Coromandel
FUTURE POSITIVE

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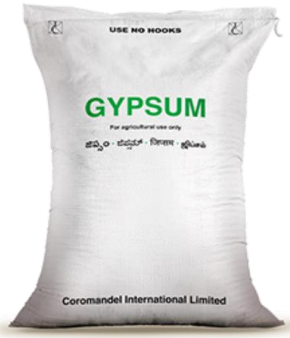
Coromandel International Ltd
Visakhapatnam Plant

Mayankar Singh – GM – Power Electrical Instrumentation
R Krishna Kumar – DGM – Maintenance
R N V Chandrasekhar – AGM - Operations

Coromandel Vizag

Coromandel FUTURE POSITIVE

Coromandel Reimagined



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Company Profile

Private	**1967**	**55024**
Ownership	Year of Establishment	Unit Turnover FY 23-24: ₹ Million

% of Manufacturing cost

0.42	**1.03**	**1.44**
Thermal	Electrical	Total Energy

6.4		**3225**
Grid Energy: ₹ / kWh		Thermal Energy: ₹ / Million kcal

Process : Phosphatic Fertiliser with captive Sulphuric acid & Phosphoric acid plants

Technology – Process Specifications

1400 MTPD Sulfuric Acid Plant I

400 MTPD Sulphuric Acid Plant II

1650 MTPD Sulphuric Acid Plant III

800 MTPD Phosphoric Acid Plant I

DCDA Process - Monsanto Enviro Chem USA

Dihydrate - Dorr Oliver USA

800 MTPD Phosphoric Acid Plant II

Dihydrate – Wet Process
Prayon Technologies Belgium

2100 MTPD Complex Plant Train A & B

TVA Pre Neutralisation
Wellman Lord USA

2000 MTPD Complex Plant Train C

Pipe Reactor Technology
Incro Spain

Technology – Waste Heat Recovery

Turbo Generator - I	Turbo Generator - II	Turbo Generator III
5 MW	6.5 MW	15.25 MW
Condensing Turbine	Non-Condensing Turbine	Condensing Turbine

Bottoming Cycle Co-Generation – Waste Heat for Process Heating, balance for Power Generation

Process Flow Diagram

Raw Materials | Intermediates | Fertiliser Minerals | Waste Heat Recovery

Raw Material Feeds

Air (O_2)
Sulphur
Water

$S + O_2 = SO_2$ — Sulphur Dioxide Combustion
$SO_2 + 1/2\ O_2 = SO_3$ — Sulphur Trioxide Conversion
$SO_3 + H_2O = H_2SO_4$ — Sulphuric Acid Absorption

High Pressure Waste Steam

High Pressure Steam | Low Pressure Steam

Turbine Driven Blower
Turbine Power Generator
Sulphur Melting

Steam Jacketing
Boiler Water Preheating

Rock Phosphate $Ca_3(PO_4)_2$
Water (H_2O)

$Ca_3(PO_4)_2 + 3H_2SO_4 + 6H_2O = 2H_3PO_4 + 3CaSO_4 2H_2O$ — Reaction

Filtration → Phospho Gypsum
Filtration → Phos Acid (28% P2O5)
Evaporation → Phos Acid (48% P2O5)

