THERMOTECH SYSTEMS LIMITED

An ISO 9001, 14001 & 45001 Company

PROPOSAL DESCRIPTION	
System	Thermic Fluid Heater
Capacity	1.5 MM Kcal/Hr.
Model	TSCV-1500-Split (Pulsating Grate)
Fuel	Biomass Briquettes / Imported Coal – Auto Feeding
Industry	
Proposal No.	TSL/2122/Q21465, Rev. 02
Proposal Date	21-04-2022

CUSTOMER DETAILS	
Company Name	Indo Amines Ltd.
Location	Mumbai
Enquiry Ref. No.	--
Contact Person & Designation	Mr. Samir Jadhav
Phone **Email**	+91-7507490346 projects1@indoaminesltd.com/projects@indoaminesltd.com

SUPPLIER DETAILS	
Company Name	Thermotech Systems Limited
Correspondence Details	Plot No. 2607-08, Phase-4, GIDC Vatva, Ahmedabad – 382 445, Gujarat, India.
Phone **Email**	+91-90164 24722 sales@thermotechsystems.com
Website	www.thermotechsystems.com
Corporate Video	YouTube Ctrl + Click to follow link)




THINK OF FUEL ECONOMY: THINK OF THERMOTECH

Dear Customer,

We, at Thermotech Systems Ltd., are pleased to submit our Techno-commercial Proposal of Thermic Fluid Heating System in aforementioned project.

After understanding the technical requirements of the project, we propose 1 No. x Thermic Fluid Heater of 1.5 Million Kcal/hr. capacity suitable for Biomass Briquettes / Imported Coal as a fuel.

Based on the enquiry documents provided, we have enclosed our detailed Techno-Commercial Proposal for design, procurement, manufacturing, Inspection, testing & supply of Thermic Fluid Heating System (TFH) as per scope mentioned in proposal.

We hope that you will find our offer in line with your requirements. In case you need any additional information/support, we shall be pleased to furnish the same.

We look forward to have a further discussion with you on this subject.

Thanking you & assuring you our best services at all times,

Yours faithfully,
THERMOTECH SYSTEMS LTD.

TABLE OF CONTENT

REVISION HISTORY

Rev. No.	Date	Changes	Page No.	Requested By
01	19-03-2022	Revisions marked with "Blue"	--	Client
02	21-04-2022	Revisions marked with "Blue".	--	Client

1. COMPANY BRIEF

- **THERMOTECH SYSTEMS LIMITED (TSL)** is an Internationally Renowned Eco-Energy company hailing from India
- Began its operation in 1988 & has established its rock solid foothold in fabricating cutting edge industrial process heating equipment & systems for wide scope of industries.
- Served more than ***3,200 industries in India & Abroad*** & numbers are increasing every day.
- An ***ISO 9001 – 2015, 45001 – 2018, 14001 – 2015*** company with quality, delivery & performance commitment.
- Manufacturing space of 4,800 Sq. Yard + 2,400 Sq. Yard with 20 Mtrs. Height shed
- Manufacturing Infrastructure of delivering 300 Tons per Month
- 200 + Strong Team Members
- State of Art Manufacturing with major TPI clearance like BVIL, SGS, TPL, TUV, L&T, TPL etc.
- Well experienced team backed by Engineering Consultants for smooth project execution

MAJOR CLIENTELE

SHELL, PETROFAC, CAIRN, OIL, L&T, RELIANCE, BASF, IFFCO, TOYO, INEOS, ADANI, THRUMAILAI CHEMICALS, GODREJ GROUP, VVF, ANSELL, HALEYS, RAYMONDS, RECKITT BENKISER, BALAJI WAFFERS, UFLEX LTD., FORBES MARSHALL, DNO MIDDLE EAST, GPS, FINLAYS, EMAMI, MULTITEX & MANY MORE…

MAJOR PRODUCT RANGE

1. **THERMIC FLUID HEATER (DIN 4754)**
2. **FIRED HEATER (API 560)**
3. **HOT WATER GENERATOR**
4. **HOT AIR GENERATOR**
5. **WATER BATH HEATER (API 12K)**

FUEL:
SOLID (COAL, BIO-MASS, AGRO WASTE etc.)
LIQUID (FO, LDO, HAS, CRUDE OIL etc.)
GAS (LPG, FUEL GAS, H_2, OFF-GAS etc.)
CAPACITY: Up to 30MM Kcal/hr.





2. TECHNICAL SPECIFICATION

BASIC CONFIGURATION				
1.	Heat Energy Output	kcal/hr.	15,00,000	
2.	Model	--	TSCV 1500	
3.	Type	--	Vertical – 4 Pass system	
4.	Fuel Type	--	Biomass Briquettes	Indonesian Coal
5.	Fuel Size	--	≤ 40 mm Dia.	≤ 6-20 mm
6.	Mode of Feeding	--	Auto through Fuel Feeders	
7.	Ash Collection	--	• Manual through Furnace Bottom, CC & APH • Auto through Rotary Airlock Valve –DC.	
OPERATING & DESIGN PARAMETERS				
1.	TF Outlet Temperature (Operating)	°C	300	
2.	TF Temperature Difference	°C	27 (Max.)	
3.	Flow Rate (Operating)	m^3/hr.	120	
4.	Pressure Available at Heater Outlet (1)	mlc	30	
5.	TF Pressure (Operating / Design)	kg/cm^2(g)	4 / 8	
6.	Flue Gas Outlet (Stack) Temperature	°C	180 ± 20	
7.	Efficiency at Full Load as per BS 845: NCV Basis	%	Bio. Briquettes 82 ± 1	Imp. Coal 86 ± 1
8.	Expansion Tank Capacity / Holdup Estimated (2)	m^3	2.0 / 5.0	
9.	Expansion Tank Temperature	°C	< 75	
10.	Outlet Emission with DC: Biomass / Coal	mg/nm^3	350 / 1200	
11.	Outlet Emission with Bag Filter: Biomass / Coal	mg/nm^3	< 150 (Optional 100)	

