Project code: 2017IE08
Cluster: Indore
Report ID: IN/07/DPR

Detailed Project Report
On
VFD enable screw air compressor

Porwal Auto Components Limited
Indore (MP)

Prepared for

Bureau of Energy Efficiency
(13/GEF-UNIDO-BEE/LSP/14/4562)

Suggested Format for Citation

GEF-UNIDO-BEE Project, Bureau of Energy Efficiency, 2018

"Capacity Building of Local Service Providers"

For more information

GEF-UNIDO-BEE PMU
Bureau of Energy Efficiency
4th Floor, Sewa Bhawan, Sector-1,
R.K. Puram, New Delhi-110066

Email: gubpmu@beenet.in
pmc@teri.res.in
Website: www.beeindia.gov.in
www.teriin.org

Disclaimer

Acknowledgement

The Energy and Resources Institute (TERI) places on record its sincere thanks to Global Environment Facility (GEF), United Nations Industrial Development Organization (UNIDO) and Bureau of Energy Efficiency (BEE) for giving opportunity to partner in this prestigious assignment on Capacity Building of Local Service Providers (LSPs) under the GEF-UNIDO-BEE project 'Promoting energy efficiency and renewable energy in selected MSME clusters in India'.

TERI is particularly grateful to Mr Milind Deore, Director, Bureau of Energy Efficiency, Mr Sanjay Shrestha, Industrial Development Officer, Industrial Energy Efficiency Unit, Energy and Climate Branch, UNIDO, Mr Suresh Kennit, National Project Coordinator, UNIDO, Mr Niranjan Rao Deevela, National Technology Coordinator, UNIDO, Mr Prabhat Sharma, Cluster Leader, Indore Foundry Cluster, UNIDO, Mr Surendra Jain (Chairman), M/s Porwal Auto Components Ltd. and IIF-Indore Chapter for their support and guidance during the project.

Last but not least, the interactions and deliberations with numerous foundry units, industry associations, technology providers and who were directly or indirectly involved throughout the study were exemplary and the whole exercise was thoroughly a rewarding experience for TERI.

The Energy and Resources Institute (TERI)
New Delhi

Table of contents

List of tables

List of figures

List of abbreviations

BEE	:	Bureau of Energy Efficiency
CO_2	:	Carbon Dioxide
D/E	:	Debt /Equity
DPR	:	Detailed Project Report
DSCR	:	Debt Service Coverage Ratio
EE	:	Energy Efficient
GEF	:	Global Environmental Facility
GHG	:	Green House Gas
IGBT	:	Insulated-gate Bipolar Transistor
IGDPR	:	Investment Grade Detailed Project Report
IRR	:	Internal Rate of Return
kW	:	Kilo Watt
kWh	:	Kilo Watt Hour
LSPs	:	Local Service Providers
MSME	:	Micro, Small and Medium Enterprises
MT	:	Metric Tonne
NPV	:	Net Present Value
O&M	:	Operation and Maintenance
PCB	:	Pollution control board
RE	:	Renewable Energy
ROI	:	Return On Investment
SME	:	Small and Medium Enterprises
SPP	:	Simple Payback Period
TERI	:	The Energy and Resources Institute
Toe	:	Tonnes of oil equivalent
UNIDO	:	United Nations Industrial Development Organization

Executive summary

The overall aim of the GEF-UNIDO-BEE project 'Promoting Energy Efficiency (EE) and Renewable Energy (RE) in selected MSME clusters in India' is to develop and promote a market environment for introducing energy efficiency and enhancing the use of renewable energy technologies in process applications in selected energy-intensive MSME clusters in India. This would help in improving the productivity and competitiveness of the MSME units, as well as in reducing the overall carbon emissions and improving the local environment.

Under the GEF-UNIDO-BEE Project, TERI has been entrusted to undertake Capacity building of Local Service Providers (LSPs) to BEE. The Scope of Work under the project

- Organizing 4 one-day training/ capacity building workshops for LSPs in each cluster.
- Development of 10 bankable DPRs for each cluster, based on mapping technology needs with capacities of local technology suppliers/service providers, and also replication potential and applications to banks in each cluster.

Brief introduction of the MSME unit

Name of the unit	M/s Porwal Auto Components Ltd.
Constitution	Limited
MSME Classification	Small
No. of years in operation	12
Address: Registered Office:	303, Navneet Plaza 5/2 Old Palasia, Indore (MP)
Industry-sector	Steel casting
Products manufactured	Manufacturer of fabricated metal products, except machinery and equipment
Name(s) of the promoters/ directors	Mr. Surendra Jain - chairman and whole time director Mr. Devendra Jain - managing director Mr. Mukesh Jain - whole time director Mr. Nitin Dafria - independent director Mr. Surajmal Kucheria - independent director Mr. Ramesh C Kashyap - independent director Mrs. Rajni Jain - independent director
Existing banking arrangements along with the details of facilities availed	State Bank Of India

Brief highlights of the past financial position of the MSME unit

(Rs lakh)

S. No	Particulars	FY 2016-17 (Audited)
1	Total income	9,195
2	Net profit	208

A detailed assessment study was undertaken in the identified area with the use of the sophisticated handheld instruments. Energy consumption pattern and production data were collected to estimate the specific energy consumption. The total energy consumption of the unit during last 12 months was 1,754 toe which is equivalent to 944 lakh rupees. The total CO_2 emission during this period is estimated to be 16,257 tonnes. Electricity and diesel were considered for CO_2 emission estimation.

Accepted/ recommended technology implementation

The recommended technology considered after discussion with the plant personnel for implementation in the unit is given below.

Technology	Annual energy saving Electricity (kWh)	Investment[1] (Rs lakh)	Monetary savings (Rs lakh/ year)	Simple payback period (Years)	Emission reduction (tonnes of CO_2)
Replacement of existing reciprocating air compressor with VFD enable screw air compressor	239,078	30.8	11.1	2.8	196

Other benefits

- The proposed project is not expected to bring in any change in process step or operating practices therefore no change expected in the product quality.
- Implementation of the selected technology in the unit may result in reduction in CO_2 emissions.