Phosphoric acid Evaporation
Process Heating

Ammonia
Urea
Sulphur
Muriate of Potash

Neutralisation

$2NH_3 + H_3PO_4 = (NH_4)_2HPO_4$
$2NH_3 + H_2SO_4 = (NH_4)_2SO_4$

Granulation
Drying
Screening
Cooling

NPKS Complex
20-20-0-13
28-28-0
24-24-0-8S
14-35-14 / 10-26-26

Air Preheating for Product Drying
High pressure Steam Flushing

Process Heating
Steam Jacketing
Condensate Preheating

Storage | Captive Berth | Raw Material Receipts

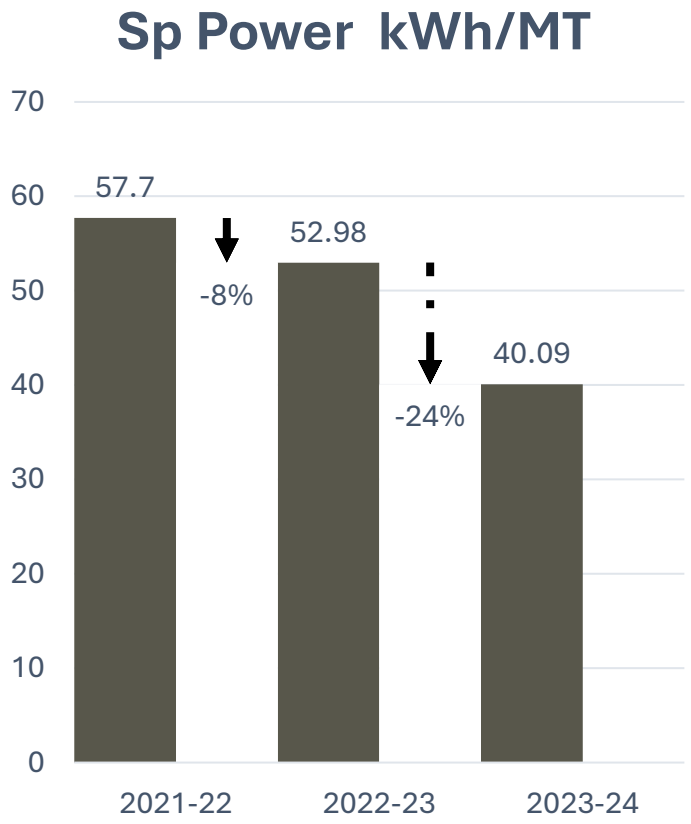
Despatch

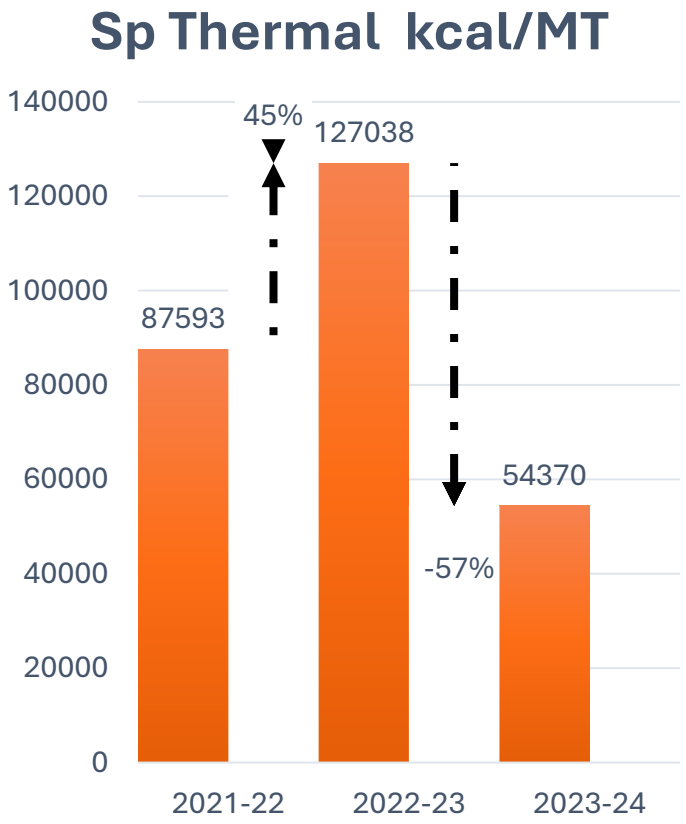
Rail | Road

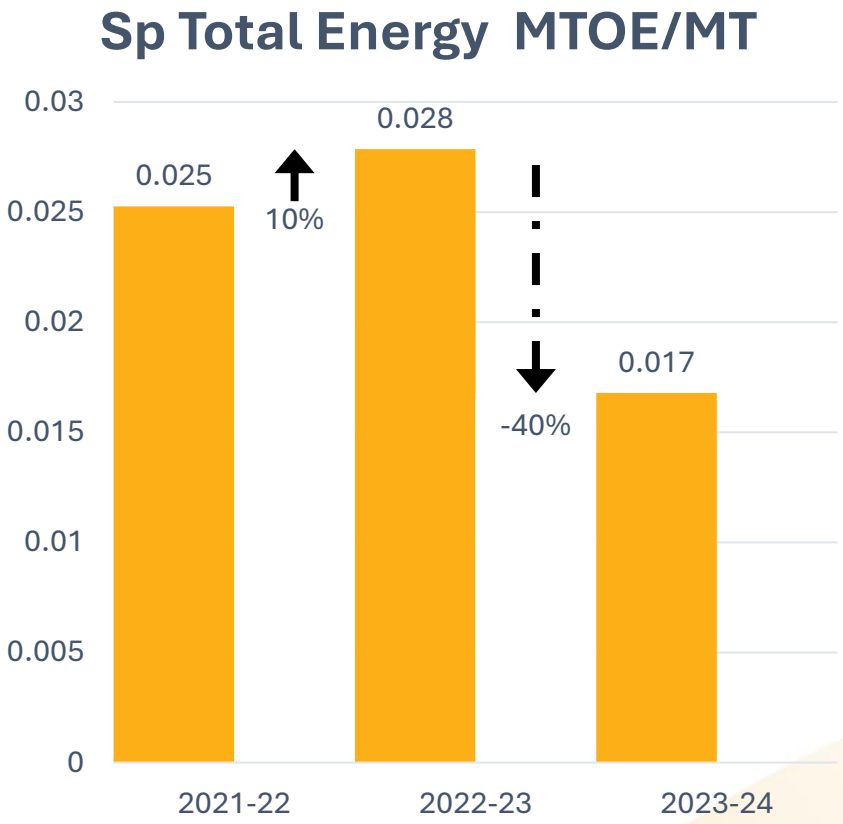
Production & Purchased Energy Consumption

	Parameters	Units	2021-22	2022-23	2023-24
Production	Complex Fertiliser	MT	1070858	1142442	1165048
	Phosphoric Acid	MT	338697	359291	370617
	Sulphuric Acid	MT	532779	515485	861859
Energy Consumption	Electrical incl Sister Concerns	million kWh	79.57	79.81	67.20
	Electrical only Visak Plant	million kWh	61.79	60.52	46.71
	Thermal	million kcal	93800	145134	63343
	Total	MTOE	27051	31822	19551
Specific Energy per Ton of production	Electrical	kWh / MT	57.7	52.98	40.09
	Thermal	Kcal / MT	87593	127038	54370
	Total	MTOE / MT	0.0252	0.0278	0.0168

