

Promoting Energy Efficiency and Renewable Energy in MSME clusters

The Gujarat Dairy cluster is one of the 12 energy-intensive MSME clusters covered under the GEF-UNIDO-BEE project titled 'Promoting energy efficiency and renewable energy in selected MSME clusters in India'. Gujarat is among the largest milk producer in the country. In 2017-18, the state produced 13.56 million tons of milk, and was responsible for 7.52% of the country's total production (NDDDB, 2019). Gujarat has played an important role in making the country one of the largest milk producers in the world, resulting from the movement started on the eve of independence in 1947, when the rural milk producers of Gujarat stood against their exploitation and formed a cooperative to take over the control of producing, processing and marketing of milk and milk products. This cooperative movement was later institutionalized in the form of "Operation Flood", and it helped transform India from a milk deficit nation to one of the largest milk producers in the world.



In Gujarat, most districts have cooperatives, and their milk processing capacity ranges from 1 lakh liters per day to 35 lakh liters per day. All these cooperatives are members of Gujarat Cooperative Milk Marketing Federation (GCMMF), and GCMMF markets the products under the brand name "Amul".

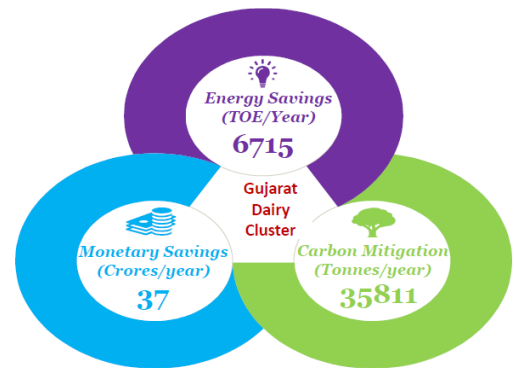
The project activities started in all the cluster around 2014. Regular walk-through energy audits and detailed energy audits (DEAs) in selected units in the cluster, identification of energy efficiency (EE) measures including Best Operating Practices (BOP) for adoption by the units in the cluster were done. Hands-on training on BOP was provided to shop-floor personnel; BOP documents and Common Monitorable Parameters (CMP) posters were developed distributed among the units, and three workshops per each cluster were conducted for knowledge sharing among other units.

The project also established an energy management cell (EMC) equipped with a set of energy auditing instruments and provided comprehensive training to unit personnel on the usage of the instruments for conducting energy audits and to analyze the saving potential. The project also developed a list of local

service providers and provided training to enhance their skills on energy efficiency concepts to deliver better services to units.

Over the last five years, the project has implemented few innovative and investment-oriented energy efficient and renewable energy technologies as a demo in selected units with partial financial assistance. The technologies are ranging from energy efficient boilers, desuperheaters, energy efficient chiller compressors, solar thermal steam generation, condensate recovery system, effluent treatment plants for biogas generation, energy efficient pumps, energy efficient, motors variable frequency drives and energy efficient lighting, to name a few.

With these interventions 22 dairy units under Gujarat Cooperative Milk Marketing Federation (GCMMF -under Amul brand name), cumulatively achieved an annual energy savings of about 6,715 tonne of oil equivalent (toe) and annual monetary benefits of 37 crores rupees with an investment of 56 crore rupees. These energy conservation initiatives avoided 35,811 tonnes of carbon emissions.



Project has also demonstrated 4 pilot projects at Amulfed, Gujarat like Waste heat recovery from Refrigeration system- Desuper heater, ICR+MBR based Effluent Treatment Plant for methane capture to utilize as fuel in boiler, Parabolic trough solar collectors for steam generation and packaged chiller compressor for air conditioning. Some of the glimpses of implementations shown below:-



ICR+MBR based Effluent Treatment Plant



Package Chiller Compressor



Concentrated Solar Thermal System

EE/RE technologies implemented in Dairy Sector

The below mentioned are the EE/ RE technologies that are implemented under the project in Gujarat Dairy Cluster

