UltraTech Cement Limited

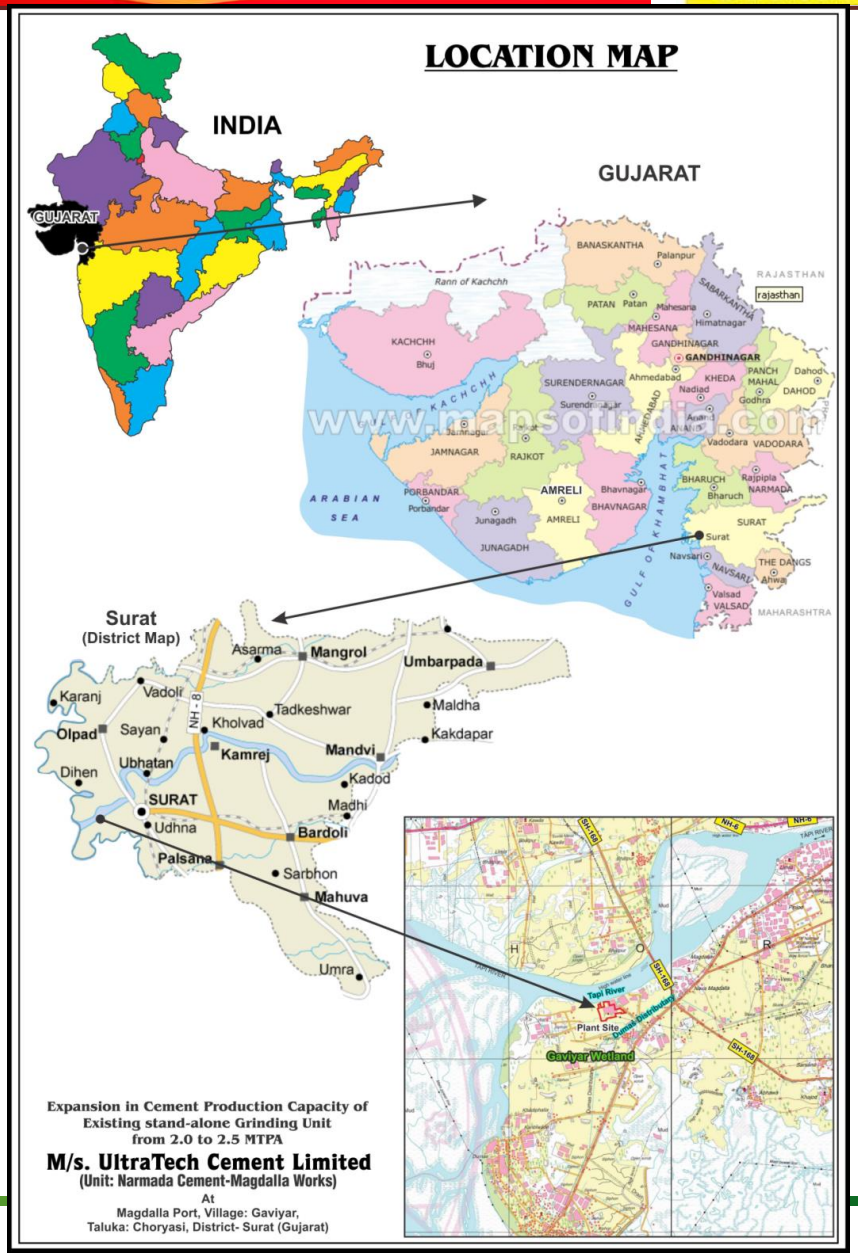
Unit: Magdalla Cement Works

CII National Award for Environmental Best Practices 2023

Presented By – Sunil Srivastava (Process & QC)
– Pawan Shukla (Environment)