Cost of project & means of finance

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	30.8	30.8	30.8
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	12.1	7.4	8.8
4	NPV	Rs. In Lakh	2.1	-1.9	-0.8
5	DSCR	-	-	2.1	0.9

[1] Investment including the technology and applicable taxes duties – Rs. 30.8 lakh

1.0 Details of the unit

1.1 Particulars of unit

Table 1.1: Particulars of the unit

1	Name of the unit	M/s Porwal Auto Components Ltd.	
2	Constitution	Limited	
3	MSME Registration No/UAN	NA	
4	PCB consent No.	NA	
5	Date of incorporation / commencement of business	1992	
6	Name of the Contact Person	Mr. Neeraj Kumar Hundi	
7	Mobile / Ph. No	+91-9630 451 386	
8	Email	maintenance@porwalauto.com	
9	Address: Registered Office	Plot No. 209, Sector No. 1, Industrial Area, Pithampur M. P.- 454775	Owned
10	Factory	Plot No. 209, Sector No. 1, Industrial Area, Pithampur M. P. - 454775	Owned
11	Industry / Sector	MSME/Manufacturing	
12	Products Manufactured	Manufacturer of fabricated metal products, except machinery and equipment	
13	No of hours of operation/shift	08	
14	No of shifts/ day	03	
15	No of days/year	350	
16	Installed Capacity	NA	
17	Whether the unit is exporting its products (Yes/ No)	No	
18	Quality Certification, if any	NA	

2.0 Energy profile

2.1 Process flow diagram

The major steps of process are mould sand preparation, charge preparation followed by melting, pouring, knockout and finishing. The steps are explained below.

2.1.1 Sand preparation plant

The major equipment installed is sand siever, sand mixer and sand transport belts and elevators. Electricity is used to run all rotary machines in sand preparation plant. Fresh sand is mixed with adhesives in sand mixer then it is pressed in mould casing by pressing machine. In casing some amount of burnt sand is reused with fresh sand.

2.1.2 Core preparation and moulding

For core preparation, fresh sand is used. Cores are baked in LDO fired ovens. After hardening of core, it is mounted in mould. In mould preparation fresh and burnt sand is pressed by machines which operate on pneumatic in mould casing. Upper and lower half of mould is assembled together and then it gets ready to pouring.

2.1.3 Melting

Melting of charge is done with help of induction furnace. Induction furnace runs on medium frequency three phase electrical supply. Once melt attained required temperature and metallurgy, the liquid melt is poured into the earlier prepared sand moulds using ladles.

2.1.4 Knockout and finishing

Mould is left to cool for certain time, then it follows to a vibrator with grated surface, it knocks-out the sand and the casting is send for finishing, which involves shot blasting and machining job.

The process flow diagram for major product and steel grade casting produced in the foundry is given in figure 2.1.4.

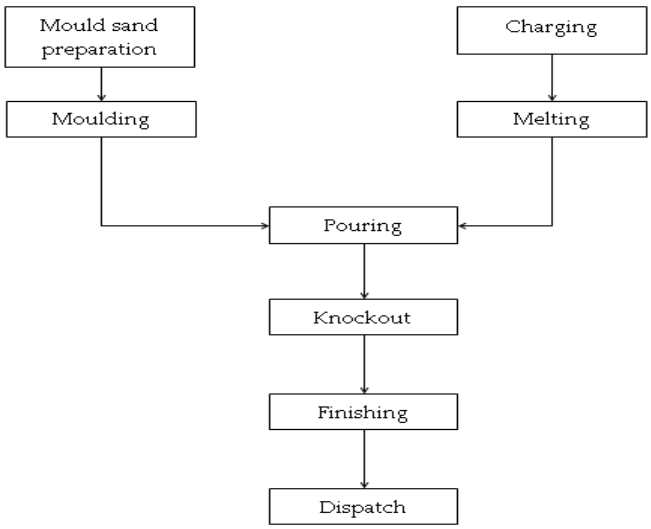


Figure 2.1.4: Process flow chart

2.2 Details of technology identified

The details of the existing technology installed in the unit are given in table 2.2.

Table 2.2: Details of existing technology

Particulars	Unit	Value
Make	-	IR
Type	-	Reciprocating
Model No.	-	-
Year of Installation	-	2007
Purpose	-	Process air
Capacity of receiver	M^3	4
Rated Capacity	M^3/Min	26.19

2.3 Energy used and brief description of their usage pattern

The unit uses grid power supplied by Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited. Table 2.3 provides the details of energy uses.

Table 2.3: Energy used and description of use

S No	Energy source	Description of use
1	Electricity	Motive power for different drives in different process sections and utilities
2	LDO	Core making process
3	LPG	Core making process/ladle preheating

2.4 Energy sources, availability & tariff details

The power supply to the facility is from Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited grid @ 33 kV, with 3,050 kVA sanctioned contract demand. The unit Different energy sources, availability of listed energy types and their respective tariffs are given in table 2.4.

Table 2.4: Energy sources, availability and tariffs

Particular	For supply at 33 kV
Demand charges	Rs. 530/kVA/month
Energy charges	Rs. 5.0/ kWh

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Total electricity consumption (kWh)	Sanctioned load/demand (kW)	Power factor	Recorded demand, kVA	Demand charges (Rs)	Energy charges (Rs)	Monthly bill (Rs)
Oct-17	1,332,000	3,050	0.997	3,253	1,724,090	6,660,000	6,943,853
Nov-17	1,749,500	3,050	0.997	3,300	1,749,000	8,747,500	8,295,811
Dec-17	1,769,900	3,050	0.998	3,300	1,749,000	8,849,500	8,027,586
Jan-18	1,671,100	3,050	0.998	3,280	1,738,400	8,355,500	6,651,399
Average	**1,630,625**	**3,050**	**1.00**	**3,283**	**1,740,123**	**8,153,125**	**7,479,662**
Total	**19,567,500**	**-**	**-**	**-**	**20,881,470**	**97,837,500**	**89,755,947**

Figure 2.5 presents contract demand, recorded maximum demand and the energy consumption of the unit.

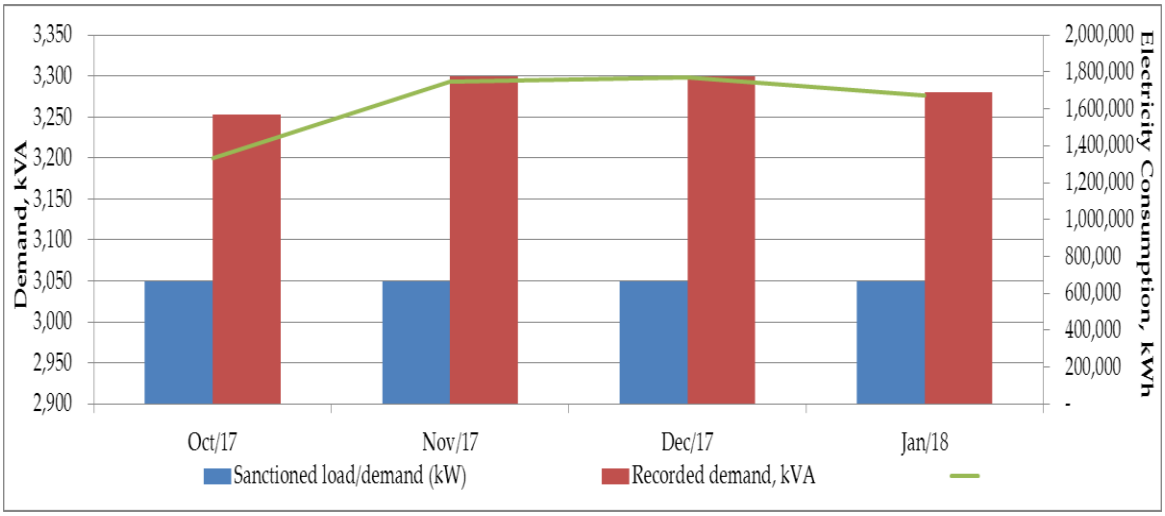


Figure 2.5: Demand pattern and energy consumption profile

2.6 Analysis of other energy forms/ fuels

The analysis of the other fuels/forms of energy used in the unit is given in table 2.6.