Specific Energy Consumption Trend







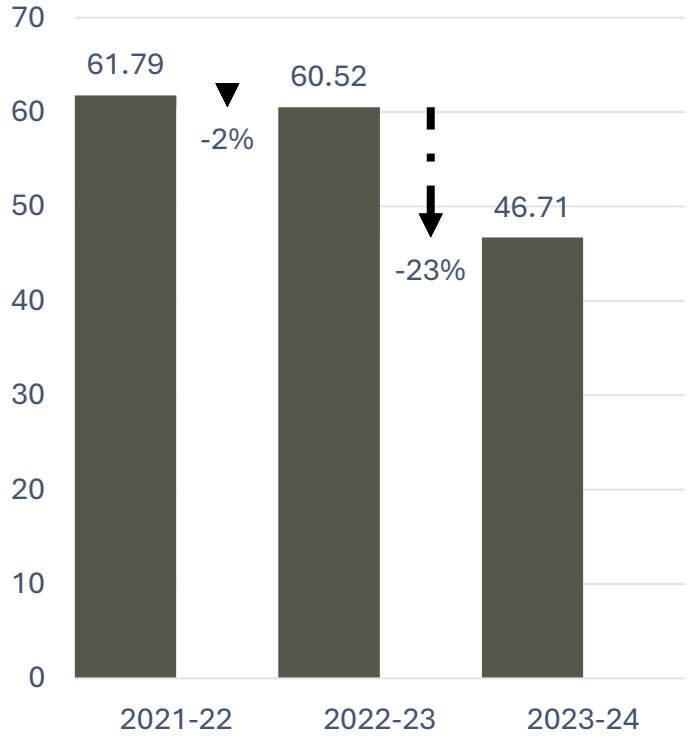
Reason for decrease in Specific Energy :

2022-23 : Higher Thermal Energy Consumption for Concentration of Captive Raw material Phosphoric Acid

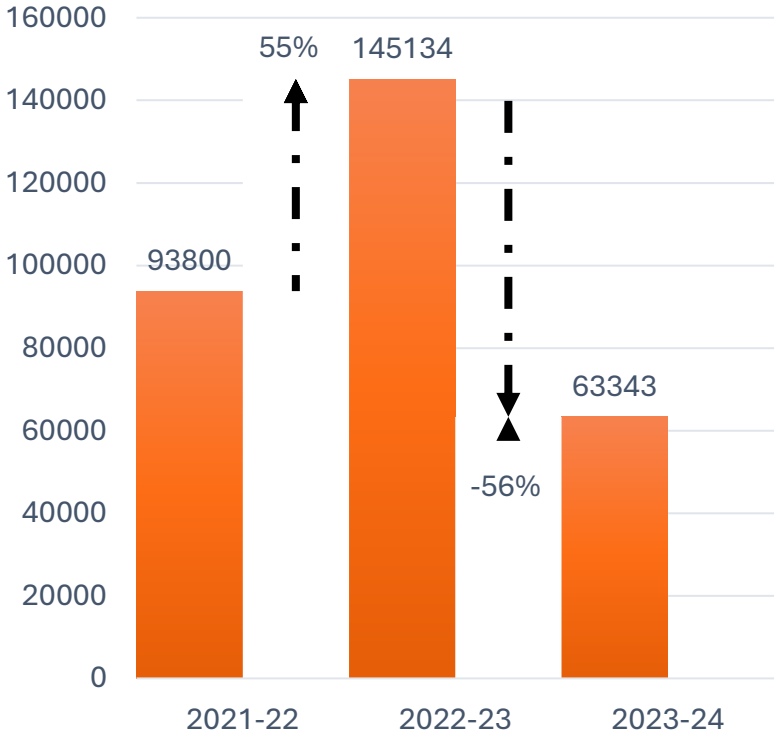
2023-24: Higher waste heat recovery & utilisation