HEAT EXCHANGER (COILS)			
1.	Heat Energy Output	kcal/hr.	15,00,000
2.	Heat Exchanger Coil Tube Material (MOC) (3)	--	Boiler Tube: BS 3059 Part – 1 ERW Gr.320 (3.66 mm Thickness)
3.	Type of HE Coil Structure	--	Series
4.	Heat Transfer Area	m^2	145
5.	Heat Flux	kcal/hr-m^2	10,345
6.	Coil Volume (Hold Up Capacity)	m^3	2.26
7.	TF residence time	Seconds	87
THERMIC FLUID CIRCULATING PUMP – SINGLE MECHANICAL SEAL PUMPS (1W + 1S)			
1.	Type	--	C.S. Body, Centrifugal, Air-Cooled
2.	Flow (Capacity)	m^3/hr	120
3.	Head	mlc	52
4.	Motor	KW	30
5.	Type/RPM	--	Centrifugal, Direct Coupled, 2880 RPM x IE2 TEFC
INDUCED DRAFT (ID) FAN SUITABLE TO BE OPERATED WITH DC ONLY			
1.	Flow	m^3/hr.	9,000
2.	Head (@ 20°C)	mmWC	450
3.	Motor	KW	15
4.	Type/RPM	--	Centrifugal, Direct Coupled, 1440 RPM x IE2 TEFC
FORCED DRAFT (FD) FAN			
1.	Flow	m^3/hr	5,400
2.	Head (@ 20°C)	mmWC	220
3.	Motor	KW	3.7
4.	Type/RPM	--	Centrifugal, Direct Coupled, 2880 RPM x IE2 TEFC

AIR PRE-HEATER (APH)			
1.	Type	--	Vertical Smoke Tube Type
2.	Heat Transfer Area	m^2	26
UTILITY CONSUMPTION			
1.	Connected Electric Load (With Bag filter)	kw	Upon request
2.	Connected Electric Load (Without Bag filter, Including Fuel Handling & S/B Pump)	kw	~105 (To be confirmed DDE)
3.	Primary Fuel: Biomass @ NCV – 2,390 Kcal/kg (4)	kg/hr.	770
4.	Primary Fuel: Indonesian Coal @ NCV – 4,975 Kcal/kg (4)	kg/hr.	360
5.	Compressed Air / Nitrogen	$kg/cm^2(g)$	4.5 – 6.5
SITE CONDITIONS (ASSUMED)			
1.	Ambient Temperature	°C	25
2.	Electric Power Supply		420 V / 50 Hz / 3 Ph.
3.	Control Power design		230 V / 50 Hz / 3 Ph.

NOTES:

(1) Outlet Pressure can be changes as per client process requirement, which will change power consumption of TF pump.

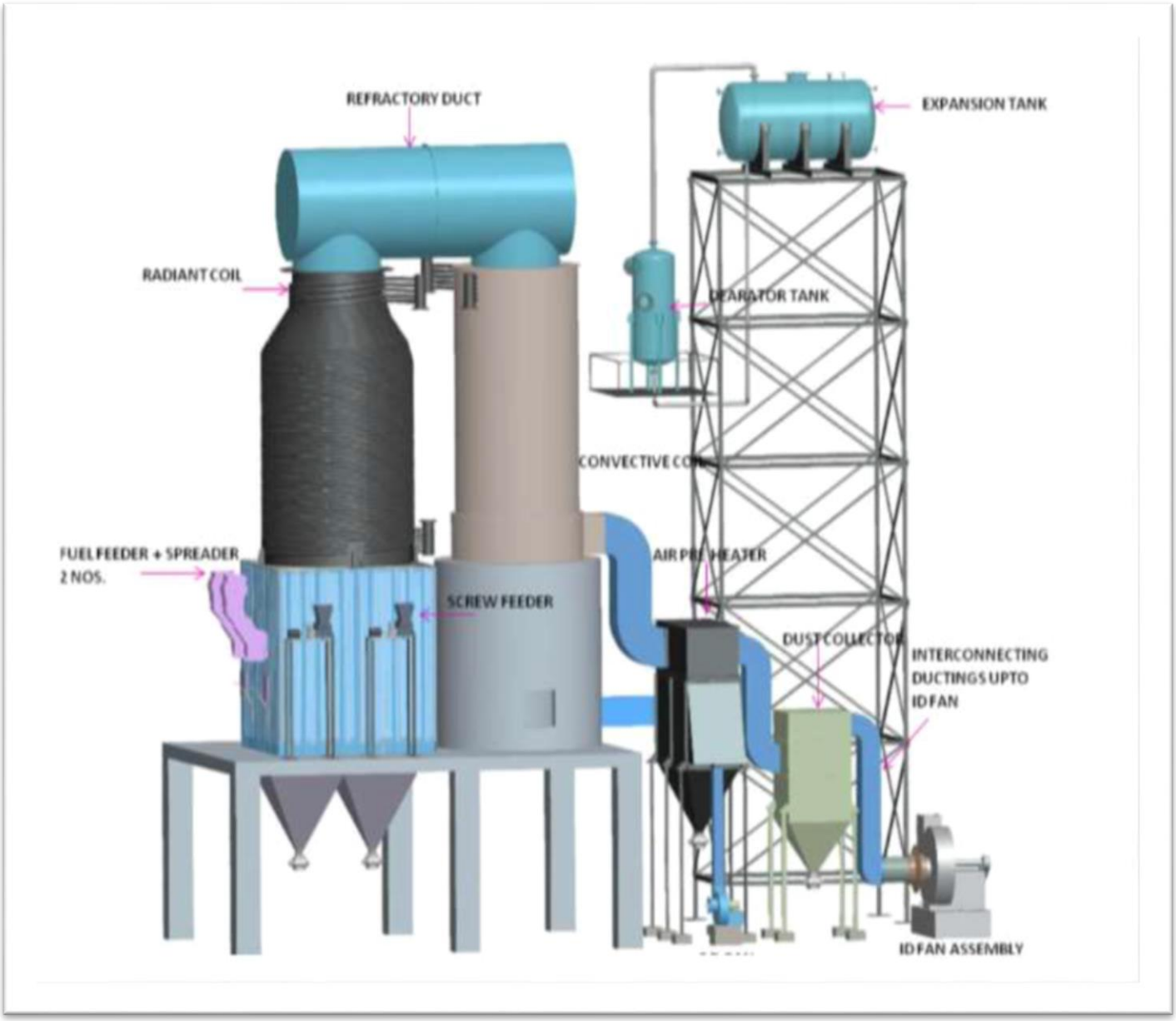
(2) Holdup estimation shall change as per client's piping & process equipment holdup. In case holdup is more than specified by us, Expansion tank capacity needs to be changed.