Table 2.6: Analysis of other energy/ fuel consumption

Parameters	LDO (liters)
Consumption unit/year	77,360
Calorific value per unit	9,202
Equivalent toe per year	71.2
Price (Rs per unit)	60.0
Total price per year	4,641,600

The share of various energy forms used in the unit is given in figure 2.6.

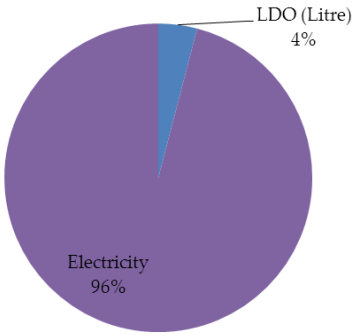


Figure 2.6: Percentage share of various fuel types in the unit

The total energy consumption of the unit during last 12 months was 1,754 toe which is equivalent to 944 lakh rupees. The total CO_2 emission during this period is estimated to be 16,257 tonnes. Electricity and diesel were considered for CO_2 emission estimation.

3.0 Proposed technology for energy efficiency

Based on the measurements, observations/ findings during detailed assessment study conducted in the unit, the following technology has been identified for energy efficiency improvement. The detail is given below.

3.1 Replacement of existing inefficient reciprocating compressed air system with a VFD based screw type compressed air system

3.1.1 Background

To cater the compressed air requirement of process and utilities, unit has installed three number of air compressors. In the existing facility, two compressors are fixed speed rotary type air compressors and one is reciprocating type. In the existing practices, the unit is operation one screw and one reciprocating compressor. The details of the existing technology installed in the unit are given in table 3.1.1.

Table 3.1.1: Details of reciprocating type air compressor

Particulars	Unit	Value
Make	-	IR
Type	-	Reciprocating
Model No.	-	-
Year of Installation	-	2007
Purpose	-	Process air
Capacity of receiver	M^3	4
Rated Capacity	M^3/Min	26.19

3.1.2 Observations and analysis

During the study, free air delivery (FAD) test of the compressed air system was conducted to evaluate the existing performance. The summary of FAD test is given in table 3.1.2

Table 3.1.2: Performance analysis of the existing compressed air system

Particulars	Unit	Value
Design details		
Make	-	IR
Type	-	Reciprocating
Model No.	-	-
Year of Installation	-	2007
Purpose	-	Process air
Capacity of receiver	M^3	4
Rated Capacity	M^3/Min	26.19
Operational parameters		
Operating Pressure	kg/cm^2	7
Initial Pressure	kg/cm^2	-
Atmospheric pressure	kg/cm^2	1.013
Capacity of Receiver	M^3	4.00

Particulars	Unit	Value
Additional holdup volume	M^3	0.01
Pump-up time	Seconds	120
Inlet air temperature	^oC	37.6
Calculated/Analyzed parameters		
Actual FAD	M^3/Min	13.87
Volumetric Efficiency	%	53
Isothermal Power	kW	44.4
Motor input power	kW	132
Efficiency of Motor	%	0.92
Shaft input power	kW	121.4
Isothermal Efficiency	%	36.6
Specific Power Consumption	kW/m^3/min	9.52

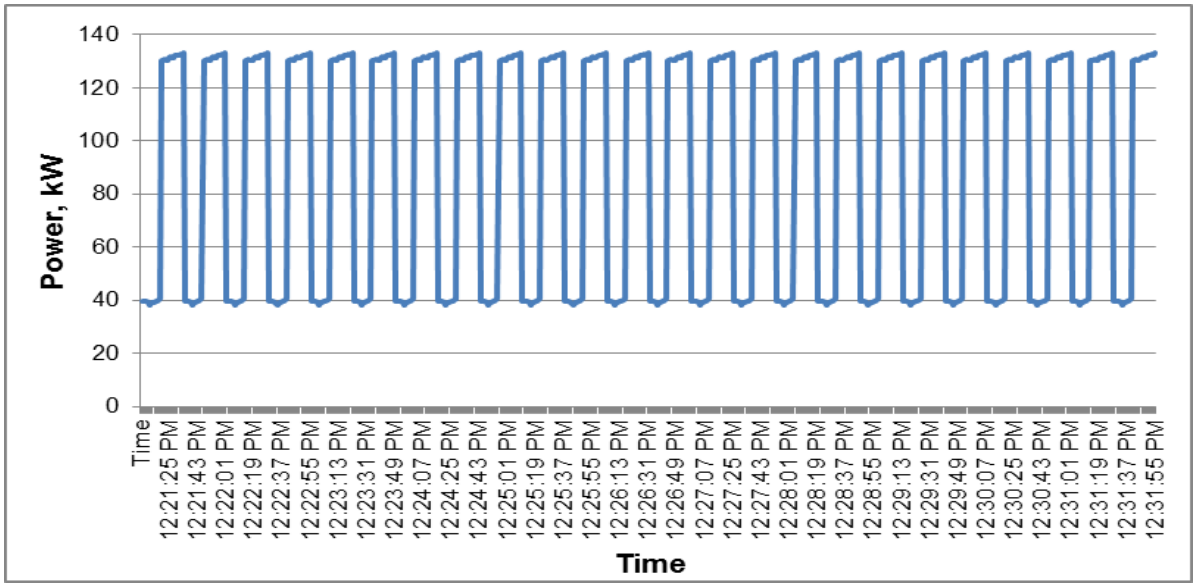


Figure 3.1.2: Power consumption profile of Air compressor

3.1.3 Recommendation

It is recommended to replace existing inefficient compressed air system with a single VFD based screw compressor. VFD operated screw compress has two functions; one it varies rpm of compressor based on pressure variation at the load or perform end and it also reduces no load power consumption during unloading condition by bringing the motor to halt. Such operation prevents consumption of power during unload condition.

The other advantages of installation of VFD based screw compressor are as follows:

- By using VFD in screw air compressors, the operating pressure of air compressor can be precisely controlled and there is no need to maintain a range of pressure as required in the existing system. This leads to reduction in average operating pressure of the compressor hence reduction in power consumption.
- The leakage in the compressed air system is proportional to the operating pressure. Since there is a significant reduction in operating pressure, volume of air leakage would also reduce.

