





# FRIGATE TEKNOLOGIES

your partner for state-of-art technology

Frigate Teknologies is a diversified global conglomerate providing integrated Design, Engineering, Procurement, Construction & Project Management Services in Aviation, Cement, Energy, Marine, Mineral Processing, Steel and other associated downstream sectors.



**FRIGATE manages projects globally for the cement and mineral processing industry.**

A dynamic enterprise, Frigate explores and pursues the enormous opportunities in markets globally. An excellent track record for successful completion of projects within tight schedules, lends credibility, encouraging clients to trust us with repeat orders. New contacts will find us approachable and friendly, those who know us well, consider us professional and trustworthy.





## PYRO PROCESS

Full Pyro Line

Pyro Audit & Upgrade

Low pressure high efficiency cyclone

Segmental Dip Tube

Low NOx Calciner

Pendulum Flap : Nearly 100% air tight

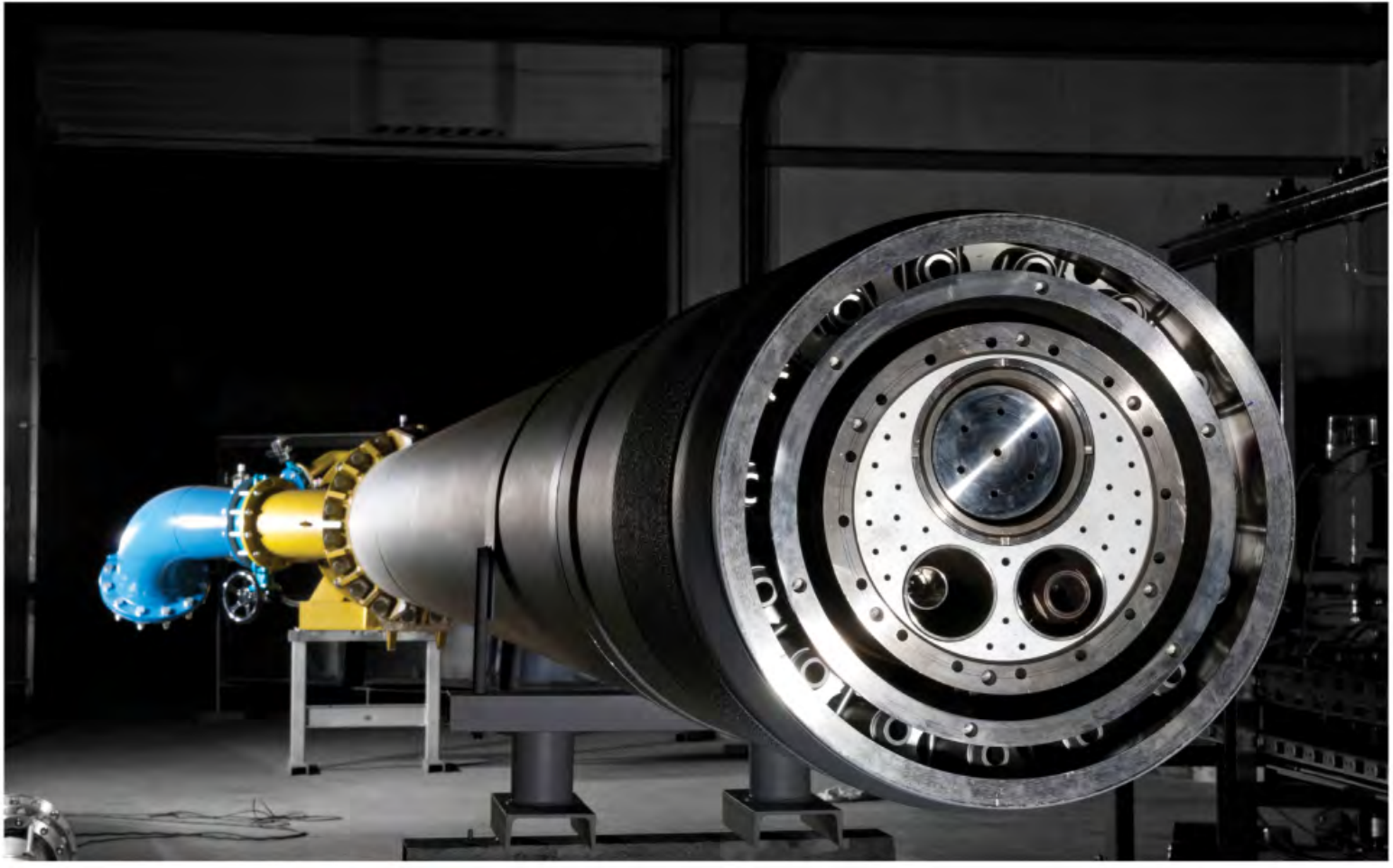
Splash Box : Optimized meal distribution and heat exchange