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
1	Replacing Metallic blades for cooling tower with FRP materials blades	Gujarat Dairy Cluster	Amul-Mother Dairy, Gandhinagar	Electricity	kWh	338800	29.13	284.59	1.90	1.46
2	Installation of VFD on existing 300 hp Refrigeration compressor motor		Panchmahal Dairy ,Godhra	Electricity	kWh	29588	2.54	24.85	2.09	1.75
3	New Commission of Premium efficiency oil free VFD base Air Compressor		Amul-Fed. Dairy	Electricity	kWh	54000	4.64	45.36	4.60	4.2
4	Energy Savings by providing condensate recovery system for boiler.		Amul-Fed. Dairy	Natural Gas	SCM	11680	11.09	25.69	4.67	18
5	Condensate Recovery System for APS (automatic production system) Bottling Plant		Amul-Fed. Dairy	Electricity	kWh	136350	11.72	114.53	1.36	3.4
6	Improvement in chilled water pipe line insulation to prevent the heat increase and thus energy loss.		Uttam Dairy, Ahmedabad	Electricity	kWh	14400	1.23	12.096	1.00	0.32

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
7	Replacement of existing 250W HPSV lamps by 72 W LED-solar street light		Amul-Fed. Dairy	Electricity	kWh	19224	1.65	16.14	1.45	4.8
8	Energy savings by interlocking agitator of Milk Cylo working with level of milk inside of Cylo.		Panchamrut Dairy	Electricity	kWh	21060	1.81	17.69	1.38	4.5
9	Replacing metallic blades for cooling tower with FRP blades		Mogar Chocolate production plant	Electricity	kWh	9720	0.83	8.16	0.66	0.84
10	Installation of new Solar street light system of Amul-Fed. Dairy (Mother Dairy)		Amul-Fed. Dairy	Electricity	kWh	299925	25.79	251.93	226.74	72
11	Replacement of existing 40 W Tube light by 22 W LED- Tube light fixture.		Amul-Fed. Dairy	Electricity	kWh	14580	1.25	12.24	1.10	1.125
12	Installation of Variable Frequency Drive on 12 TPH Boiler feed water pump.		Amul-Fed Dairy	Electricity	kWh	43200	3.71	36.28	3.45	1.16
13	Captive Power Plant Gas Engine Heat recovery system.		Amul-Fed. Dairy	Natural Gas	SCM	1500	1.42	3.30	42.07	10
14	Installation of Variable Frequency Drive on 10		Amul-Fed. Dairy	Electricity	kWh	15487	1.33	13.00	1.17	0.75

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	TPH Weismann Boiler feed water pumps.									
15	Replacement of existing 46 W x 10 nos. fixture against 36 W x 06 nos. LED dome down light fixture.		Amul-Fed. Dairy	Electricity	kWh	30045	2.58	25.23	0.15	0.09
16	Replacement of existing 72W Tube lights LED- Tube light fixture.		Amul-Fed. Dairy	Electricity	kWh	38448	3.30	32.29	0.14	0.76
17	Replacement of existing 40 W Tube light by 18 W LED- Tube light fixture.		Amul-Fed. Dairy	Electricity	kWh	377214	32.44	316.85	3.77	2.45
18	EE Effluent discharge pump replacing against existing old pump		Amul-Fed. Dairy	Electricity	kWh	17640	1.51	14.81	5.37	1.5
19	Decentralized (03 nos.) cooling tower replaced with 01 nos. centralized cooling tower		Amul Choco Plant	Electricity	kWh	163812	14.08	137.60	9.14	8
20	Replaced reciprocating compressor (02 nos.) with 01 screw compressor		Amul Choco Plant	Electricity	kWh	48243	4.14	40.52	5.12	10.5
21	Replacing existing 02 reciprocating compressor with 01 high efficiency screw compressor		Madhur Dairy	Electricity	kWh	33397	2.87	28.05	23.6	11.25