(3) Optional Coil MOC available are Seamless Tubes / Seamless Pipes as per client requirement.

(4) Fuel consumption varies as per actual fuel NCV.

(5) In view of constant R&D to improve the quality of products the technical specifications are subject to alterations without prior notice

3. SCOPE OF SUPPLY



TYPICAL LAYOUT OF THERMIC FLUID HEATER

NOTE:

Above representation of Thermic Fluid Heating System is only for understanding of customer. It may be possible that all parts shown may not be included in the scope of Thermotech Systems Ltd. (TSL). Please refer detailed scope of supply and scope matrix provide along with proposal for better understanding of scope of supply.

MANDATORY SCOPE OF SUPPLY

No.	EQUIPMENT DESCRIPTION	QTY.
1.	**FURNACE:** Furnace suitable for **Indonesian Coal/Biomass** as a fuel for combustion having Pulsating Grate bed assembly. The Pulsating Grate combustion type Furnace comprises of: • M.S. Structure of channel / angle as required • Pulsating Grate suitable for above listed fuels with side housing plates, spheroidal bearings, grate bar shafts, hydraulic power packs. • Fire inspection door & manual start-up doors	01 Set
2.	**FUEL FEEDING SYSTEM (OVERBED):** Pusher type Fuel Feeder mounted on Furnace for fuels listed above to be feeding in auto mode, comprising of: • Hydraulic Cylinders, Hydraulic Drive of suitable capacity with reverse and forward & forward mechanism for stroke adjustment between 50mm to 500mm and frequency of 7 to 15 per minute (to be adjusted during Commissioning as per Load).	01 Set
3.	**RADIANT HEAT EXCHANGER:** Single Helical Type Coil mounted directly over furnace for Maximum radiation heat absorption. Coil is Single Pass: • MOC: Tubes: BS 3059 ERW P-1 • Pneumatic Pressure test @ 10 Kg/cm2	01 Set
4.	**CONVECTIVE HEAT EXCHANGER (COIL WITH SHELL ASSEMBLY):** Twin Concentric Helical Type Coil mounted by side of Radiant Coil, where flue gas transfers heat in convection mode with Thermic fluid. The Coil is housed in Shell fabricated from M.S. Plates (IS 2062 Gr. A/B) with Top & Bottom shell refractory done. Coil is Three Pass: • MOC: Pipe / Tubes: BS 3059 ERW P-1 • Pneumatic Pressure test @ 10 Kg/cm2	01 Set
5.	**REFRACTORY DUCTING:** M.S. Plates (IS 2062 Gr. A/B) Fabricated (Refractory Duct connecting Radiant & Convective Heat Exchanger Coils with anchors inbuilt to hold refractory bricks & cement properly.	01 Set
6.	**AIR PRE-HEATER ASSEMBLY (APH):** APH is 2 pass smoke tube type heat exchanger, which preheats combustion air by hot flue gas coming from Convective Heat Exchanger assembly & thus increases overall TFH System efficiency by 4-6%. • APH pipes MOC = IS 3074 / BS 6323 • All construction of M.S. Plates (IS 2062 Gr. A/B), channel & angles	01 Set

