Zero Energy System for Precast Concrete

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Business Development manager
BASF segments

Chemicals
- Petrochemicals
- Monomers
- Intermediates

Performance Products
- Dispersions & Pigments
- Care Chemicals
- Nutrition & Health
- Paper Chemicals
- Performance Chemicals

Functional Materials & Solutions
- Catalysts
- Construction Chemicals
- Coatings
- Performance Materials

Agricultural Solutions
- Crop Protection

Oil & Gas
- Oil & Gas
- Petrochemicals
- Monomers
- Intermediates
Innovation
Meeting challenges, developing new business areas

Research for the future: with our innovative products and processes, we provide sustainable solutions for global needs.

- Expenditures for R&D circa €1.84 billion, world leader in chemical industry
- Around 10,650 employees worldwide involved in research and development
- Strongest innovation power in the chemical industry (No.1 in the Patent Asset Index)
- Around 3,000 projects
- Around 1,300 new patents registered in 2013
- Targets 2020: circa €30 billion sales and circa €7 billion EBITDA from innovations
BASF in India

- BASF had its first business contact with India in 1890
- 9 manufacturing sites, 8 sales offices
- R&D facilities are part of Global Technology Platform
- Sales 2013: INR 7900 Crs.
- Employees (as on 31st Dec’13): 2254
- 13 out of 14 global businesses operate in India
- Mangalore plant in India is BASF’s largest manufacturing site in South Asia

Dahej site – BASF’s greenfield project with single largest investment in India of 1000 crores
Partnering India’s growth story

**Invisible contribution, visible results. BASF contributes to Bandra-Worli Sealink**

**Prosperity for farmers through BASF’s Samruddhi project**

**BASF Construction Chemicals - keeping India’s Parliament House dry**

**Tata Nano on the roads with BASF’s light weight and colorful solutions**

**BASF skincare solutions enable HUL to help their customers look beautiful**

**BASF’s no-smell paints are innovative and eco-friendly at the same time**

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Area of expertise

Improving Concrete
Repairing Concrete
Protecting Concrete
Traditionally Vibrated Concrete (Precast Concrete)

Promoted on the basis of

- Speed in Construction
- Improved quality of products
- Material & labor savings
- Savings in the construction process

Common aim of any precast process is to accelerate concrete hardening in order to increase production output, without sacrificing quality and durability.
Economic Elements of a Precast Process

» COST OF THE MIX
» COST OF LABOUR
» COST OF ENERGY
» COST OF MAINTENANCE
» PRODUCTION CAPACITY
Economic Elements

Cost of the Mix

- Quantity of cement
- Type of cement
- Inorganic addition

Cost of Labor

- Difficulty of placing
- Congested reinforcement
- Vibration time
- Forms handling
Economic Elements

Cost of Energy

» Vibration
» Steam
» Hot water

Cost of Maintenance

» Forms, vibrators, wear and tear
» Steam generators
» Mixers
Economic Elements

Production Capacity/Output

» Concrete placing time
» Curing cycle
» Steam treatment
» Form demoulding
» Time to tendons cutting
Precasters Wish List

- Steam curing elimination in all conditions
- Elimination of vibration
- Cycle shorter than 12-14 hours
- Demoulding after 4-6 hours
- Cement content lower
- Reduction in labour cost
- Architectural surface and finishing
Zero Energy System (ZES) is a new technology developed to help producers of precast concrete change production processes in a way that will allow them to achieve energy reductions or elimination in various aspects of their operations.
The Mechanism of Action
RHEODYNAMIC™ CONCRETE

Kinetic Energy

RHEODYNAMIC™ CONCRETE

Is An Optimisation and Evolution
of Self Compacting Concrete
RHEODYNAMIC™ CONCRETE:

- Superior homogeneity of the mix
- Minimum energy dissipation
- Superior speed of self compaction
- Superior filling ability

The optimum exploitation of ENERGY is the key to go beyond the initial concept of Self Compacting Concrete
Mechanism of Action of a Superplasticizer

» Diffusion of the molecules of superplasticizer in water

» Adsorption of the molecules of superplasticizer on the surface of the cement granule

» Repulsion between the cement particles electrostatic (and steric) effect

» Dispersion
Diffusion and Adsorption of BNS molecules

Electrostatic Repulsion

BNS molecules
Diffusion and Adsorption of Standard GLENIUM Molecules

Electrostatic and Steric Repulsion

GLENIUM molecules
The shape of the molecules is one of the key issues of the mechanism of action.