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
22	Install APFC panel for power factor controlling		Amulchoco plant	Electricity	kWh	42138	3.62	35.39	0.31	0.25
23	Replacing LED light (180 nos.) in office and campus area		Amulchoco plant	Electricity	kWh	43090	3.70574	36.19	3.05	6.6
24	123 nos. replacing LED lighting with plant/process area.		Madhur Dairy	Electricity	kWh	15314	1.317004	12.86	1.09	7.8
25	Modification in cold storage and door opening system		Gopal-Rajkot	Electricity	kWh	10200	0.8772	8.56	6.07	12.38
26	Milk pre heat PHE system implement		Sumul Dairy	Natural Gas	SCM	14501	13.77595	31.90	0.43	4.2
27	VFD install in 300 HP motor in air compressor motor drive.		AmulFed Dairy	Electricity	kWh	30600	2.6316	25.70	1.39	1.75
28	Dome light system application with On/Off timer switch and power savings.		AmulFed Dairy	Electricity	kWh	4597	0.395342	3.86	0.34	0.21
29	Improvement in power factor and get benefits from gujarat electrical board.		Katrwa cattle feed	Electricity	kWh	0	0	0	0.17	0.23
30	Back pressure turbine in low pressure line.		Sumul Dairy	Electricity	kWh	146000	12.556	122.64	12.41	33.5
31	Concentrated solar energy to steam		AmulFed Dairy	Natural Gas	SCM	26347	25.02965	57.96	8	152

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	generation and direct usage in process									
32	Provision of soft starter with energy saver for ammonia compressor		Gopal-Rajkot	Electricity	kWh	13212	1.136232	11.09	0.85	2.88
33	VFD installation in CPP cooling water circulation pump system		AmulFed Dairy	Electricity	kWh	52560	4.52016	44.15	3.99	2.32
34	Installation of VFD in refrigeration compressor air system		AmulFed Dairy	Electricity	kWh	33660	2.89476	28.27	2.4	1.75
35	Methane capture from ETP and gas usage in Boiler, Canteen, and staff quarters		AmulFed Dairy	Natural Gas	SCM	8820	8.379	19.40	154	250
36	Replaced LED street light and new installation of LED fixture		Dudhsagar Dairy	Electricity	kWh	151016	12.987376	126.85	11.77	7.63
37	Installation VFD in BUC-1500 M/c.-Ghee maker division		Dudhsagar Dairy	Electricity	kWh	16380	1.40868	13.75	1.27	0.85
38	Replaced 14 nos. fristam Milk pumps for N3-N4 powder plant		Dudhsagar Dairy	Electricity	kWh	150414	12.935604	126.34	11.73	43.6
39	Old Reciprocating utility air compressor with Screw Compressor		Dudhsagar Dairy	Electricity	kWh	161568	13.894848	135.71	5.86	2.75

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
40	Replace old CT with IDCT with spray pond for N3 condenser plant		Dudhsagar Dairy	Electricity	kWh	117504	10.105344	98.70	8.28	0.6
41	Installation Effimax for increase Boiler efficiency		Dudhsagar Dairy	Natural Gas	SCM	35952	34.1544	79.09	23.36	10.76
42	Monobloc old pump replaced with multi stage pump		Dudhsagar Dairy	Electricity	kWh	51285	4.41051	43.07	6.28	2.7
43	VFD installation for boiler feed water pump		AmulFed Dairy	Electricity	kWh	149014	12.815204	125.17	11.62	1.16
44	Old Boiler replaced with new Vies Mann boiler with economizer		Dudhsagar Dairy	Coal	kg	5062200	2277.99	11136.84	506	250
45	Replaced old compressor (reciprocating) with Screw comp. and VFD		Dudhdhara Dairy, Bharuch	Electricity	kWh	102000	8.772	85.68	7.95	2.15
46	Plant LED lighting installation and replacing LED light		Dudhdhara Dairy, Bharuch	Electricity	kWh	92940	7.99284	78.06	6.56	5.83
47	Power factor improvement system developed		Dudhdhara Dairy, Bharuch	Electricity	kWh	0	0	0	1.5	3.27
48	Installation capacitor bank for power factor improvement		Sarhad Dairy, Bhuj	Electricity	kWh	0	0	0	1.5	1.99
49	LED lighting installation and plant lighting improvement by LED		Sarhad Dairy, Bhuj	Electricity	kWh	79002	6.794172	66.36	6.58	5.83