No.	EQUIPMENT DESCRIPTION	QTY.
7.	**POLLUTION CONTROL EQUIPMENT (DUST COLLECTOR):** Multi Cyclone Type Dust collector is a pollution control equipment, which ensures ash removal from outlet flue gas. • MOC: M.S. Plates (IS 2062 Gr. A/B) • Hopper below Dust Collector for ash collection • RAV below hopper.	01 Set
8.	**INDUCED DRAFT (ID) FAN ASSEMBLY (SUITABLE FOR DC):** ID Fan assembly comprising of: • ID Fan with coupling, drive motor, pulley, belt drive assembly, coupling guard mounted on base frame. • MOC: M.S. Plates (IS 2062 Gr. A/B) • Motor : TEFC Induction type IE2 Efficiency : 1440 rpm	01 Set
9.	**VFD FOR ID FAN:** Variable Frequency Drive (VFD) provided for ID Fan operation to: • Start ID Fan in slow speed & make power saving in ON-OFF Operation of TFH. • Control ID Fan speed to modulate Flue Gas during Start-up & Operational mode for Power Saving & TFH Control in MODULATION Operation of TFH.	01 Set
10.	**FORCED DRAFT (FD) FAN ASSEMBLY:** Separate FD Fan assembly for Wood, comprising of: • FD Fan with coupling, drive motor, direct drive assembly, mounted on base frame. • FD Fan MOC: M.S. Plates (IS 2062 Gr. A/B) • Motor : TEFC Induction IE2 Efficiency : 2800 rpm	01 Set
11.	**VFD FOR FD FAN:** Variable Frequency Drive (VFD) provided for FD Fan operation to: • Start FD Fan in slow speed & make power saving in ON-OFF Operation of TFH. • Control FD Fan speed to modulate Combustion Air during Start-up & Operational mode for Power Saving & TFH Control in MODULATION Operation of TFH.	01 Set
12.	**THERMIC FLUID CIRCULATION PUMP & MOTOR ASSEMBLY (WORKING):** Thermic Fluid Circulation Pump assembly comprising of: • Centrifugal type circulating pump with motor assembly. • Pump is of Air Cooled type. • Motor: TEFC Induction IE2 Efficiency: 2800 rpm • Pump coupled with motor by pullout coupling, coupling guard & mounted on base frame assembly.	01 Set
13.	**THERMIC FLUID CIRCULATION PUMP & MOTOR ASSEMBLY (STANDBY):** Standby Thermic Fluid Circulation Pump assembly comprising of: • Same Specification of Working Thermic Pump with Motor Assembly. • Electrical Starter of same capacity with changeover arrangement	01 Set

No.	EQUIPMENT DESCRIPTION	QTY.
14.	**DIESEL ENGINE DRIVE (DED):** Diesel Engine Drive with Pulley arrangement is supplied to maintain minimum flow of Thermic Fluid inside Radiant & Convective coils in case of power failure in plant. Diesel Engine to be coupled with working Thermic Pump only.	01 Set
15.	**REFRACTORY MATERIAL SUPPLY WITH LINING LABOUR:** Material supply of Refractory for Furnace & Refractory Ducting: • Refractory Bricks, Insulation Bricks • Refractory Cement: Accoset 50, Fire Crate, Fire Clay etc. • Lining Labor: 2 Persons for Refractory lining of Furnace & Refractory Ducting at site. (Unskilled labors, Scaffolding, mixing vessel, etc. supply in Purchaser scope)	01 Set
16.	**INTERCONNECTING DUCTING:** All Interconnecting Ducting up to ID Fan Inlet for all services (Pre-Heated Combustion Air, Flue Gas, Fresh Air) supplied pre-fabricated: • MOC of Ducting: M.S. Plates (IS 2062 Gr. A/B)	01 Set
17.	**INSULATION MATERIAL SUPPLY with LINING LABOUR:** Supply Insulation Material with cladding for Furnace Internal, Radiant & Convective Coils: • MOC of Insulation: LRB (96 kg/m^3 Density or 128 kg/m^3 Density) • Cladding Material: Aluminum Cladding Sheet of 24 SWG thickness • Lining Labor: 2 Persons for Insulation lining of Furnace Internal, Radiant & Convective Coils. (Unskilled labors, Scaffolding, etc. supply in Purchaser scope)	01 Set
18.	**EXPANSION CUM DE-AERATION TANK:** Expansion Tank designed to withstand volumetric thermal expansion of Thermic Fluid at elevated temperatures. De-aeration Tank designed for removal of low boils, vapors & is connected with Expansion Tank: • MOC of Expansion & De-Aerator Tank: M.S. Plates (IS 2062 Gr. A/B) • Expansion Tank to be mounted at least +1.5m above the highest point of Thermic Oil Pipeline / Process Equipment. • Expansion Tank Capacity: 2 m^3 (Client to confirm)	01 Set
19.	**ELECTRICAL CONTROL PANEL (MCC + VFD + PLC)** Dust protected, powder coated, Pre-wired, Electrical & Control Panel supplied with necessary switchgears: • MCC Comprising of Contactors, Overload Relays, Isolation Switches etc. for all Motors. • Control Functions for Temperatures, pressure, level switch for coil etc. • Ampere and Volt meter – common complete panel • Panel shall be of IP42 Type, to be kept in Safe Area by client. • ID & FD fan shall be VFD operated. Dust protected, powder coated, Pre-wired, PLC Panel **(Non-redundant)** supplied with necessary configuration & Programming to Control TFH Operations. The Panel consist of:	01 Set

No.	EQUIPMENT DESCRIPTION	QTY.

	• Enclosure with CPU, Communication module & required I/O's as per system configuration. 15% spare capacity from designed I/O's.
	• HMI (9") for display & operation of all values, trends, data logger, etc. The HMI is capacitive touch screen type.
	• PLC shall be of Safe Area operation & suitable for IP52 Rating, to be kept in Air-Conditioned room by Client.
	• HMI will be displaying following values
	  ○ Heat Load
	  ○ Total Flow Rate of Thermic Fluid
	  ○ All Temperatures, Pressure & Level etc.
	  ○ Fault indicator messages
	  ○ Trend Analysis for all parameters
	  ○ Start / Stop of all motors etc.
	• PLC shall be compatible for onward communication with Client's DCS.	