3.2 Cost benefit analysis

The estimated saving in annual operation cost by replacement of existing air compressor system with VFD enable compressed air system is Rs. 11.0 lakhs. The investment requirement is Rs 30.8 lakh with a simple payback period of 2.8 years. The detailed calculations of the recommended energy conservation measures for DPR are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

Particulars	Unit	Values
Total installed capacity	M^3/Min	26.2
Actual air delivery	M^3/Min	13.9
Volumetric Efficiency	%	52.9
Input motor power	kW	132
Specific Power Consumption	kW/m^3/min	9.5
Proposed power consumption of VFD enable compressor	kW/m^3/min	6
Reduction in annual power consumption (Annual operating hours – 4900 hours/year; loading – 52.95%)	kWh/annum	2,39,078
Monitory saving (@ Rs 4.62 per kWh)	Rs	11,04,542
Total investment[2]	Rs	30,80,000
Simple payback period	Years	2.8

Note: New compressor will supply the air to new plant located in front of the unit.

3.3 Pre-training requirements

The training would be required on best charging practices and best melting operations. Also best practices to be adopted for operation like - initial charging, pouring, superheating, holding for chemical analysis or de-slagging.

3.4 Process down time for implementation

The estimated process down time required for implementation of recommended measure is estimated to be 3 days after commissioning and testing of the new furnace.

3.5 Environmental benefits

3.5.1 CO_2 reduction[3]

Implementation of the selected energy conservation measures in the unit may result in reduction in CO_2 emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 196 tonnes of CO_2 per year.

3.5.2 Reduction in other pollution parameters (gas, liquid and solid)

There is not significant impact on the reduction in other pollution parameters including gas, liquid and solid.

[2] Quotation 1 has been considered for estimation of investments
[3] Source for emission factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Electricity: CO_2 Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

4.0 Project financials

4.1 Cost of project and means of finance

4.1.1 Particulars of machinery and technology comparison

The particulars of machinery proposed for the project is given in table 4.1.1.

Table 4.1.1: Particulars of machinery proposed for the project

S. No	Name of machinery (Model/ specification)	Name of manufacturer, contact person	Advantage	Disadvantage
Q-1	Oil Injection Screw Compressor Model VS110 (Variable Speed) Air Cooled (415V/50Hz/3Ph)	Gunjeet S Thukral Sr. Sales-Manager Kobelco Machinery India – Kobe Steel Ltd. Unit#409, Sewa Corporate Park, Corporate Suit, MG Road, Gurgaon 122 002, Haryana PH 0124-401 0063 FX 0124-401 0066	• Kobelco patented "Super Rotor" and Casing with new FEM analysis enhances reliability of heart of compressor. • Quality, Efficiency and Reliability backed by nearly 100 year history of KOBELCO as compressor manufacturer. • By reducing discharge temperature and RPM with new Air-End, you can get more life and margin on the rotating parts. • High quality lubricant assures peace of mind even in extreme condition.	-

4.1.2 Means of finance

The means of finance for the project is shown in table 4.1.2.

Table 4.1.2: Means of finance

S. No.	Details	100% equity	D/E- 70:30	D/E- 50:50
1	Additional (Share) Capital	30.80	9.24	15.40
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	21.56	15.40
5	Others	-	-	-
Total		**30.80**	**30.80**	**30.80**

4.2 Financial statement (project)

4.2.1 Assumptions

The assumptions made are provided in table 4.2.1.

Table 4.2.1: Assumptions made

Details	Unit	100% equity	D/E- 70:30	D/E- 50:50
General about unit				
No of working days	Days		300	
No of shifts per day	Shifts		2	
Annual operating hours	Hrs/year		7,200	
Installed production capacity	tonnes/year		2,225	
Production in last financial years	tonnes/year		1,600	
Capacity utilization factor	%		72	
Proposed investment (Project)				
Total cost of the project	Rs. (in Lakh)	30.8	30.8	30.8
Investment without interest defer credit (IDC)	Rs. (in Lakh)	30.8	30.8	30.8
Implementation time	Weeks	6	3	3
Interest during the implementation phase	Rs. in lakhs	-	0.1	0.`1
Total investment	Rs. in lakhs	30.8	30.9	30.9
Financing pattern				
Own funds	Rs. in lakhs	30.8	9.4	15.5
Loan funds (term loan)	Rs. in lakhs	-	21.6	15.4
Loan tenure	Years	-	5.0	5.0
Moratorium period (No EMI (interest and principal amount))	Months	-	3.0	3.0
Total repayment period	Months	-	60.0	60.0
Interest rate	%	-	10.5	10.5
Estimation of costs				
Operation & maintenance costs	%		5.0	
Annual escalation rate of O&M	%		5.0	
Estimation of revenue				
Reduction in energy cost	Rs. (in lakh)/year		11.0	
Total saving	(Rs Lakh/year)		11.0	
Straight line depreciation	%		16.2	
IT depreciation	%		80.0	
Income tax	%		34.0	
Period of cash flow analysis	Years		5.0	

4.2.2 Payback

The simple payback period on the investments made are shown in table 4.2.2.

Table 4.2.2: Payback

Details	100% equity	D/E- 70:30	D/E- 50:50
Total project cost (Rs. In lakh)	30.8	30.9	30.9
Cash flow as annual saving (Rs. In lakh/year)	11.0	11.0	11.0

Details	100% equity	D/E- 70:30	D/E- 50:50
O&M Expenses for first year (Rs. In lakh/year)	1.5	1.5	1.5
Net Cash flow (Rs. In lakh/year)	9.5	9.5	9.5
SPP (months)	38.9	39.1	39.0
Considered (month)	38.9	39.1	39.0

4.2.3 NPV and IRR

The NPV and IRR calculations are shown in table 4.2.3.

Table 4.2.3a: NPV and IRR (100% equity)

Particulars / years	0	1	2	3	4	5
			(Rs.in lakhs)			
Profit after tax	-	4.5	8.0	1.5	1.2	1.1
Depreciation	-	5.0	5.0	5.0	5.0	5.0
Cash outflow	30.8	-	-	-	-	-
Net cash flow	-30.8	9.5	13.0	6.5	6.2	6.1
Discount rate % @ WACC	9.3	9.3	9.3	9.3	9.3	9.3
Discount factor	1.0	0.9	0.8	0.8	0.7	0.6
Present value	-30.8	8.7	10.9	5.0	4.3	3.9
Net present value	**2.1**					
Simple IRR considering regular cash flow	**12.1%**					

Table 4.2.3b: NPV and IRR (D/E- 70:30)

Particulars / years	0	1	2	3	4	5
			(Rs.in lakhs)			
Profit after tax	-	3.4	7.2	0.5	0.5	0.7
Depreciation	-	5.0	5.0	5.0	5.0	5.0
Cash outflow	30.9	-	-	-	-	-0
Net cash flow	-30.9	8.4	12.2	5.5	5.5	5.7
Discount rate % @ WACC	10.1	10.1	10.1	10.1	10.1	10.1
Discount factor	1.0	0.9	0.8	0.7	0.7	0.6
Present value	-30.9	7.6	10.0	4.1	3.7	3.5
Net present value	**-1.9**					
Simple IRR considering regular cash flow	**7.4%**					

