

Detailed Project Report On Cupola to Induction Furnace

Jash Engineering Limited
Indore (MP)

Prepared for

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



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This DPR has been originally prepared by TERI as a part of 'Capacity Building of LSPs' activity under the GEF-UNIDO-BEE project 'Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India'.

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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
LDO	:	Light diesel oil
LPG	:	Liquefied Petroleum Gas
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 Jash Engineering Limited
Constitution	Public Limited
MSME Classification	Medium
No. of years in operation	46
Address: Registered Office:	31, Sector-C, Industrial area, Sanwer Road, Indore - 452015, Madhya Pradesh, India
Industry-sector	Steel casting
Products manufactured	Manufacturer of fabricated metal products, except machinery and equipment
Name(s) of the promoters/ directors	Mr. L.D. Amin - Chairman Mr. Pratik Patel - Managing Director Mr. Axel Schuette - Director Mr. K Mukundan - 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	147.82
2	Net profit	10.34

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 of the unit. The plant is consuming about 1,153,970 kWh of electricity per year. The annual consumption of the coke is 281 tonne. The total energy consumption of the unit during last 12 months is estimated to be 282

toe which is equivalent to 184 lakh rupees. The total CO₂ emission during this period is estimated to be 1,766 tonnes. Electricity and coke were considered for CO₂ emission estimation.

The unit manufactures the fabricated metal products, except machinery and equipment. The total annual production of the unit during 2017-18 is estimated to be 1,334 tonne. The major sources of energy are coke consume in the foundry and electricity for machining and lighting.

Accepted/ recommended technology implementation

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

S. No	Energy conservation measure	Annual energy saving		Investment ¹ (Rs. Lakh)	Monetary savings (Rs. Lakh per year)	Simple payback period (years)	Emission reduction (tonnes of CO ₂)
		Electricity (kWh)	Coke (tonne)				
1	Replacement of existing cupola furnace by new IGBT type induction furnace	(7,85,129)	226.3	47.50	23.42	2.0	125

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 CO₂ 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	47.5	47.5	47.5
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	26.02	21.65	22.90
4	NPV	Rs. In Lakh	19.63	13.20	15.01
5	DSCR	-	-	2.1	0.92

¹ Investment including the (i) Power panel and crucible – Rs. 33.5 lakh, (ii) Transformer – Rs. 8.5 lakh and (iii) Installation, Taxes and other misc. cost – Rs. 5.5 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 Jash Engineering Limited	
2	Constitution	Public Limited	
3	MSME Registration No/UAN	23/026/13/00326	
4	PCB consent No.	CIN: U28910MP1973PLC001226	
5	Date of incorporation / commencement of business	1973	
6	Name of the Contact Person	Mr. L.D. Amin – Chairman	
7	Mobile / Ph. No	+91-731-2720143	
8	Email	info@jashindia.com	
9	Address: Registered Office	31, Sector-C, Industrial area, Sanwer Road, Indore - 452015 Madhya Pradesh, India	Owned
10	Factory	31, Sector-C, Industrial area, Sanwer Road, Indore - 452015 Madhya Pradesh, India	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	8	
14	No of shifts/ day	3	
15	No of days/year	300	
16	Installed Capacity	Annexure - 1	
17	Whether the unit is exporting its products (Yes/ No)	Yes	
18	Quality Certification, if any	ISO 9001:2008	

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 divided blast cupola furnace. 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.

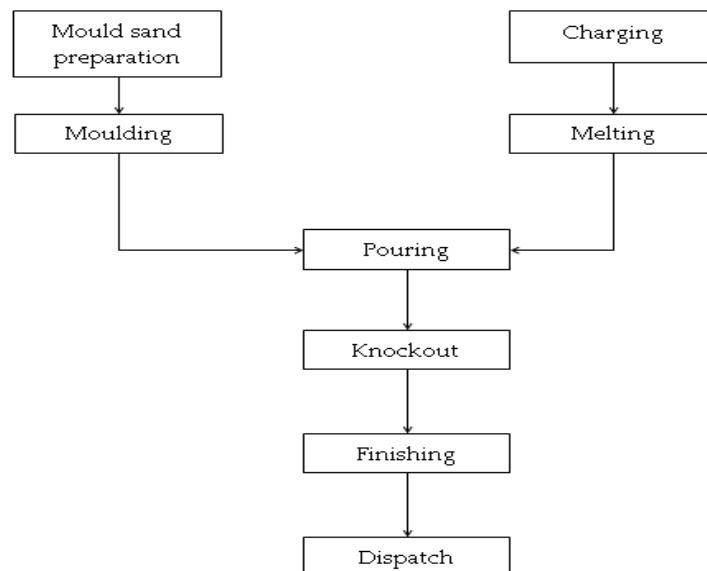


Figure 2.1.4: Process flow chart

2.2 Details of technology identified

The details of the induction furnace installed in the unit are given in table 2.2.

Table 2.2: Details of cupola furnace

Design Parameters	Unit	30”Inch	42”Inch	48”Inch
Equipment	-	Cupola	Cupola	Cupola
Type	-	Divided Blast	Divided Blast	Divided Blast
Inner diameter	inch	30	42	48
Melting rate	MT/hr	3.5	6.5	8
Operating Temperature	°C	1,300	1,280	1,280

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 @ 33 kV, with 375 kVA sanctioned contract demand. 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

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 (>50% PLF)	Rs. 5.5/kWh
Energy charges (<50% PLF)	Rs. 6.5/kWh

2.5 Analysis of electricity consumption

Table 2.5: Electricity consumption profile

Month & Year	Total electricity consumption (kWh)	Sanctioned load/demand (kVA)	Power factor	Recorded demand, kVA	Demand charges (Rs)	Energy charges (Rs)	Monthly bill (Rs)
Sep-17	1,06,920	375	0.99	361	1,84,110	6,94,980	8,64,375
Oct-17	54,541	375	0.99	341	1,73,910	3,54,516	4,87,690
Nov-17	1,07,080	375	0.99	338	1,72,380	6,96,020	8,43,126
Dec-17	1,02,320	375	0.99	338	1,72,380	6,65,080	8,23,043
Jan-18	1,09,960	375	0.99	338	1,72,380	7,14,740	8,60,271
Total	11,53,970	-	-	-	21,00,384	75,00,806	93,08,412