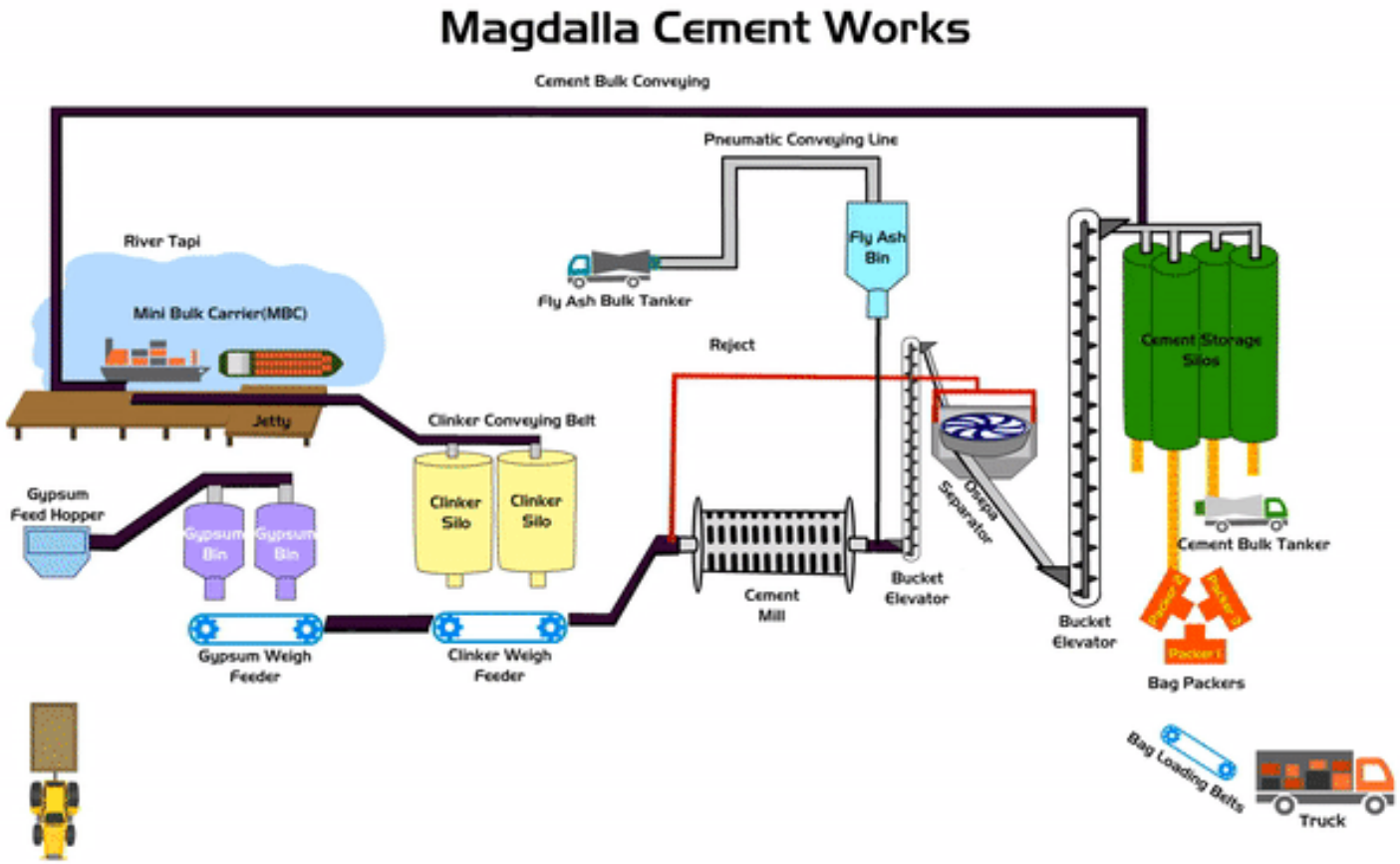
Unit Profile – At a Glance

- UltraTech Cement Limited (Unit: Magdalla Cement Works) has a cement grinding unit located at Magdalla Port, Surat, Gujarat and has an installed capacity of 1.1 Million TPA cement production.
- This plant was commissioned in October 1982, with joint venture project between Chowgules and Government of Gujarat.
- Objective is to supply Cement to Narmada Sardar Sarovar Dam Project.
- Concept of Split locations for Manufacturing at Jafrabad and Grinding unit at Magdalla and Ratnagiri
- Narmada Cement Co. Ltd was acquired by M/s. Larson & Turbo Ltd. In 1999
- Aditya Birla Group took over the cement business of L&T in 2004 and merged with UltraTech Cement Ltd (UTCL) in 2005
- The unit is manufacturing two Cement Grades i.e. OPC 53 & PPC



Manufacturing Process

- Cement manufacturing is an energy and resource intensive process.
- In this process, typical raw material is limestone (clinker) and gypsum.
- Gypsum is an indispensable component of cement primarily utilized for regulating the setting time of cement or in other words the rate of hardening of cement. About 4-5% gypsum is added while grinding clinker to produce any kind of cement.
- The laboratory study of the material concluded that the chemical sludge/gypsum has **Calcium Sulphate** just like mineral gypsum.
- It is observed that the chemical sludge/gypsum has characteristics similar to mineral gypsum. The mineral part of the waste replaces primary mineral material such as limestone and gypsum.
- In blended cement, unit is utilizing **32% fly ash** which reduce clinker factor.