Chlorine and Alkali By - Pass

Waste preparation and feeding system as Alternate Fuel

Kiln Inlet Seal





## BURNER SYSTEM

M.A.S.<sup>®</sup> Kiln Burner  
Calciner Burner  
Burner Management System  
Hot Gas Generator  
Fuel Supply System

In Technical Collaboration with

**unitherm**  
EMCON







## CLINKER COOLER

The Fons Delta Cooler has set new worldwide standards for clinker coolers.

- Efficient horizontal transport system (SHUTTLE floor)
- Bearing system (4 - JOINT MECHANISM) >> correct linear motion of shuttles
- For new plants >> Lower height of the whole pyro line
- Patented airflow control system (STAFF) >> Optimal heat recuperation
- Modular design >> Can fit into any existing casing
- Hydraulic drive station consumes: 0.3 kWh/t clinker
- Total fan flow of 1.55 - 1.80 Nm<sup>3</sup>/kg clinker >> Clinker exits at 65 deg C + ambient
- Total cooler fans consumes: 3.5 - 4.0 kWh/t clinker
- Lower stoppage time for retrofit projects
- Perfect sealing in-between lanes
- No through-fall of clinker
- No hopper under the cooler
- No under-grate compartment







## PAN CONVEYOR

Deep Pan Conveyor

Deep Bucket Conveyor

Pivoting Pan Conveyor

Reversible Pan Conveyor

Belt Pan Conveyor

- Suitable for heavy duty applications and high temperatures
- Horizontal conveying and inclines (depending on material) to 60°
- Pan widths from 400 to 2,400 mm
- Close bucket arrangement for conveying of fine particle bulk materials
- High bucket stability - integral traverse in bucket
- Forward and backward overlapping of the bucket
- Conveying capacity up to 1,486 m<sup>3</sup>/h
- Conveying capacity regulation through frequency controlled drive
- Reduced spillage due to overlapping design
- Application for conveying hot material and also as a cooling conveyor



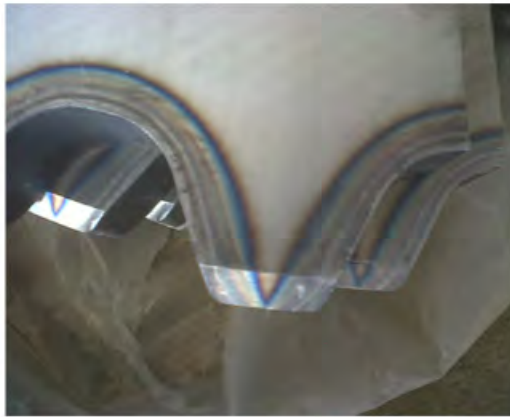


# SPARES FOR PAN CONVEYOR



## PANS & BUCKETS

- Creep resistant steel
- Spillage proof overlap design
- Guaranteed identical replacement



## CHAIN & SPROCKET

- Pin Bush Type
- Alloy Steel (Heat Treated)
- Case hardening of wear surface
- Segmental Sprocket
- Odd no. of teeth >> Double sprocket life
- Origin : EU



## ROLLERS

- Case hardened to 60 HRC
- Forged Steel Roller : C 60
- Forged Pin : C 50





## BUCKET ELEVATOR

Chain Bucket Elevator

Belt Bucket Elevator

Lifting height to 90 m (Chain) & 200 m (Belt)

Conveying capacities up to 2,000 TPH

Material temperature up to 250° C (Chain) & 130° C (Belt)

High tensile strength of the steel reinforced belts

Segmented - friction linings on all drive pulley (Belt)