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

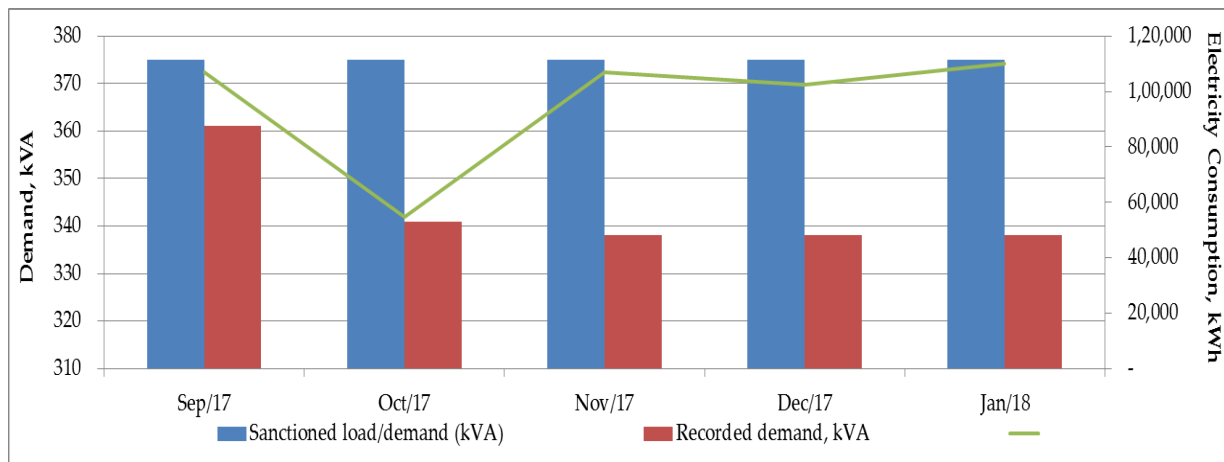


Figure 2.5: Demand pattern and energy consumption profile

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	Coke (kg)
Consumption unit/year	2,81,357
Calorific value per unit	6,500
Equivalent toe per year	182.9
Price (Rs per unit)	32.3
Total price per year	91,00,204

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

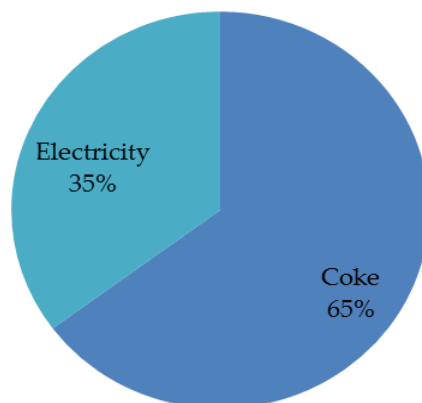


Figure 2.6: Percentage share of various fuel types in the unit

The plant is consuming about 1,153,970 kWh of electricity per year. The annual consumption of the coke is 281 tonnes. The total energy consumption of the unit during last 12 months is estimated to be 282 toe which is equivalent to 184 lakh rupees. The total CO₂ emission during this period is estimated to be 1,766 tonnes. Electricity and coke were considered for CO₂ 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 cupola furnace by new IGBT type induction furnace

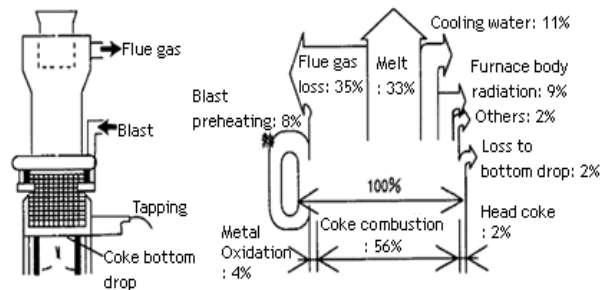
3.1.1 Background

The plant has installed three cupola furnaces to cater the melting requirements. The basic details of the cupola installed is given in table 3.1.1.

Table 3.1.1: Specification of existing cupola

Design Parameters	Unit	30" Inch	42" Inch	48" Inch
Equipment		Cupola	Cupola	Cupola
Type		Divided Blast	Divided Blast	Divided Blast
Inner diameter	inch	30	42	48
Melting rate	MT/hr	3.5	6.5	8
Operating Temperature	°C	1,300	1,280	1,280

Cupola operated at temperature 1,280-1,300°C and molten metal (CI-grade) pouring temperature is around 1,280°C. The operating hours of the cupola is very less (2 days/week). The operational parameters of the cupola furnace including the fuel consumption and material charged were measured during the detailed assessment study and analysis of the past one year data.



3.1.2 Observations and analysis

The operational data for 42 inch cupola were measured/ collected during the filed assessment study. The summary of the analysis is given in table 3.1.2.

Table 3.1.2: Summary of the analysis

Actual Parameters	Unit	42 inch
Coke consumption	MT/heat	4.36
Total molten metal	MT/heat	33.78
Metal to Coke ratio		7.76
GCV of Coke	kCal/MT	6,000
Heat supply	kCal/heat	26,130,000
Specific heat of MS	kCal/kg°C	0.11
Ambient temperature	°C	36
Heat required	kCal/heat	4,696,771
Useful heat	%	17.97

Based on the data collected/measured, the coal to metal ratio is estimated to be 1:7.76 which is very less as compare to design ratio (1:10). The trend of coal to metal ratio based on the data of previous heats for 30 inch cupola furnace is given in figure 3.1.2.

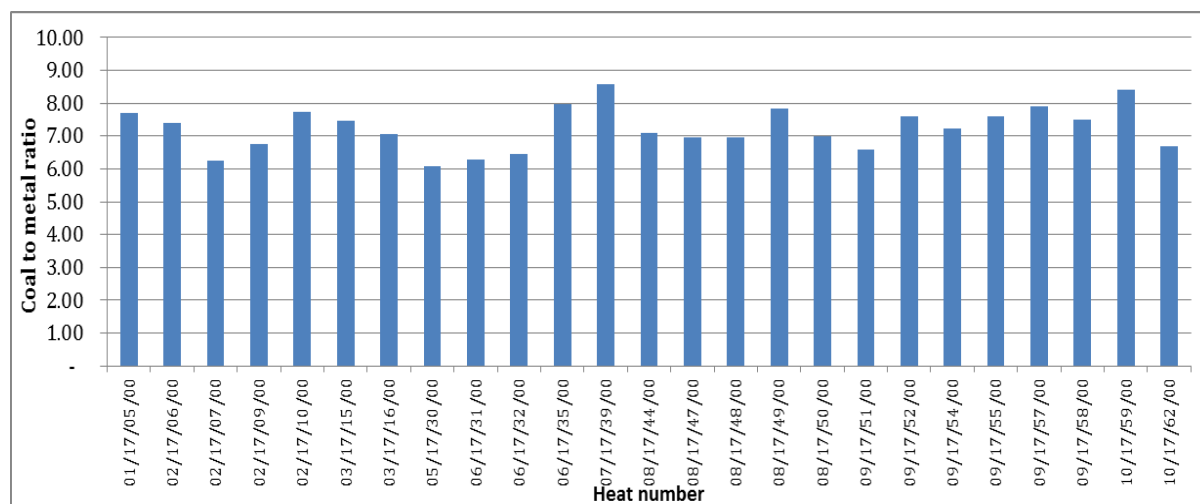


Figure 3.1.2: Trend of the coal to metal ratio (30 inch)

3.1.3 Recommendation

The average coal to metal ratio for 30 inch is estimated to be 7.07 during the financial year 2017-18, which is very less as compare to design ratio (1:10). Moreover unit wanted to diversify its products. Therefore, it is recommended to replace the existing cupola with a new induction furnace.

