Kaira District Cooperative Milk Producers' Union Ltd., Anand (Amul Dairy)

24th National Award for Excellence in Energy Management 2023

Plant Name:
Kheda Satellite Dairy, Khatraj

Team Members:
Mr. Sandeep Rai-Factory Manager (KSD)
Mr. Aditya Laharaya-Sr.Manager (Engineering)
Mr. Ravi Upadhaya-Deputy Manager (Engineering)

AMUL – AT A GLANCE

GUJARAT COOPERATIVE MILK MARKETING FEDERATION LIMITED

- District Co-operative Unions: 18 Nos.
- Milk Producers: 3.64 Million Members.
- Milk Handling Capacity : 47 Million liters per day.
- Annual Turnover (2022-23): Rs.550,550 Millions.

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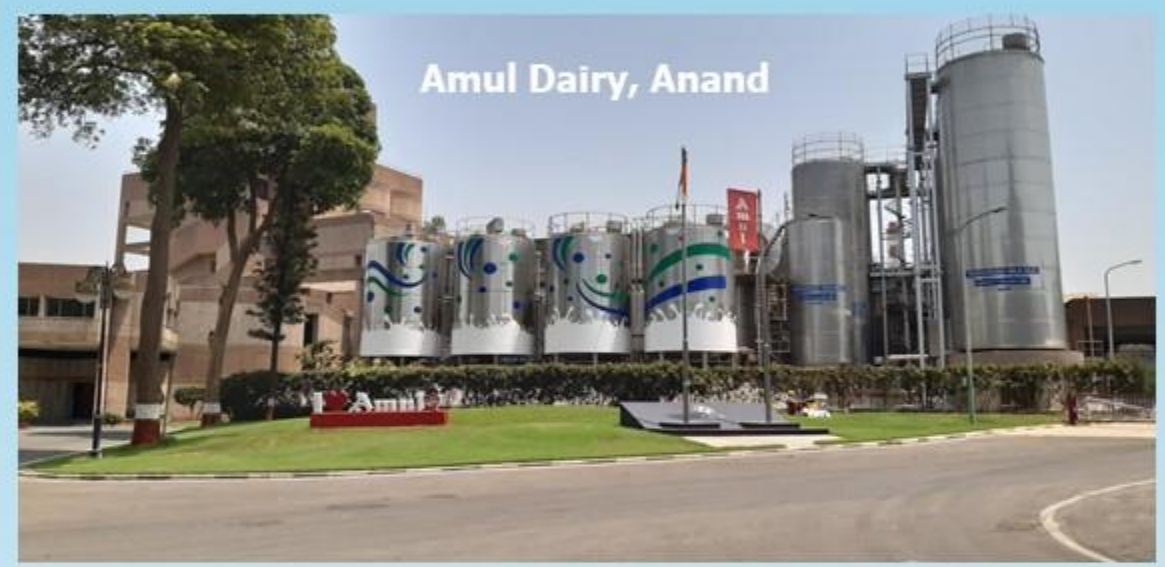
AMUL MODEL – THE ANAND PATTERN

Kaira District Cooperative Milk Producers' Union Ltd., Anand (Amul Dairy)

Amul Dairy, Anand

- KDCMPUL is having 47 Units across 13 states.
- Milk Handling Capacity : 8.4 Million liters per day.
- Milk Procurement : 1500 Millions Kg (F.Y. 2022-23).
- Sales Turnover : **Rs. 118,034 Millions** (F.Y. 2022-23).



Kheda Satellite Dairy, Khatraj

- Milk Handling Capacity : 1.15 Million liters per day.
- KSD Sales Turnover : **Rs. 11,764 Millions.** (F.Y. 2022-23).
- Products : **Cheddar Cheese, Processed Cheese, Mozzarella, Paneer, Skimmed Milk Powder & Whey Powder.**

JOURNEY OF 75 YEARS...