20.	**FUEL STORAGE BUNKER:** Bunker (Live Bottom Type) with conical bottom suitable for storage of Fuel with sufficient fuel storage capacity. Bunker will be having level switches for measuring level of fuel inside bunker. • Fuel Size: ≤ 6-20 mm • Bunker Capacity: 22 m³ (Suitable for 8 Hrs. Storage, Client to Confirm) • Bunker bottom having Reclamation Screws (Size: 400 mm Dia., Motor: 2 HP per Screw)	01 Set

21.	**FUEL HANDLING SYSTEM:**
	Fuel Handling System consisting of Feed Hopper with Grizzly, Feed Belt Conveyor, Crusher, Product Bucket Elevator, Live Bottom Silo with Reclamation Screw, Control Panel etc.
	• Fuel Handling System Capacity: 3 Tons per hour
	  → Input Fuel Size: <50 mm (Client to confirm)
	  → Output Fuel Size: ≤ 6-8 mm
	• Feed Hopper with Grizzly
	  → Capacity: 0.5 m³
	  → Accessories: Manual Operated Slide Gate for Flow Control
	• Feed Belt Conveyor (BC-1)
	  → Type: 20° Troughing
	  → Take up: Screw Type
	  → Capacity: 3,000 kg/hr. (Operational)
	  → Belt Size: 500 mm (W)
	  → Motor: 3 HP
	• Knittle Crusher
	  → Capacity: 3,000 kg/hr. (Operational)
	  → Initial Feed Size: Up-to 50 mm
		01 Set

No.	EQUIPMENT DESCRIPTION	QTY.
	→ Product Size: 6-8 mm → Motor: 10 HP x 900 RPM • Product Bucket Elevator → Capacity: 3,000 kg/hr. (Operational) → Height: 16 Mtrs. (C/C Height) → Motor: 7.5 HP → Take up: Screw Type → Accessories: Feed Hopper, Discharge Chute, Drive Platform • Running Time of Fuel Handling System → 6-7 Hrs. / Day	
22.	**INTERNAL CABLING OF TFH SYSTEM:** **Loose Supply** of Electrical & Instrument Cabling along with its accessories from & up to our Control Panel, motors & instruments etc. within **heater room only**. Panel should be installed within 15 Mtrs. Radius of Heater Room. • Power Cable & its Accessories from MCC Panel to TFH's all Motors & Switches. • Instrumentation & Control Cables and its accessories from Panel to all Instruments of TFH. • All power cables shall be of copper / aluminum as per size requirement. • All Instrumentation cables to be screened and be Cu multi-strand. • Cable Trays shall be of GI – Perforated type • Main cable from Client's mains to TFH MCC Panel shall be in **Purchaser's scope.**	01 Set
23.	**HEATER ROOM PIPELINE & VALVES:** **Loose Supply** of Pipeline with all accessories (Valves, Fittings, Insulation Material and other accessories) for Heater Room: • Pipeline Material: ERW Pipe IS 1239 / 3589, "C" Class thickness • Total Length: 60 Mtrs. (To be Confirmed by Client) • Service & Size: → Forward Line from TFH to O/S Boiler House Battery Limit & Return Line from O/S Boiler House Battery Limit to De-Aerator Tank, De-Aerator Tank to Thermic Pump & Thermic Pump to TFH: 150 NB → Drain/Overflow Line: 50NB → Charging Line of Thermic Fluid: 25NB • CS Body (Gland Type) #150 SORF Flanged End Valves with matching flanges & SS 304 Spiral Wound Gaskets: → Gate Valves, Size 150 NB: 4 Nos. → Globe Valves, Size 150 NB: 1 Nos. → Check Valves, Size 150 NB: 3 Nos. → Basket Filter, Size 150 NB: 2 Nos. → Gate valves, Size 50NB: 2 Nos. → Gate valves, Size 25NB: 3 Nos. (#800, SW)	01 Set

No.	EQUIPMENT DESCRIPTION	QTY.
	→ Check Valve, 25 NB: 1 Nos. (#800, SW) → Safety Valve, Size 50NB x 25NB: 1 Nos. → Y Strainer, 25 NB: 1 Nos. • Insulation of Hot Oil Pipeline: LRB of 128 kg/m³ Density with 24 SWG Aluminum/CRCA Cladding. • Note: All pipeline material & its accessories (including insulation) shall be loose supplied, to be fabricated and installed at site by Purchaser.	
24.	**PLATFORM, LADDERS & STRUCTURAL SUPPORTS:** **Loose Supply** of Structural supports, platforms and ladders for below listed equipment for Mounting & ease of operation and maintenance. Structure, platforms and ladders shall be complete with TSL Standard painting scheme and other applicable accessories: • Mounting Structures → Bunker → Expansion Tank (Max. Elevation Considered = 7 Mtrs) (Client to Confirm) • O&M Structure → Instrument access → APH, HE Coils	01 Set
25.	**CHIMNEY with Ducting from ID fan to Chimney:** Chimney of **600 mm** Top Diameter & overall height of **31 meters** to provide natural draft to flue gas passage and in accordance with Local Pollution Control Board guidelines. Chimney shall be Designed and manufactured as per TSL Standards. Chimney will be complete with base plate, pollution sampling point, Ladder with Platform, lightning arrestor, Earthing strip, foundation bolts, and 2 coats of High Temp. Aluminum Paint, etc. • Max. Length of Duct from ID Fan to Chimney = 5 Mtrs. • Chimney is considered suitable for 1 Nos. TFH operation. (Client to Confirm)	01 Set
26.	**STORAGE TANK:** Storage Tank designed to store Thermic Fluid, for first charging and make up during operation.: • MOC of Tank: M S. Plates (IS 2062) • Hold up of Storage Tank: 2 m^3 (Client to Confirm)	01 Set
27.	**CHARGING PUMP:** Charging Pump (External Gear Type) with Motor Assembly provided Outside of Storage Down Tank to recharge TF Oil back into the System. • Capacity = 2700 LPH, Discharge Pressure = 3 kg/cm².	01 Set

INSTRUMENTS LIST OF TSL (LOOSE SUPPLIED)