The proposed induction furnace specifications include 550 kW power panel and 2,000 kg aluminium frame box type melting furnace. The melt rate capacity of the prosed furnace will be 1,028 kg per hour. The specific energy consumption (induction furnace) of new furnace would be 535 kWh per tonne as specified by vendor. The estimated annual energy savings is Rs 23.4 lakh. The investment requirement is Rs 47.5 lakh with a simple payback period of 2 years.

3.2 Cost benefit analysis

The estimated annual monetary saving by implementation of the project is estimated to be of Rs 23.4 lakh. The investment requirement is Rs 47.5 lakh with a simple payback period of 2 years. The detailed calculations of the recommended energy conservation measures for IG DPR are provided in table 3.2.

Table 3.2: Cost benefit analysis for recommended energy savings measures

Parameters	Unit	Cupola	Induction
Specific coke consumption	kg/tonne of melt	141.4	-
Specific electricity consumption	kWh/ tonne of melt	89.0	579.5
Specific lime stone consumption	kg/tonne of melt	-	-
Price of coke	Rs./kg of coke	33.5	33.5

Parameters	Unit	Cupola	Induction
Price of electricity	Rs./kWh	8.2	6.9 ²
Specific cost of coke for melting	Rs./tonne of melting	4,736	-
Specific electricity cost for melting	Rs./tonne of melting	726	3,998
total average melting cost	Rs./tonne of melting	5,461	3,998
Reduction in specific power cost	Rs./tonne of melting	-	1,463
Annual average production	tonne/year	-	1,601
Annual monetary benefit	Rs./Year	-	23,42,098
Total investment ³	Rs.	-	33,50,000
Civil construction and other Misc.	Rs.	-	5,50,000
Electrical and Transformer	Rs.	-	8,50,000
Total investment	Rs.	-	47,50,000
Simple payback period	Years	-	2.0

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 CO₂ reduction⁴

Implementation of the selected energy conservation measures in the unit may result in reduction in CO₂ emissions due to reduction in overall energy consumption. The estimated reduction in GHG emission by implementation of the recommended energy conservation measures is 125 tonne of CO₂ 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 Based on the electricity tariff, the per unit electricity charges (Rs/kWh) is directly dependent on average load factor. The electricity price in proposed case is considered with average load factor more than 50% (refer section 2.4).

³ Quotation – 1 has been considered for estimation of investments

⁴ Source for emission factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Electricity: CO₂ Baseline Database for the Indian Power Sector, user guide version 12.0, May 2017 (CEA)

3.6 Social benefits

3.6.1 Improvement in working environment

Not envisaged

3.6.2 Increase in manpower skills

Not envisaged

3.6.3 Increase in wages/salary of workers

Not envisaged

3.6.4 Health & safety of plant & personnel

Not envisaged

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
1	550 kW/500 Hz IGBT based Induction power source with DM water circulation unit, Hydraulic unit, one no of 2000kg aluminium frame box type melting furnace with built in tank capacitor bank.. <ul style="list-style-type: none"> • 550 kW Solid State Medium Frequency IGBT Power Source. • Programmable Logic Controller with 7.0" Colour Touch screen HMI. • Energy Meter with Ethernet Communication. • Earth Leakage and Water Conductivity Monitoring System. • Wiring Drawings and water circuit diagrams • Medium Frequency Tank Capacitor bank 	Shailesh Patel (Director) ORITECH solutions B/2-3, Sarthi Comp. & Estate, Opp. Gujarat Vahepari Maha Mandal (GVMM), Odhav, Ahmedabad – 382 415 (INDIA) Ph: +91-79-32957055, Tele-fax: +91-79-22901350 E-mail: info@oritech.in web: www.oritech.in	<ul style="list-style-type: none"> • 20+ years of experience in the Development of Induction equipment • Continuous research and development process • Persistently upgrading and technology • Admirable quality norms and testing standards 	-
2	550 kW/500 Hz VIP POWER TRAK-R-PI POWER AND CONTROL SYSTEM with internal water circulating system and hydraulic power supply unit.	Mr Nishant Singh Area Sales Head Inductotherm (India) Pvt. Ltd., Plot No. SM - 6, Road No. 11, Sanand-II Industrial Estate, Ahmedabad - 382 170	<ul style="list-style-type: none"> • VIP Power TRAK-R-PI power and control system • Medium frequency induction furnace • Provide end-end solution (such as panel, crucible, transformers, water cooling system, PLC etc.) • Experience in the sector 	

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	47.5	14.25	23.75
2	Internal Accruals	-	-	-
3	Interest free unsecured loans	-	-	-
4	Term loan proposed (Banks/FIs)	-	33.25	23.75
5	Others	-	-	-
	Total	47.5	47.5	47.5

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		-	
Production in last financial years	tonnes/year		1,600	
Capacity utilization factor	%		-	
Proposed investment (Project)				
Total cost of the project	Rs. (in Lakh)	47.5	47.5	47.5
Investment without interest defer credit (IDC)	Rs. (in Lakh)	47.5	47.5	47.5
Implementation time	Weeks	3	3	3
Interest during the implementation phase	Rs. in lakhs	-	0.2	0.1
Total investment	Rs. in lakhs	47.5	47.7	47.6
Financing pattern				
Own funds	Rs. in lakhs	47.5	14.5	23.9
Loan funds (term loan)	Rs. in lakhs	-	33.3	23.8
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		23.4	

Details	Unit	100% equity	D/E- 70:30	D/E- 50:50
	lakh)/year			
Total saving	(Rs Lakh/year)		23.4	
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)	47.50	47.70	47.64
Cash flow as annual saving (Rs. In lakh/year)	23.42	23.42	23.42
O&M Expenses for first year (Rs. In lakh/year)	2.38	2.39	2.38
Net Cash flow (Rs. In lakh/year)	21.05	21.04	21.04
SPP (months)	27.08	27.21	27.17
Considered (month)	27.10	27.20	27.20

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	-	13.35	14.46	6.55	6.05	5.88
Depreciation	-	7.70	7.70	7.70	7.70	7.70
Cash outflow	47.50	-	-	-	-	-
Net cash flow	-47.50	21.05	22.16	14.25	13.75	13.58
Discount rate % @ WACC	9.30	9.30	9.30	9.30	9.30	9.30
Discount factor	1.00	0.92	0.84	0.77	0.70	0.64
Present value	-47.50	19.26	18.57	10.93	9.65	8.72
Net present value	19.63					
Simple IRR considering regular cash flow	26.02%					

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	-	11.61	13.11	4.97	4.92	5.25
Depreciation	-	7.73	7.73	7.73	7.73	7.73
Cash outflow	47.70	-	-	-	-	-
Net cash flow	-47.70	19.35	20.85	12.70	12.66	12.99
Discount rate % @ WACC	10.10	10.10	10.10	10.10	10.10	10.10
Discount factor	1.00	0.91	0.83	0.75	0.68	0.62
Present value	-47.70	17.57	17.19	9.51	8.61	8.02
Net present value	13.20					

