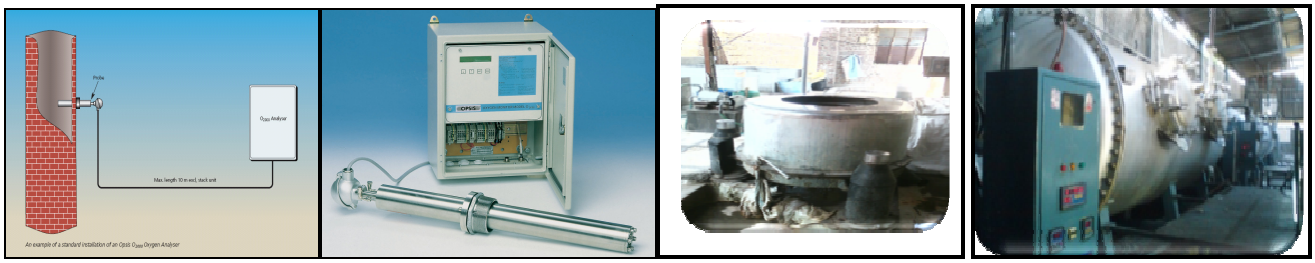
DETAILED PROJECT REPORT
ON
ONLINE FLUE GAS ANALYSER
(SURAT TEXTILE CLUSTER)



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Bureau of Energy Efficiency

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ONLINE FLUE GAS ANALYSER

SURAT TEXTILE CLUSTER

BEE, 2010

Detailed Project Report on Online Flue Gas Analyser

Textile SME Cluster, Surat, Gujarat (India)

New Delhi: Bureau of Energy Efficiency;

Detail Project Report No.: ***SRT/TXT/FGA/07***

For more information

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We take this opportunity to express our appreciation for the excellent support provided by Textile Unit Owners, Local Service Providers, and Equipment Suppliers for their active involvement and their valuable inputs in making the program successful and in completion of the Detailed Project Report (DPR).

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Zenith Energy Services Pvt. Ltd.

Hyderabad

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LISTS OF ABBREVATIONS

- BEE - Bureau of Energy Efficiency
- DPR - Detailed Project Report
- DSCR - Debt Service Coverage Ratio
- FD - Forced Draft
- GHG - Green House Gases
- HP - Horse Power
- IRR - Internal Rate of Return
- ID - Induced Draft
- MoMSME - Micro Small and Medium Enterprises
- NPV - Net Present Value
- OFGA - Online Flue gas Analyzer
- ROI - Return On Investment
- SIDBI - Small Industries Development of India
- SME - Small and Medium Enterprises
- TFH - Thermic Fluid Heater

EXECUTIVE SUMMARY

Zenith Energy Services Pvt. Ltd. is executing BEE-SME program in Surat Textile Cluster, supported by Bureau of Energy Efficiency (BEE) with an overall objective of improving the energy efficiency in cluster units. Surat is renowned for the synthetic sarees and dress materials and there are about 450 above industries in the cluster. The major Energy forms used in the cluster are Electricity and Fuels like Imported Coal, Lignite, Natural gas and Biomass (Groundnut husk briquettes and Wood). Electricity is used for driving the prime movers of pumps, fans, drives, and for lighting. Lignite and imported coal are used in boilers for steam generation. Natural gas is used in Stenter's (for heat setting) and natural gas based generators

The cost of energy as a percentage of manufacturing cost varies anywhere between 12 to 15%, which includes electrical as well as thermal. Majority of the industries located in Surat is of wet process and a very few units are engaged in production of cotton fabric with power looms and warping machines. Wet process requires high amounts of thermal energy in the form of hot water and steam, inducing a high share of energy cost. The energy cost is next to the raw materials cost. Processing is the weakest link in the supply chain of textile.

During energy audit it was observed that in various units of the cluster, air supply is not monitored properly and leading to either high or low excess air supply leading to high fuel consumption. No excess air monitoring system or instrument is available.

Installation of proposed equipment i.e. on line gas analyser in existing boiler would save 1% of present fuel consumption which is 70 tonne in a typical unit.

The DPR highlights the details of the study conducted for assessing the potential for optimizing excess air supply in the boiler by installing online flue gas analyzer, possible coal savings and its monetary benefit, availability of the technologies/design, local service providers, technical features and proposed equipment specifications, various barriers in implementation, environmental aspects, estimated GHG reductions, capital cost, financial analysis, sensitivity analysis and schedule of Project Implementation

This bankable DPR also found eligible for subsidy scheme of MoMSME for "Technology and Quality Upgradation Support to Micro, Small and Medium Enterprises" under "National Manufacturing and Competitiveness Programme". The key indicators of the DPR including the Project cost, debt equity ratio, monetary benefit and other necessary parameters are given in table below:

S.No	Particular	Unit	Value
1	Project cost	₹(in Lakh)	2.36
2	Coal Savings	tons/annum	70
3	Monetary benefit	₹(in Lakh)	1.98
4	Simple payback period	years	1.19
5	NPV	₹(in Lakh)	5.04
6	IRR	%age	64.64
7	ROI	%age	27.92
8	Average DSCR	Ratio	3.45
9	Process down time	days	Not required

The projected profitability and cash flow statements indicate that the project implementation i.e. installation of online flue gas analyser will be financially viable and technically feasible.

ABOUT BEE'S SME PROGRAM

Bureau of Energy Efficiency (BEE) is implementing a BEE-SME Programme to improve the energy performance in 25 selected SMEs clusters. Surat Textile Cluster is one of them. The BEE's SME Programme intends to enhance the energy efficiency awareness by funding/subsidizing need based studies in SME clusters and giving energy conservation recommendations. For addressing the specific problems of these SMEs and enhancing energy efficiency in the clusters, BEE will be focusing on energy efficiency, energy conservation and technology up-gradation through studies and pilot projects in these SMEs clusters.

Major activities in the BEE -SME program are furnished below:

Energy use and technology audit

The energy use technology studies would provide information on technology status, best operating practices, gaps in skills and knowledge on energy conservation opportunities, energy saving potential and new energy efficient technologies, etc for each of the sub sector in SMEs.

