August 2018

DETAILED PROJECT REPORT ON INTELLIGENT FLOW CONTROLLER

M/s Sumul Dairy, Surat– Gujarat Dairy Cluster

Submitted to
(Prepared under GEF-UNIDO-BEE Project)

Bureau of Energy Efficiency
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Prepared by

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List of Abbreviations

BEE	Bureau of Energy Efficiency
CS	Capital Structure
°C	°Celsius
CFM	Cubic Feet Minute
CO_2	Carbon dioxide
DPR	Detailed Project Report
DSC	Demand Side Controller
EE	Energy Efficiency
FI	Financial Institution
GCMMF	Gujarat Cooperative Milk Marketing Federation
GEF	Global Environmental Facility
IFC	Intelligent Flow Controller
IRR	Internal Rate of Return
kJ	Kilo Joule
kW	Kilo Watt
LSP	Local Service Provider
MSME	Micro and Medium Scale Industries
NPV	Net Present Value
OEM	Original Equipment Manufacturer
RE	Renewable Energy
SBI	State Bank of India
SIDBI	Small Industrial Development Bank of India
TOE	Tonnes of Oil Equivalent
UNIDO	United Nations Industrial Development Organisation
VSD	Variable Speed Drive
WACC	Weighted Average Cost of Capital

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We would also like to mention that the valuable efforts being taken and the enthusiasm displayed towards energy conservation by the Gujarat Dairy Cluster is appreciable and admirable.

1. EXECUTIVE SUMMARY

Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, in collaboration with United Nations Industrial Development Organization (UNIDO) is executing a Global Environment Facility (GEF) funded national project "Promoting energy efficiency and renewable energy in selected MSME clusters in India".

The overall aim of the project is to develop and promote a market environment for introducing energy efficiency and enhanced use of renewable energy technologies in process applications in 12 selected energy-intensive MSME clusters across 5 sectors in India (with expansion to more clusters later). This will enable improvement in the productivity and competitiveness of units, as well as reduce overall carbon emissions and improve the local environment.

Key activities involved in the project are shown below

- **LSP MAPPING:** Detailed Mapping of LSPs in the cluster.
- **TECHNOLOGY FEASIBILITY STUDIES:** Preparation of 10 bankable DPRs.
- **TRAINING MATERIALS:** Development of 5 customized training material based on mapping
- **TRAINING PROGRAM:** Conduct 4 training programs in the cluster for the capacity building of local service providers.
- **LSP's AS LOCAL DISTRIBUTORS:** Mapping of LSPs and OEMs so that LSPs can be local dealers for major OEMs.

1.1 Brief Unit Profile

Table 1: Unit Details

Particulars	Details
Name of Plant	Surat District Co-operative Milk Producers Union Ltd. , Surat
Name(s) of the Plant Head	Mr. S.V. Chaudhary
Contact person	Mr. A.B. Shah
Constitution	Cooperative Society
MSME Classification	Large Scale
Address:	Sumul Dairy, Near Surat Railway Station Post Box no. 501
Industry-sector	Dairy

1.2 Proposed EE Measure

After the discussion with the plant team, it has been decided to install intelligent flow controller in compressed air line to minimize the artificial air demand in the plant. The details of the proposed EE measure is given in below table:

Table 2: Proposed EE Measure

Sl No	EE Measure	Annual Energy Savings		Monetary Savings (Rs. Lakhs)	Investment (Rs. Lakhs)	Payback (Months)	Annual TCO_2 reduction
		kWh	TOE				
1	Installation of Intelligent Flow Controller in Compressed air line System	25,200	2.17	2.04	3.84	23	20.66

1.3 Means of Finance

The details of means of finance for the proposed EE measure is as under:

Table 3; Project Finance

Sl. No.	Particulars	Unit	Value
i	Total Investment (Incl of Tax)	Rs. Lakh	**3.84**
ii	Means of Finance	Self / Bank Finance	**Self**
Iii	IRR	%	**74.38**
Iv	NPV at 70 % Debt	Rs. Lakh	**8.57**

2. INTRODUCTION ABOUT SUMUL DAIRY

2.1 Unit Profile

Sumul or Surat Milk Union Limited, which is now renamed as The Surat District Co-operative Milk Producers' Union Ltd, is one among the 17 district unions which acts as manufacturing units of dairy products for Gujarat Co-operative Milk Marketing Federation Limited, the marketers of Amul brand of products. Surat District Co. operative Milk Producers' Union Ltd., SUMUL is a trade name and literally meaning sound price, came into existence on August 22, 1951. The dairy has a daily average processing capacity of 15 lakh litres of milk per day.

Table 4: Unit Profile

Particulars	Details
Name of Plant	Surat District Co-operative Milk Producers Union Ltd. , Surat
Name(s) of the Plant Head	Mr. S.V. Chaudhary
Contact person	Mr. A.B. Shah
Contact Mail Id	abs@sumul.coop
Contact No	099798 88018
Constitution	Cooperative Society
MSME Classification	SME
No. of years in operation	50
No of operating hrs/day	24
No of operating days/year	365
Address:	Sumul Dairy, Near Surat Railway Station Post Box no. 501
Industry-sector	Dairy
Type of Products manufactured	Milk ,Ghee, Dahi and Butter

2.2 Production Details

The various products manufactured in Sumul dairy are liquid milk, ghee, dahi and butter. The graph below shows the milk processed during last one year