Project Details

Waste Management & Resources Conservation

- **Project Title** – [Sustainable solution towards waste management and mineral conservation in non-pyro process cement grinding.]

1) Unit has found an innovative use of chemical sludge/gypsum. The waste is being used to replace mineral gypsum, which is a natural raw material used in cement raw mix.
   - Unit found that, chemical & dyes industries generating waste in the form of chemical sludge/gypsum, which falls under the hazardous waste category.
   - 4-5% chemical sludge/gypsum is added while grinding clinker to produce any kind of cement.

2) Unit has also identified fly ash (32%) and treated gypsum (2%), a waste material generated from Power plants & other industry to reduce clinker factor by 34% in blended cement and resulted into CO2 reduction.

Trigger of the project – Conceived at Middle management

- **Date of Commencement :** Since 2012
- **Date of Completion :** Continue in use

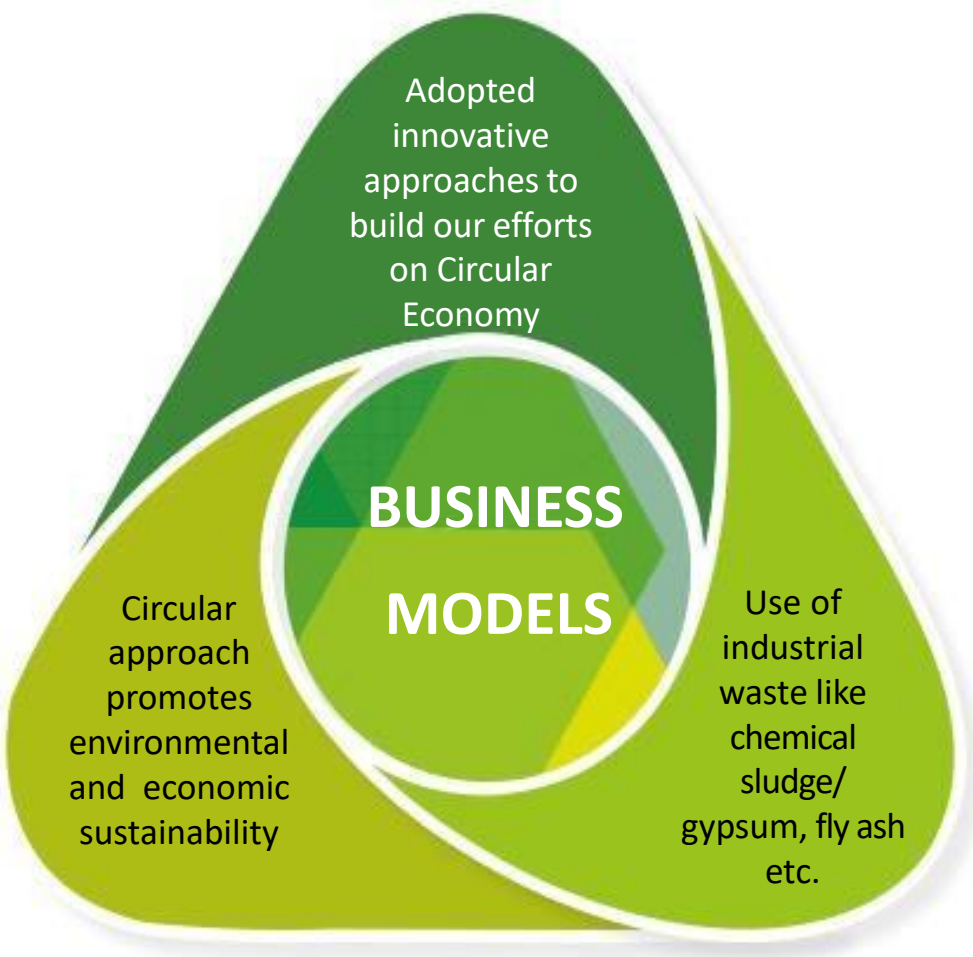
Uniqueness of the Project – Unit found that, chemical & dyes industries generating waste in the form of chemical sludge/gypsum, which falls under the hazardous waste category. About 4-5% gypsum is added while grinding clinker to produce any kind of cement.