Capacity building of stake holders in cluster on energy efficiency

In most of the cases SME entrepreneurs are dependent on the locally available technologies, service providers for various reasons. To address this issue BEE has also undertaken capacity building of local service providers and entrepreneurs/ Managers of SMEs on energy efficiency improvement in their units as well as clusters. The local service providers will be trained in order to be able to provide the local services in setting up of energy efficiency projects in the clusters

Implementation of energy efficiency measures

To implement the technology up-gradation project in the clusters, BEE has proposed to prepare the technology based detailed project reports (DPRs) for a minimum of five technologies in three capacities for each technology.

Facilitation of innovative financing mechanisms for implementation of energy efficiency projects

The objective of this activity is to facilitate the uptake of energy efficiency measures through innovative financing mechanisms without creating market distortion.

1 INTRODUCTION

1.1 Brief Introduction about cluster

The products manufactured in Surat Textile Cluster are synthetic sarees and dress materials and the produced here are renowned in the country and abroad and has good domestic market. The main raw material for the cluster units is grey cloth and is procured local weaving units and agents. The cost of energy (electrical and thermal energy) as percentage of manufacturing cost varies between 12 and 15%.

Majority of the cluster units are of integrated type, where the raw material "grey cloth" is processed in-house to the final product like sarees and dress materials. Most of the units of the cluster are working on Job basis, where the textile agents will provide design and grey cloth and the grey cloth is processed as per design provided by the clients. The energy cost is next to the raw materials cost.

Production process

The main process operation for dyeing and printing process of synthetic sarees and dress materials adopted in cluster units are as follows:

Fabric pre-treatment

The main purpose of the fabric pre-treatment process is to remove oil, grease and other materials and to whiten the grey cloth though bleaching. The various process adopted in pre-treatment are scouring, bleaching and shrinking process.

Dyeing

Dyeing is the process of imparting colors to the material through a dye (color). In which a dye is applied to the substrate in a uniform manner to obtain an even shade with a performance and fastness appropriate to its final use. This process is mainly performed in Jet Dyeing Machines and Jigger machines

Dyeing of fabric is carried out in jet dyeing machines. The temperature of the solution is raised to 50℃. Concentrated dyestuff solution is prepared separately and is added to the liquor. After the addition of dyes, the temperature is raised to 130℃ and maintained for about 60 minutes.

After whitening/dyeing, the fabric is unloaded from the machine and taken to the folding and rolling machines for improving the width of cloth, which gets shrunk during the washing and dying process.

Printing

In Surat cluster three types printing methods are used. Most of the units are following the flat bed printing, rotary printing and some units follows hand printing. Hand printing is the old method to print the fabric. The flat bed printing has provision for printing 10 to 14 colors simultaneously. The color print paste prepared is fed onto the screens from which it is transferred to the fabric fed in. The fabric after print paste transfer is passed through a drying chamber at 145℃. The dried and printed fabric is taken for further processing.

Drying and Finishing

After printing, the drying process is performed in loop machine, where the temperature is maintained between 130℃ to 170℃ for better color setting. After passing through the loop machines, the printed fabric is washed in a series of normal water and hot water washing in the presence of chemicals for color setting. After completion of the washing process, the printed and washed fabric is subjected to heat setting process in Stenter and then pressing and finishing treatments.