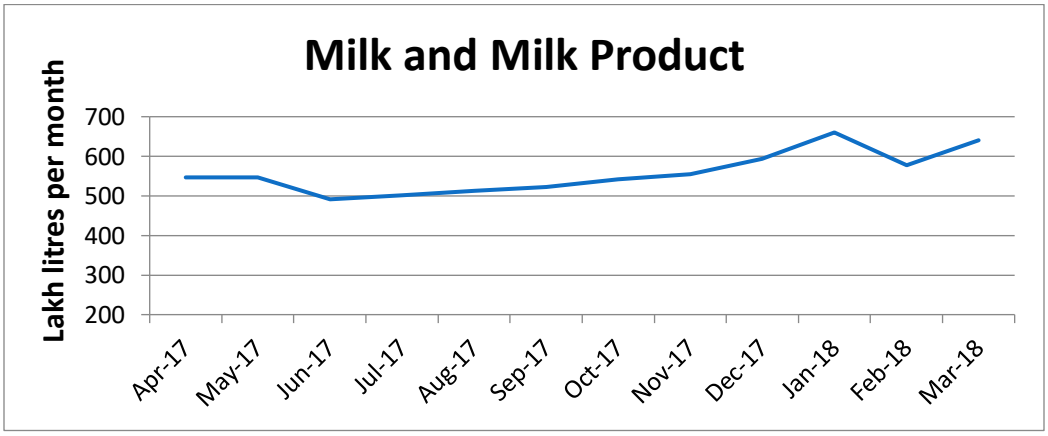

Figure 1: Milk Processed

2.3

Typical Dairy Process Flow Diagram

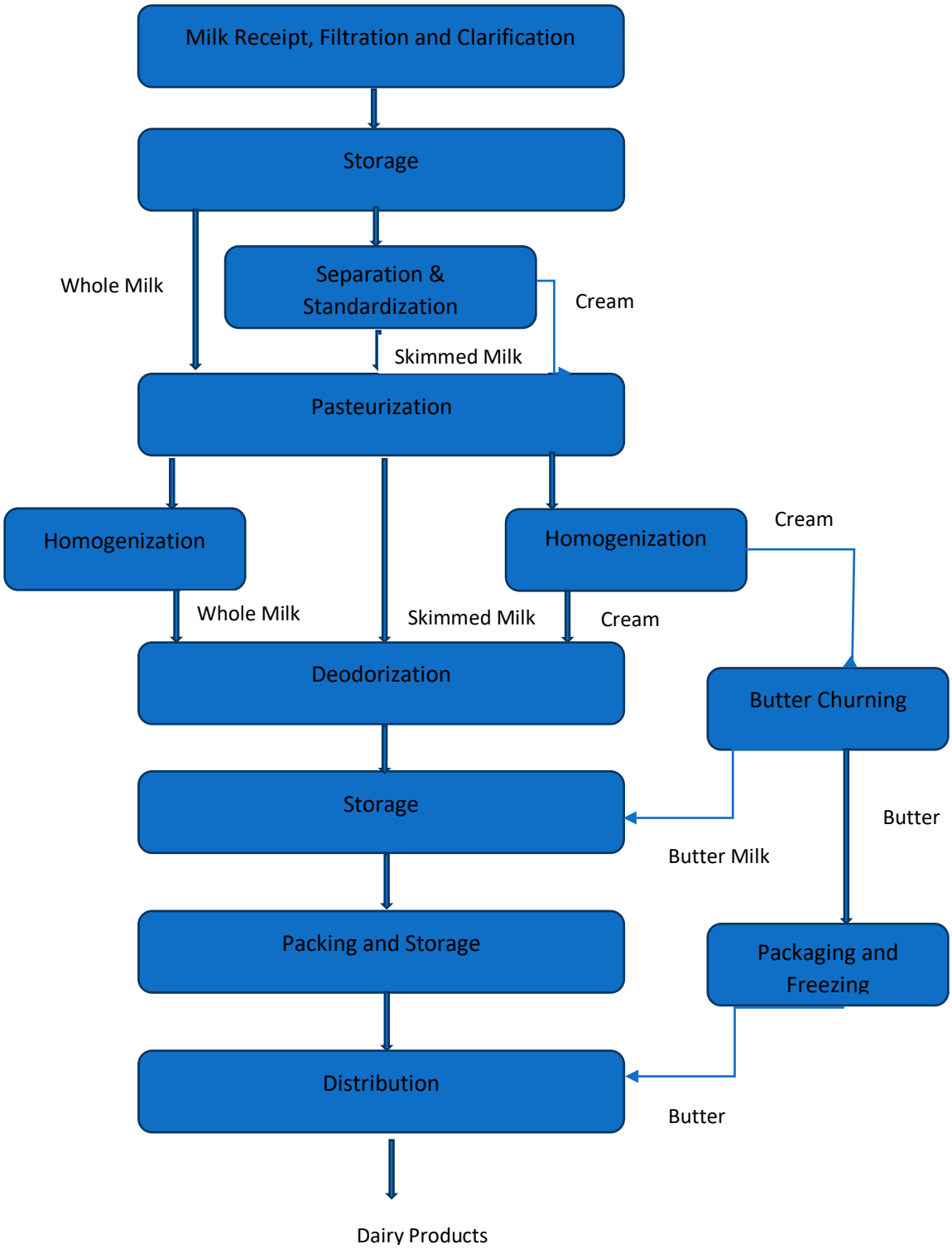

Figure 2: Typical process flow of Milk manufacturing

The processes taking place in a typical milk plant after receiving and filtration of milk from the chilling units includes:

Separation: After being held in storage tanks at the processing site, raw milk is heated to separation temperature in the regeneration zone of the pasteurizer. The milk (now hot) is standardized and homogenized by sending it to a centrifugal separator where the cream fraction is removed. The skim is then usually blended back together with the cream at predefined ratios so that the end product has the desired fat content. Surplus hot cream is cooled and usually processed in a separate pasteurizer ready for bulk storage and transportation to a cream packing plant.

Pasteurization is a process of heating milk to 72°C for 16 seconds then quickly cooling it to 4°. This process slows spoilage caused by microbial growth in the food. Unlike sterilization, pasteurization is not intended to kill all micro-organisms in the food. Instead, it aims to reduce the number of viable pathogens so they are unlikely to cause disease.

Homogenization (if required): Milk must then be homogenized. Without homogenization, the milk fat would separate from the milk and rise to the top. Milk fat is what gives milk its rich and creamy taste. Homogenization makes sure that the fat is spread out evenly in the milk so that every sip of milk has the same delicious flavor and creamy texture. Milk is transferred to a piece of equipment called a homogenizer. In this machine the milk fat is forced, under high pressure, through tiny holes that break the fat cells up in to tiny particles, 1/8 their original size. Protein, contained in the milk, quickly forms around each particle and this prevents the fat from rejoining. The milk fat cells then stay suspended evenly throughout the milk

Packaging and storage: Milk is pumped through automatic filling machines direct into bags, cartons and jugs. The machines are carefully sanitized and packages are filled and sealed without human hands. This keeps outside bacteria out of the milk which helps keep the milk stay fresh. During the entire time that milk is at the dairy, it is kept at 1°-2°C. This prevents the development of extra bacteria and keeps the milk fresh.

The table below shows the production capacity of various section in plant daily

Table 5: Production Capacity

Sl No	Product	UOM	Quantity
1	Milk Processing	Lakh Litres per Day	15
2	Milk Packaging in Poly Pouches	Lakh Litres per Day	27
3	Ghee Manufacturing and Packaging	MT/day	15
4	Dahi Milk Product	MT/day	15.5
5	Butter plant	MT/day	20

2.3 Energy Profile

Both electricity and thermal energy are used for carrying out various dairy processing activities. The following fuels are used in the plant:-

Table 6: Type of fuel used

Sl. No.	Type of fuel/Energy used	Unit	Tariff	GCV
1	Electricity	Rs./kWh	8.09	
2	Natural Gas	Rs/SCM	35	8500 (kCal/m^3)
3	FO	Rs/kg	42	9600 (kCal/kg)

The steam cost in the plant is Rs 2.42/kg. The table below shows the monthly consumption of various fuels used in the plant during the last one year

Table 7: Fuel Consumption Details

Month	Electricity Consumption (kWh)	Fuel Consumption – NG (SCM)	Fuel Consumption- FO (kg)
Apr-17	13,77,750	14,20,576	31,060
May-17	15,38,610	15,81,466	1,01,820
Jun-17	14,12,205	14,55,092	9,710
Jul-17	13,07,250	13,50,167	16,300
Aug-17	13,26,495	13,69,443	25,400
Sep-17	13,22,505	13,65,484	21,760
Oct-17	13,44,700	13,87,709	35,030
Nov-17	12,66,520	13,09,560	34,130
Dec-17	12,41,180	12,84,250	50,570
Jan-18	12,87,520	13,30,621	66,840
Feb-18	12,31,860	12,74,992	48,100
Mar-18	14,55,140	14,98,300	38,020
Total	**5,98,25,085**	**1,66,27,660**	**4,78,740**

The major form of energy used in the plant is electricity which is from UGVCL grid. For thermal plant is using NG as the major fuel along with furnace oil. The percentage share of fuel cost is shown below:

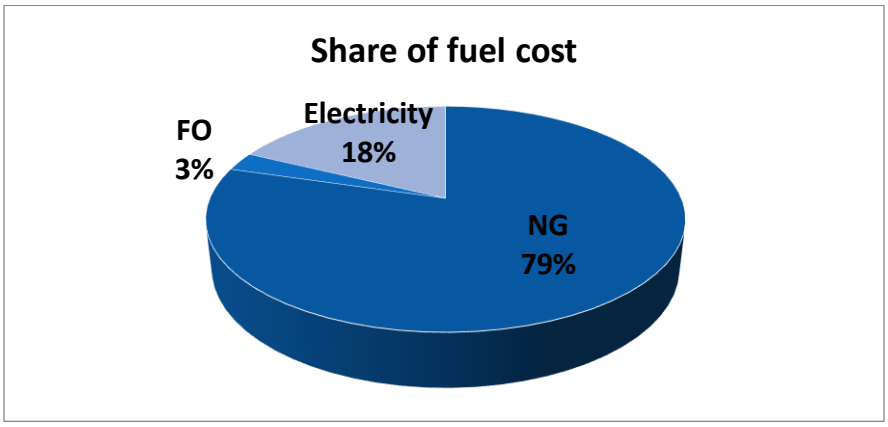

Figure 3: Share of fuel cost

Based on the data collected from the plant, the graph above shows the variation of fuel cost over the last one year. Average electricity cost is Rs 1.08 Crore/month whereas the average thermal energy cost is Rs 5.00 Crore/month.

