



CHRYSO & Innovation

CONFIDENTIAL

We are a GLOBAL PLAYER



1,130
EMPLOYEES



22
SUBSIDIARIES



24 Applications labs

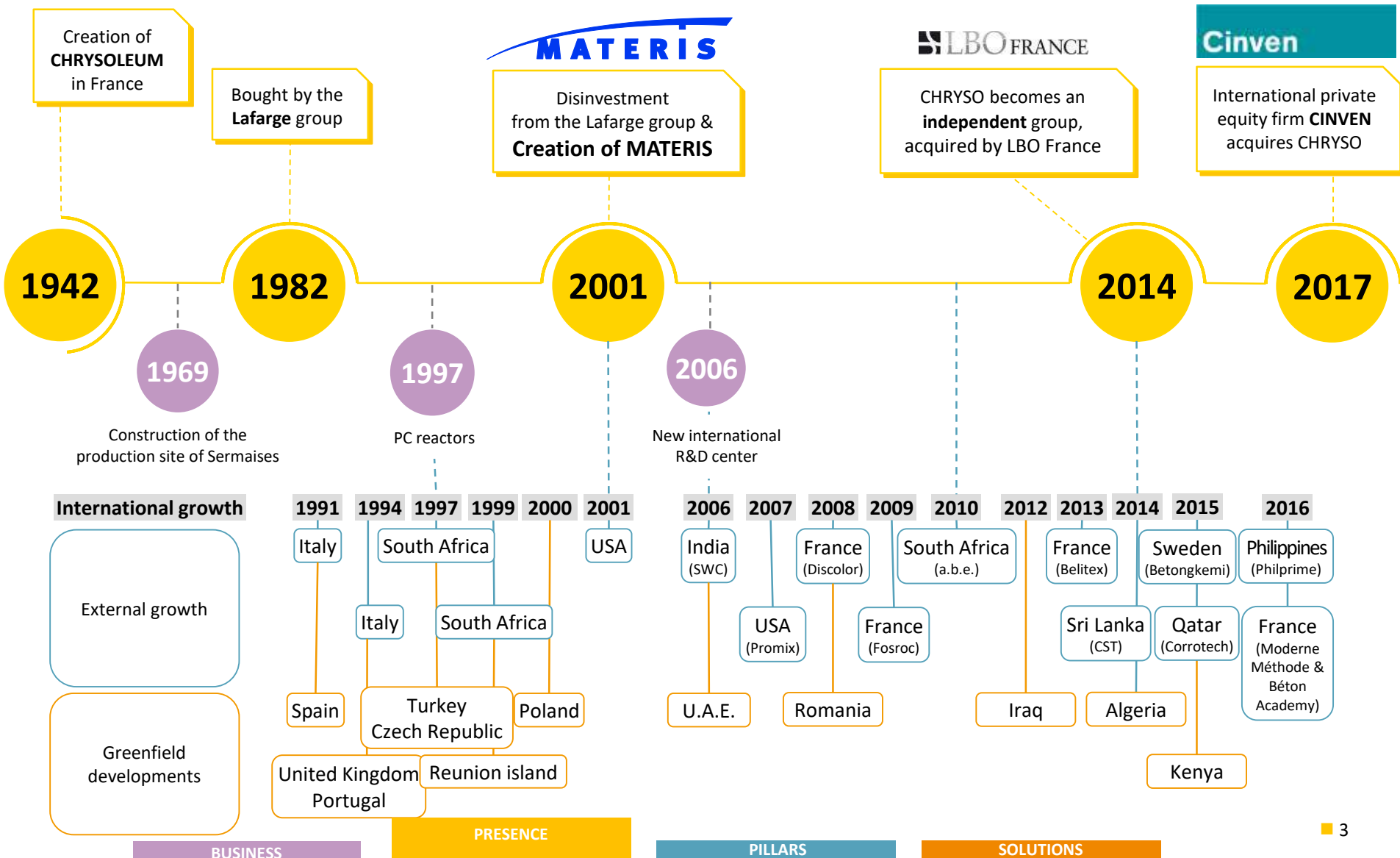
29 Manufacturing facilities



PRESENCE IN
>100
COUNTRIES



5
R&D CENTERS



We go for
OUTSTANDING INNOVATION



- ▶ We are **100% dedicated** to meeting the challenges of the **Construction Industry**
- ▶ We **process our molecules**, from design in our own labs to industrial-scale production
- ▶ Our R&D specialists have a deep understanding of **physico-chemical interactions**
- ▶ Our technical experts have a **comprehensive knowledge of materials applications**