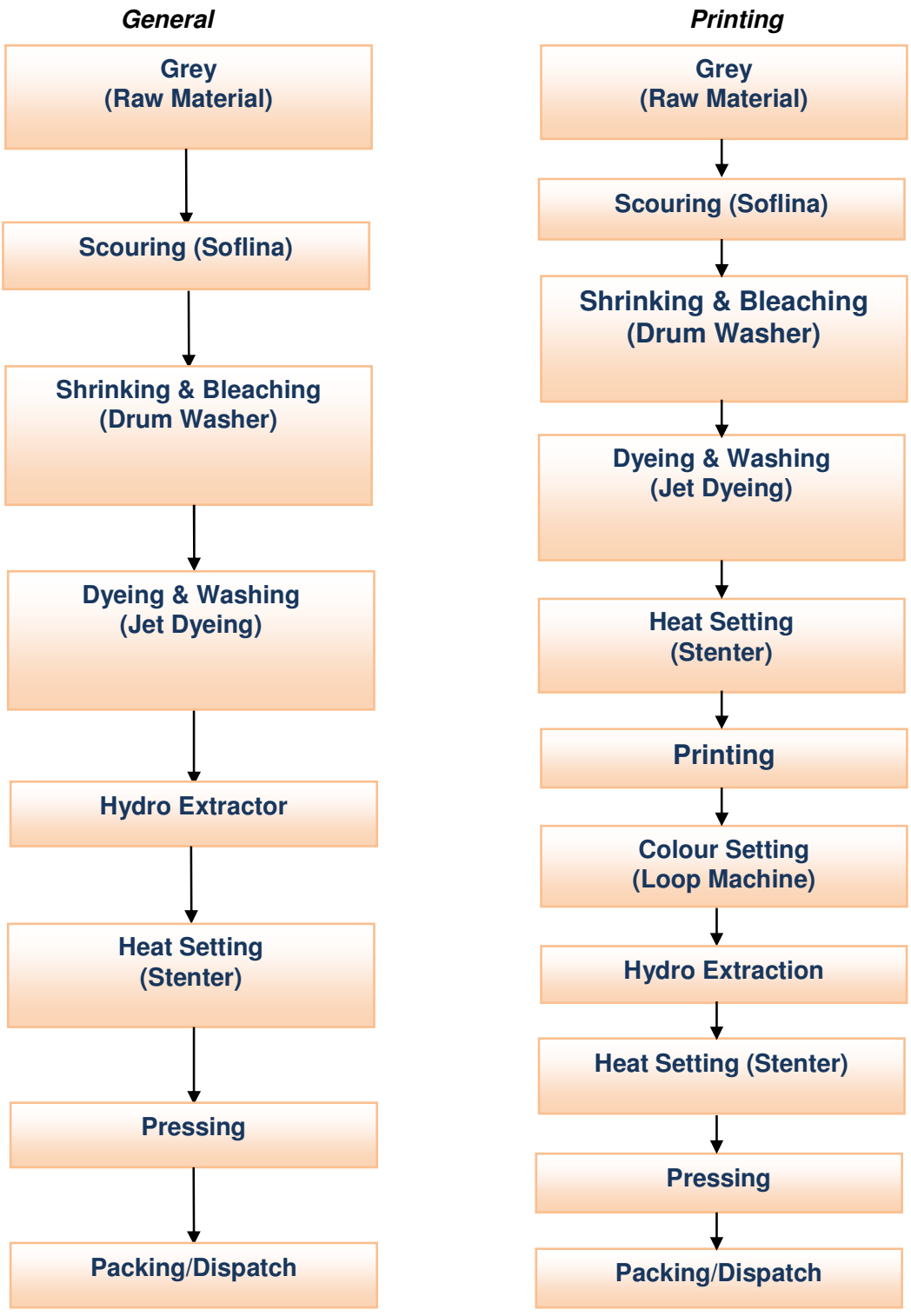


Figure 1.1: General Process Flowchart of a Typical Textile Unit

1.2 Energy performance in existing situation

1.2.1 Fuel and electricity consumption of a typical unit

The main energy forms used in a typical unit in the cluster are electricity, coal/lignite and natural gas. Electricity is used for driving the prime movers of pumps, fans, stenter fans, ID and FD fans, conveyers, loop machines drives, lighting etc. Imported coal and lignite are used as fuel in boilers for steam generation and whereas natural gas is used as fuel in generators for electricity generation, stenter, printing and loop machines. The energy consumption of a typical unit in the cluster having boiler for steam generation is furnished in Table 1.1 below:

Table 1.1: Energy consumption of a typical unit

(Navanidhi Dyeing and Printing Mills Pvt Ltd)

S.No.	Details	Value	Unit
1	Coal/lignite Consumption	Tons/annum	7,200
2	Grid Electricity consumption	MWh/annum	1078
3	Natural gas consumption	Million SCM/annum	1.286
4	Production (quantity processed)	Mts (In Lakh)/annum	175

1.2.2 Average production by a typical unit in the cluster

The average production in a year in a typical unit is 175 lakh meters of final product

1.2.3 Specific Energy Consumption

Specific energy consumption both electrical and thermal energy per Lakh mts of Production for a typical unit is furnished in Table 1.2 below:

Table 1.2: Specific energy consumption for a typical unit

(Navanidhi Dyeing and Printing Mills Pvt Ltd

S. No.	Type of Fuel	Units	Specific Energy Consumption
1	Coal/lignite Consumption	Tonne/Lakh mts	41.14
2	Grid Electricity consumption	MWh/ Lakh mts	6
3	Natural gas consumption	million SCM/ Lakh mts	0.007

Equipment wise Specific Energy Consumption

The specific energy consumption of the equipments used in the Surat textile industries is given in Table 1.3 below wherever possible.

Table 1.3 Equipment wise Specific Energy Consumption

Equipments	Units	Minimum SEC	Maximum SEC	Average SEC (for whole cluster)
Soflina machines	kWh/meter	0.011	0.013	0.012
Drum Washer machine	kWh/meter	0.012	0.016	0.014
Jet Dyeing machine	kWh/meter	0.016	0.019	0.017
Stenter machine	kWh/meter	0.018	0.020	0.019

1.3 Existing technology/equipment

1.3.1 Description of existing technology

Boiler is common used in all the Surat Textile Cluster Units. Boiler is used for steam generation and is used for various process equipments like jet machines, drum machines and final washing. Capacity of the boilers in the cluster units vary from 3 TPH to 7 TPH. Based on detailed energy audits carried out in various units of the cluster, air supply is not monitored properly and leading to either high or low excess air supply leading to high fuel consumption. No excess air monitoring system or instrument is available.

1.3.2 Its role in the whole process

Boiler is used for steam generation which is used in the machinery like Jet machines, Drum machines, and loop machines etc. for production of share and dress material.

1.4 Establishing the baseline for the equipment to be changed

1.4.1 Design and operating parameters

The detailed energy audits were conducted in the cluster units for assessing the boiler efficiency, excess air supply and analysis oxygen percentage in flue gas. Details of excess air calculation for a typical unit are furnished in Annexure 1.

1.4.2 Electricity and Fuel consumption

The fuel consumption of various three cluster units and excess air percentage is presented in Table 1.4 below:

Table 1.4 Unit wise Energy consumption and %age excess air in three typical units

S. No	Name of the unit	Fuel Consumption (Tons/annum)	Oxygen in flue gas (%age)	Excess Air (% age)
1	Navanidhi Dyeing and Printing Mills Pvt Ltd	7,200	14.70	234
2	Rachana Group of Industries	6,048	17.85	567
3	Samta Silk Mills Pvt Ltd	1,800	13.19	169

1.5 Barriers for adoption of new and energy efficient technology / equipment

1.5.1 Technological Barriers

The major technical barriers that prevented the implementation of the gas based co-generation systems in the cluster are:

- Lack of awareness of the technology and losses due to excess air supply to the boilers and thermic fluid heater
- No knowledge on the excess air supply required for various fuels fired in the boiler
- Most of the boiler operators are non technical and doesn't have knowledge on operation of the boiler

1.5.2 Financial Barrier

- lack of awareness about monetary benefit of optimizing the excess air supply

1.5.3 Skilled manpower

Lack of skilled manpower is also one of the major barriers for monitoring the excess air supply to the boiler. In majority of the units, the boilers are operated by the unskilled workers and don't have boiler operators certificates.