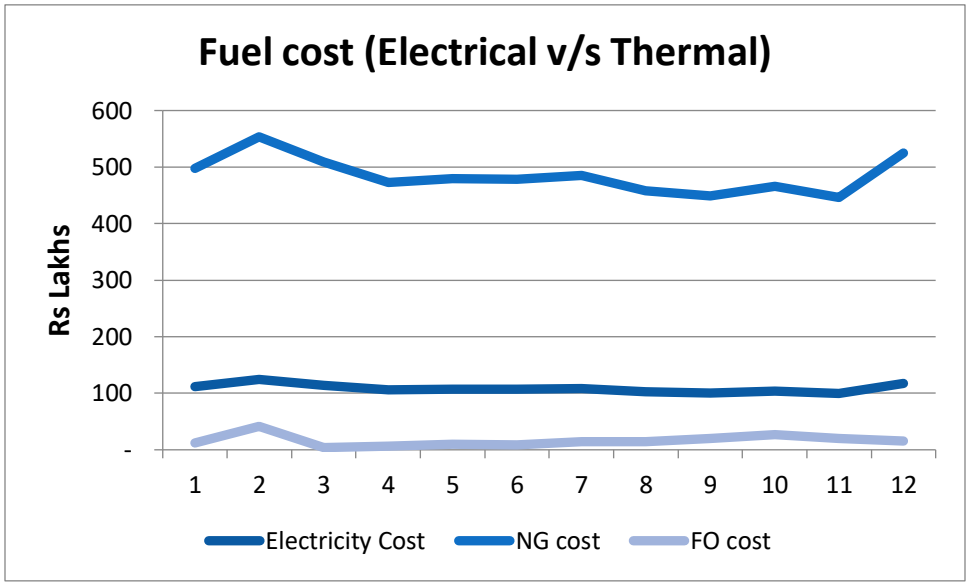

Figure 4: Fuel Cost Electrical vs Thermal

3. PROPOSED EE MEASURE – DEMAND SIDE CONTROLLER IN COMPRESSED AIR LINE

3.1 Present System

Sumul dairy have installed 3 air compressors for their process and instrumentation applications. Out of the 3 compressors installed, 1 compressor is in running condition and two are in standby. All the compressors are connected to a common header. From the header compressed air goes to a 5m^3 receiver and then to the air dryer. Only receiver is installed at generation side and there is no receiver at the user side to meet the fluctuations in compressed air generation. The table below shows the details of compressor installed in the plant:

Table 8: Compressor Details

Sl No	Make and Model	Type	Motor Rating (kW)	Capacity (CFM)	Working Status	Set Points (bar)
1	CPC50	Screw	37	223	Standby	-
2	CPE100	Screw	75	437	Running	7.5/6.5
3	CPC50	Screw	37	223	Standby	-

The schematic layout of the compressors installed is given below:-

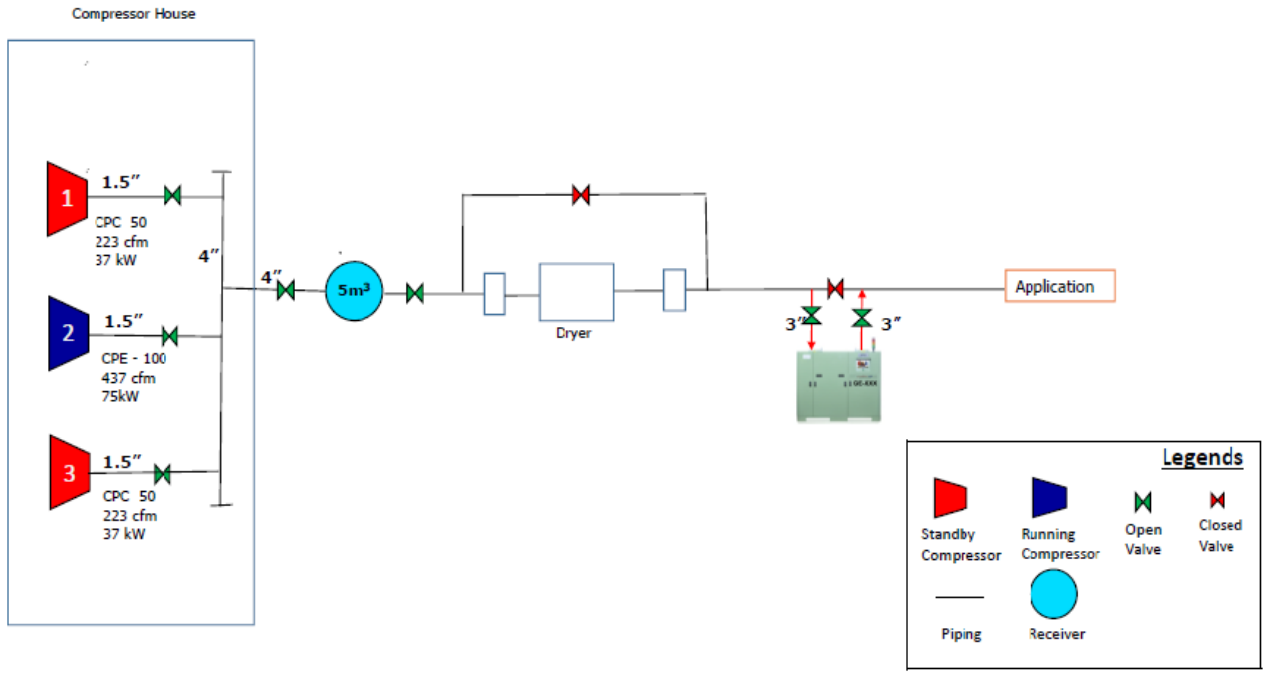

Figure 5: Existing Compressed air network

Out of the three compressors installed, plant is running only CPE 100 as it can meet the entire compressed air demand of the plant. The average CFM requirement of the plant is 300 CFM to

350 CFM and compressor is consuming 50 kW power. The SEC of the compressor is 0.15 kW/CFM. The compressor are operating at different load and unload points of 6.5 bar load and 7.5 bar unload based on the user applications. This leads to a situation where in one or more compressors tend to load more in comparison to the actual requirement. Due to this there is additional compressed air generation creating an artificial demand.

Artificial demand is due to the actual required pressure fluctuations at the demand side. Hence most of the times air (CFM) will be supplied more than required at the instant. Due to the supply of more air than the actual requirement, power consumption will also be higher than the required amount.