No.	INSTRUMENTS LIST	QTY
1.	Temperature Sensors: Thermic Oil Forward Header Thermic Oil Return Header Flue Gas Inlet of Chimney	 1 No. 1 No. 1 No.
2.	Pressure Gauge with Instrument Tubing mounted near Coils: Thermic Oil Return Header Pressure (Pump Pressure) Thermic Oil Forward Header Pressure (Circuit Pressure)	 1 No. 1 No.
3.	Differential Pressure Switch (DPS) Across Forward & Return Header of Thermic Oil	1 No.
4.	Furnace Draft Transmitter	1 Nos.
5.	Flow transmitter with Orifice Plate assembly & Indicating Controller for measurement of Thermic Oil Flow from TFH	1 Nos.
6.	Level switch (Float Type) on Expansion Tank	1 No.
7.	Level Gauge (Glass Tube) Assembly for Expansion tank	1 No.
8.	Instrument tubing and its accessories for DPS, PG, LG, etc.	1 Set
OPTIONAL LIST OF INSTRUMENTS (@ EXTRA COST)		
a.	Expansion Tank Temperature sensor & Indicating Controller	Nil
b.	Temperature Transmitters with Sensors in place of Temperature Switches	Nil
c.	Differential Pressure Transmitters in place of DPS	Nil
d.	Level Transmitter in place of Level Switch & Level Gauge	Nil
e.	Temperature Sensor with Switch / Transmitter @ APH Inlet / Outlet	Nil

OPTIONAL SCOPE OF SUPPLY (PRESENTLY CLIENT SCOPE)

No.	EQUIPMENT DESCRIPTION	QTY.
1.	**ONLINE MONITORING SYSTEM:** IIOT Module to be fitted in Standard or PLC Panel, which will give below details to client in Real-time over Mobile, Computer Dashboard, IPad, etc.: • Data Monitoring & its Analysis • Alarms & Alerts along with its reports • Performance Monitoring, evaluation & recommendation • O&M Scheduling • Historical data & its comparison with current data • Multiple reports on Shift wise, daily, weekly, monthly, quarterly, yearly, etc. available by email & in App.	01 Set
2.	**BAG FILTER SYSTEM for <150 mg/nm^3 of Emission Levels:** Bag Filter System with Filter Bags (High Temp. suitable) with its mounting plate, housing, supporting structure, bypass damper, interconnecting ducting, Insulation, Rotary Air Lock Valve, etc. as a complete assembly for maintaining Flue Gas Outlet Emission @ <150 mg/nm3 to meet local pollution norms.	01 Set
3.	**THERMIC FLUID**	01 Set

MANDATORY CLIENT SCOPE OF SUPPLY

No.	DESCRIPTION
1.	Design & Construction of Civil works, Foundation of all equipment etc.
2.	Design & Supply of Foundation Bolts of all equipment
3.	Shed for housing complete system with roof & side walls
4.	All Pipeline with Valves, Fittings, Insulation, Erection, Testing of Thermic Oil & any other utility. (Outside Heater Room)
~~5.~~	~~All Structural work for Expansion Tank mounting, O&M of Coils, APH, MDC, etc.~~
6.	~~Electric, Control & Instruments cabling from field to Panel~~ & Earthing of all equipment.
7.	Power Supply to Panels along with proper Earthing
~~8.~~	~~Fuel Handling System up to feed doors~~
9.	Ash Handling System from each Ash discharge zone of TFH to safe location
10.	All Utilities (Power, Water, Compressed Air, Fuel, Lubricants, etc.) required for assembling, erection, testing & commissioning of TFH
~~11.~~	~~Thermic Fluid Storage Tank & its charging pump~~
12.	Transportation of equipment from TSL works to Site & it's Safe Unloading
13.	Erection of all equipment supplied by TSL (Preferred under supervision of TSL)
14.	Commissioning, Operation & Maintenance of complete Thermic Fluid heating System
15.	Any other equipment / service not mentioned in TSL scope of supply

INTERLOCK & ALARMS:

INSTRUMENT / MOTOR	CAUSE	EFFECT	TYPE OF ALARM	SAFETY DESCRIPTION
Thermic Oil Pump	Trip	ID & FD Fan Trip	Visual	Low Flow safety
Level Switch (on Expansion tank)	Trip	ID & FD Fan Trip	Audio & Visual	Low fluid safety
Differential Pressure Switch (DPS)	Trip	ID & FD Fan Trip	Audio & Visual	Low Pressure safety
ID Fan	Trip	FD Fan Trip	Visual	Back firing safety
Thermic Oil Forward Temperature	High	ID & FD Fan Trip	Audio & Visual	Thermic Oil High Temperature safety
Thermic Oil Return Temperature	High	ID & FD Fan Trip	Visual	Thermic Oil High Temperature safety
Flue Gas Outlet Temp. to Chimney	High	ID & FD Fan Trip	Audio & Visual	Heater Chocking & Mechanical Safety
Mechanical Safety Valve	Open, Lift up	Release Over Pressure		Thermic Oil High Temperature Safety

DOCUMENTATION SCOPE:

No.	DOCUMENTS & DRAWINGS
1.	GA layout of Thermic Fluid Heater system
2.	Foundation Layout with Load Data
3.	Pipeline & Instrument Drawing (P&ID)
4.	Refractory Lining Drawing
5.	Refractory & Insulation material BOM
6.	Panel Drawings (GA, Wiring Diagrams, BOM etc.)
7.	Internal Testing Certificates of HE Coil
8.	Material Test Certificates (Pipes, Motor, Instruments – As Applicable)
9.	Operation and Maintenance Manual

PERFORMANCE GUARANTEE CRITERIA:

→ Thermic Fluid

- Thermic Oil "Therminol 55/Equivalent" suitable for Bulk Temperature of 305 °C & Film Temperature of 340 °C

→ Fuel for combustion

Fuel	Moisture % (Max.)	Ash % (Max.)	C % (Max.)	H_2 % (Max.)	N_2 % (Max.)	O_2% (Max.)	S % (Max.)	Size (Max.)	NCV
Biomass	30	4	30	5	0.5	30.49	0.01	<30 mm	~ 2,390 Kcal/kg
Imported Coal	12.55	8.6	59.19	3.09	1.05	15.05	0.47	<30 mm	~ 4,975 kcal/kg

→ Power Supply

- 415 volts ± 2%, 50 Hz ± 3%, 3 Phase, 4 wire system. In case of voltage fluctuation exceeds the above limits, customer is advised to install a constant voltage transformer (CVT) for protecting electrical components.