Major Milestones of the Project

Particulars	FY 21-22	FY 22-23
Chemical gypsum receipt	33000 MT	51000 MT
Fly ash consumption	89000 MT	72000 MT
Treated Gypsum	0	5100 MT

Tangible benefits

Circularity driven Business model



1.1 Lakh Tonnes

Industrial waste utilized as raw material in FY23

11.16 %

Recycled materials used, of total raw materials used

1.67 Lakh Tonnes

Conservation of natural resources per year (Gypsum, limestone & coal)

51K Tonnes

Hazardous waste reduce to dispose in landfills

36 Crores

Cost saving every year due to this project

2.3 Lakh tonnes

Cement supplied to India's first Bullet train project – Partnering the NATION in development

46 %

Out of total Power consumption is met from renewable source (Solar & Wind) in FY23

Intangible benefits

Particulars	Intangible Benefits
People/society benefits	▪ Production of low carbon cement ▪ Reduce the Burden on landfill ▪ Conserving Natural resources ▪ Reduction in GHG
Moral / Motivation	▪ Self confidence level upgraded ▪ Increase in the moral of the employees
Skill upgradation	▪ Various lab scale trials help the team to enhance the technical skills ▪ Problem solving skills improved ▪ Knowledge improved against other industrial waste
Attitude shift / development	▪ Adaptability towards the other industrial waste as alternative raw materials ▪ Improved attitude of Employees toward environment conservation & protection ▪ Improvement in waste management system
Others	▪ Aligned with 2030 UN Sustainable development goal

Major Steps taken in the Project

- The unit team conducted a thorough technical analysis and Several blended versions of cement are prepared with varying strength, durability, retardation and other specialized properties.
- Study concluded that the waste material has calcium sulphate just like mineral gypsum. Similarly, fly ash reduce clinker factor by 32% in blended cement.
- Obtaining regulatory approvals for trails and procurement.
- Unit has procured the chemical sludge/gypsum from nearby chemicals & dye industries, fly ash from nearby Power plants.
- Prepare the suitable waste mix design of the chemical sludge gypsum of different industries as per quality parameters
- Feed the suitable mixture in cement mill to produce quality Cement as per BIS norms

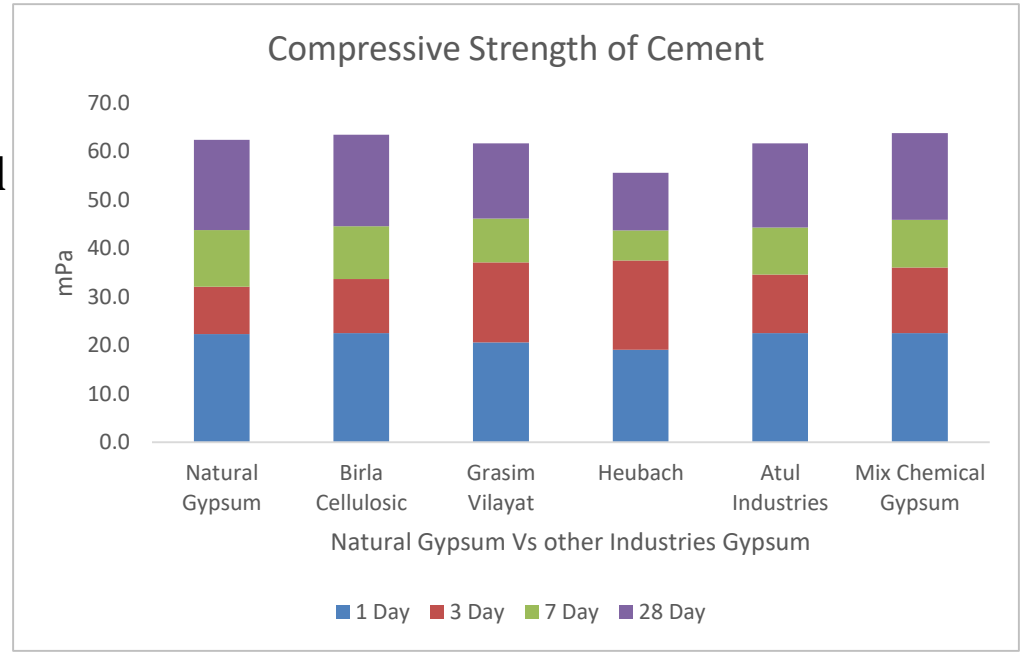
Replication potential of project within sector

- Unit has carried out complete study of different types of chemical sludge/Gypsum received from various chemicals industries. After that, different waste gypsum mix is prepared to utilize in cement manufacturing process.
- These initiatives aim to reduce waste, conserve natural resources, and promote circularity.
- It has replaced naturally occurring Gypsum & Limestone with waste materials like chemical sludge/Gypsum, fly ash and treated gypsum.
- It continues to lead and drive the industry's shift towards a circular economy by utilising chemical sludge/gypsum, fly ash and treated gypsum that enhance resources and energy efficiency within the overall manufacturing process.
- Utilization of chemical sludge/Gypsum has been carried out in our other sister units within the Group where the availability is possible.
- The same is also implemented in other Cement manufacturing Groups.