3.2 Recommendation

It is recommended to install a 500 CFM demand side controller / intelligent flow controller in the common header line to minimize the artificial demand in the plant. IFC controls the air flow & pressure being delivered thereby reducing artificial demand in the Plant. The IFC is designed to operate at the intermediate point of the compressed air system i.e. on the downstream side of the filter/ dryer/ receiver tank & upstream side of the main piping distribution system. IFC creates useful storage through controlled differential pressure across upstream receiver & itself. This storage isolates the compressors from demand side fluctuations. Peaks are dealt with reserve energy from storage instead of additional power, allowing the compressors to run on reduced load. Thus, the mass of air consumed by artificial demand, pneumatic equipment, tools & air-leakages is reduced; which in turn results in the reduction in energy consumed by air compressors.

The specification of the IFC proposed for the current plant running condition and pressure set points is given below:

Application	IFC Model	Capacity (CFM)	Upstream Pressure (bar)	Downstream Pressure (bar)
Compressed Air Network	GE 10	500	5.99	5.31

The intelligent flow controller works on the principle similar to dam. Water flows inside the lake must go out in order to maintain the constant water level. In the case of dam with gates, the reservoir will be created. The gates will be controlled based on the requirement at the downstream demand side and sudden requirement will be supplied by the reservoir. Similarly the intelligent flow controller will create the reservoir at the upstream side and will be controlled by the flow controller. The entire demand side line will be maintained with preset pressure value. Any changes in the demand side pressure requirements (artificial demand) will be take care by the flow controller and hence the artificial demand will be neglected. Hence the intelligent flow controller actually reduces the loading percentage and increases the unloading percentage by means of reduction or elimination of artificial demand.

The layout of the proposed system is shown below:

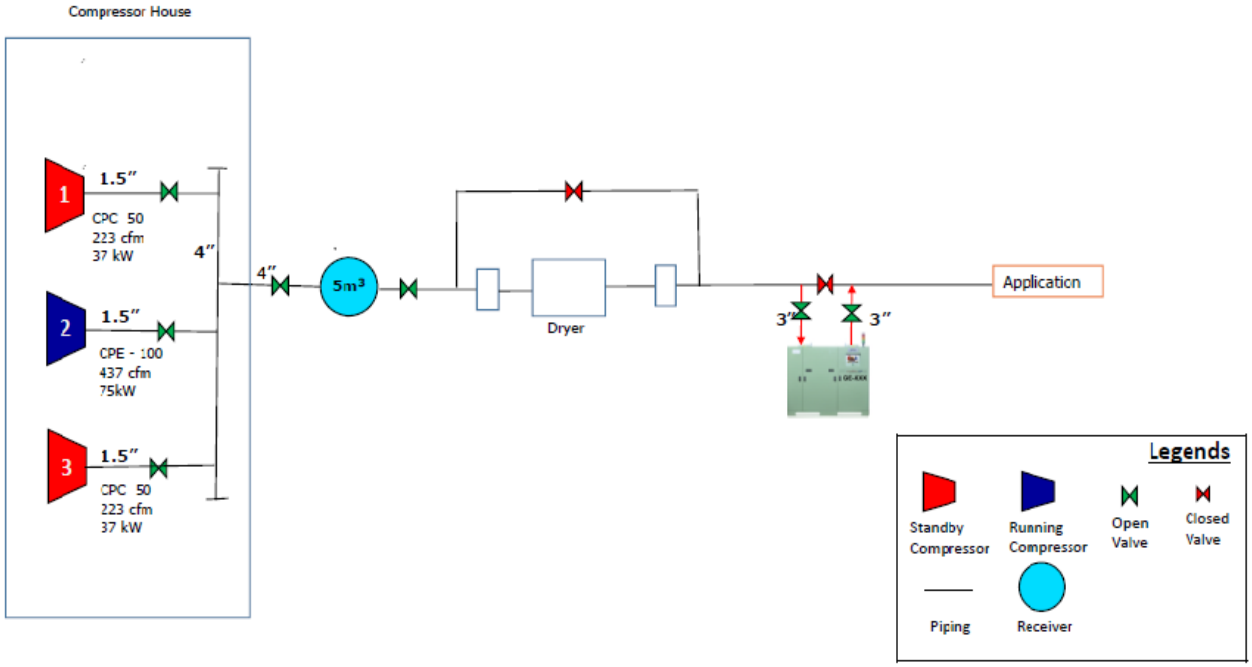

Figure 6: Proposed Compressed air network

The IFC consists of multi-parallel flow control module/s along with controlled automatic bypass, both manifolds into welded steel headers with flanged inlet and outlet top side connections. The multi-parallel flow control module/s & the automatic bypass are "fail to open" type. Both, the flow control module/s & the automatic bypass parallel open in the event of failure of either pneumatic and/or electric power make it fail-safe equipment. Electro-pneumatic transmitters continuously monitor the downstream demand along with availability of enough mass of air on upstream for the microprocessor controller to sends correct signal to the IFC for processing. The IFC increases or decreases the flow to the plant according to the sensed downstream demand. The quick response of the IFC paces the flow dynamics of the system ensuring that adequate supply of air is instantly available for production. The position (of the amount of opening or closing of each flow control module/s) is indicated by arrow moving over 0° to 90° span as well as on HMI graphic touch screen display. The IFC is selected to control at a balance demand point within ± 0.07 bar (g) / ± 1 psig, without droop.

Major advantages:

- Improves pneumatic equipment performance with constant air pressure within +/- 1 psig (0.07 bar)
- Reduces leakages losses in the plant.
- Isolates compressors from demand side peaks & troughs.
- Reduces load period of compressors & improves performance of VSD in air compressors.
- HMI Display with touch screen for easy access.

- Online as well as historical pressure trend, Inlet & Outlet pressure, system status is displayed on HMI screen.

3.3 Supplier Details

Table 9: Supplier Detail

Equipment Detail	Intelligent Flow Controller
Supplier Name[1]	Godrej & Boyce Mfg. Co Ltd
Address	Godrej & Boyce Mfg. Co Ltd Pirojshanagar Vikhroli, Mumbai 400079
Contact Person	Mr. Arun Kumar Singh
Mail Id	arunsing@godrej.com
Phone No	+91 9328029682

3.4 Savings

The expected electricity savings by installation of intelligent flow controller is 25,200 kWh annually. The annual monetary saving for this project is ***Rs 2.04 Lakhs with an investment of Rs 3.84 lakhs and payback for the project is 23 months.***

Detailed savings calculations is given in below table

Table 10: Savings Calculation

Parameters	UOM	Value
Current Energy Consumption	kWh/day	1200
Current CFM requirement	CFM	320
SEC of compressed air system	kW/CFM	0.156
Energy Savings[2]	%	6
Proposed Energy Consumption	kWh/day	1,128
Annual Energy Savings (350 days operating)	kWh	25,200
Electricity Cost	Rs/kWh	8.09
Annual Monetary Savings	Rs Lakhs	2.04
Investment	Rs Lakhs	3.84
Pay Back	Months	23

[1] It's a unique technology provided by Godrej and Boyce only
[2] Guaranteed by the supplier after doing the feasibility study

4. FINANCIAL ANALYSIS

4.1 Project Cost

Table 11: Project Cost

Parameter	Amount in Rs Lakhs
GE 10 500 CFM IFC Cost	3.20
Packing and Forwarding Charges	0.064
GST @18%	0.576
Total Project Cost	**3.84**

