
PROJECT PROPOSAL FOR 10 TON CAPACITY TIRE PYROLYSIS UNIT

Project Report

Welcome to PyroIENT

Scrap Tyre Problems

With the increasing number of motor vehicles in the world, there is a rapid increase in the amount of scrap tires. Large quantities of scrap tyres are causing serious environmental issues regarding their disposal. The main reason for this problem is that waste tyres are not biodegradable and can last 100 years or more if proper handling is not carried out. Statistics shown that in 2014, 150 million tons of scrap tires are disposed off worldwide and this number is increasing, yearly.

At the present time, there is no perfect approach to recycle scrap tyres. As a result, illegal dumping or open burning can be seen everywhere. Incorrect methods of disposal of scrap tyres can cause hazards to our environment as the numbers continuously increase without any action taken. Automotive tyres are made from synthetic rubber derived from petroleum. Seventy-five percent of a modern car is composed of ferrous and non-ferrous metals, which are readily recycled back into the metals industries. However, the remaining 25% is composed of plastics, rubber and other components, which are currently disposed of in landfills.

The unique properties of waste tyres have made for their disposal more difficult. Tyre dumps provide excellent breeding grounds for mosquitoes and elevated incidents of mosquito-borne diseases have been noted near large tyre piles. Mosquitoes lay eggs in standing water, such as can accumulate inside a discarded tire. A single tyre can be the source of thousands of mosquitoes another hazard associated with the uncontrolled disposal and accumulation of large amounts of tires is the potential for large fires.

Tyre pile fires have been an even greater environmental problem. Tyre pile fires can burn for months, sending up an acrid black plume that can be seen miles away. The plume contains toxic chemicals and air pollutants.

We at PyroIENT have found a solution for these waste tyres. We separate all contents from waste tyres and make it complete renewable process --- **Excellent Solution.**



Our Solution

After years of research and development, PyroIENT has resolved this major setback by designing an innovative 10 TPD Semi Continuous Pyrolysis Plant /Plastic Pyrolysis Plant which works on **Advance Thermal Decomposition Technology**. Our pyrolysis Plants operates on low temperature, ranging from about 200 to 420°C, providing an environmental friendly zero-waste and zero-emission recycling process. We have introduced the most viable process for recycling used tyre into Waste Rubber Process Oil, Carbon Char, Steel Wire and Hydrocarbon Gas.

Our plants are totally automated, very compact, neat & clean, user friendly and pollution free. Our pyrolysis plants are constructed & examined under the diligence of our qualified experts, who ensure to dispatch only a qualitative range to customers. We also provide customized solutions to clients as per their specifications. We are known for providing complete recycling solutions to clients with proven technologies. Along with this, we possess vast experience in Designing, Developing and Quality of equipment, along with technical analysis. Pyrolysis is Eco-friendly technology, known for transforming over 10 billion Scrap tyres around the world into energy.

PyroIENT Plant Photographs



Pyrolysis Proces

- Pyrolysis is the eco friendly chemical decomposition of organic materials by heating in the absence of oxygen or any other reagents, except possibly steam.
- Pyrolysis can be used to reprocess the tyres into fuel oil, fuel gas, solid residue (steel wire) and carbon black.
- The waste tyres are mainly composed of long polymer chain of C-H molecules.

Full Process Flow Chart

Full Process Flow Chart includes three stages

- Pre-pyrolysis
- Pyrolysis
- Further process

PRE-PYROLYSIS PROCESS:

- Tyre side wall is taken out through Tyre Side Wall Cutter.
- Tyre is put on to Tyre Strip Cutter and to make a long strip of the tyre.
- Tyre strip is put into Tyre Block Cutter to make 50 mm x 50 mm size tyre pieces.
- Bead wire is taken out from the tyre through Tyre Bead Wire Separator. Rubber and steel wire is separated from bead wire to obtain maximum profit from unburned bead wire.
- Ladder conveyor is used to feed the tire pieces into hopper. Tire feeding is done through auto screw conveyor, flap valve technology is used to assure oxygen free atmosphere in the reactor

PYROLYSIS PROCESS

- The process is based upon “ATDT” Advance Thermal Decomposition Technology as the result; Pyrolysis Oil in gaseous form is produced along with other hydrocarbon gases.
- Pyrolysis Oil is fired in closed HOT BLAST HEATING CHAMBER, made of high-grade steel, to heat the air. Hot air is circulated in the main 2.45 mt. x 7.7 mt. long reactor through heavy duty OIL BURNERS. This process is known as indirect heating system.
- Waste Hot Air is reused in the system and also converted into steam through “WHRB” WASTE HEAT RECOVERY BOILER.
- These vaporized gases are passed through heat exchanges, where in the oil gas is condensed into liquid form. Leftover gases are directed into hot blast stove to heat the reactor and oil heating is switched off.
- The heat exchanger uses coolant water, as the condensing medium and this water is re-circulated.
- System-preheating time is 4 hours. It consumes 18 to 20 liter of oil per hour. Burner can be switched off any time during the heating in case of any emergency.
- Pyrolysis period is 6 to 8 hours at 300 C° to 400 C° and known as SLOW PYROLYSIS TECHNIQUE. Heating is done under controlled conditions of temperature and (-) pressure.
- During the process left over hot air is passed through “FGD”(Flue Gas Desulfurization System) to control the Sulfur ppm level and to clean the AIR.