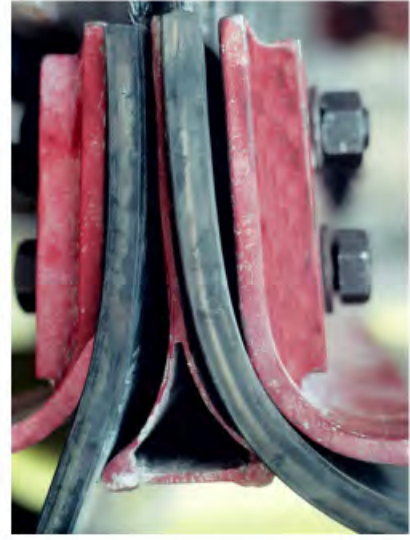
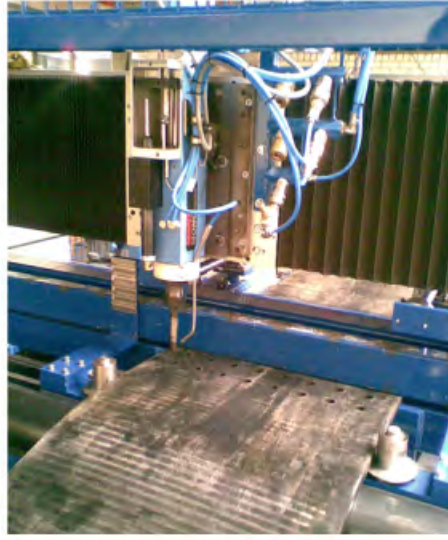
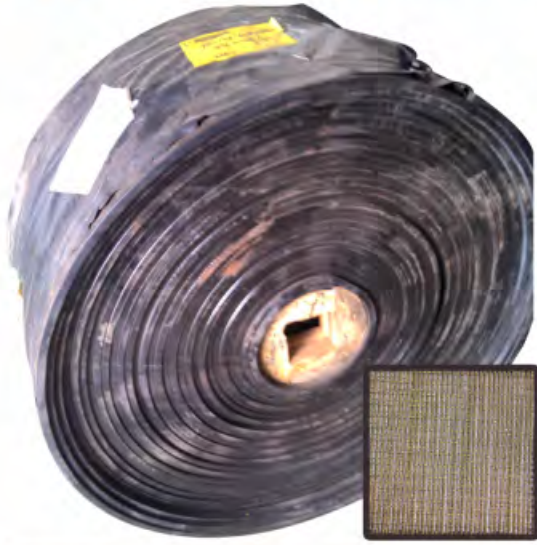
Forged central chain with large link surface

Segmented Drive Ring (Chain)

Assembly casing with large doors for easy access



# SPARES FOR BUCKET ELEVATOR



## STEEL CORD BELT

- Steel Cord carcass
- Carcass construction in warp & weft
- Temperature resistant upto 160 deg C.
- Strength : 1,200 N/mm
- Belt Origin : EU



## CHAIN, SPROCKET, TRACTION WHEEL

- Pin Bush Type
- Alloy Steel (heat treated)
- Case hardening of wear surface
- Segmented sprocket
- Odd no. of teeth >> Double sprocket life
- Origin : EU



## SAFETY SWITCHES

- Belt Sway Switch
- Zero Speed Switch
- Boot Level Indicator
- Position Switch for manual over-ride coupling
- Position switch for auto tension device
- Origin : EU



## PULLEY

- Bar Drum Assembly (Boot)
- Segmented Lagging (Head)





## SILO SYSTEM

Inverted cone, normal cone  
Flat Bottom Silo  
Continuous Blending Silo  
Clinker Silo

- Clinker Silo with dustless extraction gates (sector gates)
- Single compartments, ring and multi compartment silos
- Silos for storage of cement / flyash / ground slag
- High extraction efficiency (guarantee emptiness 99% in case of inverted cone silo)
- Low aeration air >> low power consumption
- Aeration air is take out along with material >> No lump formation.
- Higher blending efficiency
- Complete equipment range >> Open and Closed airslide, manual & pneumatic cut off gate, dosing valves, parallel distributors, adaptor box, bin weighing and aeration system, solid flow feeders, control panels, piping etc.