4.2 Assumptions for Financial Analysis

- Interest rate taken as 12 %
- Yearly increase in electricity cost by 2% for cash flow analysis
- Life cycle of the project is taken as 7 years
- Three different Capital Structure considered
    - CS1 – 70:30 Debt Equity Ratio
    - CS2 – 50:50 Debt Equity Ratio
    - CS3 – 100 % Equity
- Return on equity is taken as 15 %
- Depreciation – 40 %
- Operation and Maintenance Cost taken as 5% of Initial investment
- For calculating weighted average cost of capital, tax rate is assumed as 30 %

4.3 Cash Flow Analysis

Table 12: Cash flow of the project

Cash flow for the project		1	2	3	4	5	6	7
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Required Investment	3.84							
Energy Savings		2.04	2.08	2.12	2.16	2.21	2.25	2.30
O&M Cost		-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19
Depreciation		1.5	0.9	0.55	0.3	0.2	0.1	0.1
Net Cash Flow	-3.84	3.38	2.81	2.48	2.30	2.21	2.18	2.18

The table below shows the various capital structure assumed for the project finance

Table 13: Capital Structure

Capital Structure			
Particulars	CS 1	CS 2	CS 3
Debt	70	50	0
Cost of Debt	0.12	0.12	0.12
Equity	30	50	100
Cost of Equity	0.15	0.15	0.15
WACC	10.38	11.7	15

Table 14: NPV Calculation

NPV Calculation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	NPV
NPV at CS 1 (70:30)	-3.84	3.1	2.3	1.8	1.6	1.4	1.2	1.1	8.6
NPV at CS 2 (50:50)	-3.84	3.0	2.3	1.8	1.5	1.3	1.1	1.0	8.1
NPV at CS 3 (100% Equity)	-3.84	2.9	2.1	1.6	1.3	1.1	0.9	0.8	7.0

4.3 Sensitivity Analysis

A sensitivity analysis has been carried out to ascertain how the project financials would behave in different situations such as

- Change in energy savings
- Change in operating hours
- Change in interest rate

A good sensitivity analysis will help to estimate the behavioral nature thereby helping to understand the financial viability over a long period of time.

Table 15: Sensitivity analysis: based on energy savings

Based on Savings	at 100% Savings	at 75% Savings	at 50% Savings
NPV at CS 1 (D70:E30)	8.6	6.0	3.4
NPV at CS2 (D50:E50)	8.1	5.2	2.8
NPV at CS3 (D0:E100)	7.0	4.8	2.6
IRR	74%	58%	40%

Table 16: Sensitivity analysis: change in operating hrs

Based on Operating Hours	at 100% operating hours	at 90% Operating hours	at 80% Operating hours
NPV at CS 1 (D70:E30)	8.6	7.5	6.5
NPV at CS2 (D50:E50)	8.1	7.1	6.1
NPV at CS3 (D0:E100)	7.0	6.1	5.3
IRR	74%	68%	62%

Table 17: Sensitivity analysis: change in interest rate

Based on Interest Rate	at 9.5% interest rate	at 10.05% interest rate	at 11% interest rate	at 12% Interest Rate	at 12.5% Interest Rate	at 13% Interest Rate
NPV (70:30)	9.0	8.9	8.8	8.57	8.48	8.39

5. ENERGY EFFICIENCY FINANCING IN MSMEs

Financing plays a key role in facilitating procurement and implementation of energy efficient technologies and products in any industry. Government has given EE financing in MSMEs top priority since the sector contributes significantly towards India's economic growth. However, existing financing options are not sufficient to meet the financing requirement in the sector due to the large size of the sector. MSMEs using various financing schemes for technological up-gradation are still very less, as most of them use their own capital fund rather than making use of external financing models. Although financing models were very successful in some clusters, the scale-up of such activities is rather slow. This slow pace in implementation of energy efficiency financing in MSMEs is due to the various sector specific challenges in the sector.

Some of the key barriers to finance EE projects in the sector are:-

- Lack of available capital for investment as EE interventions being small may not get financed through FIs as they do not qualify as term loans
- Lack of clarity on financing schemes- repayment mechanism and complex procedural requirements
- Lack of availability of financing model that cater to the particular requirement of the MSME
- Lack of awareness among MSMEs with respect to benefits of implementing EE technologies
- FIs consider MSMEs as a high risk category due to low credit flow to this sector. This is due to several factors such as poor book-keeping practices, weak balance sheets, poor credit history and smaller sizes of MSME loans.
- Collateral based lending, advocated by FIs, restricts MSMEs from availing loans
- No formal M&V procedure available to estimate the savings achieved by implementing EE measure
- Risks associated with repayment of loans which include technical, commercial and performance risks

5.2 FI Schemes in Gujarat

Table 18: FI schemes in Gujarat

Sl.No	Name of Scheme	Purpose	Financial Details	Contact Address
1	SIDBI Make in India Soft Loan Fund for Micro, Small & Medium Enterprises (SMILE)	• The focus of the scheme is on technology upgradation which helps in reducing the impacts from process and operations as the reduction in resource consumption and productivity improvements are major outcome of technology upgradation • The program aims to bridge the gap by providing financial support to the companies.	• Rate of interest is according to credit rating • Interest rates for soft loans are from (8.90 % to 8.95 % pa) and term loans are in the range of (9.45% to 9.60% pa) • Min loan amount: Rs 25 Lakhs • Term Loan: 75% of the project cost as debt	Mr. Chandan SIDBI, Bhavan, Ist Floor, P.B.No. 10, Navjivan P.O., Ahmedabad Ph No : : 8769436639 Mail Id: ahmedabad@sidbi.co.in
2	4E scheme (End to End Energy Efficiency Financing scheme)	• The 4E scheme promoted by SIDBI aims to assist the industries in implementation of energy efficiency and renewable energy projects. • The scheme addresses all aspects of energy efficiency in a company from assessment and identification of energy efficiency interventions to facilitating implementation by providing technical and financial support	• Interest rate - 2.5% below market interest rate • Min loan amount: Rs 10 Lakhs • Max loan amount: Rs 150 Lakhs • 90% of the project cost as debt	Mr. Chandan SIDBI, Bhavan, Ist Floor, P.B.No. 10, Navjivan P.O., Ahmedabad. Ph No : 8769436639 Mail Id: ahmedabad@sidbi.co.in
3	Partial Risk Sharing Facility for Energy Efficiency project (PRSF)	• The partial risk sharing facility aims at transforming the energy efficiency market in India and promotion of Energy Service Contracting Model for the Energy Efficiency. • The scheme address barrier related to the financing aspects for energy efficiency	• Term Loan: 12%-15% • Min loan amount: Rs 10 Lakhs • Max loan amount: Rs 15 Cr • Total Project funding of – USD 43 million • Risk Sharing facility component of USD 37 million to be managed by SIDBI • Technical assistance component of USD 6 billion to be managed by SIDBI and	Mr. Chandan SIDBI, Bhavan, Ist Floor, P.B.No. 10, Navjivan P.O., Ahmedabad. Ph No : 0562-2521023 Mail Id: ahmedabad@sidbi.co.in