1.5.4 Other barrier(s)

No major other barriers were identified

2. TECHNOLOGY/EQUIPMENT FOR ENERGY EFFICIENCY IMPROVEMENTS

2.1 Detailed description of technology/equipment selected

2.1.1 Description of technology

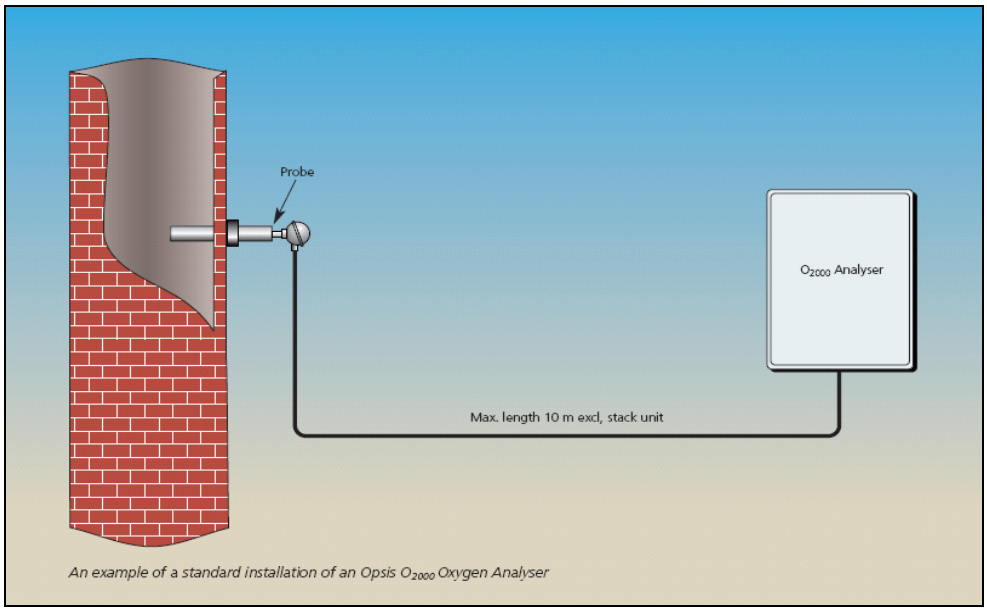
Oxygen analyzer is designed for measuring oxygen in industrial, process and CEM applications such as boilers. Since the oxygen analyzer measures the oxygen contents in the flue gas, there is no need for sample extraction systems.

The analyzer contains an embedded micro controller for fast and easy operation. It is user friendly with a 2× 20 characters LCD display with backlight. One oxygen analyser can handle two O2 probes as an option. Other key features are:

- Built-in self-checks and diagnostics
- Built-in reference pump

The standard Opsis Oxygen package includes an analyser and a probe with a 10 m connection cable. If the cable length between the analyser and the probe exceeds 10 meter, a stack unit is needed to boost the signal.

Figure 2.1: Online Flue Gas Analyser



An example of a standard installation of an Opsis O_{2000} Oxygen Analyser

2.1.2 Technology /Equipment specifications

The detailed specifications of the online flue gas analyzer suggested are furnished in table 2.1 below:

Table 2.1: Technical specification of flue gas analyser

Analyser O2000

Parameters	*Details*
Measuring range	0.01–25.0% O2
Accuracy	O2<10.0% ± 0.01% at 2% O2, O2≥10.0% ± 0.1%
Linearity	<0.5% FS
Lag time	<2 sec.
Response time	<5 sec.
Warm-up time	<30 min.
Power supply	100–240 VAC 50–60 Hz
Power consumption	<100 VA warm up, <50 VA steady state
Max. load, analogue output	500 Ω

Max. load, relay contacts	220 VAC 5 Amp.
Max. ambient temperature	0–50°C
Max. humidity	90% RH
Enclosure IP	65 Steelbox
Dimensions old	H × W × D) 400 × 300 × 210 mm
Dimensions new	(H × W × D) 300 × 380 × 210 mm
Weight	10 kg

Probe

Technical Specifications

Parameters	*Details*
Max. stack gas temperature	500°C
Sensor type	ZrO2 (Zirconia)
Material	AISI 316 Stainless steel
Mounting	3" Withworth pipe thread DIN ISO 228
Total length	730 mm
Insert length Variable	200–500 mm (EPL 1500 max. insert length 1500 mm)
Cable length	Maximum 10 m, without stack unit
Weight	4 kg

2.1.3 Justification & Suitability of the technology selected

Technology proposed is new and additional which is mounted in the chimney and completely suitable with the system.

2.1.4 Superiority over existing technology/equipment

The following are the benefits of the online flue gas analyzer:

- Optimizes excess air supply to the boiler and thermic fluid heater
- Gives alarm, when the excess air is exceeds or below the level of the set point
- Reduces fuel consumption
- Reduces GHG emissions
- The excess air can be controlled critically for all types of system

2.1.5 Availability of the proposed technology/equipment

The Online Flue Gas Analyzer suppliers are available in Mumbai and Pune. Details of the technology provider are furnished in Annexure 7.

2.1.6 Source of technology/equipment for the project

The technology is locally available.

2.1.7 Service/technology providers

Service providers are available in Hyderabad.

2.1.8 Terms of sales

Terms of payment

50% Advance with purchase order, and remaining 50% along with taxes and duties against Proforma Invoice before dispatch

Excise Duty, Sales Tax & Other Levies

The quoted prices are exclusive of all taxes, duties, levies such as excise duty, central/local sales tax, octroi, etc. as are applicable at the time of dispatch

Warranty : 1 Year from the Date of Supply

Price : Ex-Delhi,

C S T : 12.5% Extra (2% against 'C' Form)

Excise Duty : Nil.

Delivery : Within 8 – 10 Weeks from Receipt of P.O.

Validity : 30 Days

Payment terms: 50% advance and balance against Performa Invoice.

2.1.9 Process down time during implementation

No process down time is considered, the installation of online flue gas analyzer will not affect the operation of the boiler or any other equipment.

2.2 Life cycle assessment and risks analysis

The total operational life of proposed online flue gas analyzer is considered to be 15 years.

2.3 Suitable unit/plant size for the identified equipment option

The online monitoring system is suitable for all capacities of the boilers.

3. ECONOMIC BENEFITS OF NEW ENERGY EFFICIENT TECHNOLOGY

3.1 Technical benefits

3.1.1 Fuel savings per year

The project activity is installation of online flue gas analyzer and optimizes excess air supply to the boiler and hence improves the efficiency. It is well known fact that, for every 15% reduction in excess air supply, the boiler efficiency increases by 1%. By installation of online flue gas analyzer, about 1% of annual consumption is estimated for conservative purpose and works out at 70 tonne of lignite per annum.

Source : http://www.nrel.gov/docs/fy02osti/31496.pdf

3.1.2 Electricity savings per year

The online flue gas analyzer reduces only fuel consumption due to excess air supply optimization and hence electricity savings is not considered.

3.1.3 Improvement in product quality

Installation of online flue gas monitoring system doesn't have impact on product quality ***directly or indirectly.***

3.1.4 Increase in production

There is no significant impact on production quality ***directly or indirectly.***

3.1.5 Reduction in raw material consumption

No significant impact on the raw materials consumption quality ***directly or indirectly.***

3.1.6 Reduction in other losses

There is no significant reduction in other loss ***directly or indirectly.***

3.2 Monetary benefits

Installation of online flue gas analyzer reduced fuel consumption by 70 tonne per annum and the monetary savings is estimated at ₹ 1, 98,000 per annum.