## STOCKYARD SYSTEM

Linear Stockyard  
Circular Stockyard

- Linear Stacker
- Circular Stacker
- Bridge Reclaimer
- Stacker cum Bucket Wheel Reclaimer
- Portal Scraper Reclaimer
- Semi - Portal Scraper Reclaimer
- Cantilever (Side) Scraper Reclaimer







## RAPID RAIL LOAD OUT STATION

- High load rates up to 7,000 TPH
- Handle a random arrangement of rail wagons of varying capacity and types.
- Load with accuracies which meet all statutory requirements.
- Allow for variation of particles size and bulk density of loaded material.
- Handle different material through same facility.
- Integrated Wagon Compaction System.







## WAGON TIPPLER

- Meets Indian Railways RDSO's G33 Rev 1 requirements.
- Two Designs : C-Frame Rotary Tippler & Turnover Wagon Tippler
- 25 tips per hour
- Wagon Tippler capacity of 140 tonnes
- Moveable articulated side wall design
- Positioning of wagons by Side Arm Charger or wagon progression system
- Mandatory wheel gripper
- Mandatory retractable wheel chocks on outhaul side
- Wagon bogies spring release mechanisms







## CRUSHING & SCREENING STATION

Primary Crushing  
Secondary Crushing  
Crushing & Drying

- Feeding Hoppers
- Apron Feeders
- Reciprocating Feeders
- Single Roll Crusher
- Double Roll Crusher
- Jaw Crusher
- Impact Hammer Crusher
- Vibrating Screen (Ultraflo, Vibropulse, Truflor) with single or multi deck configuration.







## CONVEYOR SYSTEM

Belt Conveyor : Overland, Curved, Sidewall  
Cable Hauled Conveyor

Pipe Conveyor  
Aerial Ropeway

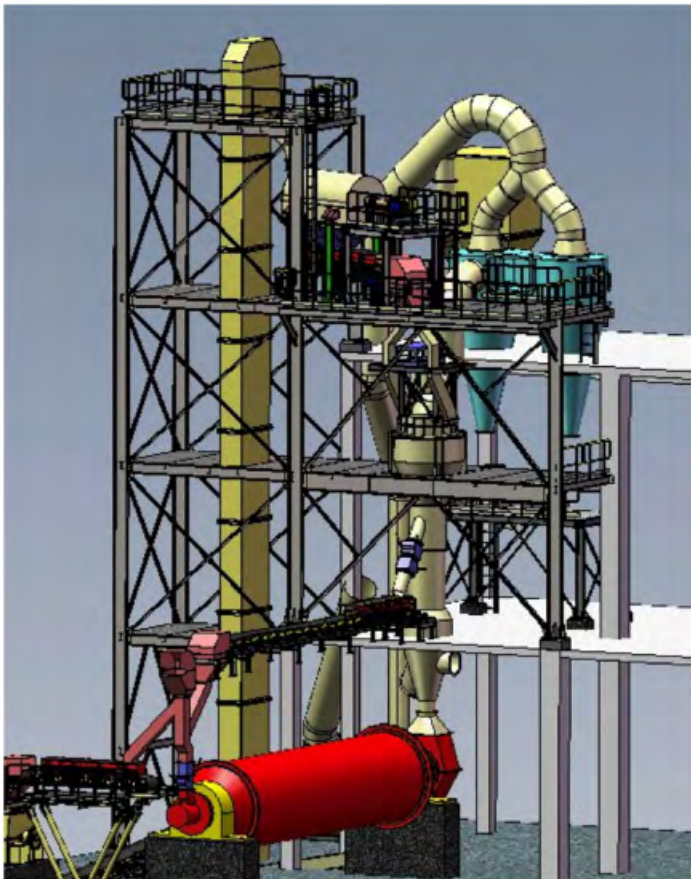






## BALL MILL

- Mill Shell with internal or external flanges
- With machined bands for sliding supports
- Heads (for traditional mills, without sliding pads)
- Toothed band in forged steel Cr Mo
- Sliding pads, easy to adjust through an oleo-dynamic system
- In composed execution, with neck in forged steel
- Enbloc in cast steel GS 20Mn5
- Crown gear in composed electro-welded execution