Table 4.2.3c: NPV and IRR (D/E- 50:50)

Particulars / years	0	1	2	3	4	5
			(Rs.in lakhs)			
Profit after tax	-	3.7	7.4	0.8	0.7	0.8
Depreciation	-	5.01	5.01	5.01	5.01	5.0
Cash outflow	30.9	-	-	-	-	-
Net cash flow	-30.9	8.7	12.4	5.8	5.7	5.8
Discount rate % @ WACC	9.9	9.9	9.9	9.9	9.9	9.9
Discount factor	1.0	0.9	0.8	0.7	0.7	0.6
Present value	-30.9	7.9	10.3	4.4	3.9	3.6
Net present value	**-0.8**					
Simple IRR considering regular cash flow	**8.8%**					

4.3 Marketing & selling arrangement

The marketing and selling arrangements of the unit are given in table 4.3.

Table 4.3: Marketing & selling arrangements

Items	Remarks
Main Markets (locations)	
Locational advantages	-
Indicate competitors	Other manufacturing units
Any USP or specific market strength	-
Whether product has multiple applications	NA
Distribution channels (e.g. direct sales, retail network, distribution network)	Direct sales
Marketing team details, if any.	NA

4.4 Risk analysis and mitigation

The risk analysis and mitigation for the proposed options are given in table 4.4.

Table 4.4: Risk analysis and mitigation

Type of risk	Description	Mitigation
Technology	The equipment/technology provided by the supplier may not be of high quality, which may result in underperformance.	The equipment/technology should be procured from standard/reputed vendors only.
Market / Product	Demand of the product manufactured by the unit may change resulting in lower capacity utilization.	Regular vigilance/tab on the market scenario by the SME will help in better understanding of new substitute product. The unit may modify the product line based on the emerging market trend.
Policy/ Regulatory	Changes in government regulation/policy related to pollution and taxes & duties can affect the viability of the unit.	Local industrial association may play a role in discussing these issues with the relevant governmental bodies on a regular basis, so that any concerns of the unit are brought to their notice.

4.5 Sensitivity analysis

A sensitivity analysis for various scenarios which may affect the return on investment is given in table 4.5.

Table 4.5: Sensitivity analysis

S. No.	Scenario	D/E ratio	Payback period (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
1	10% increase in estimated savings	100% equity	34.8	4.9	16.0	-	12.0
		70:30	35.0	0.9	11.4	2.1	19.6
		50:50	35.0	2.0	12.7	0.9	16.1
2	10% reduction in estimated savings	100% equity	44.0	-0.8	8.1	-	7.9
		70:30	44.2	-4.7	3.2	2.1	11.8

S. No.	Scenario	D/E ratio	Payback period (months)	NPV (Rs lakh)	IRR (%)	DSCR	ROI (%)
		50:50	44.2	-3.6	4.6	0.9	9.9
3	10% rise in interest rates	70:30	39.1	-2.7	6.9	2.1	15.7
		50:50	39.0	-1.4	8.4	0.9	13.0
4	10% reduction in interest rates	70:30	39.1	-1.0	7.9	2.1	16.6
		50:50	39.0	-0.2	9.1	0.9	13.5

5.0 Conclusions & recommendations

The IGDPR prepared for the replacement of existing inefficient reciprocating compressed air system with a VFD based screw type compressed air system based on the performance assessment study conducted at unit and the acceptance of the unit management. The brief of selected energy conservation measure is given below.

5.1 List of energy conservation measures

The brief summary of the energy conservation measures is given in table 5.1.

Table 5.1: Summary of the energy conservation measures

Technology	Annual energy saving Electricity (kWh)	Investment (Rs lakh)	Monetary savings (Rs lakh/ year)	Simple payback period (Years)	Emission reduction (tonnes of CO_2)
Replacement of existing reciprocating air compressor with VFD enable screw air compressor	239,078	30.8	11.1	2.8	196

The measure has an estimated investment of 30.8 lakh rupees and can yield a savings of 11.0 lakh rupees per year. The total annual reduction in emission by implementation of recommended measure is estimated to be 196 tonnes of CO_2. The financial indicators provided above in the table shows the project is financially viable and technically feasible.

5.2 Summary of the project

The summary of the project is given in table 5.2.

Table 5.2: Summary of the project

S. No.	Particulars	Unit	100% equity	D/E- 70:30	D/E- 50:50
1	Cost of Project	Rs. In Lakh	30.8	30.8	30.8
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	12.1	7.4	8.8
4	NPV	Rs. In Lakh	2.1	-1.9	-0.8
5	DSCR	-	-	2.1	0.9

5.3 Recommendations

The financial indicators provided above show the project is financially viable and technically feasible. It is recommended that the implementation of the identified the energy conservation measures may be undertaken by the unit.

6.0 Financing schemes for EE investments for MSME sector

Government of India has many schemes to provide concessional finance for EE technologies among MSMEs. Some major government schemes are summarised in table 6.1.

Table 6.1: Major government schemes

Name of the scheme	Brief Description and key benefits
ZED assessment and certification	Assessment process, fee and subsidy are as follows: Online (e-Platform) self-assessment: Nil fee Desk Top assessment : Rs 10,000 per SME Complete assessment : Rs 80,000 ZED rating per SME; Rs 40,000 for additional ZED defence rating; Rs 40,000 for re-rating The rating costs will include cost of Rs 10,000/- as certification cost by QCI. Subsidy for Micro, Small and Medium Enterprises are 80%, 60% and 50% respectively.
Credit Linked Capital Subsidy Scheme (CLCSS) (2000-ongoing)	15% capital subsidy of cost of eligible plant and machinery / equipment for adoption of proven technologies for approved products / sub-sectors for MSE units subject to ceiling of INR 15 lakhs
Credit Guarantee Fund Scheme for Micro and small Enterprises (in partnership with SIDBI) (2000-ongoing)	This scheme was launched by MoMSME and SIDBI to alleviate the problem of collateral security and enable micro and small scale units to easily adopt new technologies. Under the scheme, collateral free loans up to Rs 1 crore can be provided to micro and small scale units. Additionally, in the event of a failure of the SME unit which availed collateral free credit facilities to discharge its liabilities to the lender, the Guarantee Trust would guarantee the loss incurred by the lender up to 75 / 80/ 85 per cent of the credit facility.
Technology and Quality Up gradation Support to MSMEs (TEQUP) (2010-ongoing)	The benefits available to SMEs under TEQUP include—technical assistance for energy audits, preparation of DPRs and significant capital subsidy on technologies yielding an energy savings of over 15%. The scheme offers a subsidy of 25% of the project cost, subject to a maximum of Rs. 10 lakhs. TEQUP, a scheme under NMCP, focuses on the two important issues in enhancing competitiveness of the SME sector, through EE and Product Quality Certification.
Technology Upgradation Fund Scheme (TUFS) (1999-ongoing)	Interest subsidy and /or capital subsidy for Textile and Jute Industry only. 1. To facilitate Technology Up gradation of Small Scale (SSE) units in the textile and jute industries. Key features being: • Promoter's margin -15%; • Subsidy – 15% available on investment in TUF compatible machinery subject to ceiling of Rs 45 lakh; • Loan amount – 70% of the cost of the machinery by way of Term Loan