Diced Cheese Section- IQF

CIP Kitchen-Pumps

Milk Process Section-Bactofuge

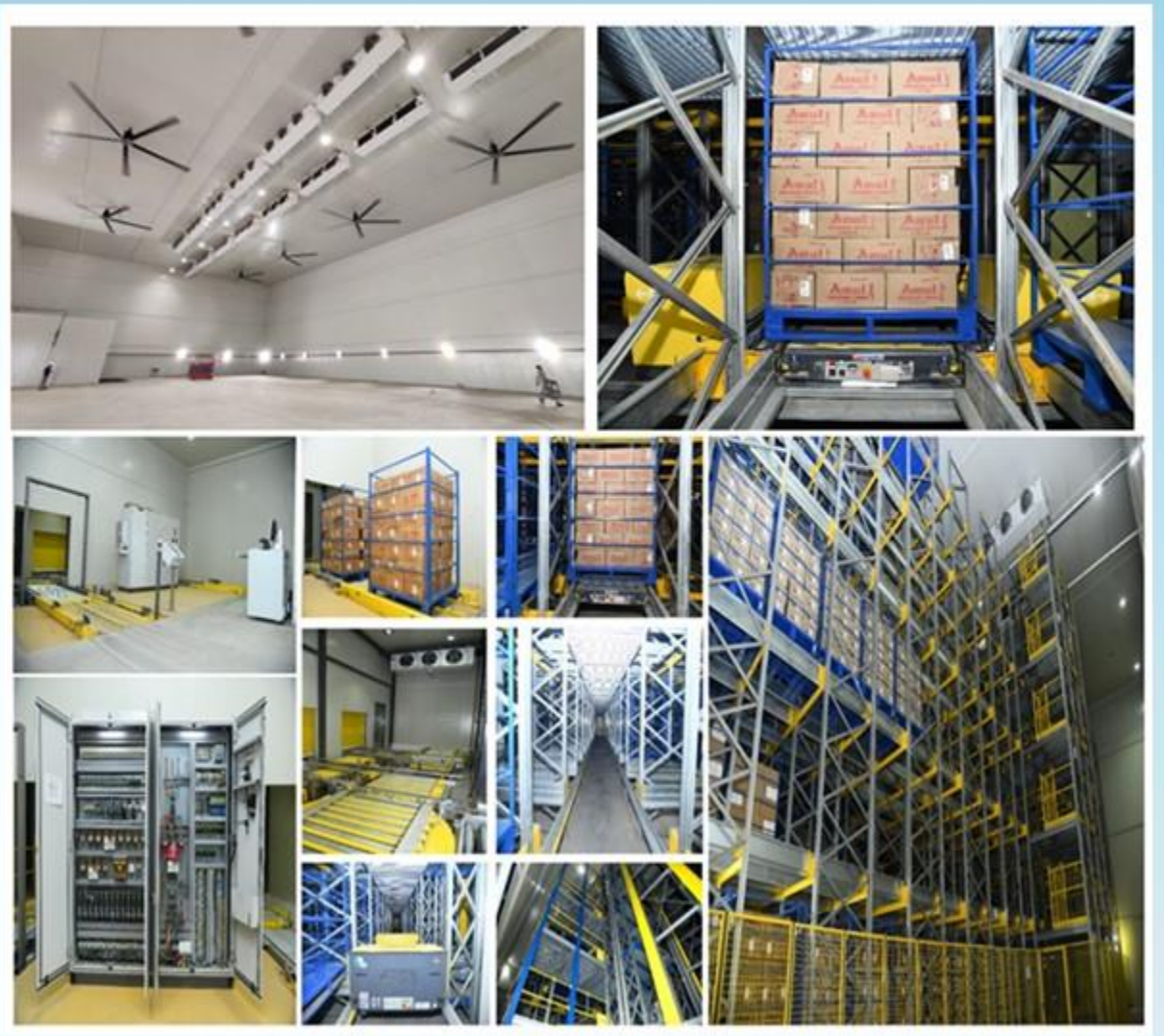
ENERGY EFFICIENT EQUIPMENT'S AT PLANT

Milk Process-Milk Pasteurizer

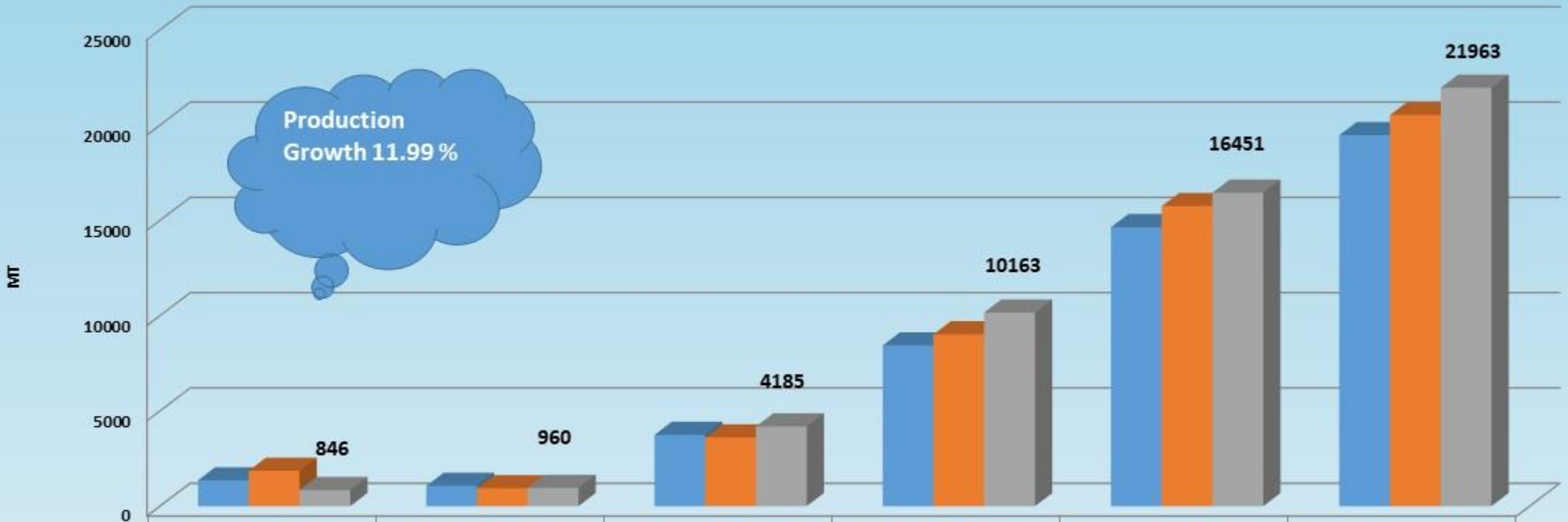
ENERGY EFFICIENT SMART SHUTTLE SYSTEM

EESS (Energy Efficient Smart Shuttle System):

- Capacity: 3996 Pallet Position(2500 MT)
- Temperature: 0 to 4 Deg. C
- Automatic Dense Storage - Less space more storage
- Lower refrigeration consumption with precise temperature control
- **HVLS (High velocity low speed) fans** installed for proper air circulation to achiever quick product temperature
- **120 TR Refrigeration load for 2500 MT**
- Earlier: Refrigeration load 30 TR for 400 MT and product cool down time 7 days
- Now **: Total refrigeration power consumption reduced by 37% of the conventional storage system and product cool down time 3 days**