Simple IRR considering regular cash flow	21.65%
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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	-	12.11	13.50	5.42	5.24	5.43
Depreciation	-	7.72	7.72	7.72	7.72	7.72
Cash outflow	47.64	-	-	-	-	-
Net cash flow	-47.64	19.83	21.22	13.14	12.97	13.15
Discount rate % @ WACC	9.90	9.90	9.90	9.90	9.90	9.90
Discount factor	1.00	0.91	0.83	0.75	0.69	0.63
Present value	-47.64	18.05	17.58	9.91	8.90	8.21
Net present value	15.01					
Simple IRR considering regular cash flow	22.90%					

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)	Pan India
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	24.40	25.67	30.81	-	18.22
		70:30	24.50	19.10	26.51	2.12	28.50
		50:50	24.50	20.95	27.74	0.92	24.21
2	10% reduction in estimated savings	100% equity	30.50	13.59	21.09	-	14.31
		70:30	30.60	7.29	16.62	2.12	23.33
		50:50	30.60	9.06	17.90	0.92	19.33
3	10% rise in interest rates	70:30	27.20	11.64	21.18	2.12	25.98
		50:50	27.20	13.87	22.57	0.92	21.84
4	10% reduction in interest rates	70:30	27.20	14.79	22.11	2.12	26.42
		50:50	27.20	16.17	23.23	0.91	22.14

5.0 Conclusions & recommendations

The IGDP prepared for the replacement of existing induction furnace by new IGBT type induction furnace 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 are given in table 5.1.

Table 5.1: Summary of the energy conservation measures

Energy conservation measure	Annual energy saving		Investment (Rs. Lakh)	Monetary savings (Rs. Lakh per year)	Simple payback period (Yrs)	Emission reduction (tonnes of CO ₂)
	Electricity (kWh)	Coke (tonne)				
Replacement of existing cupola furnace by new IGBT type induction furnace	(7,85,129)	226.3	47.5	23.42	2.0	125

The estimated annual monetary saving by implementation of the project is estimated to be of Rs 23.42 lakh. The investment requirement is Rs 47.5 lakh with a simple payback period of 2 years. 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	47.5	47.5	47.5
2	D/E Ratio	-	-	7:3	1:1
3	Project IRR	%	26.0	21.7	22.9
4	NPV	Rs. In Lakh	19.6	13.2	15.0
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	<p>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.</p>
Credit Linked Capital Subsidy Scheme (CLCSS) (2000-ongoing)	<p>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</p>
Credit Guarantee Fund Scheme for Micro and small Enterprises (in partnership with SIDBI) (2000-ongoing)	<p>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.</p>
Technology and Quality Up gradation Support to MSMEs (TEQUP) (2010-ongoing)	<p>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.</p>
Technology Upgradation Fund Scheme (TUFS) (1999-ongoing)	<p>Interest subsidy and /or capital subsidy for Textile and Jute Industry only.</p> <ol style="list-style-type: none"> To facilitate Technology Up gradation of Small Scale (SSE) units in the textile and jute industries. Key features being: <ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> • Interest rate: Reimbursement of 5% on the interest charged by the lending agency on a project of technology upgradation in conformity with the Scheme • Cover under Credit Guarantee Fund Scheme for Micro and Small Enterprises (CGMSE) available <p>2. To enable technology upgradation in micro and small power looms to improve their productivity, quality of products and/ or environmental conditions</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> ○ Cover the first loss subject to maximum of 10% of the total guaranteed amount ○ Cover the remaining default (outstanding principal) amount on

Venture Capital for Energy Efficiency (VCFEE)	<ul style="list-style-type: none"> 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
	<p>partial basis upto the maximum guaranteed amount</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Rs. 50 lakh
Type of projects considered for term loans	<ul style="list-style-type: none"> Replacement / retrofit of selected equipment with energy efficient equipment Modification of entire manufacturing processing Recovery of waste heat for power generation
Incentive available	<ul style="list-style-type: none"> Rebate in central excise duty Rebate in interest rate on term loan Rebate in prompt payment of loan instalment
Interest rate	<ul style="list-style-type: none"> 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	<p>Support for technical / advisory services such as:</p> <ul style="list-style-type: none"> • Detailed Energy Audit • Support for implementation • Measurement & Verification <p>Financing terms:</p> <ul style="list-style-type: none"> • Terms loans upto 90% • Interest rate upto 3% below normal lending rate.
TIFAC-SIDBI Revolving Fund for Technology Innovation (Srijan Scheme)	<p>To support SMEs for up-scaling and commercialization of innovative technology based project at flexible terms and interest rate.</p> <p>Preference accorded to sustainable technologies / products. Soft term loan with an interest of not more than 5%.</p>
Partial Risk Sharing Facility for Energy Efficiency (PRSF) Project (supported by World Bank)	<p>Sectors covered:</p> <ul style="list-style-type: none"> • Large industries (excluding thermal power plants) • SMEs • Municipalities (including street lighting) • Buildings <p>Coverage:</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

	<ul style="list-style-type: none"> • 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	<p>Coverage</p> <ol style="list-style-type: none"> 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 <p>Interest rate</p> <p>As per credit rating and 1% below the normal lending rate</p> <p>Eligible criteria</p> <p>3 t CO₂ emission reduction per year per lakh invested</p> <p>List of eligible equipment/technology and potential suppliers developed for guidance</p>

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

<p><u>Key Features</u></p> <ul style="list-style-type: none"> • Amount : USD 90 million • Repayment Schedule: First repayment on May 30, 2017 and final repayment date May 30, 2025 (equal instalment) <p><u>Eligibility Criteria</u></p> <ul style="list-style-type: none"> • 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: Copy of certificates from the competent authorities

Annexure- 1.

ACKNOWLEDGEMENT

जावक क्र. 3243
दिनांक 3-4-2007

Form No. 00320

M/s. JASH ENGINEERING LIMITED
HAS FILED MEMORANDUM FOR A MANUFACTURING

(MANUFACTURING/SERVICE ENTERPRISE WHICH HAS BEEN SETUP
AT THE ADDRESS 31-C, Sector, Ranven Road, Industrial Area,
A. Indore (M.P.) PIN
STATED IN FORM NO. 00320 AND ALLOCATED E.M. NO. AS
BELOW.

DATE OF ISSUE	D D M M Y Y Y Y								
CATEGORY OF THE UNIT	<table border="1"><tr><td>3</td><td>0</td><td>0</td><td>3</td><td>2</td><td>0</td><td>0</td><td>7</td></tr></table>	3	0	0	3	2	0	0	7
3	0	0	3	2	0	0	7		
(MANUFACTURING-1 SERVICES-2	<table border="1"><tr><td>1</td></tr></table>	1							
1									
(MICRO-1, SMALL-2, MEDIUM-3)***	<table border="1"><tr><td>3</td></tr></table>	3							
3									
PRODUCTS	CAPACITY	DATE OF PRODUCTION							

As per Annexure A enclosed.