Standard Molecule of MasterGlenium

Molecule of MasterGLENIUM ACE
Diffusion and Adsorption of the Molecules of GLENIUM ACE

Electrostatic and Steric Repulsion

Molecules of GLENIUM ACE
Standard MasterGlenium

The molecules cover all the cement surface = BARRIER

The hydration of the cement proceeds slowly

MasterGlenium ACE

The molecules of the New Polymer leave > FREE SURFACE

The hydration of the cement proceeds rapidly
The adsorption proceeds slowly so that part of the polymer is adsorbed onto hydration products:

- the hydration reaction is delayed
- formation of a Second Barrier
The adsorption of GLENIUM ACE proceeds rapidly:

No formation of Second Barrier-Cement hydration is not delayed.
Mechanism of Action of MasterGlenium ACE Summary:

Accelerated evolution of the heat of reaction

Rapid formation of hydration products

Decreased porosity of the cement paste/concrete
Quantitative determination of the Hydration Products 
Thermo Gravimetric Analysis (TGA)

ettringite 
Cement Gel
C$_3$A hydrates 
CaCO$_3$
Ca(OH)$_2$
The higher rate of the cement hydration can be observed in terms of:

- Quicker evolution of the heat of reaction
The higher hydration ratio generates a more compact structure of the cement paste, thus a higher compressive strength and superior durability.

Porosity

- Plain
- GLENIUM 51
- GLENIUM ACE

Pore Diameter [μm]
The contribution of GLENIUM ACE to the hydration

The properly designed molecule...

...controlling the hydration rate...

...and utilizing the heat of reaction in the best way...

...leads to a fast curing of the concrete without the need of external thermal energy
Rheodynamic Concrete

Rheodynamic concrete is self-consolidating without the need for vibration during placement, reducing the energy required to operate and maintain vibration systems.

The technology of RHEODYNAMIC concrete assures:

» Thorough concrete mixing
» faster discharge rates,
» less energy to run mixers,
» less wear and
» maintenance on the mixing equipment.
MasterGlenium ACE

GLENIUM ACE acts on the hydration kinetics of cement, without affecting the morphology of the hydrated products. MasterGlenium ACE accelerates the hydration of cement.

The heat of hydration released in the first few hours is able to self-accelerate the hydration process, and therefore the strength development. It allows producers to maintain a regular production cycle, without steam, even at 8-15°C (45-60°F).
ZES Implementation

Structural Precaster Use of *Rheodynamic* Concrete
ZES Implementation
Seeing is Believing

Up to..

50% savings in labour

50% savings in time

Smart Dynamic Concrete
Advantages of Smart Dynamic Concrete

1. Reduced Labour Requirement & Faster Completion
ZES Implementation
ZES Implementation

Structural Precaster Finish Using *Rheodynamic* Concrete
Applications
East West Gas Pipeline project
Shrinkage In Cement – 2 Stages

» Plastic shrinkage
  ■ When the grout is wet (fluid or plastic).
  ■ Loss of excess free water
  ■ Up to 2%
  ■ Irreversible

» Drying shrinkage
  ■ After the grout has hardened. Loss of capillary water
  ■ In a few days to an year
  ■ Max. 0.3%
  ■ Depends on climate
  ■ Reversible

» Both shrinkages caused by loss of water.
Shrinkage Compensated Grouts – 2 Types

» General Purpose Grouts
  ■ Only Plastic shrinkage compensated
  ■ ASTM C 1107 type A grout

» Precision grouts
  ■ Plastic and hardened shrinkage compensated
  ■ ASTM C 1107 type C grout

» Ideally, grouts must be formulated not to shrink – type C!