3.3 Social benefits

3.3.1 Improvement in working environment in the plant

No significant impact on the working environment

3.3.2 Improvement in skill set of workers

The technology selected for the implementation is new. The technology implemented will create awareness and operation and maintenance of the new technology and hence improves skills of the workers.

3.4 Environmental benefits

3.4.1 Reduction in effluent generation

There is no significant impact in effluent generation due to implementation of the project activity.

3.4.2 Reduction in GHG emission such as CO2, NOx, etc

The major GHG emission reduction source is CO_2. The technology will reduce lignite consumption by 70 tons per annum and the emission reductions are estimated at 51 tonne of CO_2 per annum due to implementation of the project activity.

3.4.3 Reduction in other emissions like SOx

As the project activity reduces coal consumption, the Sox emissions also reduces to some extent.

4. FINANCIAL ANALYSIS OF NEW EQUIPMENT

4.1 Cost of equipment installation

4.1.1 Cost of equipments

The total cost for installation of online flue gas analyzer is estimated at ₹ 2.31(` 1.97 lakh+` 0.34 lakh) which includes the cost of online flue gas analyzer, taxes and supply of equipment etc.

4.1.2 Other costs

The erection and commissioning and cabling is estimated at ₹ 0.05 lakh. The details of the item wise cost are furnished below:

S.No	Particular	Unit	Value
1	Online Flue Gas Analyser	₹ in lakh	2.31
2	Service Charge towards design and engineering for Electro-mechanical works and Cabling & Switches	₹ in lakh	0.05
3	Investment without IDC	₹ in lakh	2.36
4	Interest During Implementation	₹ in lakh	0.00
5	Total Investment	₹ in lakh	2.36

4.2 Arrangement of funds

4.2.1 Entrepreneur's contribution

The entrepreneur's contribution is 25% of total project cost, which works out at ₹ 0.59 lakh.

4.2.2 Loan amount

The term loan is 75% of the total project, which works out at ₹ 1.77 lakh.

4.2.3 Terms & conditions of loan

The interest rate is considered at 10.00% which is prevailing interest rate of SIDBI for energy efficiency projects. The loan tenure is 5 years and the moratorium period is 6 months.

4.3 Financial indicators

4.3.1 Cash flow analysis

Considering the above discussed assumptions, the net cash accruals starting with ₹ 1.67 lakh in the first year operation and increases to ₹ 8.38 lakh at the end of eighth year.

4.3.2 Simple payback period

The total project cost of the proposed technology is ₹ 2.36 lakh and monetary savings due to reduction in fuel consumption is ₹ 1.75 lakh and payback period works out to be 1.19 years.

4.3.3 Net Present Value (NPV)

The Net present value of the investment at 10.0% interest rate works out to be ₹ 4.16 lakh.

4.3.4 Internal rate of return (IRR)

The after tax Internal Rate of Return of the project works out to be 64.64%. Thus the project is financially viable.

4.3.5 Return on investment (ROI)

The average return on investment of the project activity works out at 27.92%.

4.4 Sensitivity analysis in realistic, pessimistic and optimistic scenarios

A sensitivity analysis has been worked out to ascertain how the project financials would behave in different situations like there is an increase in fuel savings and decrease. For the purpose of sensitive analysis, two scenarios are considered are

- Increase in fuel savings by 5%
- Decrease in fuel savings by 5%

In each scenario, other inputs are assumed as constant. The financial indicators in each of the above situation are indicated along with standard indicators.

Particulars	IRR	NPV	ROI	DSCR
Normal	64.64	5.04	27.92	3.45
5% increase in fuel savings	68.51	5.42	28.04	3.62
5% decrease in fuel savings	60.77	4.66	27.79	3.27

As can be seen from above, the project is highly sensitive to fuel savings, the debt service coverage ratio works out to be 3.27 times in worst scenario, which indicates the strength of the project.

4.5 Procurement and implementation schedule

The project is expected to be completed in 8 weeks from the date of financial closure and release of work order to the supplier. The detailed schedule of project implementation is furnished in Annexure 6.