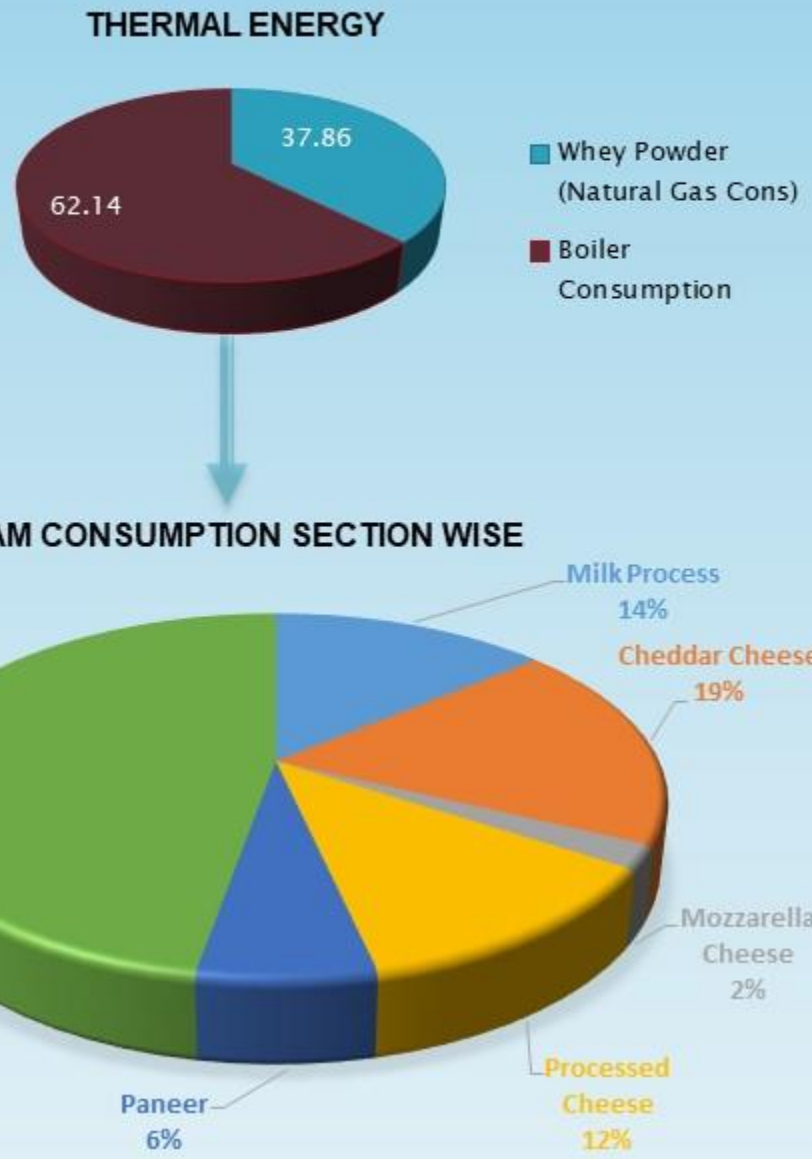


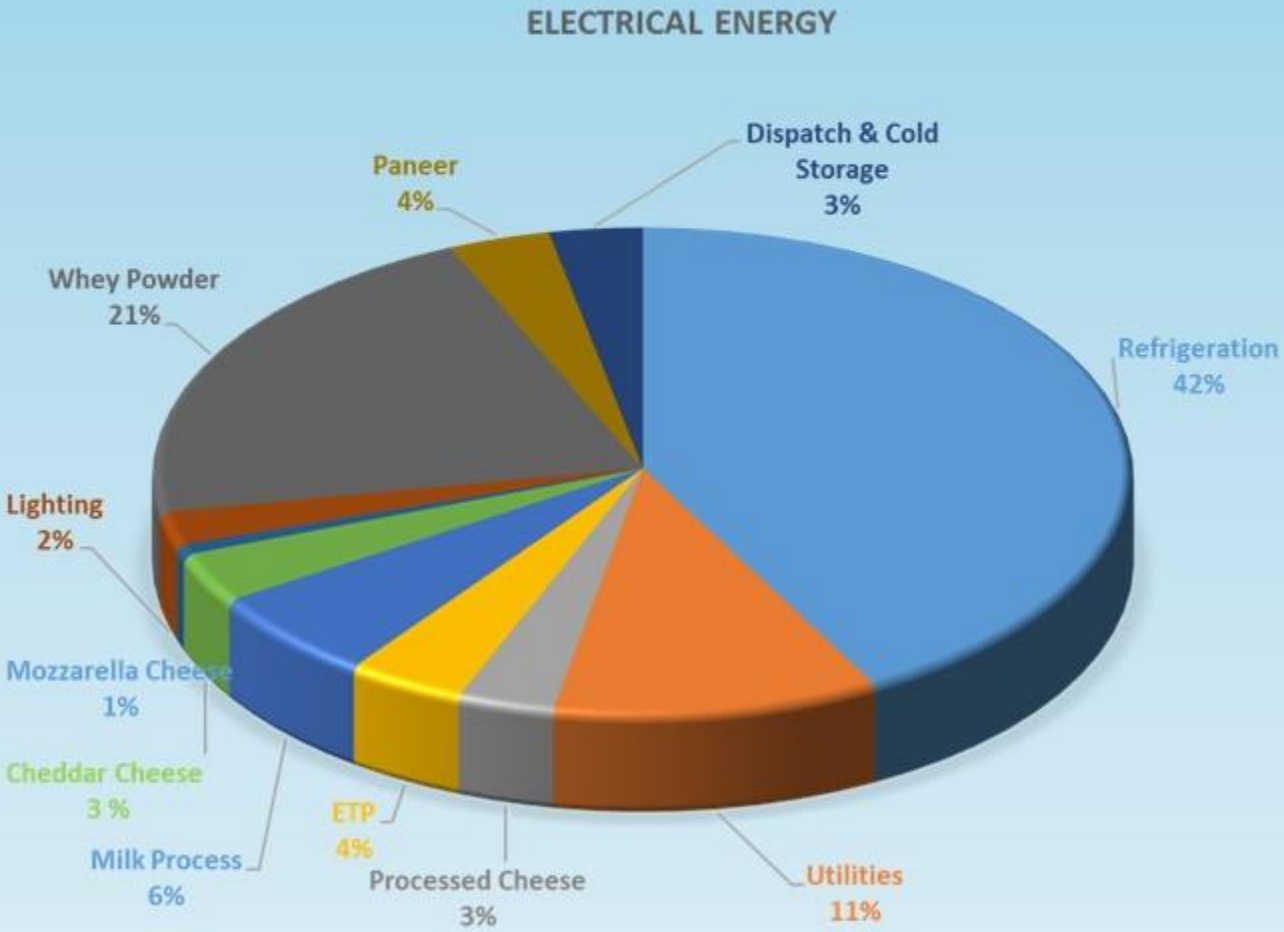
Production - FY 2020-21 to 2022-23



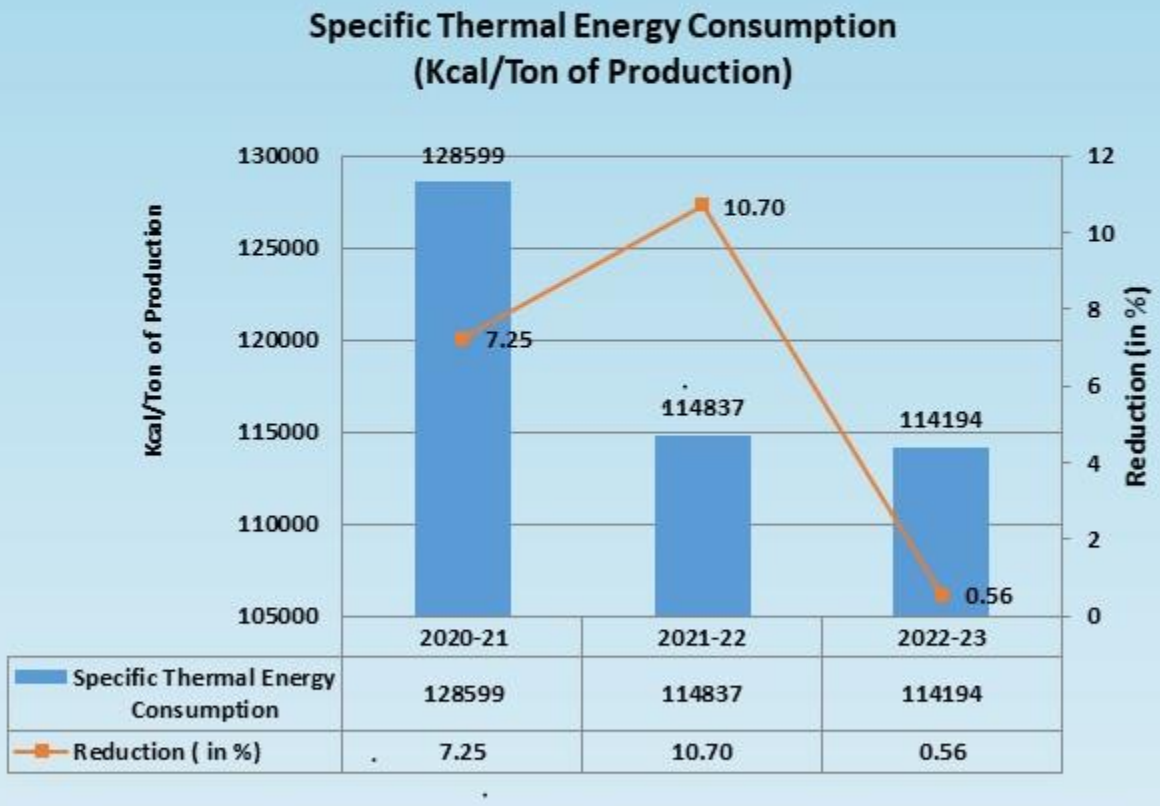
	Skim Milk Powder (MT)	Mozzarella (MT)	Paneer(MT)	Whey Powder (MT)	Cheddar Cheese (MT)	Processed Cheese (MT)
2020-21	1356	1067	3744	8439	14644	19474
2021-22	1861	941	3611	9019	15750	20528
2022-23	846	960	4185	10163	16451	21963

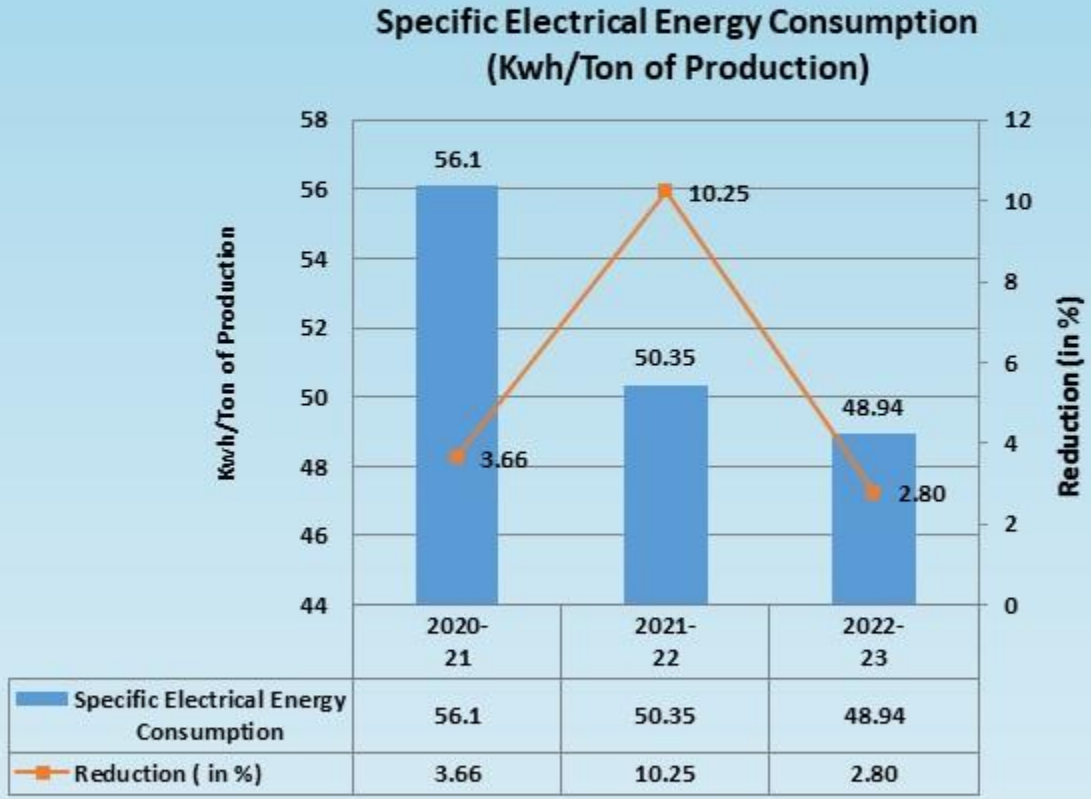
Energy Consumption Pattern





Specific Thermal / Electrical Energy Consumption (FY 2020-21 to 2022-23)





* 11.2 % Reduction in Specific Thermal Energy Consumption compared to 2020-21

* 12.76 % Reduction in Specific Electrical Energy Consumption compared to 2020-21

Energy Saving Projects Implemented in last 3 years (FY 2020-21 to 2022-23)

Year	No of Energy Saving Projects	Investments (in Millions)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal)	Savings (INR Millions)	Payback Period	Impact on SEC in % (Electrical / Thermal)
FY 2020-21	2	14	3.22	286	38.54	4 Months	17.57 / 0.68
FY 2021-22	4	28	0.79	840	41.2	8 Months	3.96 / 1.84
FY 2022-23	6	6.7	0.07	1270.82	9.318	17 Months	0.33/2.63

Encon Projects Planned in FY 2023-24

Year 2023-24

Installation of Motion and Day Night Sensors
Investment:- Rs. 1.0 Million
Savings- 1.27 M kWH/Annum

Installation of Solar Panels
Investment:- Rs. 1.4 Million
Savings- 0.5481 M kWH/Annum

Utilization of Biogas Generated at ETP in Canteen
Investment:- Rs 0.2 Million
Savings- 65.7 M Kcal/Annum

Economizer for Boiler
Investment:- Rs. 2.5 Million
Savings- 901.8 M Kcal/Annum

Revamping of UASBR
Investment:- Rs. 40 Million
Savings- 1396.44 M Kcal/Annum

Innovative Projects Implemented

Regenerative Heat Exchanger in Mozzarella Cheese Section

Trigger Point

Earlier cheese whey chilling & milk heating was consuming,

- 10 % of electrical power of refrigeration.
- 4 % of thermal energy of total plant.