Designation: C 1107 – 02

Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)\(^1\)
BASF: Non shrink Grouts

» MasterFlow 928 T: Precision Grout, 1 day = 35 MPa, 28 days = 75 MPa

» MasterFlow 718: General Purpose Grouts, 1 day = 20MPa, 28 days=65MPa

» MasterFlow 715: General Purpose Grouts, 1 day = 15MPa, 28 days= 50 MPa
MasterSeal (Conipur) Membranes
Engineering Waterproofing

Where to Use Conipur ® systems?

- Concrete
- Exterior-grade plywood
- Stadiums
- Balconies
- Podiums
- Complex roof structures
- Old Heritage Structures & Old Roofs
- Car parks
- Plant rooms
- Plazas
- Incidental metal surfaces
- Roofs
Zurich Airport Carpark
Roof parking - Stockton, Castlegate, UK
Cape East, Dubai
Shopping Mall, Abu Dhabi
MAIA Shopping, Porto Portugal
MAIA Shopping, Porto Portugal
MAIA Shopping, Porto Portugal
mall shopping, Sutton Coldfield UK
mall shopping, Sutton Coldfield UK
Hotel Kremlin Palace, Antalya, Turkey
Hotel Kremlin Palace, Antalya, Turkey
Radio station FM Choice, London, UK
Mosque, Kuala Lumpur Malaysia
Mosque, Kuala Lumpur Malaysia
Nestlé, Kuala Lumpur Malaysia
House in Cologne Germany
BRIGADE METROPOLIS - BANGALORE (2008)
(12500sqmts) Coniroof on Curved Concrete Roof
PREM MANDIR PROJECT - MATHURA (2009)
Coniroof on Marble Stone Roof (2000sqmts)
W.H.O South East Asia Regional Office – Delhi (2009)

Roof Waterproofing (1600Sqmt)
(Substrate: Concrete/ thermocrete/ Tiles/ Bitumen)
Coniroof applied on the Dome (Substrate Stone) (1200sqmts)

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Master Builder Solution
Jawahar Bhawan – Delhi (2010)
Coniroof applied on Podium Slabs for landscaping (600sqmt)
Complete Bathroom Waterproofing Protective System
Waterproof Protective System comprises of:

- **MasterSeal 561** (Formerly Known as PCI Lastogum) a **Ready to Use waterproof, flexible protective coating for use under ceramic coverings** in showers, bathrooms and other internal wet areas.

- **Pecitapes**, a special waterproof sealing tapes for corners and perimeter joints, pipe culverts and floor drains in bathrooms.
System Approach:

**STEPS:**

- Inspection & System Assessment
- Leakage Testing in Slab by water ponding
- Surface Preparation (repairs / rectification of defects in concrete substrate)
- Treatment to pipe penetration & cutouts to make it watertight
- Fixing of Pecitapes Sealing Tapes & Profiles to corners & perimeter joints.
- Waterproof Protective Coating System application on the substrate
- Testing
- Laying of screed to protect (as per requirement)
- Tile Fixing using Tile adhesive.
Recommended Use :

» For Indoor use

» For Walls & Floor

» For wet areas not exposed to pressurised water, such as bathrooms, showers in residential buildings, hotels, old people's homes and hospitals.

» On moisture-sensitive, absorptive substrates, e.g. plasters, plaster slabs, gypsum fiber boards, plaster boards, wooden chipboards, anhydrite screeds in moist and wet areas subject to usual domestic use.

» On absorptive mineral substrates, e.g. concrete, screed, render, aerated concrete,
MasterSeal 561 System Built-up

- Corner Secured Using Pectitape Corner Sealing Tape
- Sealant
- Plaster
- MasterTile 30 Tile Adhesive to fix Tiles
- Primer
- Pipe Penetration Waterproofed with Pectitape Wall Gasket
- MasterTile 100 – Coloured Tile Grout to fill the tile joints
- MasterTile 100 tile Grout
- Drainage Gully waterproofed with Pectitape floor gasket patch
- MasterSeal 561 Waterproof Protective Coating under ceramic tiles
- MasterSeal 399 – Primer
- Wall/Floor Junctions secured against movement & water ingress with Pectitapes
System Installation:
Tile Fixing: using Tile Adhesive & Tile Grout
Waterproofed – Well finished Bathroom
Thank you!!!!