			EESL	
4	Bank of Baroda's Scheme for Financing Energy Efficiency Projects	All these Schemes from various banks (SBI, Bank of Baroda, Canara Bank) have their focus towards technology upgradation. Technology upgradation can lead to improvement in energy, productivity, and lower emission from the MSME company. As technology upgradation could be capital intensive most of the schemes from banking institutions aim at bridging the gaps for access to finance for MSME sector	• Loans of up to 75% of the total project cost, subject to maximum of Rs. 1 crore, will be provided. (Minimum amount of loan Rs. 5 Lakhs • Collateral will be required for all loans. An interest rate of bank base rate + 4% will be applicable, to be paid back over a period of 5 years.	Bank of Baroda SME Loan Factory 2nd Floor Baroda Towers, Ellisbridge, Ahmedabad Ph No : 9979867501 Mail Id : cpc.sme.ahmedabad@bankofbaroda.com
5	Canara Bank's Loan scheme for Energy Savings for SMEs		• The scheme covers up to 90% of project costs of up to INR 1 million (EUR 13,000). • Max. loan: INR 10 million (EUR 130,000) • Security: collateral free up to INR 5 million (EUR 65,000), beyond INR 5 million collateral required as determined by the bank • Margin: 10% of project costs	Swaraj Arcade, Kumudvadi Opp.Lal Tanki, Chitra Road,Bhavnagar-364002 Ph No : 0751-2233141/ 2431541 Email Id : cb4831@canarabank.com
6	SBI's Project Uptake for Energy Efficiency		• SBI identifies industrial clusters with potential for quick technology upgradation and a supporting environment. Based on studies in interested units, technology upgradation is undertaken if the same in viable. • With a ceiling of INR 1 lakh, an amount equal to that invested by the unit is provided under this loan. There is a start-up period of 3 years, with a repayment period of 5-7 years, at zero interest.	SBI SMECC Ground Floor, Zodiac Avenue, Opp Commisionar Bunglow, Navrangpura, Ahmedabad, Gujarat Ph No : 022 22029456 Email Id : sbi.60438@sbi.co.in
7	Solar Roof Top Financing Scheme IREDA	The loan scheme is applicable to grid interactive, rooftop solar PV plants for industries, institutions and commercial establishments. Financing can be	• Interest rate: 9.9% - 10.75% • Max. repayment time: 9 years • Minimum promoter's contribution: 30% • The applicant's minimum capacity needs to be 1MW	IREDA Camp Office 603, Atlanta Towers Near Panchvati Circle, Gulabi Tekra Ahmedabad

		accessed for single or aggregated investments.		Ph No : 9811889805 Email Id : ashokyadav@ireda.in
8	SBI - World Bank: Grid Connected Rooftop Solar PV Program	Loans for financing grid connected rooftop solar photovoltaic (GS- RSPV)	• Loan amount is 75% of the project cost • Fixed Asset coverage ratio: >1.25 • Moratorium period: upto 12 months from date of commencement of commercial operations • Guarantee: in case of sole proprietorship/partnership firm/personal guarantee of partners	SBI SMECC Ground Floor, Zodiac Avenue, Opp Commisionar Bunglow, Navrangpura, Ahmedabad, Gujarat Ph No : 022 22029456 Email Id : sbi.60438@sbi.co.in

6. ENVIRONMENTAL AND SOCIAL BENEFIT

6.1 Environmental Benefit

A resource-efficient business demonstrates a responsibility towards the environment. Energy and the environment are so closely linked, that, in addition to saving energy and reducing utility expenses, there are additional and often unreported benefits from conserving energy, saving natural resources being an important benefit.

Energy efficiency plays a major role, even where company output is increased, energy efficiency improvements can contribute significantly in most cases to reducing the negative impact of energy consumption per unit of output. Any increase in pollutant emissions will thus be minimized. Significant environmental benefits gained by adopting energy efficient technologies and processes may include lowering the demand for natural resources, reducing the emission of air pollutants, improving water quality, reducing the accumulation of solid waste and also reducing climate change impacts. Improving energy conservation at the facility can improve the facility's overall efficiency, which leads to a cleaner environment.

Reduction in Pollution Parameters

The proposed EE measure of installing intelligent flow controller would result in annual electricity savings of 25,200 kWh which is equivalent to 2.17 TOE per annum. The proposed EE measure will result in decrease of CO_2 emissions by 20.66 TCO_2 annually, thus resulting in reduced GHG effect.

6.2 Social Benefit

Work Environment

The Factories Act, 1948 covers various aspects relating to working environment maintenance and improvement. The good maintenance practices, technology up gradation, efficient use of energy and resource conservation not only contribute to energy and pollutant reduction but also contributes in ensuring safe and clean working environment to the employees of the organization. Many units have also been doing review of safety process and have provided access to safe working environment to the workers. Basic facilities such as first aid kit, PPE gears and many others have been made available

Skill Improvement

Implementing energy efficiency measures requires mix of people and skills. It involves up skilling workers at all levels from the shop floor to the board room to understand how companies manage their energy use—and to identify, evaluate and implement opportunities to improve energy performance. As the project involved identifying energy saving projects, implementing and verifying the savings, the unit have understood how to estimate energy savings with respect to energy saving proposals and also energy wastage have been identified. The activity has been successful in bringing the awareness among workers on energy wastage reduction, technology up

gradation possible, etc. Each new technology implemented in a dairy plant will create an impact on the entire Gujarat Dairy cluster as each dairy units can replicate the new technology and promote the concept of energy efficiency in entire Gujarat Dairy Cluster and thus reduce the overall energy consumption of the cluster as a whole.

Technical skills of persons will be definitely improved. As the training provided by the OEMs on latest technology will create awareness among the employees on new trends happening in market. The training also helps in improving the operational and maintenance skills of manpower required for efficient operation of the equipment. Each new technology implemented in a dairy plant will create an impact on the entire Gujarat Dairy cluster as each dairy unit can replicate the new technology and promote the concept of energy efficiency in entire Gujarat Dairy Cluster and thus reduce the overall energy consumption of the cluster as a whole.

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7. CONCLUSION

Energy efficiency is an instrument to address the issue of energy crisis and also be employed as a cost effective means to attain sustainability and business. Cost of energy is considered as a vital component for industries and warrant judicious use of energy. Amid spiraling power cost energy efficiency assumes at most importance for the sector to remain competitive.

The GEF, UNIDO and BEE project through its various engagements is able to demonstrate energy efficiency potential in Gujarat Dairy cluster. The project is able to promote the concept of energy efficiency and renewable energy in dairy cluster through various capacity building programs for local service providers, technology feasibility studies in dairy units, training programs on EE/RE technologies and also helped in penetrating new /latest technologies into the cluster.

The DPR for installation of intelligent flow controller has been prepared after the OEM came to the dairy and done a detailed feasibility study. The implementation of this measure will significantly will result in an annual electricity savings of 25,200 units with 20.66 TCO_2 reduction. The following table gives the overall summary of the savings achieved:-

Table 19: Proposed EE Measure

Sl No	EE Measure	Annual Energy Savings		Monetary Savings (Rs. Lakhs)	Investment (Rs. Lakhs)	Payback (Months)	AnnualCO_2 reduction (Tonnes)
		kWh /year	TOE/year				
1	Installation of Intelligent Flow Controller in Compressed air line System	25,200	2.17	2.04	3.84	23	20.66

The summary of financial analysis given in the below table clearly indicates that implementation of this project is economically and financially viable with an attractive payback period. So it is recommended to install demand side controller in the compressed air line.