Regenerative Heat Exchanger

Technical Details

- Installed 10KLPH regenerative type heat exchanger
- Milk processing of 2,00,000 Ltr/day
- Whey processing of 2,00,000 Ltr/day
- Annual savings: Thermal Energy: 1610 million Kcal
  Electrical Energy: 0.63 million Kwh
  Rs. 15.82 million

Replication Potential

- This can be replicated in similar kind of industry

Innovative Projects Implemented

Bio Gas generated in ETP used in Canteen

Trigger Point

Flaring of excess gas in ETP

- 100 % of natural gas replaced by biogas in canteen.
- 2.5 % of thermal energy utilized in canteen generated from ETP.

Technical Details

- 30 SCM per day utilization
- Calorific value 6000 kcal/SCM
- Working pressure : 0.5 kg/cm2
- High pressure cylinder procurement avoided

Replication Potential

- This can be replicated in all kind of industry

Biogas Generation at ETP

Biogas Generation utilization at Canteen

GHG Emmissions (KgCO2/Ton of Product)

	2018–19	2019–20	2020–21	2021–22	2022–23
Scope 1 Emmission	292.3	307.29	141.93	182.84	188.53
Scope 2 Emmission	345.75	354.09	308.23	315.00	316.05

Automatic Milk Sampling System & Route Optimization

- Route allocation on rotational basis through Tracking system.
- Tanker allocation on Route milk capacity
- Tanker capacity utilization> 95%.
- Reduction in tanker Kms by 1,12,000 km per year

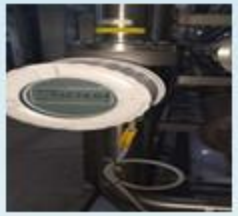
Reduction in CO_2 Emission reduced
89.25 MT/Annum

Teamwork/Employee involvement & Monitoring

Daily monitoring of energy consumption through Whatsapp, SMS, Kaizala and Email

More than 150 energy meters installed for measuring system

Power Consumption, Utilities, Production & OEE Data			
Date: 08-08-2022			
Power	64200.0	Total Production	174.05
md	3014.4	Raw Milk	5,39,900
Avg. PF	1.0	Skim Milk	0
Daily P.F	1.0	Whey	7,45,000
Refrigeration	23195.0	Total	12,84,900
Whey Powder	14462.0	Machine OEE	
Service	7375.0		
Paneer	5324.0		
New. Ref	3287.0	Sapal	81
Milk Process	3599.0	Corozza Chiplet	79.31
Cheese Pkg	2071.0	Old Corozza	86.25
Lighting	1357.0	New Corozza	84.72
ESS	2030.0	GBM	84.47
Cheddar	1704.0	Ishida 1 Kg	0
ETP	1956.0	Ishida 100 Gm	0
ETP inlet	1082000	Ishida 200 Gm	93.23
Borewell Water	1014000	Ishida 500 Gm	0
Gas	18512	Bactofuge	99.4
Sp.power-milk+whey	50.0	Nano	100
Sp Refri	18.1	Whey Pasteurizer	99.91
Oil	0.0	Powder Dryer	72.29
New PCC Incomer 2	28900	Evaporator	95.7
Incomer-1	14232		



AMUL KSD ETP ANALYSIS REPORT DATE:- 08 08 2022

SAMPLE	PH	B.O.D.	C.O.D.	T.S & MLSS	F.O.G.	T.D.S.	CHLORIDE	SETTLING	D.O.	V.F.A.	ALKALINITY	RATIO
INLET	5.94		6040	5630	4990	5140	1035					
EQUALIZATION	7.00		3480									
UASB-1	7.41		480							18.2	40	0.41
UASB-2	7.43		456							18.1	41	0.39
UASB-3	7.38		576							18.2	38	0.48
NEW AERATION	7.72			4480				970	1.9			
OLD AERATION	7.69			4640				980	1.6			
NEW CLARIFIER			80									
OLD CLARIFIER			88									
FINAL	7.80		84			2210	790					
CHEDDAR	6.49		5180									
PANEER	7.31		4320									
WPP	6.16		5840									
CIP	5.98		4800									
CH PKG	6.13		4180									
SLUDGE				6.20%								
SCREWPRESS	SOLIDS	21	MOISTURE	79								

Weekly Monitoring Meeting

Amul

PARTICULAR	03.08.23 TO 09.8.23			27.07.23 TO 02.08.23			23-Aug Till 09.08.2023			August-2022 SPECIFIC
	Total	Average	Specific	Total	Average	Specific	Total	Average	Specific	Average
POWER	439333	62762	49.30	424550	60650	49.92	562376	62486	48.87	51.31
THERMAL (Gas)	114547	16364	109461	106260	15180	110218	140622	15625	104406	116668
THERMAL (LDO)	1900	271		5016	717		2716	302		
BOREWELL WATER	7122000	1017429	799	7265000	1037857	854	9273000	1030333	806	840
TOTAL WATER	10833784	1547683	1216	10887552	1555365	1280	14003696	1555966	1217	-
ETP WASTE WATER	8904000	1272000	999	9511000	1358714	1118	11574000	1286000	1006	1054 (Avg)
MILK (KG) + Whey	8911550	1273079		8505276	1215039		11506550	1278506		1175136 (Avg)
INLET COD TO ETP (PPM)	41360	5909		41480	5926		53320	5924		6161 (Avg)
%TS LOSS	3.99	0.57		3.99	0.57		5.13	0.57		0.57 (Avg)

Monthly Monitoring

Amul

Specific Consumption (Milk + Whey)