Energy Consumption

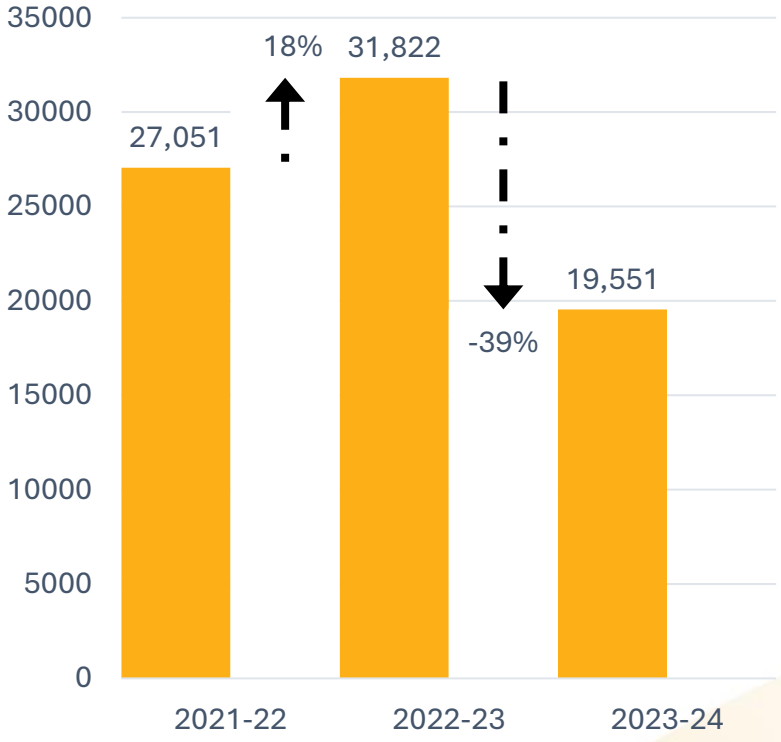
Power Million kWh



Thermal Million kcals



Total Energy MTOE



Reason for decrease in Specific Energy :

2022-23 : Higher Thermal Energy Consumption for Concentration of Captive Raw material Phosphoric Acid

2023-24: Higher waste heat recovery & utilisation

Benchmarking

	Electrical	Thermal	Total
Unit of measurement	kWh/MT	Kcal / MT	MTOE/MT
Coromandel Specific Energy	40.09	54370	0.017
Global Benchmark	149	870740	0.1161
Location of Unit	Europe	Europe	Europe
Difference with Global Benchmark	109	816370	0.099
Internal Target Specific Energy	40	54370	0.017

Comments

Derived benchmark being sum total energy of Sulphuric acid, Phosphoric acid & NPK complex plant

Reasons for Lower Specific Energy

Maximisation of Waste Heat Recovery from Sulphuric Acid plant

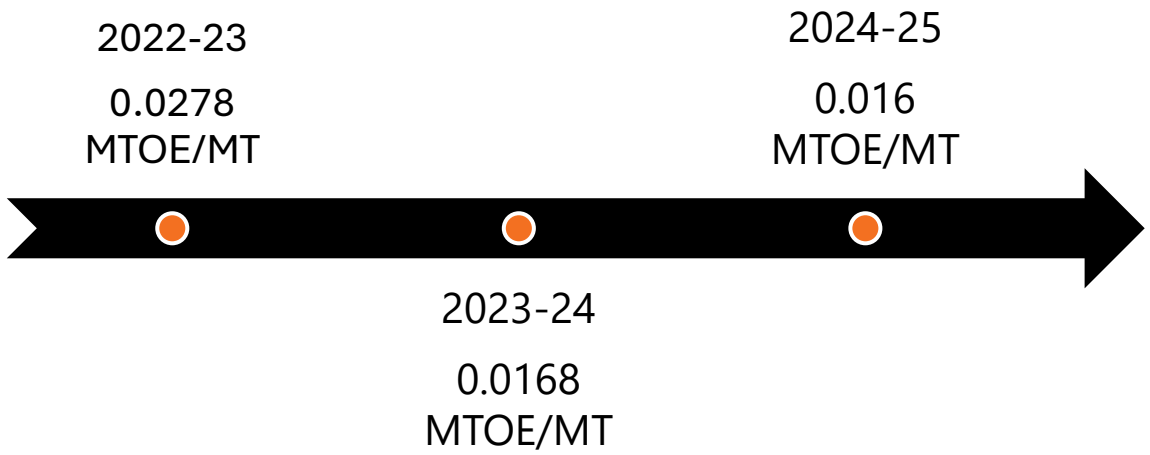
Source of Information

1. Page 58 Table A2, Best Available Techniques for Production of Sulphuric Acid, Booklet No 3 of 8, Year 2000
2. EU IPPC - Reference Document on Best Available Techniques in Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilizers Industries. December 2006
3. Roger Heath, John Mulckhuyse and Subrahmanyan Venkataraman, Page 16, The Potential for Energy Efficiency in the Fertilizer Industry. World Bank Technical paper No 35, 1985

Benchmarking

Action Plans to Achieve Benchmark

- Annual Specific energy consumption targets
- Annual Energy efficiency improvement projects with specific targets and allocated budget
- Maximise Rail transport. Maximise 35 MT trucks replacing 10 – 20 MT trucks for product despatch
- Institutionalization of energy efficiency & conservation awareness programs.
- Institutionalization of internal incentive system to promote & reward energy efficiency behaviors
- Support technical training



Activities:

- ✓ Installation of capacitor banks at motor control centers
- ✓ SCADA & IIOT for real time monitoring
- ✓ Installation of LED lights for general illumination
- ✓ Installation of Variable Frequency drives
- ✓ Installation of Roof top solar plant
- ✓ Modernisation of age-old electrical drives & switchgear
- ✓ Maximise day light savings using translucent roof sheets and optimization of auto light sensors
- ✓ Optimisation of process plant loads
- ✓ Maximise Planned shutdown
- ✓ Maximise utilisation of waste heat
- ✓ Avoid Diesel Power & Coal Fired Boiler Generation,
- ✓ Maximize internal storage & avoid multiple material handling
- ✓ Deploy best available technologies in manufacturing