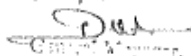
NUMBER

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(First two boxes are for State/Union Territory code, next three boxes are for District code, sixth and seventh boxes are for category of enterprises (sixth box for indicating manufacturing or services and seventh box for indicating micro or small or medium) and last five boxes are for Entrepreneurs Memorandum number)

नोट - भारत सरकार द्वारा लघु एवं मध्यम उद्यम विकास अधिनियम 10/1980
2006 अनुसार पूर्व में जारी एम.एन. प्रमाण पत्र क्र. 10/16/04879

DATE: 30-3-2007 दि. 20-12-97 के अन्तर्गत अधिष्ठापित जारी किया।
PLACE: INDORE.


Signature
WITH OFFICE SEAL



ANNEXURE-A

Registration No.10/16/048/PMT/SSI dated 20.12.1987

S. No.	Name of Item	Annual Capacity		Date of commencement of production	Remarks
		Existing	Expanded		
1.	Water control equipment like C.I. & M.S. Sluice Gate, Penstock Gates, Regulator, Emergency & Radial Gates with manual & electrical hoisting equipments etc.	300 M.T.	450 M.T.	20.08.1988	
2.	Precision Surface Equipments like Surface Plate, Angle Plate, Straight Gages, M.S. & C.I. Floor Plates, Bending Plates, Welding Tables, Granite Surface Plates etc.	200 M.T.	300 M.T.	20.08.1988	
3.	Paper Plant Machine	75 M.T.	75 M.T.	20.08.1988	
4.	Electric & Manual Cranes hoisting & handling equipments, Job work	-	5,00,000/-	20.08.1988	
5.	Machine Tools & Accessories Like Metrological & Inspection machines, Tools and Instruments like multi axis, Co-ordinate measuring machine, layout (marking) machine etc.	100 M.T.	100 M.T. 100 M.T.	20.08.1988 30.05.1991	Amended (1 st) on 30.05.1991
6.	Valves Like Butterfly Valves, Sluice Valves, Swing Valves, Knife Gate Valves, Slide Gate Valves, Double Flap Valve, Deviator Valves, Rotary Valve.		500 Nos.	20.12.1993	Amended (2 nd) inclusion of new products on 27.01.1994
7.	Valve Components Valve components of above all valves Change in name from "M/S JASH ENGINEERING (P) LTD.," to "M/S JASH ENGINEERING LTD."		5000 Nos.	20.12.1993	
	Stainless Steels				Amended (3 rd) on 29.04.1995
9.	Stainless Steel Gates		50 Nos.	10.12.1995	Amended (4 th) Products on 22.05.1998
10.	Fibre Re-inforced Plastic Gates		100 Nos.	31.12.1995	
11.	Aluminium Gates		225 Nos.	01.07.1997	
12.	Grey Iron Casting		1200 M.T.	01.11.1981	Amended (5 th) on 29.11.2000 As a result of Amalgamation of existing industry M/s H.G. Casting of Partnership firm with M/s Jash Engineering Ltd. effective from 30.11.98
13.	Alloy Iron Casting		600 M.T.	01.11.1981	

Annexure 2: Budgetary offers / quotations

Quotation - 1: Oritech Solutions



April 14, 2018
Jash Engineering Ltd.
Indore
M. 7869962233
Email.: sangram@jashindia.com

Kind Attn.: Mr. Sangram Patil.

SUBJECT: Offer for 550 kW/ 2000 Kg IGBT based INDUCTION MELTING FURNACE.

Dear Sir,

This is in connection to your requirement of Induction Melting Furnace.

Please find our offer No.: OTM/1551_R1/1718 for 550 KW/500 Hz IGBT based Induction Power Source with DM Water Circulation Unit, Hydraulic Unit, one no of 2000Kg aluminum frame box type melting furnace with built in Tank capacitor bank..

We are also attaching a brief introduction about *ORITECH solutions*, our *Product Range* and the *Technology we Implement*.

We look forward to associate further with your company.
For any further information/details, please feel free to contact us.

Thanking you,

Yours faithfully,

for **ORITECH** solutions

Shailesh Patel
DIRECTOR
Mb: 0 93747 64116

Qtn. No. : OTM/1551_R1/1718 Jash Engineering Ltd.
 Date: 14 April., 2018 Indore
 Page: 2 of 10



QUOTATION

Sr.No.	Description	Qty.	Price (Rs. In Lakh)
1.	550 kW / 500Hz IGBT Based Solid State Power Source. <ul style="list-style-type: none"> • 550 kW Solid State Medium Frequency IGBT Power Source. • Programmable Logic Controller with 7.0" Colour Touch screen HMI. • Energy Meter with Ethernet Communication. • Earth Leakage and Water Conductivity Monitoring System. • Wiring Drawings and water circuit diagrams. 	1 No.	33.50
2.	Auxiliaries: <ul style="list-style-type: none"> • D. M. Water circulation unit complete with non-Ferrous pump, Plate type Heat Exchanger and D.M. Resin Cylinder. • Hydraulic Power Pack with motor - gear pump, direction control valves, mounting stand and Hydraulic Pipes and fittings etc. 	1 set	
3	Intelligent power and load Manager. <ul style="list-style-type: none"> • Active Load Controller with Auto Power Control circuit. • Additional Programmable Logic Controller Module. • One No. Additional Energy Meter with Ethernet Communication. • Enclosure with 96 x 96 cutout for Energy Meter, with internal wiring and Fuse Protection. 	1 unit	
4.	2000 kg Aluminum Frame box type Melting Furnace. <ul style="list-style-type: none"> • One No. of 2000 kg Aluminum frame melting furnace. • Medium Frequency Tank Capacitor bank. • Copper Bus-bars / Cables from Power Source Panel to Melting Furnace. • Manually swing type Top lid to reduce radiation losses. • One set of Inlet and Outlet manifolds, Magnetic Flow switches, Valves, Temperature and Pressure Gauges. • Furnace Erection materials consisting of Carbon Free Rubber hoses, fastener, fittings, etc 	01 Nos	
5.	Separate Plate type heat exchanger for coil DM water cooling. (Closed Loop water circuit)	1 No	
Rs. 33.50 Lakh ONLY			
RUPEES THIRTY THREE LAKH AND FIFTY THOUSAND ONLY			

TERMS AND CONDITIONS

1. Price : Ex our Ahmedabad works.
2. Packing : At actual special for wooden box packing.
3. Validity : 30 days from the date of this Quotation.
4. GST : 18% Or as applicable at the time of dispatch.
5. Other Levis / Taxes : As applicable at the time of dispatch, to your account.
6. Freight with Transit Insurance : At actual, to your account.
7. Delivery Period : 14-16 week after receipt of Techno-Commercial confirmed Purchase Order and Advance payment.
8. Payment Terms : 40% advance Along with PO and balance before dispatch.
9. Warranty : 12 months from the date of Commissioning or 15 months from the date of Dispatch whichever is earlier.