Sr. No	Description	Unit	July-23	July-22	June-23	% Diff July-23 Vs July-22	Co2 Emission MT
1	Electricity KWH/1000 liters	KWH/KL	53.20	47.80	51.73	11.29	159
2	Fuel Consumption/1000 liters	KCal / KL	1,10,326	1,04,030	1,10,285	6.05	14
3	Water Consumption /1000 liters	Ltrs / KL	895	763	890	17.24	36
4	Power in Refri /1000 liters	KWH / KL	16.67	17.34	17.32	-3.89	25
5	(Milk +Whey)	Ltrs/Day	11,57,676	12,51,536	11,87,391	-7.50	173

Kaizen use for Energy conservation

- Kaizen drive is continued.
- Kaizen rewards awarded to each participant
- Best kaizen monthly reviewed by team
- Energy savings through Kaizen activities -

1. Installation of new vacuum sealing machine for cheddar blocks resulting in appx. 7.2 Lacs/year Elect. power saving, and 76 MT/year CO2 emission reduction
2. Installation of online CBX Printer to replaced stickers
3. Installation of hot water Generator
4. Replacement of RO with soft water
5. Economizer of steam boiler
6. Falling film evaporator
7. Replacement of old motors with energy efficient motors
8. Installation of LED with motion sensors and day and night sensors

- Periodic training organized by industrial experts

Amul

KSD, Khatraj Kaizen Report – March 23 to May 23

Sr. No.	Department	Mar-23			Apr-23			May-23		
		Empl	Kaizen	Avg.	Empl	Kaizen	Avg.	Empl	Kaizen	Avg.
1	Plant Admn & FMO	12	18	1.50	12	19	1.58	11	18	1.64
2	Cheddar Cheese	25	156	6.24	25	158	6.32	25	220	8.80
3	QA (KSD)	29	39	1.34	29	37	1.28	29	24	0.83
4	Cheese Pkg.	68	511	7.51	68	724	10.65	68	576	8.47
5	Paneer Plant	28	54	1.93	28	53	1.89	32	26	0.81
6	WPP	34	149	4.38	34	88	2.59	34	151	4.44
7	Utilities	23	207	9.00	18	19	1.06	17	46	2.71
8	Engineering	35	239	6.83	35	266	7.6	33	275	8.33
9	Dispatch & Stores	18	98	5.44	18	73	4.06	18	168	9.33
11	Mozzarella	21	62	2.95	21	84	4	21	94	4.48
12	VCU	10	23	2.30	10	33	3.3	9	43	4.78
13	Milk Process	14	33	2.36	14	17	1.21	14	28	2.00
	Total	**317**	**1589**	**5.01**	**312**	**1571**	**3.79**	**311**	**1669**	**4.72**

Award & Achievement

CII National Award for Excellence in Energy Management 2022

Gujarat Pollution Control Board Award Reduction in Plastics waste 2022

Shri Guruji Puraskar - 2023 for exceptional Sustainability & Environment Initiatives

Gujarat State Shram Bhushan Award 2022

Recognition from
Bureau of Energy Efficiency – New Delhi
National Energy Conservation Award 2017

Winner of prestigious "Golden Peacock Eco – Innovation Award 2016" for Biogas Purification and Bottling Plant project

Certifications

- We have applied for ISO :50001:2018 Certification through our apex organization M/s GCMMF Ltd, Anand and allied implementation process is going on for training, Documentation, Audit & implementation.

- Investment of energy saving projects on total turnover of the company for FY22-23 is 0.06 %.
  Turnover: Rs. 11512 millions.
  Investment: Rs. 6.7 millions.

ISO 14001 : ENVIRONMENT MANAGEMENT SYSTEM CERTIFICATE

FSSC 2200 : FOOD SAFETY SYSTEM CERTIFICATION CERTIFICATE

ISO 45001:2018 : OCCUPATION HEALTH AND SAFETY MANAGEMENT SYSTEM

EXPORT INSPECTION COUNCIL CERTIFICATE OF APPROVAL

HALAL CERTIFICATE

Learning from CII Energy Award or Any other Award Program

- Employees Motivation.
- Learning from other fellow participating companies.
- Kaizen - Improvements at workplace for ease of work.
- Kaizen activities enhancing the involvement of workforce to get desired output.
- Sense of ownership among workforce.
- Increased recognition of the organization.
- Learning about environmental aspects and devices for energy savings.

Road Map Ahead

2022-23

Hot Water Generator

Biogas generation form Kitchen Waste

Additional 8 Nos of Rain Water Harvesting

Economizer for Boiler

2023-24

Solar panel installation with investment of Rs.1.4 Million

Revamping of UASBR
Investment:- Rs. 40 Million

2024-25

Installation of Solar thermal plant

Utilization of treated effluent water

250 kw solar panel installation

Use of 30% E-Vehicle for milk transport

2030-31

Water surplus Organization

30 % Electricity from Renewable Energy

TREE PLANTATION

- Started tree plantation in the year 2007 on 15th Aug.
- This year on 15th August 4,12,255 tree planted
- Till date, planted 94,55,707 trees

Sustainability

Utilization of ETP Water for Gardening

RAINWATER HARVESTING SYSTEM AT AMUL

- 105 Rainwater Harvesting systems across all plants
- 16 Rainwater Harvesting at KSD Khatraj