Major Encon Planned 2024-25

	Electrical Energy Savings		Investment	Payback	Comment
	Million kWh	MTOE	₹ Million	months	
Replacement of age-old rewound motors by IE3 motors	0.353	101	9.5	59	10 no's age-old rewound motors
Condensate management system for evaporators	0.102	29	2.5	54	Installation of Condensate Monitoring & Recovery system for Evaporator I system
Replacement of 45 nos age old window AC units with 3-star rating units	0.06	17	2	73	Replacement of 45 no's age-old window AC units

Encon 2021-24

Year	No of Encon Projects	Investment	Electrical Savings	Thermal Savings	Savings	Payback
		₹ Million	Million kWh	Million kcals	₹ Million	Months
2021-22	4	10	0.426	439	7	17
2022-23	12	193	0.940	1117	19	124
2023-24	5	4336	74.7	0	478	109

Major Encon 2021-22

Sl No	Name of Encon Projects	Investment	Electrical Savings	Thermal Savings	Savings	Payback
		₹ Million	Million kWh	Million kcals	₹ Million	Months
1	Deployment of 35 MT Capacity Trucks for Product Despatches	0.0	0.00	439	4.4	0
2	Replacement of age-old capacitor banks	1.4	0.13		0.7	24
3	Replacement of age-old motors by IE3 motors	6.8	0.25	0	1.4	60
4	Replacement of 41 no's age-old window AC units with 3-star rating units	1.5	0.05	0	0.3	67

Major Encon 2022-23

Sl No	Name of Encon Projects	Investment	Electrical Savings	Thermal Savings	Savings	Payback
		₹ Million	Million kWh	Million kcals	₹ Million	Months
1	Green Building	2.0	0.044		0.28	86
2	Solar Street Lighting	0.7	0.003		0.02	389
3	LED Lighting	0.5	0.102		0.65	9
4	Replacement of 52 nos age old window AC units with 3-star rating units	1.5	0.073		0.4	46
5	Battery Operated Transport Vehicles	0.9		0.05	0.05	249
6	Bicycles for all employees for Commuting To & From workplace	6.0		3.0	3.0	24

Major Encon 2022-23

Sl No	Name of Encon Projects	Investment	Electrical Savings	Thermal Savings	Savings	Payback
		₹ Million	Million kWh	Million kcals	₹ Million	Months
7	Higher Pipe Size Instrument Air Piping	8.1	0.125		0.8	121
8	Evaporator - II Steam Condensate recovery at Utilities Plant	3.3	0.119		0.8	52
9	Laid Port & Market Connectivity Internal Roads through shortest Route	137.2	0.000	796	8.1	202
10	HP Steam Line interconnectiing AFBC Boiler and Sulfuric acid plant steam systems	22.0	0.316		2.0	131
11	3 Star Packaged Air Handling Units replacing split air conditioners	1.2	0.039		0.3	57
12	Turbo Generator -I Island mode operation	9.2	0.119		2.3	48

Major Encon 2023-24

Sl No	Name of Encon Projects	Investment	Electrical Savings	Thermal Savings	Savings	Payback
		₹ Million	Million kWh	Million kcals	₹ Million	Months
1	Installation of Waste Heat Boiler and Captive Steam Turbo Generator in SAP-III	4300.0	72.77		466	111
2	Installation of 11KV Automatic Power Factor controlling system	29.5	1.70		11	32
3	Replacement of age-old rewound motors by IE3 motors	4.4	0.17		1.1	49
4	Replacement of 41 nos age old window AC units with 3-star rating units	2.384	0.05		0.31	92
5	Kaizen - Installation of AC controls, close to respective AC Units	0	0.02		0.14	0

Innovative Project 2023-24

1650 MTPD Sulphuric Acid Plant - III

Turbo Generator - III

1. **Project** Installation of Waste Heat Boiler and Captive Steam Turbo Generator in SAP-III

2. **Description** 1650 MTPD Sulphuric Acid Plant III installed, generating 87 MT / Hr., high pressure waste steam at 69kgf/cm^{2}g 485 ^{o}C.

   High pressure & temperature steam turbine results in lower Specific Steam Consumption of 4.0 MT / MW. Old Condensing turbine was medium pressure 31kgf/cm^{2}g 315 ^{o}C with 5.8 MT/MW specific Steam Consumption.

3. **Why Innovative** Known Concept with Unique Application

4. **Impact** 40% reduction in specific energy consumption from 0.028 MTOE/MT in 2022-23 to 0.017 MTOE / MT in 2023-24

5. **Replication** High as high-pressure steam and temperature enables lower Specific steam consumption

6. **Investment** ₹ 4300 Million **Savings** ₹ 466 Million

Innovative Project 2023-24

1. **Project** Installation of 11KV Automatic Power Factor controlling system

2. **Description** Installation of Automatic Power Factor controlling panels comprising

   1.11 KV Limiting Reactors 2.12 MVAR – 3 no's

   2.100 KVAR,440V,3Ph,50Hz, CLMD 83 Capacitor – 30 no's

   3.11kV, 2500kVAr APFC with 6% inrush current – 1 no.

   4.11kV, 2000kVAr APFC with 6% inrush current – 1 no.