B/2-3, Sarthi Comp. & Estate, Opp. Gujarat Vahepari Maha Mandal (GVMM),
 Odhav, Ahmedabad – 382 415 (INDIA)
 Ph: +91-79-32957055, Tele-fax: +91-79-22901350 | E-mail: info@oritech.in | web: www.oritech.in



Vendor List

Sr. No.	Description	Vendor
1.	HRC FUSE	BUSSMAN / FERRAZ
2.	THYRISTOR (CONVERTER)	WESTCODE / PROTON / RUTTONSHA
3.	IGBT	INFINEON / FUJI / MITSUBISHI / ABB
4.	DC LINK CAPACITOR	ALCON /ELECTRONICON / DUCATI
5.	FREE WHEEL DIODE	WESTCODE / PROTON / RUTTONSHA
6.	SNUBBER CAPACITOR	ARCOTRONICS / ELECTRONICON
7.	WATER COOLED RESISTOR	ARCOL / KIYOSH / SURE
8.	MEDIUM FREQUENCY CAPACITOR	YESHA/ RECTIPHASE
9.	NON-FERROUS PUMP	UK INDUSTRIES / AJAY INDUSTRIES
10.	HYDRAULIC GEAR PUMP	REXROTH/ DOWTY/ YUKEN
11.	DIRECTOR CONTROL VALVE	WALVOIL/ REXROTH / POLYHYDRON / JACKTECH
12.	HIGH PRESSURE FLEXIBLE HOSE	MARKWEL/ GATES
13.	PRESSURE RELIEF VALVE	WALVOIL / REXROTH / POLYHYDRON / JACKTECH
14.	STRAINER / FILTER	JACKTECH
15.	FURNACE TRANSFORMER	MPT / T & R
16.	PLATE TYPE HEAT EXCHANGER PLATES	ALFA LAVAL / TRANTER / GEA .
17.	CARBON FREE RUBBER HOSE	GATES
18.	HHT HOSE	GATES
19.	PE PIPE	LEGRIS / CDC

TECHNICAL SPECIFICATIONS

Sr. No.	Description	Specifications
1.	Rated Input Power	550 kW
2.	Input KVA to MFPS.	558 kVA
3.	Input Power factor (pf) at MFPS at any load conditions	Above 0.985
4.	Power Supply Input Voltage <i>(± 5% variation in voltage is permissible)</i>	570 Volts
5.	Output Frequency Range	500-750 Hz
Operational Parameters for Melting operation		
6.	Holding capacity of furnace	2000kg
7.	Metal To be melted	CI
8.	Pouring Temperature deg. Cent.	1450
9.	Power applied for melting KW	550
10.	Melt rate @ rated capacity (+/- 3%) Kg/Hr.	1028
11.	Typical Energy consumption KWh/T (+/- 3%)	535
12.	Average melting time @ 95% utilization, Minutes.	120-122 MIN
Operational Parameters for Duplexing operation		
13.	Holding capacity of furnace	2000 Kg
14.	Metal To be melted	CI
15.	Inlet temperature from cupola in deg. Cent.	1300 °C
16.	Final temperature from Furnace	1520 °C
17.	Power applied	550KW
18.	Total temperature rise required	220 °C
19.	Time required for temperature rise	30 min.
20.	Total Energy consumed for this temperature rise. For 2T Metal.	270 KWh
21.	Energy consumed for temperature rise in KWh/T	135
D.M. WATER CIRCULATION UNIT		
22.	Flow rate of DM water for Power source and Capacitor bank	175 LPM
23.	Tank Capacity	150 LTRs
24.	Nominal Working Pressure Kg/ cm ²	4-5 Kg/ cm ²
25.	Min. and Max. Inlet Temperature to power source °C	25 -40 °C
26.	D. M. Water Quality	< 10 micro siemens
27.	Heat Exchanger type	S.S. Plate type

Above energy consumption is valid for, furnace lined with recommended sized formar, furnace in hot condition, clean and sized (99% yield and shredded) scrap

with minimum bulk density of 1000-1500 Kgs/m³(@ Charging rate of 25 Kgs/Minutes) , good working conditions, proper feeding, no superheating, alloy addition and holding delays and furnace must be running at full load.

Please note that slag will consume electricity @ of 1100KWh/T.

Extra features of the IGBT based Induction melting system

- Most advanced and efficient IGBT Inverter design. NO IGBT Chopper.
- No Series(Voltage fed) Or Parallel (Current fed) inverter but Indigenously developed unique Hybrid (Voltage fed parallel tank) design.
- Maintains Output power with wide variation in input voltage.
- Max. demand controller gives same production even with up to 30- 40% lower sanctioned load for auxiliaries.
- 7" colour touch screen HMI with following specification.
 - Display with 65536 colour, resolution 800x480 pixels, MCU 32 bit RISC micro controller, Flash ROM 128MB, 64MB SDRAM, Backup memory 16 MB, 01 nos USB client Ver 1.1,)3 nos com port.
- Max. Up to 10 years of Storage facility of data like KWh consumed, daily/ shift wise production report, tripping log ETC.
- Automatic Sintering facility for upto 99 type of different sintering pattern.
- Data can be saved to USB pen drive and further printed in to MS- Excel format.
- Online interlock and tripping navigation facilities with description and photographs for easy diagnostic of fault.
- *Ethernet connectivity to access system from anywhere in the world.*
- *No Separate Load Manager, Power Optimizer OR power factor correction/ harmonic filter bank required.*

Customer's Scope of Work, Supply and Services

Civil and Structural Work

1. Design and execution of entire civil and structural work for steel melt shop, scrap yard; water complex (underground soft and raw water tanks, overhead emergency water tanks, service tank); stores and office buildings; civil work related with foundations and platforms for induction furnace, transformer and all other machinery; rooms for workshop, hydraulic, compressor, laboratory, electrical system; anchors and bolts and wall embedment for all machinery foundation; earthing pits including coal and salt for filling for all machinery; HVAC system for the plant; and plant lighting.
We will be providing General Arrangement drawing with component placement with loading conditions, detailed civil design has to be arranged by customer based on the details provided and, and the detailed design has to be sent to us for approval.

Electrical Equipment

2. 600 KVA, 3Ph, 50Hz, 11Kv/0.570 Kv, DYn11 Rectifier duty furnace Transformer.
3. Auxiliary Transformer.
4. Switch Gear with CT and PT for furnace transformers and Auxiliary Transformer input of 11KV.
5. Bus Duct between Furnace Transformer and MFPS.

