Factor (LCF)
- ☞ Characterization & Evaluation of raw materials & Fuels
- ☞ Optimization of raw mix design
- ☞ Utilization of marginal / low grade limestone in the manufacture of cement and building materials
- ☞ Development of newer cements, composite formulations, alternate binding materials
- ☞ Improving clinker/cement quality
- ☞ Investigations on lump formation in cement silos/bags and remedial measures
- ☞ Effect of minor constituents on clinker/cement quality
- ☞ Optimization of SO_3 content in cement
- ☞ Studies on use of mineralizers in clinkerization



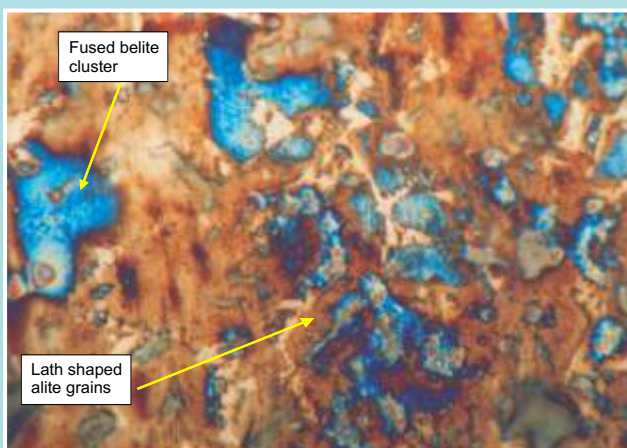
Shotcreting of NCB-Quick set formulation inside tunnel at a dam site

Achievements

- Meeting delivery schedules and targeted quality of delivered cement through minimizing/eliminating lump formation in silos/bags for 6 cement plants.
- Utilizing flyash, low grade limestone and additives in cement manufacturing through optimization of raw mix design for 44 cement plants.
- Optimisation of cement properties such as, setting time and early strength through optimization of clinker quality, PSD and SO_3 content.
- Carried out 143 LCF studies for cement plants resulting in :
 - Rationalization of limestone consumption
 - Estimating limestone royalty payable
 - Internal material audit in cement plants



Electron-Micrograph of OPC Clinker



Optical Micrograph of control OPC clinker fired at 1450°C (50x)



Optical Micrograph of mineralized OPC clinker fired at 1400°C (50x)

WASTES UTILIZATION

- ☞ Techno-economic feasibility studies on utilization of industrial wastes such as fly ash from thermal power plants, blast furnace slag and non-conventional slags (lead-zinc slag, copper slag, LD slag etc.) from metallurgical industries, lime sludges from chemical, paper, sugar, fertilizer, refinery, soda ash and carbide industries, red mud from aluminum industries, phospho-gypsum from fertilizer industry and agricultural wastes such as rice husk ash in manufacture of OPC, blended cements and other building materials.
- ☞ Typical studies on enhancing the level of fly ash content in the manufacture of PPC and in lime-flyash bricks/blocks
- ☞ Utilization of raw materials like dolomitic limestone, low grade limestone, shale, fly ash, bottom ash etc in making slag comparable to BF slag.
- ☞ Utilization of marble industry wastes in making artificial marble coatings, tiles, bricks and blocks etc.
- ☞ Development of gypsum board and tiles utilizing by-product gypsum.