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
50	Demonstration proj. and implement of Bulk Milk Chiller		Sarhad Dairy, Bhuj	Natural Gas	SCM	36000	34.2	79.20	2.16	1.08
51	Replaced Biomass-wood Steam Generator for Ghee plant		Sarhad Dairy, Bhuj	Natural Gas	SCM	14280	13.566	31.41	30	19.14
52	VFD installation for whole pumping system of water softener plant		Sarhad Dairy, Bhuj	Electricity	kWh	72800	6.2608	61.15	5.04	0.82
53	Solar Water Heating system commissioning for karate washing		Sarhad Dairy, Bhuj	Natural Gas	SCM	159552	151.5744	351.01	1.76	6.58
54	Solar Water Heating system develop and implement in Sarhad dairy Chilling center for Can/Tanker washing		Sarhad Dairy, Bhuj	Electricity	kWh	88040	7.57144	73.95	6.74	6.58
55	Parcogen make Biomass-wooden water heater system		Sarhad Dairy, Bhuj	Natural Gas	SCM	7597	7.21715	16.71	27.34	18.8
56	Ice Bank Tank modification and get smart saving in power consumption		Dudhdhara Dairy, Bharuch	Electricity	kWh	59400	5.1084	49.89	4.63	1.2
57	Installation of APFC capacitor bank for new process plant and dairy unit		Sabar Dairy	Electricity	kWh	0	0	0	27.43	3.50.

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
58	Heat recovery form Boiler system application in new boiler house		AmulFed Dairy	Natural Gas	SCM	183230	174.0685	403.10	51.3	4.28
59	New water treatment plant replaces HPSV dome light with LED light		AmulFed Dairy	Electricity	kWh	40176	3.455136	33.74	3.13	3.5
60	Replace of Evaporatorcondensing sytem with PHE system in new refrigeration plant		AmulFed Dairy	Electricity	kWh	100036	8.603096	84.03	83	100
61	VFD installation in new WTP unit for 17 nos. process pumps		AmulFed Dairy	Electricity	kWh	438000	37.668	367.92	26.28	35
62	Application of ring-man compressed air lickages attended by 07 air audit attend 120 lickage point		AmulFed Dairy	Electricity	kWh	620000	53.32	520.80	49.66	2
63	Biogas capturing, purification and Compressed and usage of all amul kaira division.		Amul Dairy, Anand	Natural Gas	SCM	4745700	2135.565	10440.54	240	225
64	Energy saver technology by evaporator system for powder plant -03		Amul Dairy, Anand	Electricity	kWh	963600	82.8696	809.42	5.39	8.46
65	Replaced old Vacuum Pump with new vacuum		Dudhsagar Dairy	Electricity	kWh	33600	14.2	31.50	2.32	3.55

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	pump for N3-N4 powder plant.									
66	Most use full and beneficial system in any process OR Dairy industries, just Audit, review Analysis, attend the air lick point and direct get benefits because Air is free but Compressed air is not free (very costly) we attend 30 point (Jul-17) and all attend & get 100% benefits.		Amul Fed Dairy, Gandhinagar	Electricity	kWh	12000	0.78	11.5	9.6	0
67	Installation of APFC (capacitor bank) panel for power factor improvement.		Banas Dairy, Palanpur	Electricity	kWh	51054	0.13	1.02	5.87	6.2
68	Replaced HPSV – MHLF etc. (campus) plant lighting with LED lighting in Banas dairy internal road light, (150 w replaced with 72w LED fixture)		Banas Dairy, Palanpur	Electricity	kWh	31247	0.9	6.2	2.2	8.23
69	Methane Capture from Effluent than purification		Banas Dairy, Palanpur	Natural Gas	SCM	138297	14	52	65.4	55