6. HT cable from plant main input to furnace Transformer input and Auxiliary Transformer, of adequate rating.
7. 415V,3 Ph, 50 Hz supply for auxiliary loads like pumps, motors, cooling towers, hydraulic system, etc. up to respective load points.
8. Communication cable between plant main input to melting furnace power supply unit for Max. Demand controller.
9. Emergency power supply through DG set in case of main power failure.
10. Circuit breaker with CT and PTs for main plant input for Intelligent Load Management system.
11. All types of MV cables and LV cables.
12. Power distribution board, LV control panels and motor control centers for all electrical load of the plant **including for all loads related with Induction Furnaces** like pumps & motors, cooling towers, hydraulic systems etc.
13. DSL for EOT cranes.
14. Earthing with required material for all the equipments, as per local norms.
15. Cable tray and conduits for the entire plant wiring.
16. LT Circuit breakers for all the water circulating pumps, Hydraulic power pack

Water Cooling System

17. All types of water pipes & fittings, valves gauges etc. for furnace cooling as per drawing given by us.
18. Water circulating pumps for furnace coil water circulation.
19. Water circulating pumps for Power source DM water cooling water circulation.
20. Water circulating pumps and plate type heat exchanger for furnace secondary water circulation in case of closed loop water circuit option.
21. Cooling tower.
22. Water treatment plant to maintain Hardness of Furnace coil cooling water to below 20 PPM.
23. Over head water tank (minimum 50 KL) with filling pump. (only if stand-by power to water filling pumps restores within 30 minutes of power failure. Otherwise 100KL)

Hydraulic circuit

24. Laying fitting and welding of hydraulic lines as per drawing given by us. Hydraulic pipes and fittings are supplies by us.

25. First filling of hydraulic oil in hydraulic power pack (600 Ltrs).

Laboratory Setup and Temperature Measuring Devices

26. Chemical, physical, mechanical and metallurgical laboratory including spectrometer.

27. Temperature measuring instruments.

Material Handling System for Scrap, Liquid Metal and Billets

28. Material handling equipment viz. EOT cranes, magnets, scrap charging buckets, scrap charging vibratory cars, slag pots, ladles, lifting beams, slide gates, ladle pre-heating system, ladle cars, etc. for plant operation.

29. Scrap preparation equipment like hydraulic bundling press and scrap shearing / shredding equipment; mobile equipment like dumper, mobile crane, pay loader; scrap handling equipment like crane, electromagnet and hydraulic grab in the scrap yard for unloading, preparation and transfer of scrap from yard to SMS bay.

30. Weigh bridge and weigh scales.

Casting Facility

31. Complete billet / Ingot casting facilities.

Pollution Control System

32. Complete air pollution control system / fume extraction system to meet local / international norms, and suitable dust disposal system.

Workshop and Refractory Lining Devises

33. Complete workshop machinery including plate bending machine, plate cutting machine, welding machine etc.

34. Tools & tackles for breaking and ramming furnace refractory lining.

Erection Facility

35. Necessary material handling equipment, tools & tackles required for placement, erection, testing and commissioning of the plant and machinery.

36. All utilities and consumables viz. electric power, water, oxygen, natural gas, welding machines and welding electrodes and all other material required for erection, testing and commissioning of the plant.

Manpower

37. Skilled and unskilled workmen necessary for erection and commissioning of the equipment and subsequently for operation and maintenance of the plant. This includes qualified engineers and technicians – civil, electrical / electronics, mechanical, metallurgical, industrial etc.



Raw Materials and Consumables

38. All types of consumables including first fills, viz. refractory for Induction Furnace, Melting form as per dimensions given, hydraulic oil, diesel / liquid fuel, grease and lubricants, chemicals for laboratory, temperature measuring tips, storage facility for all gases (argon / inert gas, natural gas, acetylene, oxygen) and liquid fuels (diesel, furnace oil) and pipeline up to take off point to deliver fluid at requisite pressure.
39. Raw materials viz. scrap, ferroalloys and fluxes etc. for operation of the plant.

Safety Equipment and Communication System

40. Plant safety equipment including fire detection and extinguishing system and safety gadgets for operating personnel. All types of communication system in the plant and shops.

Statutory Requirement

41. Visa, necessary work permit and medical insurance policy for all expatriate personnel necessary for supervision of erection and commissioning of the equipment.
42. All necessary approval from the local authorities for construction, erection, testing, commissioning and operation of the plant.
43. All other work / items / equipments / tackles which are not specifically mentioned but are required for installation and operation of the plant.

OTHER TERMS & CONDITIONS

Installation & Commissioning:

Total Installation will be done by customer as per drawings submitted by us. However if required we can provide our Representative on per day charge bases. After completion of erection work and making all other necessary arrangements for start-up like power, water, manpower raw materials etc, we will depute our representative for commissioning. During commissioning, you will provide necessary skilled and unskilled work force with tools and tackles to our engineers. We will provide you assistance of our engineers for a maximum of 03 **working days** at your end. This period is sufficient for commissioning of the above equipment and in case the number of working days exceeds, extra commissioning charge of Rs. 6000/- will be charged per day / engineer. In addition, you will arrange boarding and lodging, to & fro fare, conveyance and any other incidental expenses during Installation and commissioning or the same will have to be paid by you at actual as applicable.

Any third party inspection and testing required during erection and commissioning will be arranged by the customer. All expenses regarding testing & inspection will be borne by the customer. If any approvals, work permits, insurance coverage, etc. are needed to be procured from the local governing bodies or as per the local statutes, then the same will be arranged by the buyer.

Qtn. No.: OTM/1551_R1/1718 Jash Engineering Ltd.
Date: 14 April., 2018 Indore
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Inspection:

Cost of any pre-shipment inspection needed by customer done at our end or our supplier's end, has to done by customer. We will test the equipment at our end or at our supplier's end as per our testing procedure only. Test certificate will be issued as per our formats and procedure only.

Warranty:

The equipment is guaranteed for 12 months from the date of commissioning or 15 months from the date of dispatch, whichever is earlier. It should be clearly understood that this guarantee is against any manufacturing/ design defects, if any. The warranty does not extend to components like fuses, thyristors, IGBTs, capacitors, etc. and consumables such as refractory, hydraulic oil, rubber/ plastic parts. However all the control cards are guaranteed for above mentioned time period. Our liability is only limited to repairing the equipment or replacing any defective control card which is been supplied by us, but does not extend to any incidental or consequential damages.

This warranty is valid only if

1. The equipment is commissioned and serviced by our engineer,
2. The equipment is used as per our guidelines and
3. You use genuine spare parts supplied by us.

The warranty may elapse if the customer is found to be using components from any other sources or manufactured by himself without our express written permission or has tampered any of the settings of the system. Further the warranty will not cover any failure arising out of improper operation, maintenance negligence, heavy voltage fluctuation, erratic supply voltage or any accident.

After Sales Service:

It is suggested that the buyer employ's well trained maintenance staff capable of carrying out all routine maintenance jobs themselves as per our instructions. After sales services will be provided by our representative without any service charges during warranty period and on chargeable basis thereafter, depending on availability. However, in both the cases actual expenses like traveling, lodging boarding, etc will be borne by the customer.

Price Escalation

The prices quoted is based on the current price of raw-materials like Steel, Copper, Stamping, etc. and major components like capacitors, thyristors etc. Any major escalation in the price of the above items will alter the equipment price if delivery time will prolonged by customer beyond 3 months from committed time.

Delayed Payment

Delayed payment will accordingly delay the delivery of equipment. Further interest @ 15% per annum will be charged on the amount of delayed payment after a grace period of 30 days.