Table 20: Financial Analysis

Sl. No.	Particulars	Unit	Value
i	Total Investment (Incl of Tax)	Rs. Lakh	**3.84**
ii	Means of Finance	Self / Bank Finance	**Self**
Iii	IRR	%	**74.38**
Iv	NPV at 70 % Debt	Rs. Lakh	**8.57**

7.1 Replication Potential

Intelligent flow controller has a good replication potential in all the dairy plants. All the dairy plants have compressors installed for process and instrumentation applications. Most of the dairy plants are operating with compressors load and unload at different pressure bands based on the user application. This leads to a situation wherein one or more compressors tend to load more in comparison to the actual requirement. Due to this there is additional compressed air generation creating an artificial demand. For the implementation of this project detailed pressure profiling of the generation side, distribution side and user side should be done. The implementation of this project will inspire other units to take up similar energy efficiency initiatives which eventually will lower the bottom line and increase the top line therefore the margin increases. Secondly, the very clear specifications on vendor and the cost base is already available which makes it easy for other units in the Gujarat Dairy cluster to access the technology and gives them a very good idea about the cost and benefits associated with the projects. Overall, the holistic approach adopted by the project will be extremely useful in achieving the goal of improving EE in the cluster.

8. ANNEXURE

8.1 Financial Quotation

| ELECTRICALS& ELECTRONICS
(ISO 9001, 14001 and OHSAS CERTIFIED)
COMPRESSED AIR SOLUTIONS
Tel: 91-22-6796 2251 To 2259
Fax: 91-22-6796 1410/1525
E-mail: casene@godrej.com
Website: www.godrej-airsolutions.com

Godrej & Boyce Mfg. Co. Ltd.
Regd. Office : Pirojshanagar,
Vikhroli, Mumbai400079, India
T.: 91-22-67961700/1800
W : www.godrej.com

QUOTATION NO. : SJ/20182019/SQ-SQ02/000146 **DATE :** 07/05/2018

SURAT DISTRICT CO-OPERATIVE MILK PRODUCERS UNION LTD.
Sumul Dairy Station Road,
Surat -395008 , Gujarat India

Kind Att. : Mr. Alpesh Shah

Subject : - Quotation for Supply and Demand Side Management System- ControlAir IFC and ICC

Dear Sir,

We would like to thank you for the kind courtesy extended to our engineer Mr. Chintan Patel during his visit to your plant for conducting a detailed data logging study in your compressed air system. Please find attached the following documents in this techno commercial offer based on the analysis of the data collected .

1. Commercial quote detailing the price quoted with all terms and conditions.
2. Technical quote detailing the existing compressed air system, proposed system with analysis of data collected and the energy saving summary, money back guarantee, scope of supply and exclusions from scope of supply and depreciation benefit.
3. Technical Literature detailing product description and salient features of the product .
4. Modification drawing showing a single line diagram of the existing piping layout and the recommended piping modification to be done for retrofitting the proposed system in the existing layout.

We trust that our proposal will meet your requirement and looking forward to your favorable acceptance . Please do not hesitate to contact us should you need any further information or clarification, we will be happy to be at your service.

Encl: 1) Commercial Quote 2) Technical Quote 3) Technical Literature 4) Proposed Piping Modification Drawing

Thanks & Regards,

Rohit V. Shetty
Associate General Manager

Contact Details of Concerned Sales Person
Name : Deepak Belamkar
Designation : Asst. Manager
Telephone : 02267962257
Mobile : 9769131407
Fax :
Email : belamkar@godrej.com

ELECTRICALS& ELECTRONICS
(ISO 9001, 14001 and OHSAS CERTIFIED)
COMPRESSED AIR SOLUTIONS
Tel: 91-22-6796 2251 To 2259
Fax: 91-22-6796 1410/1525
E-mail: caseng@godrej.com
Website: www.godrej-airsolutions.com

Godrej & Boyce Mfg. Co. Ltd.
Regd. Office : Pirojshanagar,
Vikhroli, Mumbai400079, India
T.: 91-22-67961700/1800
W.: www.godrej.com

COMMERCIAL QUOTE. : SJ/20182019/SQ-S/Q02/000146 **DATE :** 07/05/2018

SR. NO	DESCRIPTION OF GOODS	PRODUCT CODE	UNIT AMOUNT (Rs.)	QTY.	AMOUNT (Rs.)
1	GE-10, 500 CFM CONTROLAIR (HSN Code: 90328990)	FGOCR0GIFCGE010A	320000.00	1.00 No	320000.00
				Total	320000.00
In words: Rupee Three Lakhs Twenty Thousand Rupees Only				Grand Total	320000.00

Terms And Conditions :	
PACKING & FORWARDING	2% Extra
FREIGHT, INSURANCE	At actuals to your account
PURCHASE ORDER	Purchase order to be released in favour of Godrej & Boyce Mfg. Co. Ltd, Godrej - Electricals & Electronics, Pl-1, Compressed Air Solutions, Pirojshanagar, Vikhroli, Mumbai - 400079.
PAYMENT	100% along with PO. Payment will be released as per terms in PO Confirmation given by Godrej. If there is any delay in release of payments beyond the terms mentioned in the PO, an interest at @18% will be applicable.
DELIVERY	12-16 weeks from the receipt of your firm PO. Road permits and other forms required in the State should be made available to Godrej in advance to avoid any delay in dispatches.
GST	Applicable GST rates depending on the HSN codes of the products/ parts as mentioned in quote above.
CHANGES IN TAXATION	If there changes in GST rates, the applicable rate of taxes on the date of supply will be charged.
VALIDITY	30 Days from the date of offer.
WARRANTY FOR GOODS	One-year warranty, from the date of delivery of material at your works will be provided against any manufacturing defects. However this does not include parts or products, which have been subjected to misuse or which have been repaired or altered without the company's authorization. This warranty will not cover consumables, rubber, plastic parts, etc...During this period, if any defect is noticed, the same should be brought to our notice immediately. Godrej will investigate such complaints and either repair or replace the components found defective, if the defect is found to be a manufacturing defect. Godrej decision in this regards will be final and legally binding.
CONFIDENTIALITY	The information contained in this offer is privileged information of Godrej and should not be disclosed without taking written consent from Godrej.
FORCE MAJEUR	This offer shall be subject to force majeure conditions like invasion, hostilities, embargoes, strikes, lock-outs, sabotages Civil commotion, and acts of God such as earthquake, fir, flood, etc. in case of any of the majeure conditions take place during the currency of the contract, the delivery period shall be suitably extended by mutual agreement.
ARBITRATION	Any disputes arising out of this offer shall lie within the jurisdiction of the Courts in Mumbai only. In case of arbitration, decision of the sole Arbitrator to be appointed by Godrej will be final.
CONSEQUENTIAL DAMAGES	In no event we will be liable for any consequential, incidental, indirect, exemplary, punitive, special or other damages whatsoever resulting from the performance or failure to perform under this agreement or the furnishing, performance or use of any goods sold pursuant hereto.
MARK PO. TO	Please mark PO. Copy to aemsales@godrej.com

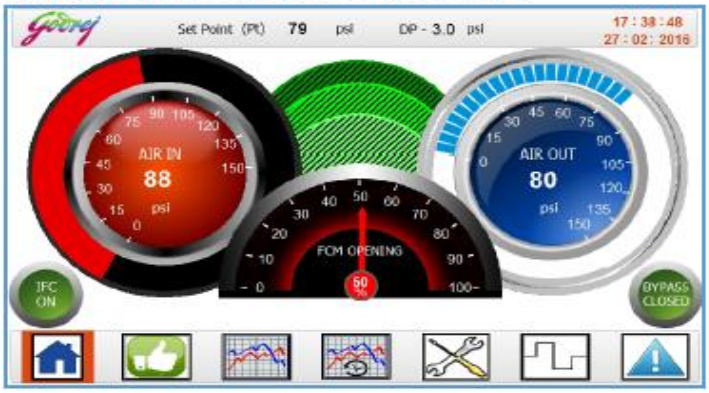
8.2 Technical Details

#	Application	Godrej ControlAiR IFC Model	Nominal Flow Capacity, SCFM	Upstream Pressure (psig)	Downstream Pressure (psig)
1	For Low Pressure Line	GE-10	500	87 psig	77 psig