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	and utilization in plant area-Banas Dairy, Palanpur.									
70	New Commission of Premium efficiency oil free VFD base Air Compressor.		Banas Dairy, Palanpur	Electricity	kWh	345600	0.9	6.91	25.92	84
71	Installation of Variable Frequency Drive on ETP pumps and Compressor pumps for utility of Banas Dairy.		Banas Dairy, Palanpur	Electricity	kWh	43733	8.3	8.87	3.36	2.25
72	Replaced spray pond type cooling tower system with Induced draft cooling tower for Chilling Centre of Banas Dairy Union, Palanpur.		Banas Dairy, Palanpur	Electricity	kWh	201462	2.43	4.02	14.08	6
73	Replacing of Evaporation Condenser in refrigeration unit at Banas-2 Refrigeration system		Banas Dairy, Palanpur	Electricity	kWh	9800	1.45	1.91	7.84	72
74	Replacing of Evaporation Condenser in Chilling Centre unit at Banas RDCC- Disa Chilling		Banas Dairy, Palanpur	Electricity	kWh	31150	3.23	6.21	2.48	27

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	Centre for Water and Energy savings									
75	Methane Capture from Effluent & Utilization as fuel for dairy canteen (200 persons capacity of food preparation per day in dairy campus)		Vasudhara Dairy, Valsad	Natural Gas	SCM	18600	19.5	22.5	8.92	38
76	Replacing 02 nos. (Old) existing reciprocating air compressor with 01 nos. Screw air compressor.		Vasudhara Dairy, Valsad	Electricity	kWh	33397	11	6.67	2.36	10.55
77	Replacing of existing condensing system with new condensing chiller system as Falling Film Chiller and get very good energy efficiency and Delta T.		Vasudhara Dairy, Valsad	Electricity	kWh	630720	13.45	12.61	46.98	32
78	Replacing 02 nos. (Old) existing reciprocating air compressor with 04 nos. Screw air compressor. (Design for plant expansion)		Vasudhara Dairy, Valsad	Electricity	kWh	267840	0.78	5.35	20.89	48.8
79	Replaced HPSV – MHLF etc. (campus) plant lighting with LED lighting		Vasudhara Dairy, Valsad	Electricity	kWh	72864	0.45	1.45	5.17	3.6

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	in Vasudhara dairy internal road light (pole flood light) (400 w replaced with 200w LED fixture, 150 watt with 72 watt, LED T5 light and Bulb)									
80	Installation of Variable Frequency Drive on ETP pumps, Compressor pumps and Chilling system pumps for utility of Vasudhara Dairy.		Vasudhara Dairy, Valsad	Electricity	kWh	56889	0.23	1.23	4.16	2.35
81	Replaced existing multistage pump (old system) with proposed system Booster pump (grundfoss make) pump for boiler feed water pumping and Refrigeration plant-chilled water circulation pumps. (with standby system) (05 nos.)		Vasudhara Dairy, Valsad	Electricity	kWh	169357	2.5	3.38	11.51	10.24
82	Install Biomass- Steam Generator (Wood Fired) for CIP and hot water utilization and low pressure steam line in		Vasudhara Dairy, Valsad	Natural Gas	SCM	20258	4.5	24.51	27.34	28.35

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	process of Ghee making total 03 boiler (2+2+3=7 TPH)									
83	Installation of Solar water heater equipment, (500 Liters * 02 nos. system) implements in 01 is near Boiser and 01 is in Chilling plant of Valsad roof top.		Vasudhara Dairy, Valsad	Natural Gas	SCM	5816	2.1	7.03	1.76	0.98
84	Installation of APFC (capacitor bank) panel for power factor improvement.		Vasudhara Dairy, Valsad				0	0	6.14	3.22
85	Condensate Recovery System for Vasudhara Chikhli plant, 85% condensate recover from plant and use in CIP and Karate Washing application.		Vasudhara Dairy, Valsad	Natural Gas	SCM	3111	2.27	3.76	1.4	3.2
86	Most use full and beneficial system in any process OR Dairy industries, just Audit, review Analysis, attend the air lick point and direct get benefits		Vasudhara Dairy, Valsad	Electricity	kWh	173950	1.14	160	13.91	0