4. BATTERY LIMIT

- Thermic Fluid
  - → Forward Header @ Heater Room B/L
  - → Return Header @ Heater Room B/L
- Fresh Air
  - → Air Inlet of FD Fan
- Fuel
  - → Inlet of Fuel Handling System Feed Point
- Flue Gas
  - → Outlets of Chimney
- Electrical & Instruments
  - → Incoming and outgoing terminals in Electrical & Control panels
  - → All terminal connections in Motors & Instruments

5. MAKES OF MAJOR COMPONENT

NO.	COMPONENT	MAKE
1.	HE Coil Pipes/ Tubes	MSIL / TI / Penner / Goodluck / TATA /Equivalent
2.	Electric Motors	CGL / BBL / LHP / Havells / Equivalent
3.	Thermic Fluid Circulation pump	KSB / Equivalent
4.	Thermic Fluid Charging / Makeup Pump	Prakash / Equivalent
5.	A.C. Variable Drive (VFD)	ABB / Rockwell / Denfoss / Delta / Equivalent
6.	FD Fan (Direct Drive)	Thermotech Approved Vendor
7.	ID Fan (Belt Driven)	Thermotech Approved Vendor
8.	Safety Relief Valve	Fainger Lesser / MH Valves / Darling Muesco
9.	Temperature Sensor	GIC / Altop / Rays
10.	Pressure/DP Switch	WIKA / Indfoss / Denfoss
11.	Main incomer - SFU	Siemens / Schneider
12.	HRC Fuses	Siemens / Schneider
13.	Indicating lamps	Siemens / Schneider
14.	Selector Switches	Siemens / Schneider/ Salzer
15.	CT Coils	Trio / Equivalent
16.	MCB / MPCB / MCCB	Siemens / Schneider
17.	Relays	Siemens / Schneider
18.	Contactors	Siemens / Schneider
19.	Electric & Control Panel Enclosures	Thermotech Approved Vendor
20.	Programmable Logic Controller (PLC)	ABB / Rockwell / Siemens / Honeywell
21.	HMI	TSL Approved Vendors
22.	Flexible cables	RR / Polycab / Equivalent
23.	Orifice Plates	GIC / Scientific Devices / Flowtech / Equivalent.
24.	All Transmitters (PT, TT, DPT, LT)	ABB / Honeywell / Emerson / Fuji/ Yokogawa
25.	Temperature controllers	TSL Approved Vendors
26.	Control Valves	Pneucon / Mecaster / Darling Muesco / Equivalent
27.	Gate / Globe : Valves	Thermotech Approved Vendor
28.	Pipe for Heater House Pipeline	Thermotech Approved Vendor
29.	All Gaskets & Fittings	Thermotech Approved Vendor

NOTE:

The above lists of makes are indicative and not compulsory. Optional makes Indicated would be supplied at the consideration/discretion of Thermotech Systems Limited (TSL). Specific make of components can be offered which will have implication on offer price. The list is of all generic items used in various models of Thermic Fluid Heating Systems (TFH), and may not be part of quoted system of your project.

6. COMMERCIAL BID

a) PRICE BASIS:

ITEM	DESCRIPTION	QTY	UNIT PRICE (INR)	TOTAL PRICE (INR)
1.	Thermic Fluid Heating System as per Mandatory Scope of Supply Model: TSCV-1500 – Pulsating Grate	1	Later upon confirmation on Technical Specifications & Scope of Work	
COMPLETE SUPPLY OF LISTED ITEMS				**₹ --**
AMOUNT IN WORDS : INR --				
NOTE : FOR ALL LABOR WORK: RETURN TICKETS + STAY + FOOD IS IN CLIENT SCOPE				

b) SUPERVISION OF ERECTION & COMMISSIONING

Site Supervision for Civil Marking, Unloading of TSL supplied equipment, Erection, Testing & Commissioning charges are **NOT** included in above quoted prices. Please refer Site Supervision Policy for Charges and related terms.

c) TAXES, FREIGHT & TRANSIT INSURANCE

I. GST: 18% shall be charged extra on above quoted prices.
II. Price Basis: Quoted prices are Ex-Works Thermotech - Ahmedabad Factory basis.
III. Freight: In Purchaser's Scope
IV. Transit Insurance: In Purchaser's Scope.

d) PAYMENT TERMS

I. XX% Advance on Acceptance of Purchase Order
II. XX% + Taxes against Proforma Invoice prior to Dispatch of Unit.

e) DELIVERY SCHEDULE

XX Weeks from the date of receipt of purchase order & approval of PID & GA Layout drawing by Client, which so ever is later.

Delivery of Control Panels to be confirmed later according to confirmation from OEM.

f) OFFER VALIDITY

This offer is valid for acceptance for a period of 30 days from the date of issue.

g) PACKING & FORWARDING

All material shall be loaded on trailer / truck to ensure safe delivery as per our standard packing procedure. In case of client's specific packing procedure to be followed, it shall be done at extra price.

h) OTHER TERMS & CONDITION

Any order arising from this offer will be subject to TSL standard terms and conditions of Sale - See attachment.