Name of the scheme	Brief Description and key benefits
	• Interest rate: Reimbursement of 5% on the interest charged by the lending agency on a project of technology up-gradation in conformity with the Scheme • Cover under Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGMSE) available 2. To enable technology up-gradation in micro and small power looms to improve their productivity, quality of products and/ or environmental conditions • 20% margin subsidy on investment in TUF compatible specified machinery subject to a ceiling of Rs 60 lakhs or Rs 1crore (whichever is applicable) on subsidy amount to each unit – released directly to the machinery manufacturer.
Tax incentives	• Accelerated depreciation is provided to the customers / users of the energy saving or renewable energy devises under the direct tax laws. • Under indirect taxes, specific concessional rates of duty are only available to CFLs and not to all energy efficient products • A further waiver of import tariffs and taxes for EE technology imports are dealt on a case to case basis, meaning higher costs for those imported technologies that are not available in the domestic markets at present.

Two financing schemes have been created by Bureau of Energy Efficiency (BEE) under The National Mission for Enhanced Energy Efficiency (NMEEE) for financing of energy efficiency projects - Venture Capital for Energy Efficiency (VCFEE) and Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE). These funds seek to provide appropriate fiscal instruments to supplement the efforts of the government for creation of energy efficiency market. Highlights of these two schemes are provided in the table 6.2.

Table 6.2: BEE's VCFEE and PRGFEE scheme

Venture Capital for Energy Efficiency (VCFEE)	• This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. • A single investment by the fund shall not exceed Rs 2 crore • Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less
Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)	• A PRGF is a risk sharing mechanism lowering the risk to the lender by substituting part of the risk of the borrower by granting guarantees ensuring repayment of part of the loan upon a default event. • Guarantees a maximum 50% of the loan (only principal). In case of default, the fund will: o Cover the first loss subject to maximum of 10% of the total guaranteed amount o Cover the remaining default (outstanding principal) amount on

Venture Capital for Energy Efficiency (VCFEE)	• This fund is to provide equity capital for energy efficiency projects in Government buildings and Municipalities in the first phase. • A single investment by the fund shall not exceed Rs 2 crore • Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicle (SPV) or Rs 2 crore, whichever is less
	partial basis upto the maximum guaranteed amount • PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower. • The Guarantee will not exceed Rs 300 lakh per project or 50% of loan amount, whichever is less. • Maximum tenure of the guarantee will be 5 years from the date of issue of the guarantee

Indian Renewable Energy Development Agency (IREDA), a non-banking financial institution established by the government also extends financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation. The detailed financing guidelines for energy efficiency projects are provided in table 6.3.

Table 6.3: IREDA's financing guidelines

Eligible companies who can apply	Private Sector Companies/ firms, Central Public Sector Undertaking (CPSU), State Utilities/ Discoms/ Transcos/ Gencos/ Corporations, Joint Sector Companies which are not loss making.
Minimum loan amount	• Rs. 50 lakh
Type of projects considered for term loans	• Replacement / retrofit of selected equipment with energy efficient equipment • Modification of entire manufacturing processing • Recovery of waste heat for power generation
Incentive available	• Rebate in central excise duty • Rebate in interest rate on term loan • Rebate in prompt payment of loan instalment
Interest rate	• 10.60% to 11.90% depending upon the grading of the applicant with prompt payment rebate of 15 bps if payment is made on / before due dates • Interest rates are floating and would be reset on commissioning of the project or two years from the date of first disbursement. Thereafter, the rates will be reset after every two years. • Rebate of 0.5% in interest rates are available for projects set up in North Eastern States, Sikkim, J&K, Islands, Estuaries. Rebates of 0.5% in interest rates are also available for projects being set up by SC/ST, Women, Ex Servicemen and Handicapped categories involving project cost of upto Rs. 75.00 lakh.
Loan	Upto 70% of the total project cost. Promoter's contribution should be Minimum 30% of the total project cost
Maximum debt	3:1

equity ratio	The project cash flow should have a minimum average Debt Service Coverage Ratio of 1.3
Maximum repayment period	12 years with moratorium of maximum 12 months
Procurement procedures	The borrower is required to follow the established market practices for procurement and shall demonstrate that the quality goods and services are being purchased at reasonable and competitive prices. Wherever the loan is sanctioned against international lines of credit such as the World Bank, Asian Development Bank, kfW, etc., the relevant procedures will have to be followed and requisite documents will have to be submitted by the borrower

Small Industries Development Bank of India (SIDBI) has several schemes and focused lines of credit for providing financial assistance for energy efficiency and cleaner production projects for SMEs. Highlights of some of the major financial assistance schemes/projects managed by SIDBI are given in table 6.4.

Table 6.4: Major EE financing schemes/initiatives of SIDBI

End to End Energy Efficiency (4E) Program	Support for technical /advisory services such as: • Detailed Energy Audit • Support for implementation • Measurement & Verification Financing terms: • Terms loans upto 90% • Interest rate upto 3% below normal lending rate.
TIFAC-SIDBI Revolving Fund for Technology Innovation (Srijan Scheme)	To support SMEs for up-scaling and commercialization of innovative technology based project at flexible terms and interest rate. Preference accorded to sustainable technologies / products. Soft term loan with an interest of not more than 5%.
Partial Risk Sharing Facility for Energy Efficiency (PRSF) Project (supported by World Bank)	Sectors covered: • Large industries (excluding thermal power plants) • SMEs • Municipalities (including street lighting) • Buildings Coverage: • The minimum loan amount Rs 10 lakh and maximum loan amount of Rs 15 crore per project. • The extent of guarantee is 75% of the loan amount
JICA-SIDBI Financing Scheme	• The loan is used to provide SMEs with funds necessary to invest in energy-saving equipment (and some medical equipment) in the form of two-step loans through SIDBI or three-step loans through intermediary financial institutions.