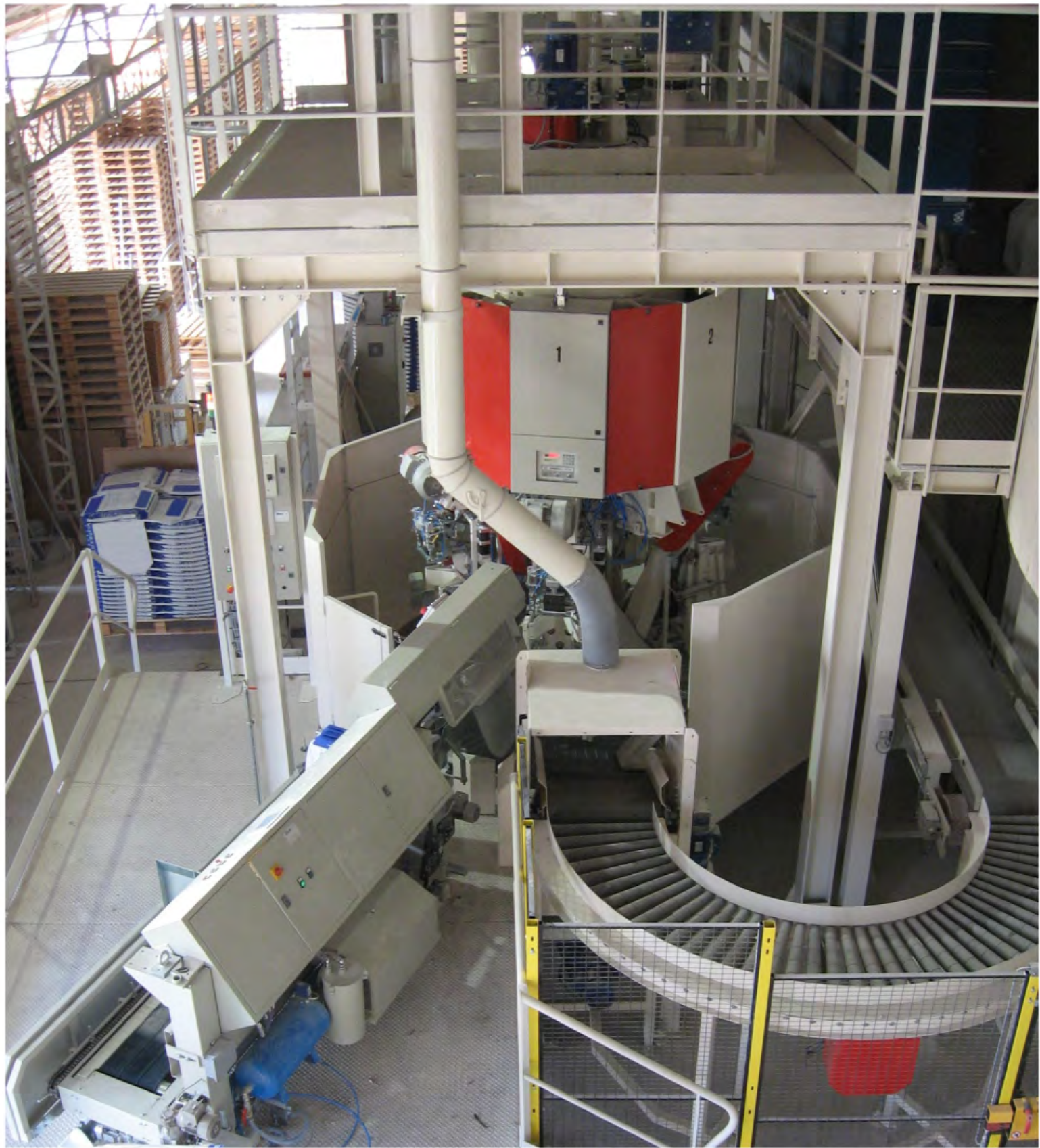


## DYNAMIC CLASSIFIER

- Very low absorbed power
- High cutting efficiency: imperfections  $< 0.2$
- Cylindrical casing with inspection doors
- Feeding from top, bottom, top + bottom simultaneously.
- Circular damper with swivelling counter blades
- Turbine with specially designed rotor blades and anti-vortex plates.
- Cutting range from 6 to 300 microns
- Sharp tromp curves.
- Wear protection lining
- Inner cone for tailing
- Drive system with speed variation