15%
of our staff
work
in R&D

35%
of our **TURNOVER** is
generated thanks to our
PRODUCTS which are
under
5 YEARS OLD

282
PATENTS
registered

We bring VALUE-ADDED SOLUTIONS to the Construction Industry

We design,



Produce,

Market,



& Deliver

Our own **SYSTEMS & SOLUTIONS** all over the world

R&D and QC Lab : INDIA

R&D lab
Noida

QC
lab Alwar

QC lab
Vapi

R&D
Central lab
Mumbai

QC lab
Patalganga

R&D and
Ambatur

QC lab

QC lab
Polba

R&D lab
Kolkata

Arabian
Sea

Bay
of
Bengal

--- International Boundary
--- State Boundary

Solutions dedicated to the CONSTRUCTION MATERIALS

CEMENT



CONCRETE



**CONSTRUCTION
SYSTEMS**

**INDUSTRIAL
APPLICATIONS**

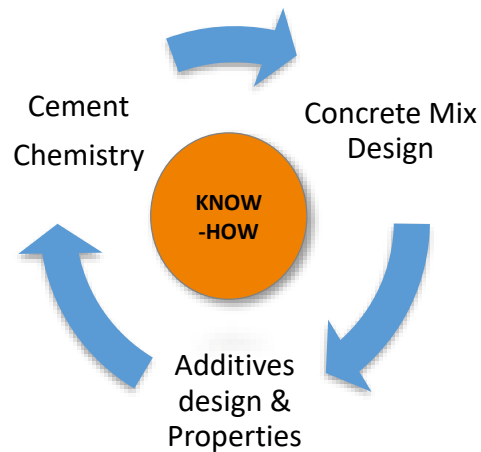


Solutions dedicated to the CONSTRUCTION MATERIALS

CEMENT



CONCRETE



Technical Product Offering :

- ✓ Optima1000 Technology.....Long Slump Retention.
- ✓ Fill Free Technology..... SCC / High rise pumping facilitation.
- ✓ Rover Technology... Robustness enhancing properties.
- ✓ Rehology Modifier..... Easy to handle concrete.
- ✓ EnviroMix® Technology.....To support green concrete : High SCM Mix.
- ✓ Turbocast® Technology.....To increase productivity : High Early strength.
- ✓ Serenis Technology..... Shrinkage reduction Technology.



Captive Coal Jetty- 2x660 MW UDANGUDI SUPER CRITICAL THERMAL POWER PROJECT

Optima 1  TECHNOLOGY



DEPARTMENT OF OCEAN ENGINEERING
ANNA UNIVERSITY OF TECHNOLOGY MADRAS
CHENNAI 600 036, INDIA

Dr. P. Sundaravadivelu FRAE
Professor

By Post / Fax
22.03.2019

NAIC/18/15020007/ADBB/04/18 - 877

The Chief Engineer / Engineer - II,
TANAKKAL,
1st Floor, New EB Quarters,
144, Anna Road,
Chennai- 600002.

Dear Sir,

Re: FEED - Consulting services for Udangudi Project - Establishment of
Captive Coal Jetty with Unloading Facilities and Pipe Conveyor System for
1x660MW Udangudi Super Critical Thermal Power Project - Approval for
concrete pile design for M40 grade India (06 hours retention period) (Estt
No. no - 80994) with 1/1000th SPS/ 50 grade Cement - Reg
Ref: 1) CR/PR/03/1850/CA/PR/03/18 - Coal Jetty/ 2) 18/02/18, dt.24.03.2018
3) FEED No. no. 00241/FEED/CA/TANAKKAL/18/03/18 dt.26.01.2018
4) FEED No. no. 00241/FEED/CA/TANAKKAL/18/03/18 dt. 31.01.2018

The following report submitted by FEED Consultant India Ltd has been scrutinized
and found to be in order. Hence the document is approved.