	• Project uses an Energy Saving Equipment List approach • Equipment/machinery with energy saving potential less than 10% is not eligible. • Interest rate: As per credit rating and 1% below the normal lending rate • Separate technical assistance component which is used for wetting of loan applications, holding seminars to raise awareness of energy saving among SMEs and to improve the ability of financial institutions to screen loan applications for energy-saving efforts
KfW-SIDBI Financing Scheme	Coverage a) SMEs for energy efficiency projects b) SMEs and clusters for cleaner production and emission reduction measures, waste management and Common Effluent Treatment Plant (CETP) facilities Interest rate As per credit rating and 1% below the normal lending rate Eligible criteria 3 t CO_2 emission reduction per year per lakh invested List of eligible equipment/technology and potential suppliers developed for guidance

State Bank of India (SBI) has been provided a green line of credit by Japan Bank for International Cooperation (JBIC) for financing of energy efficiency investments. Highlights of the line of credit are given in table 6.5.

Table 6.5: JBIC-SBI Green Line

Key Features

- Amount : USD 90 million
- Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment)

Eligibility Criteria

- Projects contributing to preservation of global environment, i.e. significant reduction of GHG emissions
- Acceptance of JBIC-MRV ('J-MRV") by the project proponent in terms of the numerical effect of the environment preservation. To ensure effective GHG reduction emissions in Green financed projects, JBIC reviews such effects through simple and practical Measurement Reporting Verification (MRV) process both in (a) prior estimation and (b) ex-post monitoring.
- Procurement in line with the "Guidelines for Procurement under Untied Loans by Japan Bank for International Cooperation"

Canara bank has a dedicated scheme for financing EE investment among SME sector as mentioned in table 6.6.

Table 6.6: Canara bank scheme of EE SME loans

Purpose	**For acquiring/adopting energy conservation/savings equipment/ measures by SMEs**
Eligibility	Units under Small and Medium Enterprises Cost of energy for the unit should constitute not less than 20% of the total cost of production Unit should possess energy audit report issued by an approved energy Consultant/Auditor. Borrowal a/cs-ASCC code S1 or S2 during previous review. Current account holders having dealings exclusively with us satisfactorily for a period of last one year
Maximum loan	Maximum Rs 100 lakhs in the form of term loan
Security	Prime: Assets created out of loan Collateral: Upto Rs.5 lakhs – NIL Above Rs.5 lakhs, as determined by the bank
Repayment	Maximum 5-7 years including moratorium of 6 months
Guarantee cover	Cover available under CGMSE of CGTMSE available for eligible loans
Margin	10% of the project cost
Rate of interest	1% less than the applicable rate
Upfront fee	1% of the loan
Insurance cover	Assets acquired and charged as security to Bank to be insured
Special offer, if any	**Grants :** Bank provides 25% of the cost of Energy Audit / Consultancy charges with a maximum of Rs 25000/- to the first 100 units on a first come first served basis which is in addition to the grant of Rs 25000/- being provided by IREDA(First 100 units)

Among the private sector banks in India, Yes Bank is also active in financing of renewable energy and energy efficiency projects. The bank has an MOU with SIDBI for providing funding for EE through PRSF.

Most commercial banks charge interest rate between from 11% to 13% from MSMEs depending upon general criteria such as credit ratings, references, past lending record, balance sheet for last 3 years and so on. Interest rebate is offered for a few customers whose collateral value is around 125% of the loan amount. Further 0.5% concession in interest rate was offered to women entrepreneurs.

Annexures

Annexure 1: Budgetary offers / quotations

Quotation 1: Kobelco

KOBELCO

Quotation
Page 1

Ref No.: QCP/17-18/44
Date: 2/16/2018

QUOTATION OF KOBELCO SCREW AIR COMPRESSOR AND ALLIED ACCESSORIES

Company	PORWAL AUTO COMPONENTS LIMITED
Address	Plot 209 & 215, Sector-1, Pithampur, Indore, MP
Attention to	Mr. Ayan Ganguly
Mobile	+91-

Subject **Offer of lube screw compressor 110KW Variable Speed Compressor**

Dear Sir,

We sincerely thank you for your invitation for Screw Air Compressor quotation and continue to have a long lasting business association with your esteemed organization.

- **OIL INJECTED SCREW COMPRESSOR VS110AH [Air cooled] Variable Speed**
  Oil injected, single stage, electric motor driven screw compressor having discharge air volume of 755.6 cfm at working discharge pressure of 7.0 bar(g).

We do hope you will find our offer in line with your requirement.
For any information / clarifications please do contact undersigned.

Yours faithfully,

Gunjeet S Thukral/ Sr. Sales-Manager.
Standard Compressor Division,
Cell : +91 - 8800454777

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Serra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 2

WHAT IS KOBELCO

Kobe Steel, Ltd.

KOBELCO is a corporate brand of KOBE STEEL GROUP who is a major steel producer in Japan founded in 1905.

KOBE STEEL adopts diversified farming system and has 8 major business units, Iron & Steel, Aluminum & Copper, Welding, Machinery, Engineering, Construction Machinery, Mobile Crane, and other business unit like Real Estate. Each business unit is leading Japanese industry with its 'Only One / Number One' technology.

Now the consolidate turnover is $ 17.92 billion, number of subsidiaries are more than 200, and total numbers of employee reaches 36,018 in 03.2013.

KOBELCO Compressor

KOBELCO starts manufacturing high pressure reciprocating compressor in 1915, first in Japan. And from that day, we have leaded compressor industry. In 1956, we launch first Oil Free Screw Compressor as technical collaboration with Svenska Rotor Maskiner AB (SRM). We, KOBELCO, are the manufacturer who can make both Oil-Free and Oil-Injected Screw from law material to finish product. There is no compromise in quality as well as performance.

Till today, we lead compressor industry with its energy efficient and reliable product to help increasing client productivity.

Headquartered in Tokyo, Japan
Leading producer of industrial compressor
Oil-Injected Screw Compressor : 2 - 340HP
Oil-Free Screw Compressor : 2 - 530HP
Certified quality with : ISO9001 / ISO14001 / ISO8573-1 Class 0

Global Operations

KOBELCO has four factories in Japan (2 location), US, and in Shanghai. We can supply most suitable products from convenient location to anywhere in the world. There are numbers of sales/service providers locating in the world to serve our product in well condition.

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Serra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 3

TYPE : VS110A-H

CAPACITY CONTROL... VARIABLE SPEED CONTROL

KOBELION VS-AG SCREW COMPRESSOR

Premium line oil-injected screw compressor ranged from 20 - 340HP. 'Kobelion' stands for KOBELCO + LION, which is the strongest animal on the earth. Kobelion always benchmarks world best energy saving compressor with its advanced technology in compression and control.