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	because Air is free but Compressed air is not free (very costly) we attend 30 point (Jul-17) and all attend & get 100% benefits.									
87	Implement and gas fuel base air preheater with Steam air pre heater in 60 TPD powder plant		Amul Fed Dairy, Gandhinagar	Natural Gas & Electricity	SCM & kwh	248839 250749	21.6	712	88.48	330
88	02 nos.replacement of existing pump with booster pump for condensate transfer to storage tank.		Amul Fed Dairy, Gandhinagar	Electricity	kwh	9360	9.3	8.61	0.73	0.76
89	Installation of 50 Kw Solar Roof Top system at ASRS godown.		Amul Fed Dairy, Gandhinagar	Electricity	kwh	198400 Generation	18.31	182	15.61	22.5
90	Use all (banas 1,2,and 3) plant roof top installation of 1 MW SPV project.		Amul Fed Dairy, Gandhinagar	Electricity	kwh	3720000 Generation	25.34	342.2	289	1190
91	Installation of 170 Kw (phase-2) solar roof top system at ASRS roof top.		Banas Dairy, Palanpur	Electricity	kwh	261760 Generation	12.8	210	20.6	76.5
92	Replacement of existing soft starter with VFD system up grade in		Amul Fed Dairy, Gandhinagar	Electricity	kwh	181300	8.7	166	14.5	91.5

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	ammonia compressor (430 TR) in 400 HP motor									
93	Replaced HPSV – MHLF – CFL plant lighting with LED lighting in Plant for Street lighting.		Baroda Dairy, Vadodara	Electricity	kwh	8428	9.96	69	0.65	4.2
94	Provision of soft starter with VFD (Allen Bradly Smart MCC system) for Total Refrigeration compressor on change over with variable frequency drive (VFD)		Baroda Dairy, Vadodara	Electricity	kwh	614304	25.2	50.3	48.1	102
95	Replaced Utility air compressor with two stage air compressor for new process plant of Baroda and Sugam Dairy plant,		Baroda Dairy, Vadodara	Electricity	kwh	102630	8.82	66.21	6.95	2.85
96	Replacement Old plant reciprocating KC 324- Kirloskar make 210 TR reciprocating Air Compressor with 384 TR (Frick Design) Screw compressor for Refrigeration plant (VFD based Plant)		Baroda Dairy, Vadodara	Electricity	kwh	102000	18.01	274	7.95	2.15

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
97	Methane Capture from Effluent than purification and utilization in plant area-Baroda (Sugam) Dairy,		Baroda Dairy, Vadodara	Natural Gas	SCM	92100	5.33	40.41	134	58
98	New Commission of Premium efficiency oil free VFD base Air Compressor, Make: ATLAS COPCO ZR 160 VSD		Amul Fed Dairy, Gandhinagar	Electricity	kwh	50220	14.18	32..70	40.38	48
99	Installation of Variable Frequency Drive on centralize cooling tower for new Process (150 TPD) powder plant-process air by air compressor		Amul Fed Dairy, Gandhinagar	Electricity	kwh	50700	27.04	205	3.85	0.68
100	Replacement of Premium efficiency VFD base Ammonia Screw Compressor		Vidhya Dairy, AAUC, Anand	Electricity	kwh	31861	6..08	45.6	2.41	17.45
101	Replaced HPSV – CFL plant lighting with LED lighting in Plant, Process, Parking area and Street lighting. (somewhere not replacing new		Vidhya Dairy, AAUC, Anand	Electricity	kwh	7074	11.39	98.65	0.53	0.75

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	installation in plant) continue of this LED replacing as per schedule									
102	Installation of APFC (capacitor bank) panel for power factor improvement		Vidhya Dairy, AAUC, Anand	Electricity	kwh	0	0	0	3.68	0.25
103	Methane Capture from Effluent treatment plant and application of biogas at boiler feed water pre heating, Canteen and Indian Sweet making purpose		Vidhya Dairy, AAUC, Anand	Natural Gas	SCM	33048	9.31	98.6	12.89	150
104	Modifications in refrigeration system and implementation of De- Super Heater technology and save energy		Vidhya Dairy, AAUC, Anand	Natural Gas & Electricity	SCM & KWh	7334 & 18876	8.06	21.89	4.28	6.76
105	Installation of ETP-biogas water heater equipment, (1000 Liters * 01 nos. system) implements in Vidhya Dairy (Just like a simple Gas Heater run by bio gas)		Vidhya Dairy, AAUC, Anand	Natural Gas	SCM	2000	2.3	52.8	0.78	0.92
106	Condensate Recovery System for Vidhya Dairy		Vidhya Dairy, AAUC, Anand	Natural Gas	SCM	10327	12.22	30.82	4.02	3.2