Replication potential of project within sector

Sr. No	Parameter	Limit	Natural Gypsum	Chemical Gypsum
1	Moisture	0-15 %	0.5-5%	25-45 %
2	pH	6 – 9	8-9	6 - 9
3	Purity	> 70 %	90-95%	70 – 85 %
4	SO3	> 35 %	40-45%	35-42 %
5	P2O5	< 0.05 %	0.03	< 0.05 %
6	Cl^-	< 0.1 %	0.01	< 0.1 %
7	Color	-	White	Various

Ball mill Test Result



Existing Gypsum Shed

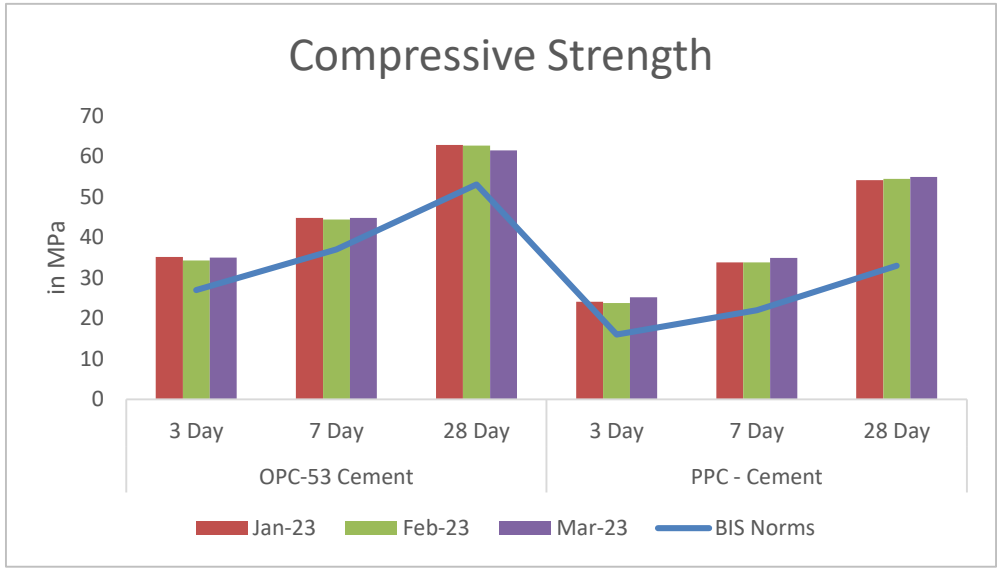
New Gypsum Shed

Various Chemical gypsum samples

Replication potential of project within sector

Sr. No.	Fly Ash source	Physical Analysis		Chemical Analysis										
		Blaine- BM	Residue (%)	LOI	IR	SiO2	SiO2+Al2O3 +Fe2O3(%)	CaO	Mgo	SO_3	P_2O_5	TiO_2	Cl	LR
		m^2/kg	+45	%	%		%	%	%	%	%	%	%	%
1	Ukai	200-270	25-35	0.2-.08	85-93	63.15	92.14	1.18	0.60	0.31	0.32	1.92	0.03	4-6
2	J K Paper	350-500	24-28	5-7	70-80	55.77	89.17	4.61	1.99	1.59	0.36	1.90	0.02	5-7
3	Reliance	550-600	20-25	5-8	70-80	42.98	53.26	20.26	3.61	7.99	0.28	1.00	0.01	5-8
4	Grasim Vilayat	500-600	3.27	4.5-6.5	70-80	45.28	55.26	15.6	2.68	2.00	0.3	1.80	0.02	4-6