3. **Why Innovative** In House Driven / Beyond OEM

4. **Impact** 2% reduction in Specific Energy Consumption as Grid Power factor increased from 0.97 to 0.995

5. **Replication** High as higher power factor avoids penalty and power losses

6. **Investment** ₹ 30 Million **Savings** ₹ 11 Million

Central & Field Capacitor Banks

Utilisation of Renewable Energy Sources

On Site

Year	Source (Solar, Wind etc)	Installed Capacity	Capacity Addition	Total Generation	Share % w.r.t to overall energy consumption
		MW	MW	Million kWh	
2021-22					
2022-23	Ground Mounted Solar	0.00078		0.003416	0.005
2023-24					

14 no’s Solar Street Lights installed on Pilot Scale

Utilisation of Renewable Energy Sources

Off Site

Year	Source (Solar, Wind etc)	Installed Capacity	Capacity Addition	Total Generation	Share % w.r.t to overall energy consumption
		MW	MW	Million kWh	
2021-22					
2022-23					
2023-24					

Renewable Purchase Obligations

Year	Source (Solar, Wind etc)	Mode	Consumption	Share % w.r.t to overall energy consumption
			kWh	
2021-22				
2022-23	Solar	Power Purchase Agreement	6405489	9.2
2023-24				

Waste Utilisation

		2021-22	2022-23	2023-24
Generation, MT				
Waste Steam from Sulphuric acid Plant	MT	608961	602596	1023612
GCV	Kcal/kg	634	634	681
Heat Value	Mkcal	386081	382046	695579
Disposal, MT				
Utilised for Process Heating	MT	428262	414221	587459
Balance for Power Generation	MT	180699	188375	436152
Power Generated from Waste Heat	kWh	30452047	31088600	96562100
Specific Power per MT	kWh/MT	73.11	71.89	45.49
% Share of Waste heat in overall Electrical energy consumption	%	28.0%	27.5%	64.6%

GHG Inventorisation

Kg CO_2 / MT Product

Parameters	FY 2021-2022	FY 2022-2023	FY 2023-2024
Scope 1 Emission (direct emission from fuels used)	23	37	14
Scope 2 Emission (indirect emission from grid electricity)	50	42	41
Scope 3 Emission (employee commuting)	4	4	4
Total Emission	77	83	59

Emission Intensity Target	Kg CO2 / MT Product
Short Term	55
Long Term (Year 2035)	0

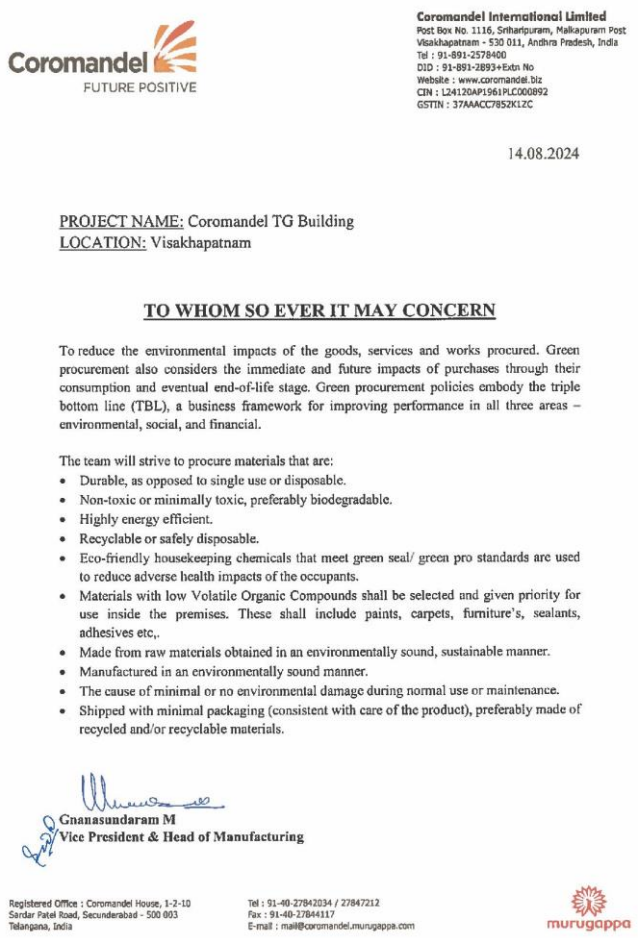
Disclosure of Emission data Publicly thru Integrated Annual Report

Action Plan

1. Maximise Sulphuric Acid Production & Power Generation from Waste Heat
2. Maximise Purchase of Renewable Energy
3. Avoid operation of Emergency Diesel Generating Sets
4. Switch over to energy efficient lighting
5. Replacement of age old by modern 3 Star Air conditioning Units
6. Replacement of age old rewound by modern IE3 motors
7. Improve insulation & condensate recovery

Green Supply Chain

Green Purchase Policy



Coromandel
FUTURE POSITIVE

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DID : 91-891-2893+Extn No
Website : www.coromandel.biz
CIN : L24120AP1961PLC000892
GSTIN : 37AAACC7852K1ZC

14.08.2024

PROJECT NAME: Coromandel TG Building
LOCATION: Visakhapatnam

TO WHOM SO EVER IT MAY CONCERN

To reduce the environmental impacts of the goods, services and works procured. Green procurement also considers the immediate and future impacts of purchases through their consumption and eventual end-of-life stage. Green procurement policies embody the triple bottom line (TBL), a business framework for improving performance in all three areas – environmental, social, and financial.