Operation of ControlAiR IFC is controlled by 32-bit microprocessor controller. It senses the air demand and directs the Flow Control Module/s to proportionately open/close to increase/decrease the downstream flow/pressure as per process requirement. User friendly **HMI Touch Screen Graphics Display** facilitates communication with microprocessor and it has following significant features:

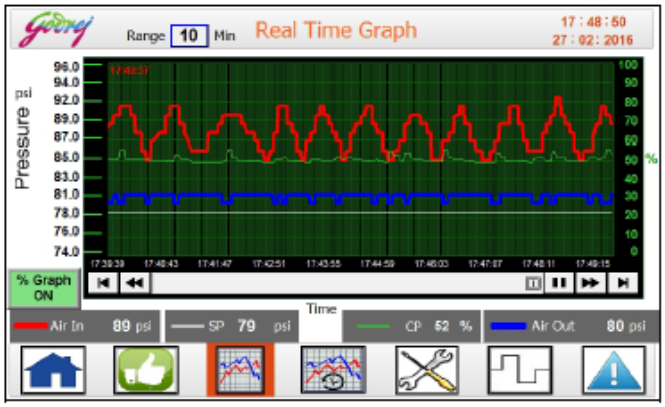
i. User-friendly **HMI Touch Screen Graphics Display**:

a. Displays real time Inlet pressure, Target Pressure, Actual Discharge pressure, % opening of flow control modules, error codes and status.

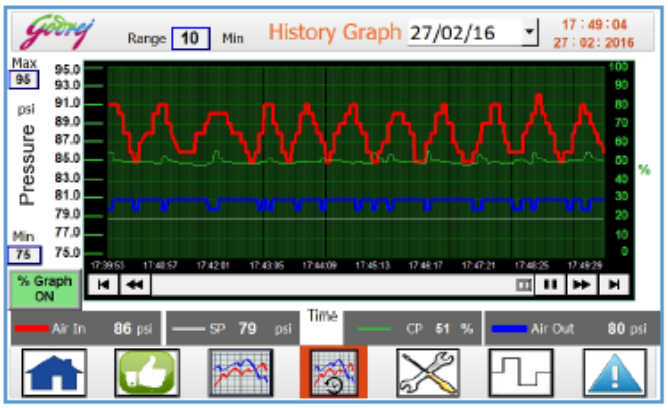


b. Displays Run Hours, Service Due Hours.

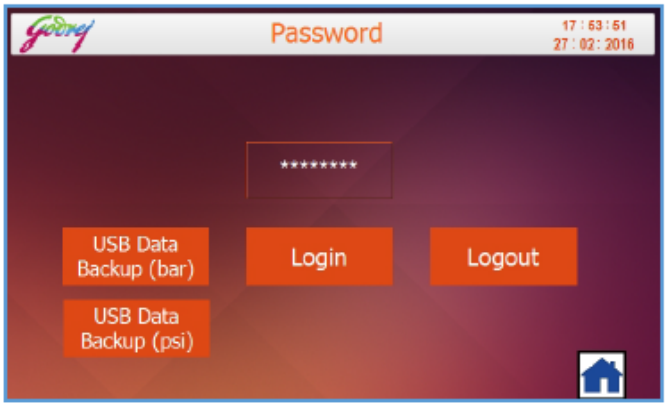
c. Displays real time online trends for inlet & outlet pressure, % opening of flow control modules



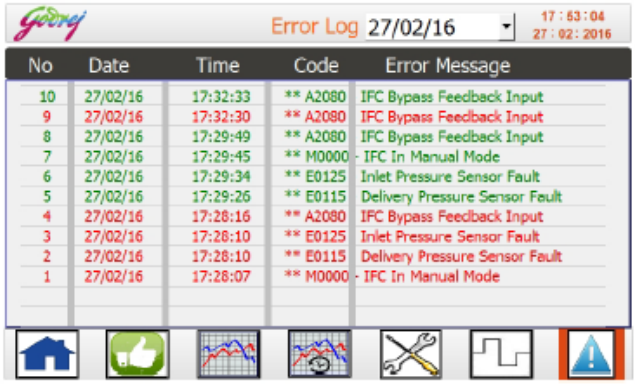
d. Displays historical trends of inlet & outlet pressures, % opening of flow control modules etc.



e. Retrieval of historical data of inlet & outlet pressure, target pressure, % opening of flow control modules w.r.t date & time through USB port for analysis.



f. Displays day-wise error / alarm logs to analyse in case of any errors occurred in the system.



ii. Pre-programmed Weekly Pressure Schedule enables an operator to set the IFC system to maintain a pre-determined target pressure at desired time periods. The pressure value can be set to minimum of 0 psig, especially when no air flow is required in the plant during shift changes, recess times & weekends.

- Six different pressure schedules can be programmed quickly using **HMI Touch Screen Graphics Display**.
- In case of more number of different pressure values are required at various time intervals, 28 different pressure schedules can be programmed through the microprocessor controller.

iii. Microprocessor controller intelligently controls the Automatic Bypass valve. The Automatic Bypass valve will open in case the downstream plant pressure falls below the Low Delivery Pressure Limit thereby bypassing the IFC system and supplying air to the Plant at whatever available pressure. However, once the downstream plant pressure is restored above the "Low Delivery Pressure Limit", the Auto-Bypass valve self-resets and closes thereby allowing the IFC Flow Control Modules to again start controlling the Plant pressure. The Auto-Bypass Valve first checks the stability of target pressure to be in the permissible range and thus avoids rapid cycling of the bypass arrangement.

iv. Display of Upstream & Downstream pressure can be selected in "bar" / "psig" as per the operator's convenience.

v. HMI Touch Screen Graphics Display can also be configured to display the Air Temperature (Dew Point) or the Air Flow to the plant by providing a suitable Temperature / Air Flow sensor in the system and configured in the microprocessor controller.

C PRODUCT FEATURES

a. Fail safe operation through 'Fail Open' Flow Control Modules & additional Auto-Bypass Valve.
b. Multi-Parallel System for better air pressure / flow control in the plant.
c. Flow capacity: 500 cfm to 15,000 cfm in standard models. Higher flow capacity models on request.
d. Rated for 150 lb ANSI. Higher pressure rating can be manufactured as per requirement.
e. Uses digital electronic micro-processor with closed loop feedback control system.
f. 28-Programmable Pressure Schedules & Remote selection of 3 preset Pressures on external signal
g. Power Supply: 230 VAC, 1ϕ, 50 Hz. Other voltage & frequency option as per customer request.
h. Compressed Air inlet temperature up to 50°C (122°F). Options available for higher temperature.
i. Ambient operating conditions: between 4°C to 50°C (40°F to 122°F) & indoor installation
j. Pressure drop across the IFC at rated flow is less than 1 psig (0.07 bar)
k. ANSI Flanged inlet & outlet from top, installed with No Air loss auto condensate drains.
l. Built-in desiccant dryer for instrument quality air for pilot control air.
m. Enclosure for better protection, noise level reduction and aesthetically good looks
n. Microprocessor menu structure with three level passwords for security.
o. HMI with touch screen for easy access and online information.
p. Can be programed at site for safe operation with centrifugal air compressor avoiding blow-off.