Ball mill Test Result
OPC Vs PPC



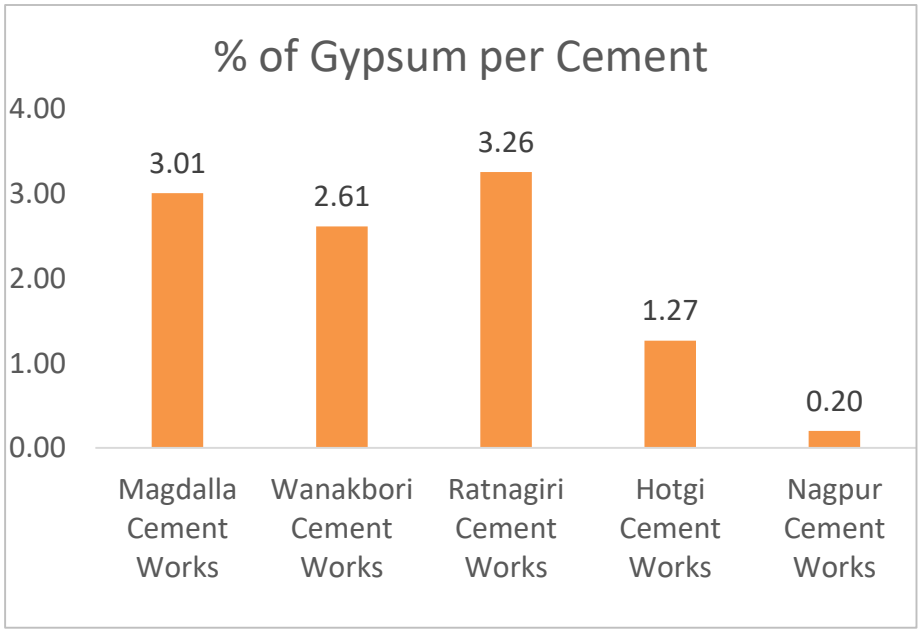
Challenges Faced and its countering

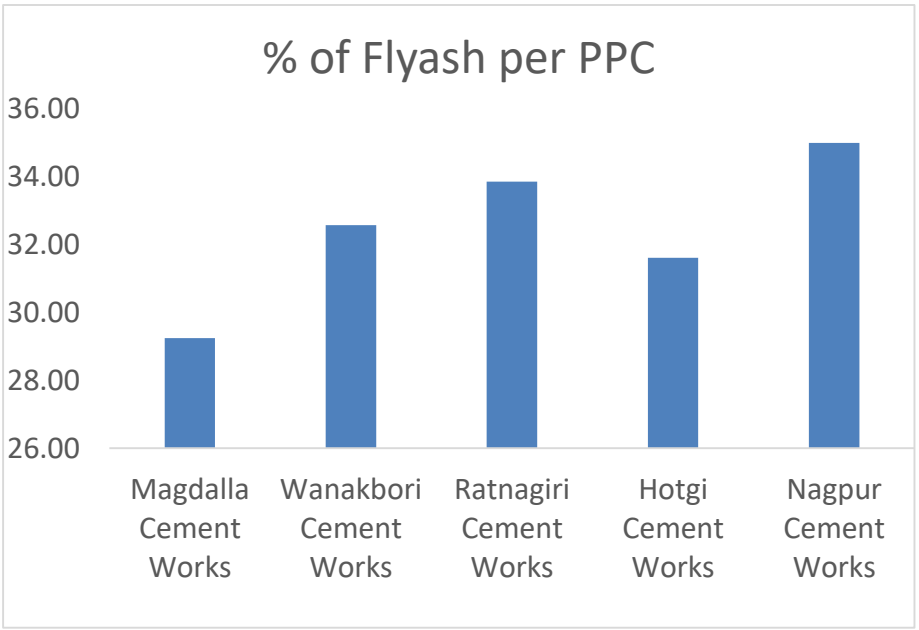
Particulars	Challenges	Countering Measures
Technical	▪ Moisture is a critical factor in the waste material. Chemical sludge/Gypsum receive from the different industries having very high moisture around ~ 25 to 40%.	▪ Sun drying the waste material by spreading into thin layer and heap of the waste are flipped at regular intervals to expose the waste in the inner core to air so that temperature in these fresh sections rise again and remove moisture
	▪ Color is also present in the Chemical Gypsum received from the dyes industries. Due to this, different color is appeared while applying cement by end users ▪ High Chloride is also present in the Chemical gypsum. This Chloride has direct impact in the cement quality.	▪ The unit team conducted a thorough technical analysis and prepare several raw mix version with varying color, chloride, SO3 and other properties.
	▪ Purity of CaSO4 in chemical gypsum is low	▪ Brainstorming the vendors to develop the facility for Segregation of chemical sludge from the bio sludge.
	▪ Storage of Chemical sludge/Gypsum and fly ash as per CPCB	▪ Provided dedicated gypsum storage shed of capacity 40,000 MT with concreate impervious layer and fly ash silos with bins.
Administrative	▪ Chemical sludge/Gypsum comes under hazardous waste category, so required permission from GPCB	▪ Obtained the permission from GPCB for reception, collection, storage and use in process
Maintenance	▪ Choking of gypsum weigh feeder ▪ Jamming of conveyor belt	▪ Installed Blaster and vibrator ▪ Modification of chute & used PTFE coated bags in bag filter