ANNEXURE

Annexure 1: Excess air measurement & calculation for three typical units

Case 1: Navanidhi Dyeing and Printing Mills Pvt. Ltd

Oxygen Percentage in Flue gas	:	14.70%
Excess Air Level	:	234%

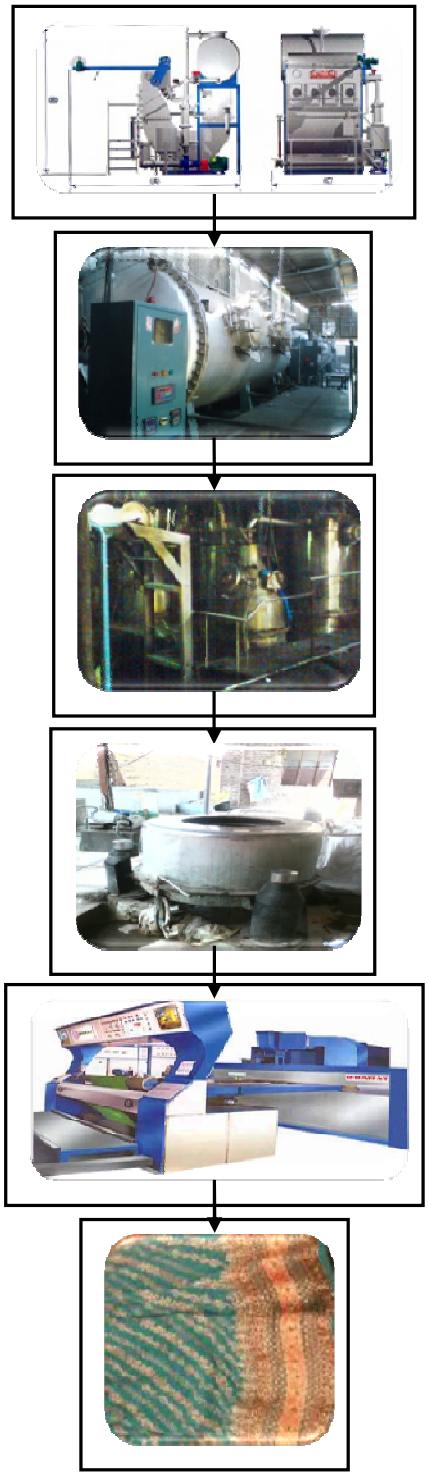
Case 2: Rachana Group of Industries

Oxygen Percentage in Flue gas	:	17.85%
Excess Air Level	:	567%

Case 3: Samta Silk Mills Pvt Ltd

Oxygen Percentage in Flue gas	:	13.19%
Excess Air Level	:	169%

Annexure 2: Process flow diagram



Annexure3: Detailed technology assessment report

Operating boiler with an optimum amount of excess air will minimize heat loss up the stack and improve combustion efficiency. Combustion efficiency is a measure of how effectively the heat content of a fuel is transferred into usable heat. The stack temperature and flue gas oxygen (or carbon dioxide) concentrations are primary indicators of combustion efficiency.

Given complete mixing, a precise or stoichio-metric amount of air is required to completely react with a given quantity of fuel. In practice, combustion conditions are never ideal, and additional or "excess" air must be supplied to completely burn the fuel. The correct amount of excess air is determined from analyzing flue gas oxygen or carbon dioxide concentrations. Inadequate excess air results in unburned combustibles (fuel, soot, smoke, and carbon monoxide) while too much results in heat lost due to the increased flue gas flow—thus lowering the overall boiler fuel-to-steam efficiency. The table relates stack readings to boiler performance.

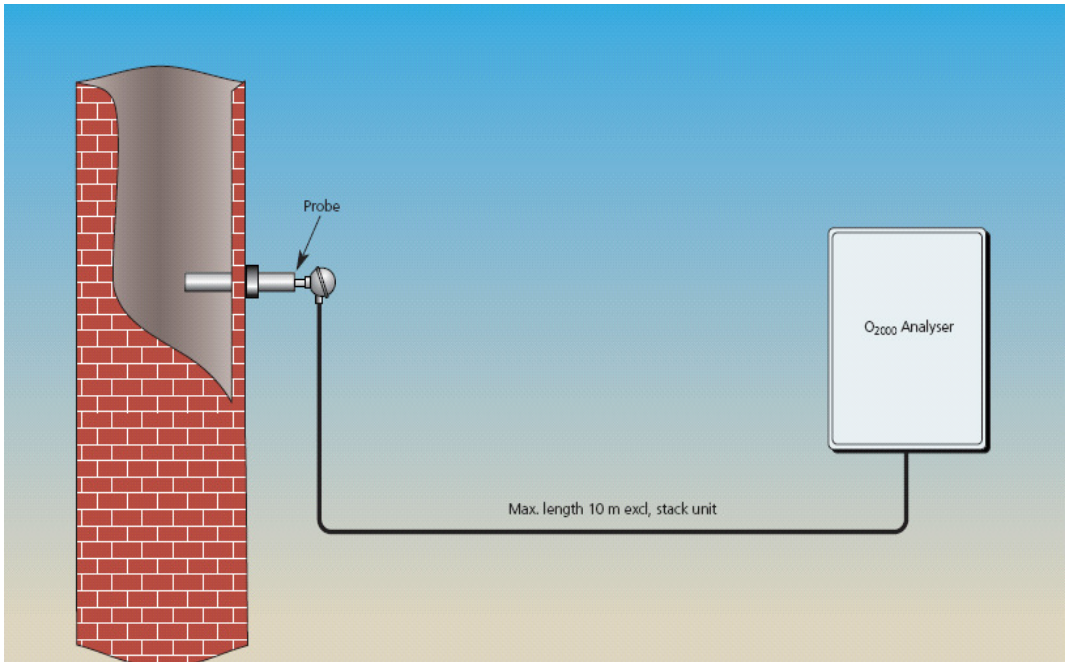
Excess %		Combustion Efficiency				
		Flue gas temperature less combustion air temp, °F				
Air	Oxygen	200	300	400	500	600
9.5	2.0	85.4	83.1	80.8	78.4	76.0
15.0	3.0	85.2	82.8	80.4	77.9	75.4
28.1	5.0	84.7	82.1	79.5	76.7	74.0
44.9	7.0	84.1	81.2	78.2	75.2	72.1
81.6	10.0	82.8	79.3	75.6	71.9	68.2

Flue gas monitoring system will optimize the excess air supply at all the loading conditions of the boiler and hence enhances the efficiency of the boiler or thermic fluid heater.

The oxygen analyzer is common for all the capacities and types.

S.No	*Particular*	*Unit*	*Value*
1	Present fuel consumption (Navanidhi Dyeing and Printing)	Tons/annum	7200
2	Present excess oxygen	%age	70
3	Fuel saving estimated	%age	1
4	Total fuel Saving	Tons/annum	70
5	Cost of fuel	₹ /kg	2.83
6	Total monetary saving	₹ in lakh	1.98

Annexure 4: Standard installation layout of flue gas monitoring system



Annexure 5: Detailed financial calculations & analysis for financial indicators

Assumption

Name of the Technology	***Online Flue Gas Analyser***		
Rated Capacity	***NA***		
Details	***Unit***	***Value***	***Basis***
No of working days	Days	350	
Proposed Investment			
Plant & Machinery	₹ (in lakh)	2.31	
Erection & Commissioning	₹ (in lakh)	0.05	
Total Investment	₹ (in lakh)	2.36	
Financing pattern			
Own Funds (Equity)	₹ (in lakh)	0.59	Feasibility Study
Loan Funds (Term Loan)	₹ (in lakh)	1.77	Feasibility Study
Loan Tenure	years	5	Assumed
Moratorium Period	Months	6	Assumed
Repayment Period	Months	51	Assumed
Interest Rate	%	10.00%	SIDBI Lending rate
Estimation of Costs			
O & M Costs	% on Plant & Equip	4.00	Feasibility Study
Annual Escalation	%	5.00	Feasibility Study
Estimation of Revenue			
coal savings per annum	Tons	70	
Cost	₹/Ton	2830	
St. line Depn.	%age	5.28	Indian Companies Act
IT Depreciation	%age	80.00	Income Tax Rules
Income Tax	%age	33.99	Income Tax