S. No.	Document Name	Document No.	Date
1	Concrete pile design for India (06 hours retention period) of grade M40 pile (India) with 1/1000th SPS/ 50 grade cement & substitute 5% by wt Optima 1277	Total No. of - 0009	31.01.2018

Thanks with regards,
Yours faithfully,

(P. SUNDARAVADIVELU)

Tel: 01-44-2077-4818 (P) 01-44-2207-4819 (R) 01-44-2077-4819 Fax: 01-44-2077-4819
www.anna-univ.ac.in, www.anna-optima.com



Commitment, Reliability & Quality

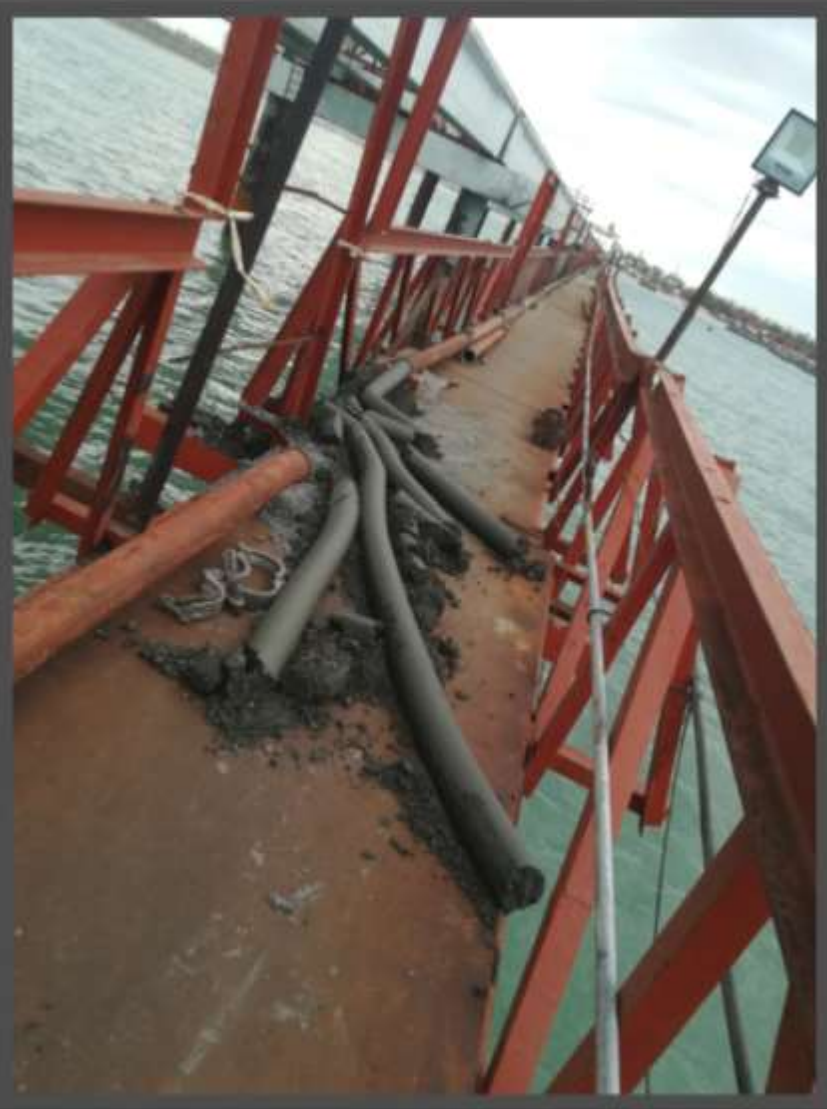


Technical Specification

Parameter	Minimum	Maximum
Flow (mm), season dependent	600	700
<u>Type of concrete</u>	Flowable	Flowable
Final setting time (h) in lab	12	17
Pumping distance (m)	450	2500
Retention time (h)	4	7
Ambient temp. outside (°C)	25	41
Relative humidity inside the tunnel (%)	95	100
Stripping strength of concrete (MPa) @24hrs	16	24
Characteristic strength (MPa)	65	–



Homogeneous, non-segregating, enough paste, stable.



- Single stage concrete pumping through 2.432 km (1.51 miles): Weather and execution challenges
- The **workability retention** was designed taking into account a contingency time of around **SIX hours** in addition to the batching, transporting, and testing time requirements
- Methodology should be robust and responsive while **judicially balancing with weather**
- **Concrete Temperature**

As far as possible, a **single robust admixture** should be targeted to meet all of these requirements.

Optima 1  **TECHNOLOGY**



Ingredients	Qty/Cu.m
cement (Kg)	375
Flyash (Kg)	120
20mm (Kg)	210
12.5mm (Kg)	846
M sand (Kg)	773
Free Water (Kg)	158
Admixture	3.96



Homogeneous, non-segregating, enough paste, stable Flow after SIX hours 640mm X 635mm

Thixotropy evaluation on a concrete scale & Application in Field :

The new superplasticizer
« **CHRYSO® Fill Free**
Technology » brings a faster
and more even filling of the
mould !