Achieving national benchmarks/Standards

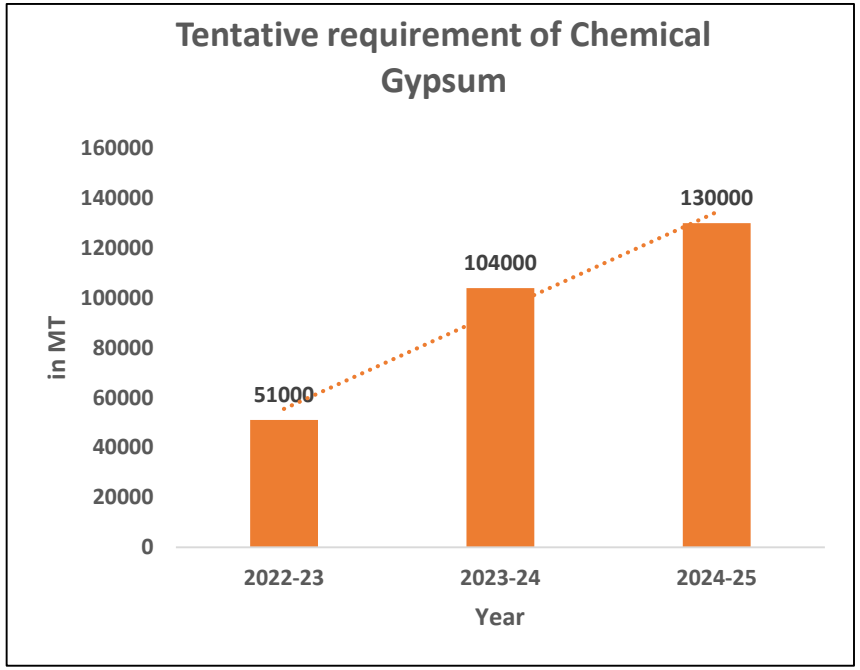
- To contribute towards circular economy and natural resource conservation, unit utilize industrial waste as alternate raw material, derived from industrials like chemical, dyes & power plant.
- The waste materials that would have otherwise gone to landfills are being used as mineral substitution in cement mills, which is the final stage of cement production.
- 51000 MT of hazardous waste and 77300 MT of non-hazardous wastes from other industries have been receipt in FY23, thereby reducing the use of fossil fuels.

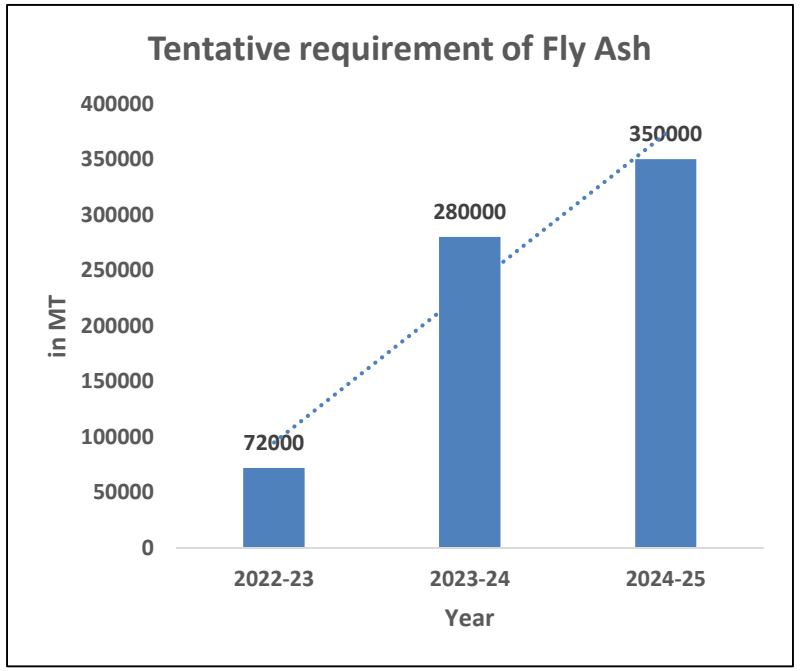
Summary of % consumption of by UTCL units FY 23