Estimation of Interest on Term Loan

(₹in lakh)

Years	***Opening Balance***	***Repayment***	***Closing Balance***	***Interest***
1	1.77	0.06	1.71	0.16
2	1.71	0.12	1.59	0.17
3	1.59	0.24	1.35	0.15
4	1.35	0.48	0.87	0.12
5	0.87	0.56	0.31	0.06
6	0.31	0.31	0.00	0.01
		1.77		

WDV Depreciation

Particulars / years	***1***	***2***
Plant and Machinery		
Cost	2.36	0.47
Depreciation	1.89	0.38
WDV	0.47	0.09

Projected Profitability

Particulars / Years	1	2	3	4	5	6	7	8
Revenue through Savings								
Fuel savings	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Total Revenue (A)	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Expenses								
O & M Expenses	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.13
Total Expenses (B)	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.13
PBDIT (A)-(B)	1.89	1.88	1.88	1.87	1.87	1.86	1.85	1.85
Interest	0.16	0.17	0.15	0.12	0.06	0.00	0.00	0.00
PBDT	1.73	1.72	1.73	1.76	1.80	1.86	1.85	1.85
Depreciation	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
PBT	1.60	1.59	1.60	1.63	1.68	1.74	1.73	1.72
Income tax	0.00	0.46	0.59	0.60	0.61	0.63	0.63	0.63
Profit after tax (PAT)	1.60	1.14	1.02	1.03	1.07	1.10	1.10	1.10

Computation of Tax ***₹(in lakh)***

Particulars / Years	1	2	3	4	5	6	7	8
Profit before tax	1.60	1.59	1.60	1.63	1.68	1.74	1.73	1.72
Add: Book depreciation	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Less: WDV depreciation	1.89	0.38	-	-	-	-	-	-
Taxable profit	(0.16)	1.34	1.73	1.76	1.80	1.86	1.85	1.85
Income Tax	-	0.46	0.59	0.60	0.61	0.63	0.63	0.63

Projected Balance Sheet ***₹(in lakh)***

Particulars / Years	1	2	3	4	5	6	7	8
Liabilities								
Share Capital (D)	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Reserves & Surplus (E)	1.60	2.74	3.75	4.79	5.85	6.96	8.06	9.15
Term Loans (F)	1.71	1.59	1.35	0.87	0.31	0.00	0.00	0.00
Total Liabilities D)+(E)+(F)	3.90	4.92	5.69	6.25	6.75	7.55	8.65	9.74
Assets								
Gross Fixed Assets	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
Less: Accm. Depreciation	0.12	0.25	0.37	0.50	0.62	0.75	0.87	1.00
Net Fixed Assets	2.24	2.11	1.99	1.86	1.74	1.61	1.49	1.36
Cash & Bank Balance	1.67	2.81	3.71	4.39	5.02	5.93	7.16	8.38
TOTAL ASSETS	3.90	4.92	5.69	6.25	6.75	7.55	8.65	9.74
Net Worth	2.19	3.33	4.34	5.38	6.44	7.55	8.65	9.74
Dept equity ratio	2.90	2.69	2.29	1.47	0.53	0.00	0.00	0.00

Projected Cash Flow:

₹(in lakh)

Particulars / Years	0	1	2	3	4	5	6	7	8
Sources									
Share Capital	0.59	-	-	-	-	-	-	-	-
Term Loan	1.77								
Profit After tax		1.60	1.14	1.02	1.03	1.07	1.10	1.10	1.10

Depreciation		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Total Sources	2.36	1.73	1.26	1.14	1.16	1.19	1.23	1.22	1.22
Application									
Capital Expenditure	2.36								
Repayment of Loan	-	0.06	0.12	0.24	0.48	0.56	0.31	-	-
Total Application	2.36	0.06	0.12	0.24	0.48	0.56	0.31	-	-
Net Surplus	-	1.67	1.14	0.90	0.68	0.63	0.92	1.22	1.22
Add: Opening Balance	-	-	1.67	2.81	3.71	4.39	5.02	5.93	7.16
Closing Balance	-	1.67	2.81	3.71	4.39	5.02	5.93	7.16	8.38

Calculation of Internal Rate of Return

₹ (in lakh)

Particulars / months	***0***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Profit after Tax		1.60	1.14	1.02	1.03	1.07	1.10	1.10	1.10
Depreciation		0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Interest on Term Loan		0.16	0.17	0.15	0.12	0.06	-	-	-
Salvage/Realizable value									
Cash outflow	(2.36)	-	-	-	-	-	-	-	-
Net Cash flow	(2.36)	1.89	1.43	1.29	1.27	1.25	1.23	1.22	1.22
IRR	64.64%								

NPV	5.04

Break Even Point

₹ (in lakh)

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Variable Expenses								
Oper. & Maintenance Exp (75%)	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10
Sub Total (G)	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10
Fixed Expenses								
Oper. & Maintenance Exp (25%)	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Interest on Term Loan	0.16	0.17	0.15	0.12	0.06	0.00	0.00	0.00
Depreciation *(H)*	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Sub Total (I)	0.31	0.31	0.30	0.27	0.22	0.15	0.16	0.16
Sales (J)	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Contribution (K)	1.91	1.91	1.90	1.90	1.89	1.89	1.89	1.88
Break Even Point (L= G/I)	16.20%	16.52%	15.82%	14.06%	11.46%	8.18%	8.28%	8.39%
Cash Break Even {(I)-(H)}	9.67%	9.98%	9.27%	7.50%	4.88%	1.59%	1.68%	1.77%
BREAK EVEN SALES (J)*(L)	0.32	0.33	0.31	0.28	0.23	0.16	0.16	0.17

Return on Investment

₹ (in lakh)

Particulars / Years	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***Total***
Net Profit Before Taxes	1.60	1.59	1.60	1.63	1.68	1.74	1.73	1.72	13.29
Net Worth	2.19	3.33	4.34	5.38	6.44	7.55	8.65	9.74	47.61
									27.92%

Debt Service Coverage Ratio

₹(in lakh)

Particulars / Years	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*Total*
Cash Inflow									
Profit after Tax	1.60	1.14	1.02	1.03	1.07	1.10	1.10	1.10	6.96
Depreciation	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.75
Interest on Term Loan	0.16	0.17	0.15	0.12	0.06	0.00	0.00	0.00	0.66
TOTAL (M)	1.89	1.43	1.29	1.27	1.25	1.23	1.22	1.22	8.36

Debt

Interest on Term Loan	0.16	0.17	0.15	0.12	0.06	0.00	0.00	0.00	0.66
Repayment of Term Loan	0.06	0.12	0.24	0.48	0.56	0.31	0.00	0.00	1.77
TOTAL (N)	0.22	0.29	0.39	0.60	0.62	0.31	0.00	0.00	2.43
Average DSCR (M/N)	3.45								

Annexure 6: Details of procurement and implementation plan

Project Implementation Schedule – ECT

S. No.	Activities	weeks							
		1	2	3	4	5	6	7	8
1	Placement of order								
2	Installation and Trial runs								

No Process down Time is considered for the project.