WASTE TO ENERGY

Biogas Generation in ETP

- 1000 SCM/day Biogas is generated from ETP

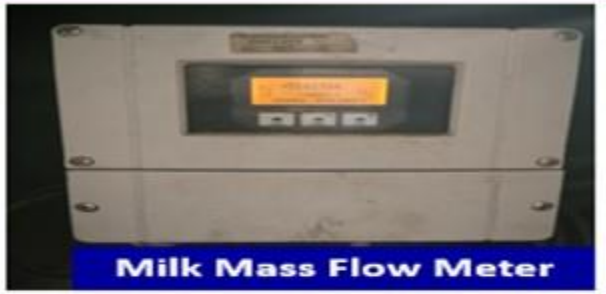
Hot Water Generator

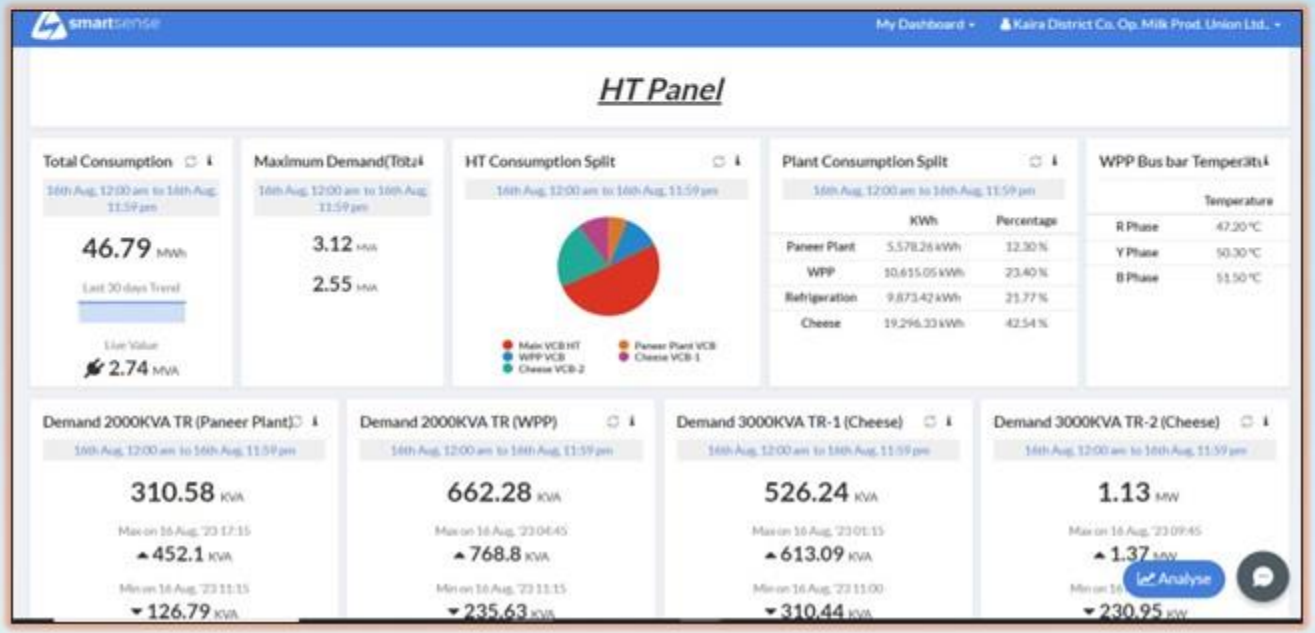
- Biogas used to heat boiler feed water up to 95 deg C
- Current saving is 5% of total fuel

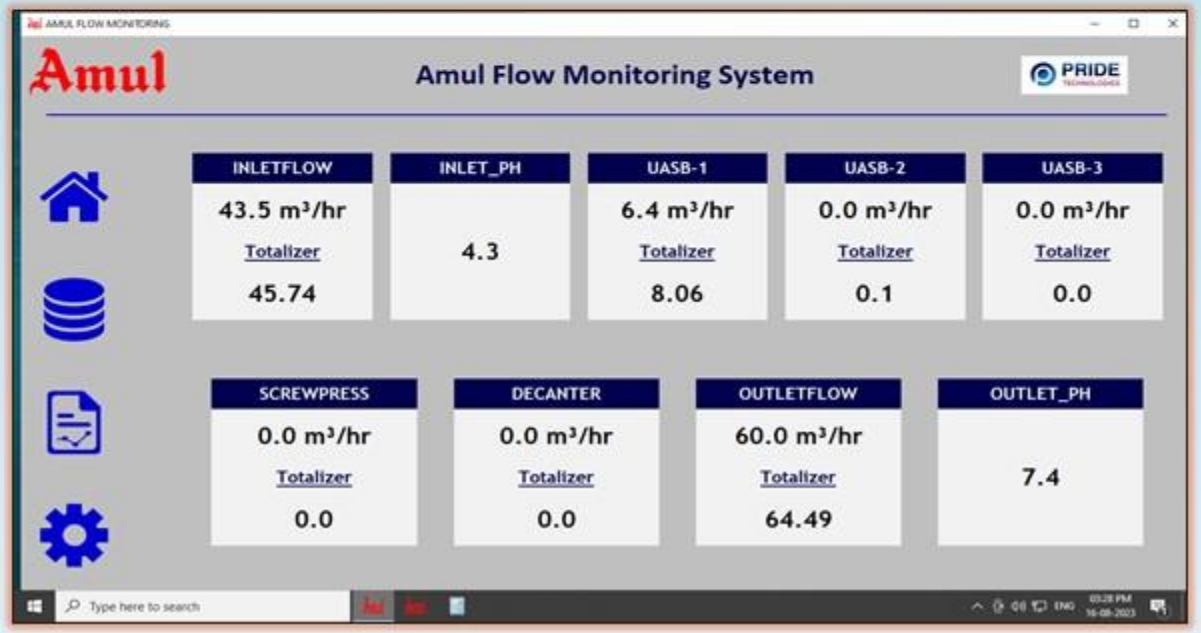
Biogas plant of 15 M3

- Biogas Generation at Canteen resulting in annual thermal Saving of 16.43 M Kcal.

Energy Monitoring







Digitalization of Amul
AMCS (Automatic Milk Collection System)

Amul

Amul 75 YEARS OF MILK & PROGRESS

Code-0500(134)
Date-30-07-2019
Shift-Morning
Milk-Buff
Qty-4.20
Fat-5.4
Amount-130.50