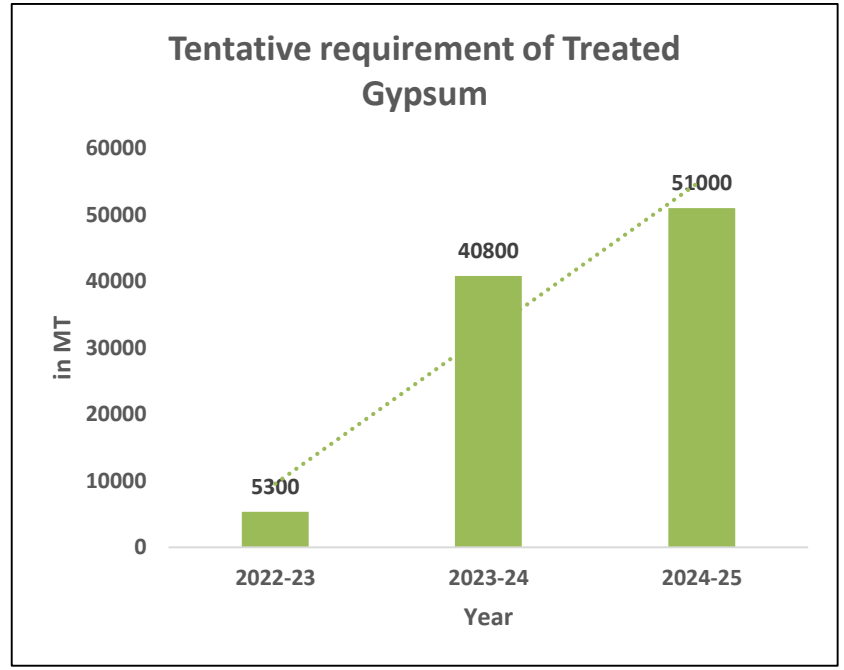




Priority Plans for +1 year and +2 year







- Enhancing the cement production capacity by installing Roller Press
- Constructing new Fly ash Silo of 1000 MT & 4000 MT capacity
- Constructing New Gypsum shed of 20000 MT capacity
- Also Planning to produce PCC cement by using Slag & Fly ash

Best Practices of Plant

- Unit has developed the Rainwater harvesting facility inside the plant and unit is 2 times water positive in FY 23.
- Unit has installed 1 MW Solar plant in the plant premises.
- Unit is implemented Zero liquid discharge facility.
- FY23, 46% power consumption is met from renewable sources (Solar & Wind).
- Unit is focus on utilization of industrial hazardous waste chemical gypsum as alternative raw material contributes to circular economy.
- Unit is utilizing fly ash, a by-product of the energy production process at thermal power plants, to blend with cement. This repurposed use ensure reduction in carbon footprint.
- The dust collected from pollution control equipment is being reused in the process.
- Unit has implemented Integrated Management System certified as per international standards ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018 to ensure continual improvement of the organization on all fronts of Quality, Health, Safety and Environment.
- Unit has implemented waste minimization 3R concept. Hazardous waste (Used oil, grease, and Empty barrel), E-waste, Battery waste, plastic waste, metal scrap etc. are being sold to authorized GPCB recyclers only.
- OPC grade cement is dispatched through Bulkers not in HDPC plastic bags which reduce the plastic waste.
- Virtual reality (VR) safety training initiated to all the trade workmen.

Best Practices Towards Sustainability by UTCL

A summary of our sustainability progress in FY23

DECARBONISATION

UltraTech's CO_2 intensity has decreased by 22% from base year 2017, which is aligned with our target of reducing 27% carbon intensity by 2032.

BIODIVERSITY

Biodiversity assessments completed at 12 integrated units and working to complete biodiversity assessments in all 23 integrated units by 2024.

WATER CONSERVATION

85+ million cubic metres of water successfully reused, recycled, harvested and recharged. Achieves water positivity of 4.17.

CIRCULAR ECONOMY

Over one million tons of alternative fuels used, and 28 million tons of alternative raw material used. 2.48 times Plastic Positivity achieved.

GREEN ENERGY

UltraTech currently has 578 MW of green energy capacity, which includes 228 MW of WHRS installed capacity and 350 MW of renewable energy.

Progressing towards our sustainability targets

ESG Metric	Climate and Energy	Circular Economy	Environment	Green Energy
	CO_2 Reduced [kg CO_2/t cement]	WASTE Recycled [MnT]	WATER Positive [Times]	Green Power Mix^ [% to total Power]
FY23 Performance*	557 -4.3%	29.3 +21%	4.1x +8%	25% +32%

* % changes are with respect to YoY comparison

^ Includes renewable power mix in grid power consumption

Major Learning

- Identification of other industrial waste for better utilization as alternative raw materials in our plant.
- Enhanced Competency of team resulted more sustainability initiatives CO2 Reduction, circular economy etc.
- Explore different industries to identify the valuable waste and view process flow of waste at micro level.
- Sharing Good practice at unit level as well as cluster level.
- Cost benefit analysis, to reduce per cement bag cost
- Support other small industries towards circular economy
- Various brainstorming sessions with our employees and also with supplier

THANK YOU !!!