Annexure 7: Details of equipment and service providers.

Equipment details	Source of technology	Service/technology providers
Online Flue Gas Monitoring System	**Imported and dealers are available in India**	HEAD OFFICE: 90A, (II Floor) Amritpuri B, Main Road, East of Kailash, Opp. (Iskcon Temple), New Delhi – 110 065 Tel.: (011) – 2622 6328, 2621 3009, 2628 5196, 2628 5197, Fax: +91 – 11-, 2628 5202, **sales@nevco.co.in**, mdnevco@yahoo.co.in

Annexure 8: Quotations or techno-commercial bids for new equipment

NVC Web : www.nevco.co.in

Tel: +91 – 40 – 27110213, 27110513
Fax: +91 – 40 – 27110513
E-mail: nevco@sify.com

Nevco Engineers Pvt. Ltd.
Branch Office:
Plot No. 91/A, Bank Colony
Rama Krishna Puram
Secunderabad – 500 056 A.P. (INDIA)

To,
Mr. T.Krishna – Head of Energy
M/s Zenith Energy Services Pvt. Ltd.
10-5-6/B, My Home Plaza
Masabtank, Hyderabad - 500 028
A.P., India

No.: NV/AP/QT/15469
Date: 09/10/2010

Sub: Offer for On-line Oxygen Analyser.
Ref: Your mail dated 07/10/10

Dear Sir,
With reference to above please find our offer for above said item.

Q U O T A T I O N

SL.NO.	DESCRIPTION	QTY.	TOTAL PRICE(Rs.)
1.	**ON-LINE OXYGEN GAS ANALYSER** MODEL: O2000 with control and display unit, 10 mt. Cable, standard probe MAKE: OPSIS AB, SWEDEN (An ISO 9001, 14001 & 17025 company)	**1 No.**	**1, 97, 000/-**

SPECIFICATION:

Range	:	0.01-25.0% O2
Accuracy	:	O2<10.0% ± 0.01% at 2% O2 O2≥ 10.0% ± 0.1%
Linearity	:	<0.5% FS
Lag time	:	<2 Sec.
Response Time	:	<5 Sec.
Warm-up time	:	<30 min.
Power Supply	:	100 - 240 Vac 50 - 60 Hz
Power Consumption	:	<100 VA warm up <50 VA steady state
Max. Load, analogue output	:	500
Max. Load, relay contacts	:	220 Vac 5 Amp
Max. Ambient temperature	:	0 - 50° C
Max. Humidity	:	90% RH
Enclosure	:	IP 65 Steel box
Dimensions	:	400 x 300 x 210 mm
Weight	:	10 kg

PROBE TECHNICAL SPECIFICATIONS:

Max. Stack gas temperature	:	500°C
Sensor type	:	ZrO2 (Zirconia)
Material	:	AISI 316 Stainless Steel
Mounting	:	3 " With worth pipe thread

HEAD OFFICE: 90A, (II Floor) Amritpuri B, Main Road, East of Kailash, Opp. (Iskcon Temple), New Delhi – 110 065
Tel.: (011) – 2622 6328, 2621 3009, 2628 5196, 2628 5197, Fax: +91 – 11-, 2628 5202,
E-mail: sales@nevco.co.in
OFFICES: CHENNAI, MUMBAI, KOLKATA, COCHIN, BANGALORE, VISHAKAPATNAM, GOA, BHUBANESWAR AND BARODA.

		DIN ISO 228
Total Length	:	730 mm
Insert length	:	Variable 200 - 500 mm (EPL 1500; Max. Insert length 1500 mm)
Cable length	:	Maximum 10 m, without stack unit
Weight	:	4 Kg

FEATURES:

* Continuous, in situ Oxygen measurement
* Complete system package for easy installation and start - up
* Cost effective monitoring of O2
* Well proven design
* Isolated current and alarm output
* RS 232 communication
* Automatic gas calibration (Option)

OPTIONS:

* Extended length of the probe
* High temperature probe for process temperatures up to 1800 C
* Probe designed for very corrosive environments
* Automatic calibration set
* Flame arrester to prevent explosion in the process
* RS 232 output
* High and Low O2 alarm output
* Stainless steel monitor box
* 115Vac operation
- Stack unit

STANDARD AND APPROVALS

DELIVERY : Within 8 – 10 Weeks from Receipt of P.O.
VALIDITY : 30 Days
DESPATCH : By Courier
PAYMENT TERMS : 50% advance and balance against Proforma Invoice.

You may contact us for any further clarifications/ requirements.

Thanking you.

Yours Faithfully,
For NEVCO ENGINEERS PVT. LTD.

(A.S.RAY)
AGM (Mktg.)
9440422320

Bureau of Energy Efficiency (BEE)
(Ministry of Power, Government of India)
4th Floor, Sewa Bhawan, R. K. Puram, New Delhi – 110066
Ph.: +91 – 11 – 26179699 (5 Lines), Fax: +91 – 11 – 26178352
Websites: www.bee-india.nic.in, www.energymanagertraining.com

Zenith Energy Services Pvt. Ltd
10-5-6/B, My Home Plaza, Masab
Tank HYDERABAD, AP 500 028
Phone: 040 23376630, 31,
Fax No.040 23322517
Website: www.zenithenergy.com

India SME Technology Services Ltd
DFC Building, Plot No.37-38,
D-Block, Pankha Road,
Institutional Area, Janakpuri, New Delhi-110058
Tel: +91-11-28525534, Fax: +91-11-28525535
Website: www.techsmall.com