Fly ash bricks in construction

Achievements

Waste Materials	Benefits based on NCB Studies	
Flyash from Thermal Power Plants	Increase in utilization up to	8% in PPC manufacture and 85% in brick manufacture
Lead-Zinc Slag (ISF Slag) From Hindustan Zinc Ltd.	Utilization up to	6% as raw mix component, and 5% as performance improver in OPC
Copper Slag from Sterlite Industries Ltd.	Utilization up to	2.5% as raw mix component, and 5% as performance improver in OPC
Steel Slag From Tata Steel Ltd.	Utilization up to	2% as raw mix component, and 5% as performance improver in OPC
Spent Pot Lining from NALCO	Utilization up to	1.5% as raw mix component
Red Mud from NALCO	Utilization up to	4% as raw mix component
E-cat from Oil Refinery	Utilization up to	10% in manufacture of blended cement
Marble Dust from Marble Industries	Utilization up to	5 to 15% as raw mix component
Soda Ash Sludge from Soda Ash Industry	Utilization up to	6 to 25% as raw mix component
Lime Sludges from Different Industries	Utilization up to	25 to 70% as raw mix component
Jarosite from Hindustan Zinc Limited	Utilization up to	1.5% as raw mix component



Marble based flooring tiles



Granulated Slag sample



Copper slag generation

REFRACTORIES AND CERAMICS

Services Offered

- ☞ **Diagnostic studies / investigations related to**
 - Premature refractory failures in cement rotary kilns
 - Damage assessment during shipment of refractories
 - Quality evaluation of fresh refractories lot at cement / refractory plant
 - Loosening of brick rings in cement rotary kiln during operation
 - Coating and build-up formation/ring formation
 - Kiln shell corrosion
- ☞ **Refractory management studies and optimization of refractory lining performance**
- ☞ **Development and technology transfer of refractory products**
- ☞ **High temperature investigations**
 - Devitrification studies of slag, alumino silicates, etc.
 - Refractory-raw mix interaction studies
- ☞ **Technical suitability of industrial wastes in refractory and ceramic industries**
- ☞ **Comprehensive thermal investigation of refractories using state-of-art equipments heating microscope, thermal analyzer, PCE, RUL, Spalling, PLC, etc.**



Brick sample from cement kiln at 24m indicated heavy discoloration due to infiltration of gases



Corroded rotary kiln shell



Crushed light weight sintered aggregate

Achievements

- **Developed high performance refractory products for cement plants:**
 - Alumina Zircon Refractory (AZR) Bricks for transition zone
 - Magnesia Spinelide Refractory Bricks for burning zone
 - High Strength Insulating Bricks for preheating zone
 - Coating Repellent Castables for build-up prone areas
- **Light weight sintered aggregate based on 99.5% industrial wastes for construction industries.**
- **Use of NCB-AZR bricks in rotary kiln improved productivity by up to 10%.**
- **Trouble shooting services to 20 cement plants with following benefits:**
 - Kiln uptime increase by up to 12%
 - Fuel consumption reduction by 2-3%
 - Lining performance synchronization for one year
 - Trouble free kiln operation



Refractory kiln furniture utilizing spent catalyst from refinery



Ceramic pottery-ware utilizing refinery waste

FUNDAMENTAL AND BASIC RESEARCH

Areas of Research

- ☛ Exploratory studies related to materials science
- ☛ Application of nano technology for enhancing the cement performance
- ☛ Development of novel cement systems and additives such as geopolymer, composite cement, portland limestone cement etc.

Services Offered

INDEPENDENT TESTING

- ☛ Complete physical, chemical, mineralogical and micro structural analyses of various types of cement, clinker, pozzolana, aggregate, concrete, admixtures, water, refractories, bricks, limestone and other raw materials, coal, lignite, etc as per national and international standards.

Achievements

- About 7000 samples are tested every year. The samples are mainly from BIS, Cement and Construction Industries and public sector organizations in India as well as from neighbouring countries.

Facilities

- ISO 9001 -2008, NABL Accredited and BIS Certified Laboratories
- Laboratory Information Management System (LIMS)
 - Performs coding of samples, generation of test reports and data storage and retrieval
 - Facilitates smooth and efficient operations in Test House
- State-of-the-art testing equipment



Flame Photometer



Heating Temperature Furnace



Orbital Shaker



X-RAY DIFFRACTOMETER (XRD)

- Mineralogical and phase analysis of raw materials, industrial by-products, clinker, cement, aggregates and concrete.
- Diagnostic studies on unstable kiln coating, ring formation, build-ups and kiln shell corrosion.