“WORLD ONE”-MBI

M-95
M-60
M-40

- ✓ CHRYSO® Optima Range...
- ✓ CHRYSO® Optima100
- ✓ CHRYSO® Tard SRC(80)



▶ **Durability & Sustainability :Extensive use of SCM**

- CO2 content reduction per m3 of concrete
- Higher cement replacement % but early strength/set required
- Water reduction, slump retention and early strength together thanks to specific polymer & hydration catalysts



Real Estate & Commercial



World One
CHRYSO®Optima
CHRYSO®Delta
CHRYSO®Excem 80
CHRYSO®Cure AC



Sky City
CHRYSO®Optima
CHRYSO®Delta



Marine Kingdom
CHRYSO®CWA 10
CHRYSO®Elastophane

Road & Bridge



Narmada Bridge
CHRYSO®Optima
CHRYSO®Polycaulk PS
CHRYSO®Cure AC



Ganga Bridge
CHRYSO®Optima
CHRYSO®Delta
CHRYSO®Excem V1



Numerous Roads
CHRYSO®Optima
CHRYSO®Delta
CHRYSO®Cure AL

Metro Rail



Chennai Metro
CHRYSO®Optima
CHRYSO®Swell Seal
CHRYSO Reinjecto



Ahmedabad Metro
CHRYSO®Optima
CHRYSO®Delta
CHRYSO®Armourflex
CHRYSO®Resicrete



Mumbai Metro
CHRYSO®Optima
CHRYSO®Delta
CHRYSO®Premia
CHRYSO®Cure AL

Power



Kota
CHRYSO®Optima
CHRYSO®Swell Seal
CHRYSO Reinjecto



Kalpakam
CHRYSO®HP
CHRYSO®Delta
CHRYSO®Swell Seal
CHRYSO®Resicrete 21



Kakrapara
CHRYSO®HP
CHRYSO®Optima
CHRYSO®Resicrete 21

Ports



Mumbai
CHRYSO®HP
CHRYSO®Cure ST
CHRYSO®Correcrete
CHRYSO®Armourcrete



Delhi
CHRYSO®HP
CHRYSO®Elastophane
CHRYSO®Excem GP & V1
CHRYSO®Elastophane



Kolkata
CHRYSO®HP
CHRYSO®Elastophane
CHRYSO®Armourshield
CHRYSO®Elastophane

CHRYSO

INNOVATION IS OUR CHEMISTRY

Central R&D Lab : Navi Mumbai

Concrete Lab



HO & central Lab



Product Development Lab



Cement Ball Mill



Central R&D Lab Facilities : Navi Mumbai



GC : Gas Chromatography



Alpine Sieve



F.T.I.R



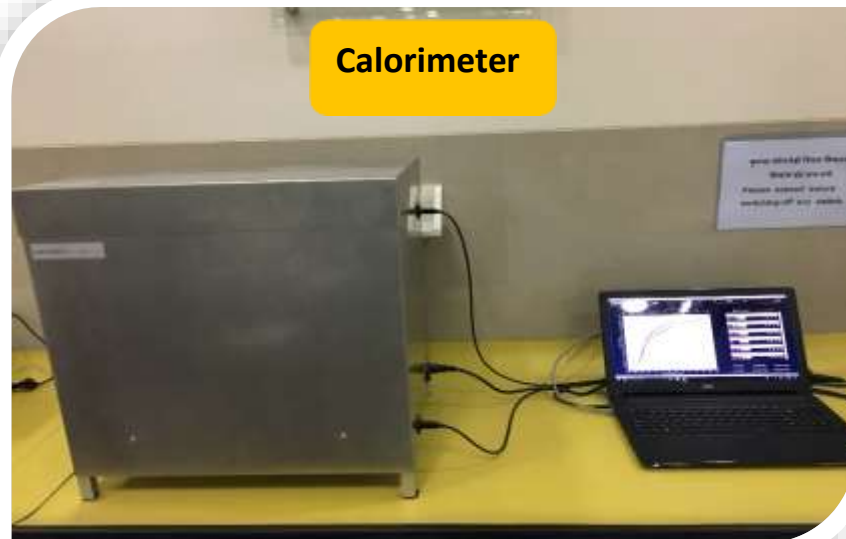
Pycnometer

Central R&D Lab Facilities : Navi Mumbai

**Flame
Photometer**



Calorimeter



**PSD : Particle Size
Distribution Analyzer**



Thank You For your Kind Attention !