7. TERMS & CONDITIONS

1. ORDER CONFORMATION

All orders placed on us directly or through our regional offices will be binding on us only after our Head Office in Ahmedabad has issued an order confirmation.

2. SPECIFICATIONS ETC.

Specifications, designs, dimensions, descriptions, shades of paints etc. are not binding on us in minute details and are subject to reasonable alterations without prior notice.

3. PRICES

All prices are ex-works, Vatva, Ahmedabad / ex-works of our suppliers for the part of the goods to be manufactured at their works and are exclusive of transit insurance, all taxes excise and other duties & levies as applicable at the time of delivery, which shall be charged separately. Freight & octroi if any, shall be borne by the purchaser. The purchaser registered under the Sales Tax Act are advised to send sales tax registration number and date and also concessional tax form along with the purchase order. Otherwise the state/central tax concession will not be considered.

4. MODE OF DELIVERY

All delivery will be ex-works, Vatva, Ahmedabad – our supplier's works. The goods may be dispatched in one or separate lots at our option. If we are required to dispatch the goods on behalf of the purchaser, on freight to pay basis, on the understanding that no liability is attached to us. The freight charges contracted by us on behalf of the purchaser will be treated as negotiated under the purchaser's authority and shall, therefore be final.

5. PACKING AND FORWARDING

Packing wherever necessary will be done by us in accordance with our standard practice or as specified in our proposal.

6. INSPECTION

If necessary, the goods will be offered for visual inspection only at our works, AHMEDABAD. The date of inspection will be intimated by us by 15 days in advance. If inspection is not carried out on the date so advised, we shall be free to dispatch the consignment as per the terms of delivery.

7. WAREHOUSING CLAUSE

If payment is not made within 15 days of date of proforma invoice, we reserve the right to divert the ordered material. We will give a fresh delivery period and price at the time of diversion which will be binding on the purchaser and the contract cannot be rendered void on this account. If the goods cannot be diverted, charge will be made for storage, insurance and interest at the rate of 1% of the invoice value for each week or part thereof commencing 15 days from the date of proforma invoice. Warehousing charge is subject of a maximum of 5%.

8. PAYMENT

(A) **Advances** paid against an order shall not be subject to any interest. We shall have right to adjust against such advances payments, which might become due to delay in lifting the ordered equipment or because of any incidental expenses we may incur on the purchaser's behalf. The advances shall be forfeited in case request for cancellation of order is accepted by us.
(B**) Interest** at 24% will be charged on overdue bill payment as per P.O. Terms Condition.

9. GENERAL LIEN

We shall be entitled to general lien on goods in our possession or dispatched for all money due to us from the purchaser, both under the contract or any other account and we shall also be entitled to apply any money in our hands under any contract due to us under any other contract or contracts.

10. FORCE MAJEURE

This offer is subjected to force majeure by which it means causes such as war, invasion, civil disobedience, government orders or restrictions, strikes, lockouts, riots, fires, epidemics, sabotages, trade embargoes, earthquakes, floods, accidents, breakdown of machinery, delay or inability to obtain labor, raw materials, wagons, shipping space or any other causes whatsoever beyond our reasonable control, affecting us or our sub-contractors, suppliers etc.

11. WARRANTY

All our equipment is thoroughly inspected before dispatch & therefore can be depended upon for long and trouble-free services. We undertake to make good by replacement or repair, defects arising out of faulty design, material or workmanship within 12 months of the date of dispatch, provided that if we so require, the parts are respect of which a claim is made, must be sent at purchaser's expenses to our works before liability can be entertained under this clause. Such expense will be refunded if our liability is admitted.

Bought out components are guaranteed by us only to the extent of guarantees given to us by our suppliers. Electrical components such as heaters, contactors, motors etc. rubber components & instruments such as pressure gauges, thermometers, combistats etc. are however not covered under this warranty. This warranty is valid subject to:

1. Installation having been completed within 3 months of dispatch of equipment & as per our installation instructions.
2. The supply / installation having been formally accepted as per the handling over clause no. 13 (below).
3. Supply of right fuel as per relevant IS specification available.
4. The equipment being operated & maintained as per our operation & maintenance manual.
5. The equipment or part thereof not being subject to accident, alteration, abuse or misuse.

12. COMMISSIONING

Commissioning service offered at the rate and terms mentioned in the quotation covers reasonable number of visits / meetings to:

1. Help in preparing the user to safely unload the material, when received.
2. Discuss installation details in terms of physical / technical requirements.
3. Make the user conversant with statutory requirements if any.
4. Discuss details of requirements in respect of power supply, feed system, fuel system, etc.
5. Ensure that the installation has finally been made as recommended.
6. Commission the unit for a short run from point of view of mechanical working and to set various controls necessary.
7. Conduct demonstration for the purpose of user's education for equipment operation and maintenance.

13. HANDING OVER

Unless otherwise specified in the order and accepted, handing over the equipment and/or installation would be considered as completed and a formal completion certificate shall be issued by the purchaser/user if: -

1. The material has been supplied as per the terms of scope of supply or with agreed deviations, if any.
2. Erection: If involved, has been completed generally as per the terms of order or with unavoidable deviations.
3. The equipment has been commissioned, if applicable, generally as agreed or the equipment and/or installation has been put to commercial use either with or without the help of our engineer.

The purchaser/user is expected to put the equipment to commercial use only after issuing a formal completion certificate. Our responsibility in terms of warranty shall cease straight away if the equipment is put to use without formal taking over.

14. CANCELLATION

Order received & acknowledge by us shall not be subject to cancellation, either wholly or partly or any reason whatsoever without our consent.

15. JURISDICTION

All contracts between purchasers & ourselves are deemed to be entered into, at Ahmedabad, and are therefore subject to the jurisdiction of courts at Ahmedabad.