X-RAY FLUORESCENCE SPECTROMETER (XRF)

- Chemical characterization of raw materials, additives, clinker, cement, pozzolanic materials, gypsum, etc.
- Facility for bead preparation.



FOURIER TRANSFORM IR SPECTROMETER

- Fully automatic, computerized and state-of-the-art equipment
- Determination of functional groups such as carbonate, sulphate, silicate, aluminate, etc.
- Characterization of cements, admixtures and fuel.



CHNS ANALYZER

- Ultimate analysis of various types of fuels for carbon, hydrogen, nitrogen and sulphur.



ADIABATIC BOMB CALORIMETER

- Computerized and fully automatic instrument.
- Determination of calorific value of coal and other fuels.



PARTICLE SIZE ANALYZER

- Fully automatic and rapid analysis of particle size distribution in cement and other powder samples.



Pulverizing Equipment



Transverse Strength Testing Machine



Hardgrove Grindability Test Apparatus

DIFFERENTIAL THERMAL ANALYZER

- Thermal behavior of raw materials, kiln feed and fuels up to 1450°C.
- Decarbonization and clinkerization reactions.
- Hydration characteristics of cements.



INDUCTIVELY COUPLED PLASMA SPECTROMETER

- Estimation of toxic and non-toxic elements present in trace amounts in cements, industrial waste/by-products, water, effluents, etc.
- Rapid and simultaneous analysis of elements.



OPTICAL MICROSCOPE

- Mineralogical, microstructural, granulometric analysis of raw materials, aggregate and clinker etc.
- Evaluation of different types of coarse and fine aggregates for alkali-silica reaction.
- Petrographic investigation of silt of different origin.
- Model percentage and granulometric analysis of fly ashes and slags.
- Petro fabric analysis of rocks.



AUTOMATIC COMPRESSION TESTING MACHINES

- 2000, 1000, 350, 100 & 50 kN capacities.
- Compressive strength determination of cement mortar and concrete samples.



HEATING MICROSCOPE

- High temperature behaviour of raw materials, fuel ash, refractory, etc.
- Sintering studies.
- Initial Deformation Temperature (IDT), Spherical Temperature (ST), Hemisphere Temperature (HT) and Flow Temperature of Fuel Ash.



SCANNING ELECTRON MICROSCOPE WITH EDXA

- High magnification (upto 200000x) and high resolution (3nm) microstructural, nanostructural investigations and elemental mapping of clinker, hydrated cement, aggregate and concrete etc.
- Point-to-Point chemical Analysis by EDXA.



Mortar Cube Vibrator



Flame Photo Meter



PH / ION Meter

OUR VALUED CUSTOMERS/BENEFICIARIES

▪ A. P. Government, Hyderabad ▪ Bureau of Indian Standards ▪ Central Pollution Control Board, New Delhi ▪ Central Pulp and Paper Research Institute, Saharanpur ▪ Delhi Metro ▪ Dhrangdhra Chemical Works, Dhrangdhra ▪ Gammon India ▪ Hindustan Zinc Limited, Udaipur ▪ Indian Oil Corporation, R & D Centre, Faridabad ▪ Jindal Steel Works, Torranagullu ▪ L&T ▪ Ministry of Environment and Forests, Govt. of India ▪ National Aluminium Company Ltd., Bhubaneswar ▪ National Environmental Engineering Research Institute, Nagpur ▪ National Mineral Development Corporation, Hyderabad ▪ Rajasthan State Pollution Control Board, Jaipur ▪ Rajasthan State Minerals Development Corporation, Jaipur ▪ Reliance Industries Ltd. ▪ State Directorates of Mines and Geology ▪ Sterlite Industries (India) Ltd., Tuticorin ▪ Tata Steel Limited, Jamshedpur ▪ Thermal Power Plants - Nasik, Panki, Obra, Badarpur, Faridabad, Kota, Dhanu ▪ United Nations Industrial Development Organisation



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