FARMERS APP

Amul VDCS App

Central Server

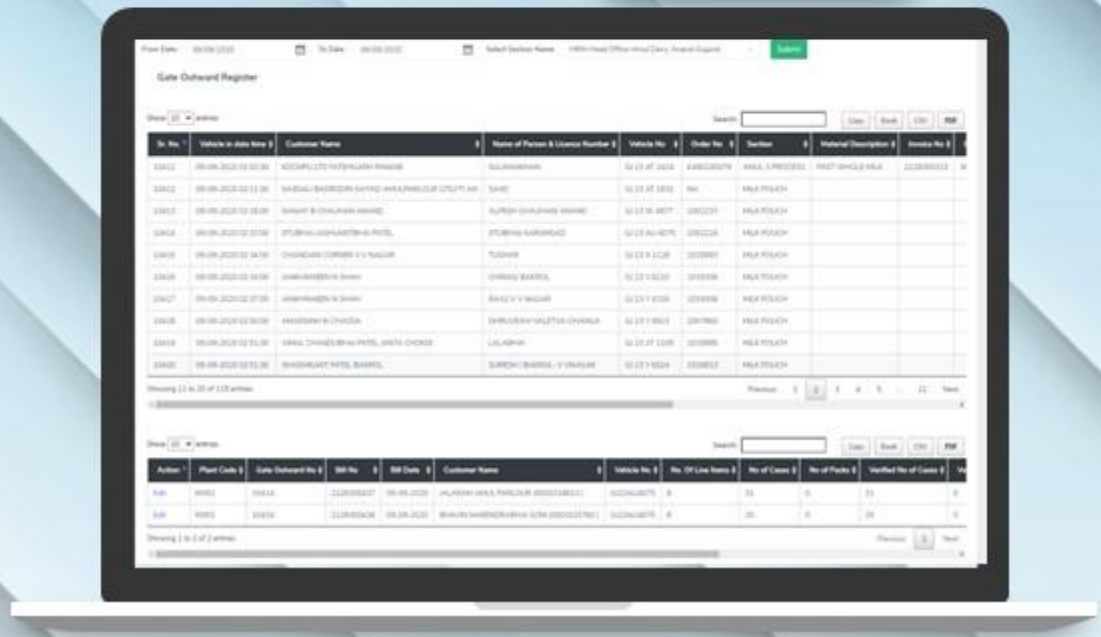
MU APP

Bank Portal for Direct Payment to Farmers

Amul KIOSK

Paperless Documentation

- Mobile app to scan QR code of invoice while Gate Outward.
- Data captured and integrated to DIGI app. So, no need to keep copy at Main Gate.
- Avoid data entry duplication.
- No vehicle queue at out gate.
- Time & Paper Saving.



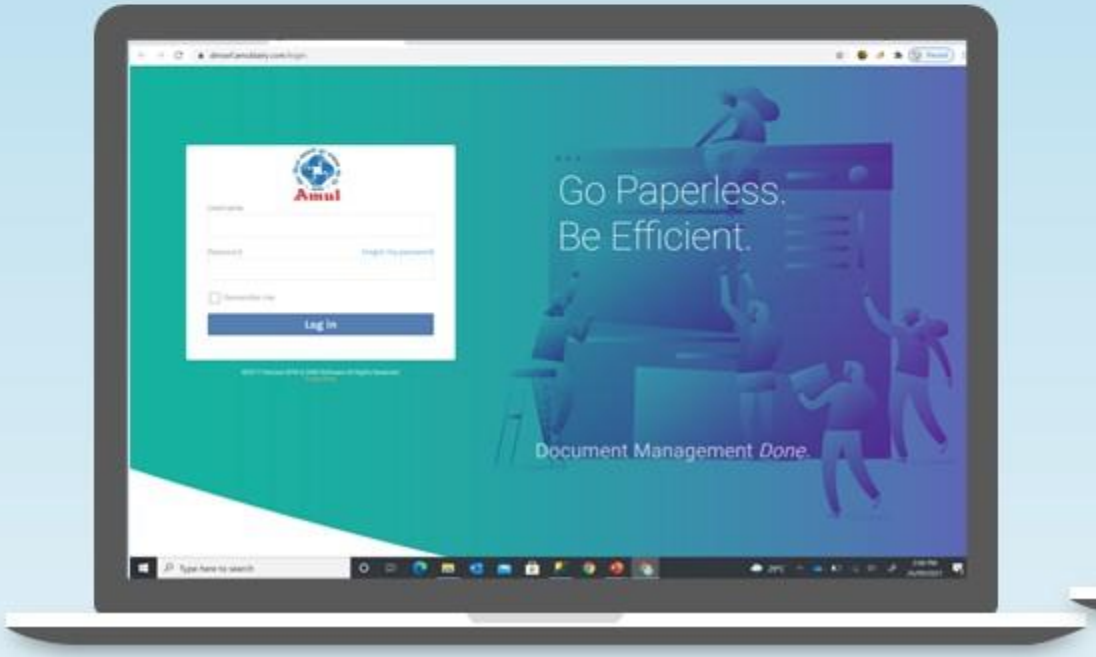
Digital Document Management System

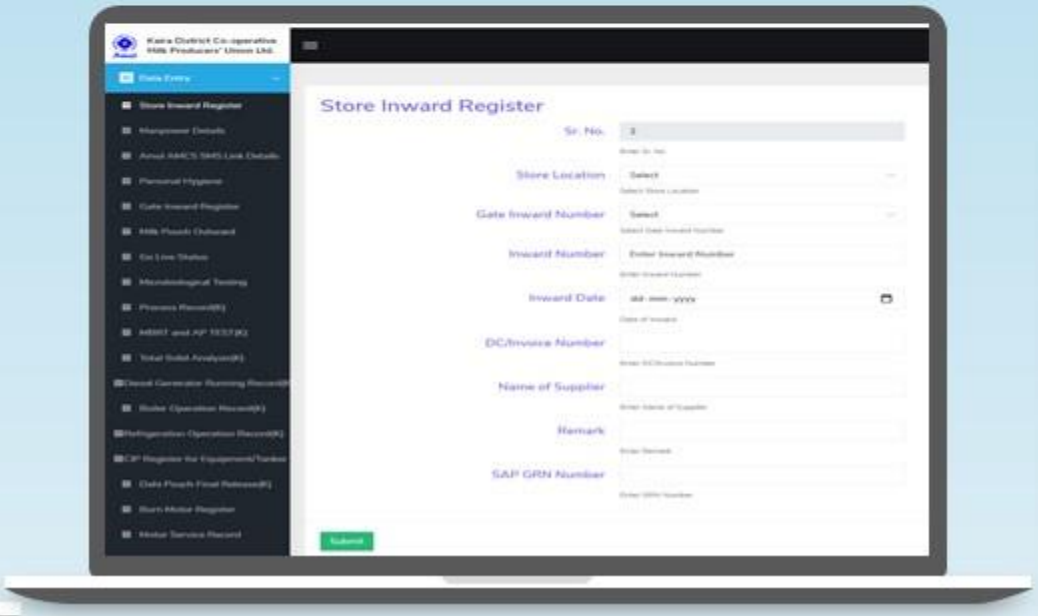
- 100% Paper Less Office
- Fast movement of document
- Digitally signed documentation
- Easy to retrieve

- 1 sheet of paper requires around 5 liters of water & 10,000 trees are needed roughly to make 1 tonne of paper.

Paper Saved	Water Saved	Trees Saved
90,50,000 Sheets	4,52,50,000 Ltrs	4,23,672 Nos.

Savings of "Time, Money & Mother Earth"






Amul
Thank you all