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	plant, 85% condensate recover from plant and use in CIP and Karate Washing application									
107	Installed indirect heater in incubation chamber (heat supply from ice cream cold chamber) and save energy		Vidhya Dairy, AAUC, Anand	Electricity	kwh	57600	13.99	137	4.35	6.1
108	Condensate Recovery System for Sarvottam Dairy plant and Chilling Centre, 85% condensate recover from plant and use in CIP and Karate Washing application		Sarvottam Dairy, Bhavnagar	Furnace Oil	Ton	41	26.3	117	16.03	20.77
109	Commissioning of 250 TR Freon package chiller (compressor for refrigeration) system, (Demo. Project)		AmulFed Dairy, Gandhinagar	Electricity	kWh	468000	10.3	389	36.78	60
110	Commissioning of MBR+ICR technology in effluent treatment plant, (Demo.Project)		AmulFed Dairy, Gandhinagar	Natural Gas	SCM	465000 (Generation)	21.3	700	130	600
111	Installation of best technological solution of wastage food and		AmulFed Dairy, Gandhinagar	Natura Gas	SCM	905 (Generation)	1.9	26.82	28960	11.12

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
	biodegradable materials to biogas generation from FOV reactor,									
112	Installed Solar PV project on roof top of ASRS system of AFDG, capacity (Phase-3) 300 KWp (Total installed capacity at AmulFed Dairy, Gandhinagar 520 KWp)		AmulFed Dairy, Gandhinagar	Electricity	kWh	483200 Gen.	38.9	434	37.97	114
113	Installation of APFC (capacitor bank) panel for power factor improvement.		Sursagar Dairy, Surendranagar	Electricity	kWh	0	0	0	4.05	3.31
114	New Commission of Premium efficiency oil free VFD base Air Compressor, Entex SC (PBL_1100 cfm) importade from china,		Sursagar Dairy, Surendranagar	Electricity	kWh	31320	1.9	28.9	27.47	29.14
115	Condensate Recovery System for Srendranagar Dairy plant, 85% condensate recover from plant and use in CIP and Karate Washing application.		Sursagar Dairy, Surendranagar	Natural Gas	SCM	4521	1.4	4.06	1.4	2.3

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
116	Replacement Old plant (Chilling plant) reciprocating 200 TR reciprocating Air Compressor with 384 TR (Frick Design) Screw compressor for Refrigeration plant		Sursagar Dairy, Surendranagar	Electricity	kWh	102000	31	91.78	7.95	12.45
117	Replaced HPSV – MHLF – CFL plant lighting with LED lighting in Plant for Street lighting.		Sursagar Dairy, Surendranagar	Electricity	kWh	10584	2.2	9.54	0.78	4.8
118	Installation of Variable Frequency Drive on Water Treatment Plant in circulation pump of treated water.		Sursagar Dairy, Surendranagar	Electricity	kWh	15448	1.9	10.02	2.91	10.2
119	Installed Effimax-2000 online boiler efficiency monitoring system for boiler model no. GT 2021 (02 TPH)		Sursagar Dairy, Surendranagar	Natural Gas	SCM	18095	14	11.9	5.79	8.75
120	Replaced Milk process and Utility applications pumps (old horizontal local make pump with Vertical Grundforse pump)		Sursagar Dairy, Surendranagar	Electricity	kWh	52162	1.87	469.4	3.81	4.87

S.No.	Name of Energy Efficiency Intervention	Cluster	Implemented at	Primary Fuel/Energy saved	Units	Value	Equivalent Energy Savings (TOE)	Equivalent CO ₂ Reduction (Tonnes)	Monetary Savings (Lakh ₹)	Investment (Lakh ₹)
121	Implementation of Condensing Economizer and fulfill the pre heat boiler feed water for 10 TPH Weismann boiler		AmulFed Dairy, Gandhinagar	Natural Gas	SCM	129780	16.1	324	44.1	3.5