Termination:

If the purchaser terminates the order after placing his order, the purchaser shall reimburse the seller all costs including materials purchased and committed, direct and



indirect labor, manufacturing and engineering costs. In no case, the termination charges will be less than 30% of the purchase order. *All legal disputes subject to Ahmadabad Jurisdiction.*

Arbitration

Any dispute arising regarding the contract shall be referred to two arbitrators, one to be appointed by either party. The arbitrators shall, before proceeding with the arbitration nominate an umpire. For the time being the umpire will be nominated by the president of Gujarat Chamber of Commerce. The arbitration will be held in Ahmedabad and in accordance with the provision of Indian Arbitration Act 1940 and/or any act substituting statutory modification thereof.

Force Majeure Clause:

The delivery schedule as mentioned by us is subject to Force Majeure Clause. The Force Majeure conditions would mean delay in delivery commitment due to:

1. Civil wars or hostilities whether declared or not.
2. Riot or civil commotion.
3. Earthquake, flood, fire or natural disasters.
4. Load shedding or power breakdown or disruption in water supply due to reasons beyond our reasonable controls.

The delivery period as offered by us shall automatically get extended by the period of delay occurred due to any of the factors mentioned above or any other factors which may influence delivery period.

Jurisdiction

All disputes are subject to Indian laws and are covered by Ahmadabad, India Jurisdiction.

Modifications

Neither this offer nor any provisions of this offer can be changed, modified, waived, discharged orally but only by an instrument in writing agreed by both the parties against which enforcement of the change, modification, waiver, discharge is sought

for **ORITECH** solutions

Shailesh Patel.

DIRECTOR
93747 64116

Quotation – 2: Inductotherm India Pvt Ltd.



Inductotherm (India) Pvt. Ltd.
Plot No. SM - 6, Road No. 11
Sanand-II Industrial Estate,
BOL Village, Sanand,
Ahmedabad - 382 170, India.
CIN No. U29120GJ1982PTC005739

Tel: +91.2717.62.1000
Fax: +91.2717.62.1111
Toll Free No: 1800.419.2900
iil@inductothermindia.com
www.inductothermindia.com

To,
M/s. Jash Engineering Ltd.
Plot - 31, Sector 'C'
Industrial Area, Sanwer Road
Indore
Madhya Pradesh, India

Kind Attn.: Mr. L D Amin
Mob: 09755416000
Email: lda@jashindia.com

Sub: Your Requirement of Induction Melting Furnace

Dear Sir,

This is in reference to your discussions with undersigned in connection with your requirement of Medium Frequency Induction Melting Furnace. We really appreciate your interest in Inductotherm Induction Melting Furnace.

As per your discussion, we are pleased to enclose herewith following quotation for your perusal:

- Quotation for ONE [1] NO. 550 KW/500 HZ VIP POWER TRAK-R-PI WITH ONE [1] NO. 2000 KG DURALINE FURNACE.

We are also enclosing herewith technical specification sheet, scope of supply, standard terms & conditions and relevant literatures.

Hope our offer is in line with your requirement. If you need any further information/assistance from our side, please feel free to contact undersigned or our **Mr. Tarun Sangal, General Manager (Capital Sales), (Cell # 09377673760)**.

Thanking you,

Sincerely,

NISHANT SINGH
AREA SALES HEAD
Cell: 09375226751

Encl: Quotation consists of price sheet, technical specification, bulletins, standard terms & conditions (TAC-03).



QAHD112407 /2 Dated: November 22, 2017
JASH ENGINEERING LTD.

GIVING OUR CUSTOMERS THE COMPETITIVE
EDGE SINCE 1953, **UNINTERRUPTED**

TECHNICAL SPECIFICATIONS			
550 KW/500 Hz VIP POWER TRAK-R-PI			
A. APPLICATION REQUIREMENTS			
1.	Alloy to be melted	Steel	Iron
2.	Melt temperature	1650°C	1480°C
B. CHARACTERISTICS OF RECOMMENDED POWER UNIT			
1.	Rated KW	550 KW	
2.	Maximum KW	550 KW	
3.	Nominal Furnace Frequency	500 Hz	
4.	Line Power Factor	0.95 and above	
5.	KVA required at input of VIP Power Trak-R	610 KVA on load	
6.	Melt Rate at 550 KW **	1025 Kg/hour – Steel 1125 Kg/hour – Iron	
7.	Power Connection	575 V, 3 Phase, 50 Hz	
C. CHARACTERISTICS OF RECOMMENDED MELTING FURNACE			
1.	Nominal capacity (Steel Capacity)	2000 KG	
2.	Style of Furnace	DURALINE	
3.	Pouring Mechanism	Hydraulic tilt	
4.	Furnace Lining (Recommended - to be provided by the customer)	Silica..... Iron Mgo..... Steel	
<p>** The above melt rate is based on a nominal furnace size for second heat when lining is hot, charge is dense and bus runs proper. The voltage should be steady within allowable range. Cooling water should be as per our specification. Melt rates will be for the weight of charge and does not include time for initial charging, pouring, superheating, deslagging or chemical analysis. Please note that slag consumes nearly double the power.</p>			



QAHD112407 /2 Dated: November 22, 2017
JASH ENGINEERING LTD.

GIVING OUR CUSTOMERS THE COMPETITIVE
EDGE SINCE 1953, **UNINTERRUPTED**

PRICING

550 KW/500 Hz VIP POWER TRAK-R-PI		
A.	<u>POWER UNIT</u> One [1] No. 550 KW/500 Hz VIP POWER TRAK-R-PI POWER AND CONTROL SYSTEM with internal water circulating system and hydraulic power supply unit.	Rs.29,25,000/-
B.	<u>MELTING FURNACE</u> One [1] No. 2000 KG DURALINE FURNACE with hydraulic tilting arrangement, water cooled leads and interconnecting arrangement. (Without lid).	Rs.15,50,000/-

All the above quoted prices are ex-works, Sanand (Ahmedabad). They do not include any applicable taxes. Packing, Forwarding and Insurance charges will be extra.

Presently **SGST @ 9% & CGST @ 9%** are applicable on Induction Furnace. However taxes ruling at the time of delivery will be applicable.

The quoted prices are strictly valid for Thirty (30) days. Thereafter, you have to obtain fresh quotation. The quoted prices are valid only if the equipment is to be installed and commissioned in India by Inductotherm (India) Pvt. Ltd.

Delivery will be within Two [2] to Three [3] months. Other terms and conditions are as per the enclosed Standard Terms and Conditions (Bulletin No. TAC-03).

For INDUCTOTHERM (INDIA) PVT. LTD.

NISHANT SINGH
AREA SALES HEAD



QAHD112407 /2 Dated: November 22, 2017
JASH ENGINEERING LTD.

GIVING OUR CUSTOMERS THE COMPETITIVE
EDGE SINCE 1953, **UNINTERRUPTED**

Annexure 3: 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%
Infrared thermometer	Testo: 845, Comark: KM848	Surface Temperature	±0.75% of mv