## PACKING STATION

- In Line Packers, Rotary Packers
- Equipped from 3 spouts to 16 spouts
- Production rates up to 6,000 bags/hour
- Bags capacity from 10 to 60 kg
- Bag type : Paper
- Bag valve : 90 to 180 mm
- In-line weighing system
- Supply voltage 400V, 50Hz
- Installed impeller power : 5.5kW
- Motor & Panel protection class IP55
- Compressed air pressure : 600kPa
- Noise emission < 78 dB (A)
- Integral Bag shooter with storage capacity of 700 bags
- Weighing system certified as per OIML
- Bag valve sealing system using Ultrasound, Sonotrode
- Entire packing station automated and controlled by PLC





## BAGGED DESPATCH SYSTEM

### Truck Loader

- Floor mounted
- Roof suspended
- Combo (floor & roof)

### Wagon Loader

- Rail Mounted with 3 dimensional movement
- Loading on 1 side or 2 sides of platform
- Load closed & open wagon

(BCN-HL, Box N, Box N-HL, BCN, BCNA, BCNA-HS)

### Barge Loader

- Portal arm includes a conveyor belt
- Spiral chute
- Centre turntable & loading head
- 1 to 3-step telescope loading head







## CEMENT TERMINAL

Fully integrated Cement Import & Export Terminal

- Ship Loader & Unloaders
- Barge Loader & Unloaders
- Ship Loading rates upto 2000 TPH
- Ship unloading rates upto 1000 TPH (bulk)
- Can handle self discharging bulk carriers
- Silo in RCC or steel construction
- Bagged cement dispatch through barge loader, truck loader, wagon loader
- Mobile Silo
- Terminal can handle clinker import too
- Cement despatch in bulk through bulkers (bowsers)
- Integrated facility can include RMC plant
- Terminal operation : 24 \* 7 \* 365







## SHIP (UN) LOADER

In Technical Collaboration with



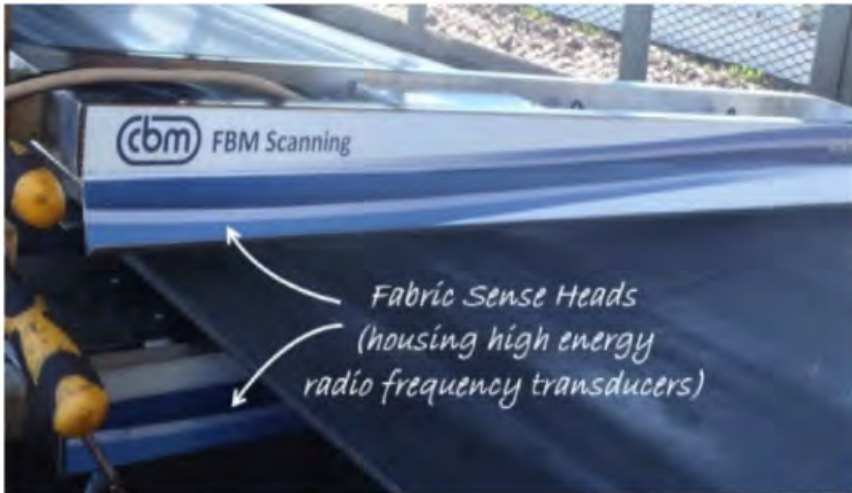
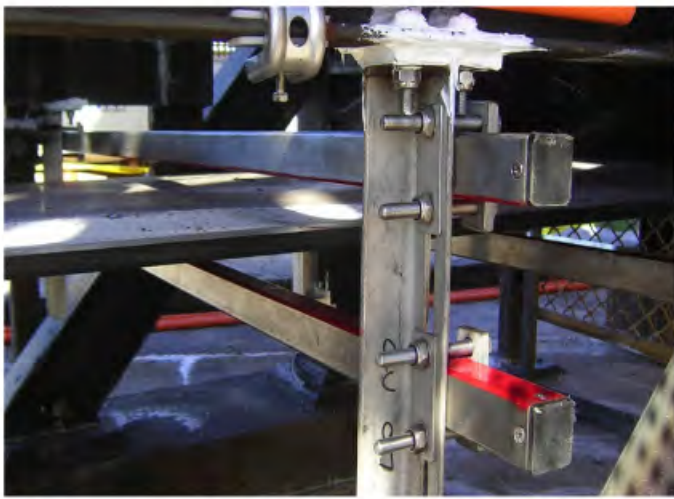
- Ship Unloader up to 800 TPH
- Road Mobile Ship Unloader 225 TPH
- Ship Loader from 200 TPH to 800 TPH
- Dome and silo aeration and extraction equipment