The team will strive to procure materials that are:

- Durable, as opposed to single use or disposable.
- Non-toxic or minimally toxic, preferably biodegradable.
- Highly energy efficient.
- Recyclable or safely disposable.
- Eco-friendly housekeeping chemicals that meet green seal/ green pro standards are used to reduce adverse health impacts of the occupants.
- Materials with low Volatile Organic Compounds shall be selected and given priority for use inside the premises. These shall include paints, carpets, furniture's, sealants, adhesives etc,.
- Made from raw materials obtained in an environmentally sound, sustainable manner.
- Manufactured in an environmentally sound manner.
- The cause of minimal or no environmental damage during normal use or maintenance.
- Shipped with minimal packaging (consistent with care of the product), preferably made of recycled and/or recyclable materials.

Gnanasundaram M
Vice President & Head of Manufacturing

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Telangana, India

Tel : 91-40-27842034 / 27847212
Fax : 91-40-27844117
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Year	Initiatives taken in supply chain to reduce energy consumption
2021-22	Maximised Deployment of 35 MT axle load trucks for product Despatches
2022-23	Laid Port & Market Connectivity Internal Roads through shortest Route
2023-24	Maximised captive power generation by Waste heat recovery & minimised grid supply power

Info on investments in supply chain & benefits achieved presented under Annual Encon measures implemented

Energy Management System

Certifications

ISO 50001

Integrated Mgmt Systems

IGBC Green Building

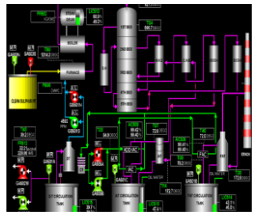
Life Cycle Assessment of our Products

1. Our Products are fertilisers for agriculture are absorbed by plants
2. Regularly Environment Impact Assessment conducted, our average emissions are less than 20% of permitted by AP Pollution Control Board & Environment has capacity to assimilate such quantities
3. Energy & CO_2 emission intensity of our product is very minimum
4. Hence our products are environmentally sustainable

Process & Energy Monitoring IOT Systems

Electrical Energy Dashboard

Thermal Energy Dashboard



DCS Process Monitoring

Learnings from CII / BEE / NREDCAP Award Programs

1. Competitive Spirit among participating companies
2. Advice by Judges on implementing energy efficient technologies
3. Knowledge on Energy efficient technologies under implementation among Industries
4. Sense of recognition for energy conservation efforts undertaken

Energy Management System

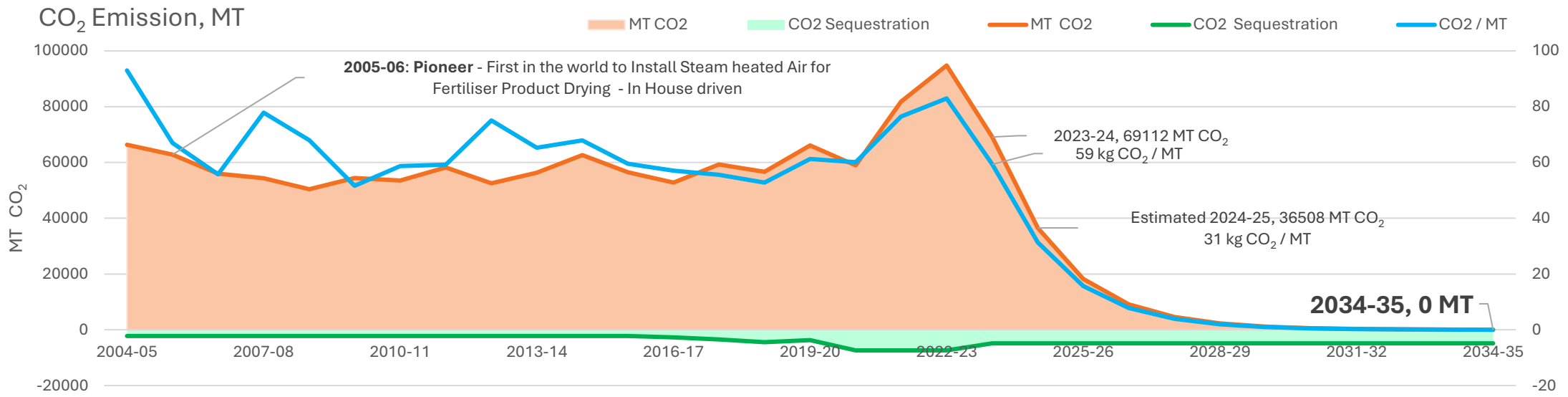
Monitoring – Daily Target Vs Actual Specific Energy compared & corrective actions undertaken