Technical data

(performance at reference condition as per ISO1217-2009 Annex C, reference condition at 1barA/RH0%/20 C)

DGD Direct Gear Drive

INVERTER

Discharge air flow	378-756 cfm
Speed	1,500 rpm
Max operating pressure	8.5 barg
Reference pressure	7.0 barg
Motor output	110 kW
Electrical connection	415 V / 3 ph / 50Hz
Starter	Inverter (in-built)
Dimension (W x L x H), mm	2600 x 1600 x 1850
Weight (dry)	3000 kg
Service area (Top/side)	1500 / 1000 mm
Motor protection	IP55
Motor type	Induction motor
Motor construction	TEFC Air cooled
Fan motor	2 x 1.8 kW
Oil pump motor	- kW
Discharge temperature	Less than 35.0 C
Noise level	69 dBA
Lube oil capacity	81 L
Discharge connection	R_c 3 / DN80
Cooling water in/out	-
Cooling water quantity	-
Cooling water supply head	-

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Serra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 4

SALIENT FEATURES OF AG/VS SERIES

Reliable Air End

- Kobelco patented "Super Rotor" and Casing with new FEM analysis enhances reliability of heart of compressor.
- Quality, Efficiency and Reliability backed by nearly 100 year history of KOBELCO as compressor manufacturer.
- By reducing discharge temperature and RPM with new Air-End, you can get more life and margin on the rotating parts.
- High quality lubricant assures peace of mind even in extreme condition.

- **Rigid Drive Train**

- No V-belt, No Coupling design eliminate chance of misalignment, frequent tension adjustment and minimize mechanical loss.
- Rigid construction with quality components realizes industrial lowest vibration characteristics.

- **Efficient Oil Separation**

  - Efficient 3 steps oil removal system assures excellent air quality up to 2ppm.
  - Original designed separator tank not only reducing oil content to coalescing filter but also reducing oil foaming.

- **Reliable and Efficiency Control**
  - Special tuned inverter unit with in-built line choke equipped for all VS series.
  - Efficient control of inverter unit guaranteed by custom built algorithm from ITCS controller.

- **Resistance to Extreme Conditions**
  - AG/VS series designed for operation under 45degC ambient condition.
  - Even under 45degC ambient condition, expected discharge temperature is with more than 15degC margin against tripping point.

- **Optimized Unit Design**
  - Unit is separated into HOT zone and COOL zone.
  - This enables to keep Suction, Air-End, Motor, Electrical Cubicle in cool condition and eliminate heat circulation from Cooler section.

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Suvra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 5

- **Powerful and Efficient Ventilation**
  - Industrial top quality Axial Fan assures powerful cooling with less energy consumption against conventional fan.

- **Two Option of Saving Electricity Cost**

☑ **[AG series] Fix Speed model**

- Quick response two step control (Load/Un-load) suction valve standard equipped.
- 10 - 20% energy saving in partial load condition.
- Patented ***'Energy Saving Logic'*** achieves another 3-6% energy saving compare to conventional control.
- Also Automatic Unload Stop (AUS) provided standardly.

☐ **[VS series] Inverter model (Variable Speed)**

- By optimizing rotation speed of screw rotor, eliminating unnecessary pressure hike in process.
- 20 - 40% energy saving in partial load.

- **Maintenance Friendly Unit Package**
  - Easy access to the maintenance parts. All consumables can be exchanged by opening door or maintenance lid.
  - Main motor re-greasing can be done from grease nipple outside canopy.
  - Accessibility to the coolers also considered.
  - Each and every component is designed to reduce down time.

- **Longer Life Consumables**
  - Long life consumables like Suction Filter, Oil Filter, Air-Oil Separator and Lubricant enable client to operate compressor nearly 1 year (or 4,000h) without exchanging those parts.
  - Optionally heavy duty filters and separator also available for prolonged up time.

- **New Microprocessor Controller with Large LCD Display**
  - 5.7 inch graphic display visualize compressor
    - Operating parameter

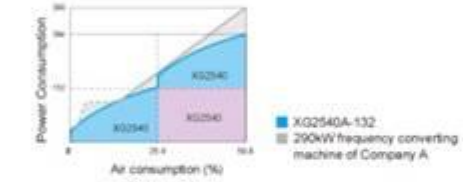
KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Serra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 6

- Flow chart display
- Caution status
- Shut down status
- Service information

- Last 4 events of caution / shut down status with trend data before event can be stored in memory
- Selectable language
- Weekly timer is available as standard with 3 pressure setting
- In-built data logging system and USB output
- Sequencing up to six (6) machines standardly equipped.
- Standard I/O for remote operation and alert equipped.
- Modbus© I/O module
- Heavy electrical protection like 12,000V lightning surge killer, and 0.5sec momentary blackout ride-through as standard feature



- **Various Options, Customizations are Available**
  - Motor input CT
  - Without starter panel version for standalone soft starter or DOL starter
  - Oversized motor
  - Heavy duty air filter, air oil separator

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Serra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 7

PRICE SUMMARY

(AG 110- FIX SPEED & VS 110- VARIABLE SPEED)

Sr	Description	Qty	Unit Price	Line Total
1	Oil Injection Screw Compressor Model VS110 (Variable Speed) Air Cooled (415V/50Hz/3Ph)	1	Rs 30,80,000	Rs 30,80,000.00
	Total		Ex Godown -INR	30,80,000.00

Pl note the above quoted price is List Price & during Discussion/Negotiation Final Price shall be offered.

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Seva Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

KOBELCO

Quotation
Page 8

TERMS & CONDITIONS

Delivery Time	12-14 weeks from date of firm PO and advance payment
Delivery Term	Ex-Godown, Manesar
GST	**28% on Compressor**
Packing & Forwarding	3% extra
Freight/Insurance	Extra as actual
Payment Term	30% advance, 70% against proforma invoice before shipment
Validity	30 days from today
Warranty	As per below 'special note'
Commissioning Supervision	Rs 8,000/man
First filled oil	Rs 10,000/20L

Special Note)

All the specifications are as per KOBELCO Std. All the engineering/manufacturing/inspection standards are as per GB, JIS, JEC, JEM and KSL standards.

The warranty period shall be 12 months after completion of test run & site commissioning or 18 months after shipment, whichever comes first.

Compressor design basis is (suction temp=20dC/RH=0%/suction pressure=1bara) : Test Code.. ISO 1217 equiv

Air Tank with satisfied volume is necessary just after the compressor (please refer std. spec.).

Out of scope)

Installation / Commissioning / Initial charge Oil/ Spares (Separate Quote), Any other items/any site works/documents (except Std. Spec, Operation Manual, Test report)/Witnessing at KOBELCO works.

KOBELCO MACHINERY INDIA – KOBE STEEL, LTD.
Unit#409, Serra Corporate Park,
Corporate Suit, MG Road,
Gurgaon 122 002, Haryana
PH 0124-401 0063
FX 0124-401 0066

Annexure 2: Instruments used

Instruments	Model/ Make	Application	Accuracy
Power analysers	Fluke: 435, Krykard ALM 10,	Electrical Parameters Harmonics analysis, power logging	± 0.5%
Thermal imager	875-2/Testo	Surface Temperature & Image	± 2%
Anemometer	Testo: 425, Airflow: TA45	Air Velocity	±(0.03 m/s +5% of mv)