- Dust free operation
- Hurricane aeration system >> reduced power consumption
- Pinch valves >> reduced maintenance costs
- Rotating fluidizing nozzle >> reduced forces in suction arm
- Dense phase conveying systems
- Loading arms with radio remote control

Pneumatic ship (un)loaders for dusty, abrasive powders:  
Cement | Fly Ash | Alumina | Granulated Slag







# CONVEYOR BELT MONITORING

In Technical Collaboration with



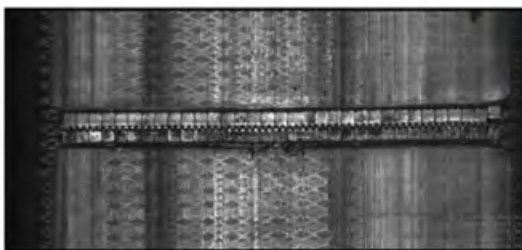
## Fabric Belt Scanning

Fabric Belt Monitoring (FBM) utilizes high-energy radio frequency transducers to:

- Locate internal damage with aid of an Encoder
- Interrogation of Splice events
- Scan data provides a unique "palm print" for future comparison

## Steel Cord Belt Scanning

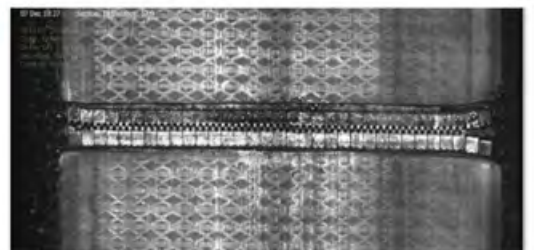
- Based on MFL (Magnetic Flux Leakage) System
- System is designed to spot anomalies or damage within the steel cords of conveyor belting, invisible to the naked eye.
- Scanning applied to Belt Conveyor, Pipe Conveyor, Side Wall Conveyor



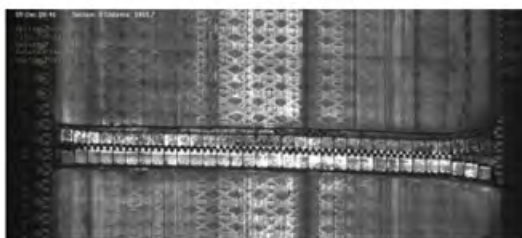
03 Dec - Moderate damage - still acceptable

## Beltspy Vision Detection

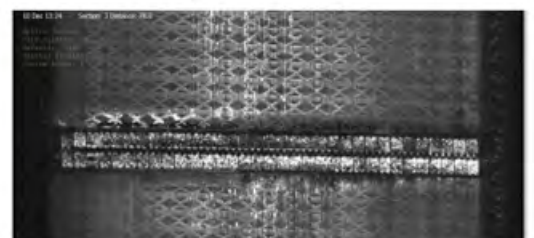
- Auto damage detection while conveyor is operational
- Programmed Parking - Repair Station
- Accurate cover damage
- Reliable early detection



07 Dec - Damage is deteriorating - requires close monitoring



09 Dec - Damage becomes critical - requires immediate repair



10 Dec - Clip joint has been repaired





## SERVICES

- Owner's Engineer
- Plant Audit
- Erection & Commissioning
- Operation & Maintenance
- Stabilization of plant production
- Equipment Retrofit & Upgrade
- Spares





# CEMENT TECHNOLOGY WORLDWIDE

[www.frigate.in](http://www.frigate.in)



EACH PROJECT IS  
**100% CUSTOM BUILT**



Concept to Commissioning

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