Review Meeting Chaired By - Unit Head

TYPICAL REPORT		Jul-24						Cumulative						Variance Rs./MT	
Conversion Cost - Variable		Norm		Rate		Rs/MT		Norm		Rate		Rs/MT		Budget vs Actual	
COMPLEX		Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	MTD	YTD
Power	Kwh	155	159	2.68	1.88	416	299	157	173	2.55	2.02	400	350	117	51
Water	M3	3.99	3.81	63	70	250	268	3.97	4.44	63	64	249	282	-17	-33
Fuel (Lshs)	Kgs	0.45	0.44	54	60	24	26	0.47	0.49	54	58	25	28	-2	-3
Fuel - Others (Diesel & Kerosene)						9	8					29	34	1	-4
Coal& O&M	Kgs	2	0	17		41	19	3	0	17		43	21	22	22
Chemicals & Consumables															
Defoamer	Kgs	1.66	1.24	58	50	96	61	1.64	1.48	58	57	95	84	35	11
Granulation Aid	Kgs	0.07	0.00	33	0	2	0	0.05	0.00	33	0	2	0	2	2
Anti Caking Agent	Kgs	0.40	0.40	62	72	25	29	0.40	0.39	62	65	25	25	-4	0
Caustic Lye	Kgs	1.24	1.33	38	35	47	47	1.25	1.26	38	36	47	45	0	2
Catalyst	Kgs	0.00	0.00	0	0	0	0	0.00	0.00	0	0	0	0	0	0
Hydrated Lime	Kgs	1.21	0.24	9.8	9.4	12	2	1.19	0.20	9.8	8.4	12	2	10	10
Other Chemicals & Mos						84	19					84	22	65	62
Hyd Lime -for Nut-gypsum	Kgs	13.38	14.75	8.4	8.0	112	118	12.77	15.3	8.4	8.01	107	123	-5	-16
Total Conv cost with Nut-Gypsum - Rs./MT						**1119**	**896**					**1120**	**1017**	**223**	**103**
							223						103		
Less: P205 STO cost - Rs./MT						229	137					212	143	91	69
Net Converstion cost - Rs./MT						**890**	**758**					**907**	**874**	**132**	**33**

Challenges in Undertaking Monitoring Projects – Dashboard configuring, IIOT installations, Commissioning Servers, Installing Software, Cabling, DCS Networking & configuring dashboards, rigorous IT security assessment, release to mass users through real time portal, very challenging.

Net Zero Commitment



Our Commitment - We intend to commit to Net Zero by the year 2035, 35 years ahead of Govt of India commitment to Net Zero by the year 2070

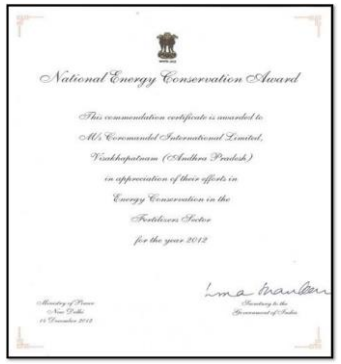
Road Map for Target - Actual 2023-24 - 59 kg CO_2 / MT Fertiliser, Short Term Target 2024-25 - 31 kg CO_2 / MT Fertiliser, Long Term Target 2035 - 0 kg CO_2/ MT Fertiliser

Voluntary Initiatives - Continuously improving our environmental performance by undertaking Self Driven initiatives

- ✓ Maximise Renewable Energy Consumption
- ✓ Maximise Process Waste Heat Consumption

Energy Management Awards

BEE NECA 2007



BEE NECA 2012

NREDCAP 2010

NREDCAP 2012

NREDCAP 2013

2000

Excellent Unit Award

2001

Excellent Unit Award

2018

2002

Excellent Unit Award

2019

2014

2015

2016

2017

2020

Excellent Unit Award

2022

2024

Accolades

Award	Awarded By	Year
SAFETY & ENVIRONMENT		
"One of the Top 10 Greenest Companies in India"	TERI & Business Today	2001
Safety, Health & Environment Performance Award	CII - SR	2003, 2004
Environment Protection Award	FAI	1996, 2009,2017
5 Star Rating	British Safety Council	1999, 2011, 2023
Sword of Honour	British Safety Council	2023
Safety Award	National Safety Council	1998
WATER & ENERGY CONSERVATION		
Excellence in Energy Conservation & Management	CII	2000,2001,2002,19-20
Energy Efficient Unit Award	CII	2013-14,2014-15,2015-16,16-17,17-18,18-19,21-22
Certificate of Merit	BEE	2002-03, 2003-04, 2005-06 & 2006-07, 2011-12
Excellence in Energy Conservation	NREDCAP – Govt of AP	2009-10,2011-12,2012-13
Excellence in Energy Conservation	AP Productivity council	2006-07
Excellence in Water Management	CII	2009-10, 2010-11, 2011-12
PRODUCTION		
Best overall performance of Fertiliser Plant	FAI	1994-95
Best Operating Phosphoric Acid Plant	FAI	1994-95,1995-96,1996-97,1997-98,2000-01,2001-02,2003-04,2004-05,2005-06,06-07,09-10, 11-12,13-14,14-15,15-16,16-17,17-18
INDUSTRIAL RELATIONS		
Best Management Award	Labour Dept – AP Govt	2005, 2013, 2015, 2016,2017

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Vice president - Manufacturing

THANK YOU

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