POST PYROLYSIS

- At the end of each process steam is pushed in the reactor to push out the Hydrocarbon Gas from the reactor for safety purpose & to cool down the temperature and for cleaning the pipelines during the maintenance.
- During the process, “PCB” Pyrolytic Carbon Char generated and its discharged at the end of process at 150 C° through WATER COOLED CLOSED SCREW JACKET, which assures 60 C° temperature when its discharged and maintains cleanness on work floor.

- “PCB” Pyrolytic Carbon Char is passed through ELECTROMAGNETIC METAL SEPARATOR and small mesh steel wires are separated before it is packed.
- Pyrolysis Oil is passed through filtration system to remove the water and to separate the carbon and taken to reserve oil tank for storage.
- Moisture from the oil is taken out and water generated from moisture is treated and water is reused in the system
- “ETP” (Effluent Treatment Plant) is installed, to clean and recycle the WATER.
- “UVOP ”(Ultra Violet Photolysis Odor Purification) System used to control the ODOR, which is very important to keep your neighbors happy and run your plant peacefully without any hassles.
- Automatic Tire feeding time is 2 to 3 hours. Automatic Carbon discharge and carbon char and steel wire scrap packing period is 2 to 3 hours. Reactor heating time is approximately 4 to 5 hours, pyrolysis process time is 6 ton 8 hours. Total process time is 18 to 20 hours.
- 1.5 processes can be taken out in 24 hours but 1 process is recommended for new users till the time they understands the technology well.

Variety of polymer waste material is suitable as a raw material. Given below is the list of suitable raw materials for pyrolysis

- ü Waste Tyres and tubes
- ü Rubber parts from auto vehicles
- ü Any kind of rubber waste

The choice of feedstock and process (mainly operating temperature) can affect the value of the finished products.

Input-output ratio of waste tyre

| Type of Material | Total Quantity | Finish quantity |
|--------------------|----------------|---|
| Nylon Scrap Tyres | 1000kgs | -550 to 600 liter of Pyrolysis oil -50 to 80 kg of Hydrocarbon Gas -300 to 350 kg of Carbon Black |
| Redial Scrap Tyres | 1000kgs | -400 to 450 of Pyrolysis oil -50 to 80 kg of Hydrocarbon Gas -300 to 350 kg of Carbon Black -150 to 200 kgs of Mild steel tyre scrap |

Yield from Pyrolysis Process

Pyrolysis Oil (“RPO” Waste Rubber Process Oil)

The essential product of tyre pyrolysis process is pyrolysis oil referred as “RPO” waste rubber process oil (**40 to 45 %** of total quantity feed) which is used as a fuel component for heating in fire chamber. Pyrolysis oil has flash Point between 60°C to 70°C.

Carbon Char (Pyrolytic Carbon Char)

The vital product of pyrolysis plant is Carbon Char referred as pyrolytic carbon char (**35 to 40%** of total quantity feed).carbon char has Industrial and commercial use. Its been used in cement and steel plant as solid fuel.

Steel Wire (Metal Scrap)

There are 15 to 20% steel wires in radial truck Tyres. 40% is in bead wire which taken out through bead wire Extruder before the pyrolysis and rest 60% mesh wire of 50 mm size can be removed from the carbon char with electromagnetic magnet separator after pyrolysis process & sold to the metal scrap dealers.

Hydrocarbon Gas.

The smaller molecules eventually vaporize and exit from the reactor. These vapors can be burned directly to produce power or condensed into an oily type liquid generally used as a fuel. Some molecules are too small to condense. They remain as a gas **5 to 8%** of total quantity feed which can be recycle in the system to heat the reactor , left over gases if any can be stored in the gas balloon.

Pyrolysis Plant

Pyrolysis plant is renewable energy generation system. Pyrolysis plants are designed to generate quality fuel from polymer waste. Pyrolysis system or pyrolysis plant is an industry for conversion of waste and tyre into usable products like:

- Pyrolysis Oil(RPO – waste rubber process oil)
- Carbon Char (pyrolytic carbon char)
- Steel Wire (metal scrap)
- Hydrocarbon Gas

Advantages of Pyrolysis Plants

- Purest quality of pyrolysis oil as finished product.
- Use of green technology to achieve environment friendly processes.
- Pyrolysis plant is energy self-sufficient.
- No external fuel required for heating.

Benefits of Pyrolysis Plant

- Recover energy and value from waste in form of waste rubber oil, steel wire scrap and carbon char.
- Reduce tyre land pollution.
- Eco-friendly recycling of tyre.
- Commercially viable process.
- Product is used as substitute to fuel oil.
- Perfect solution for polymer waste management.
- Raw material available in huge quantity in India & abroad.

Basic function of pyrolysis plant is to achieve following process conditions

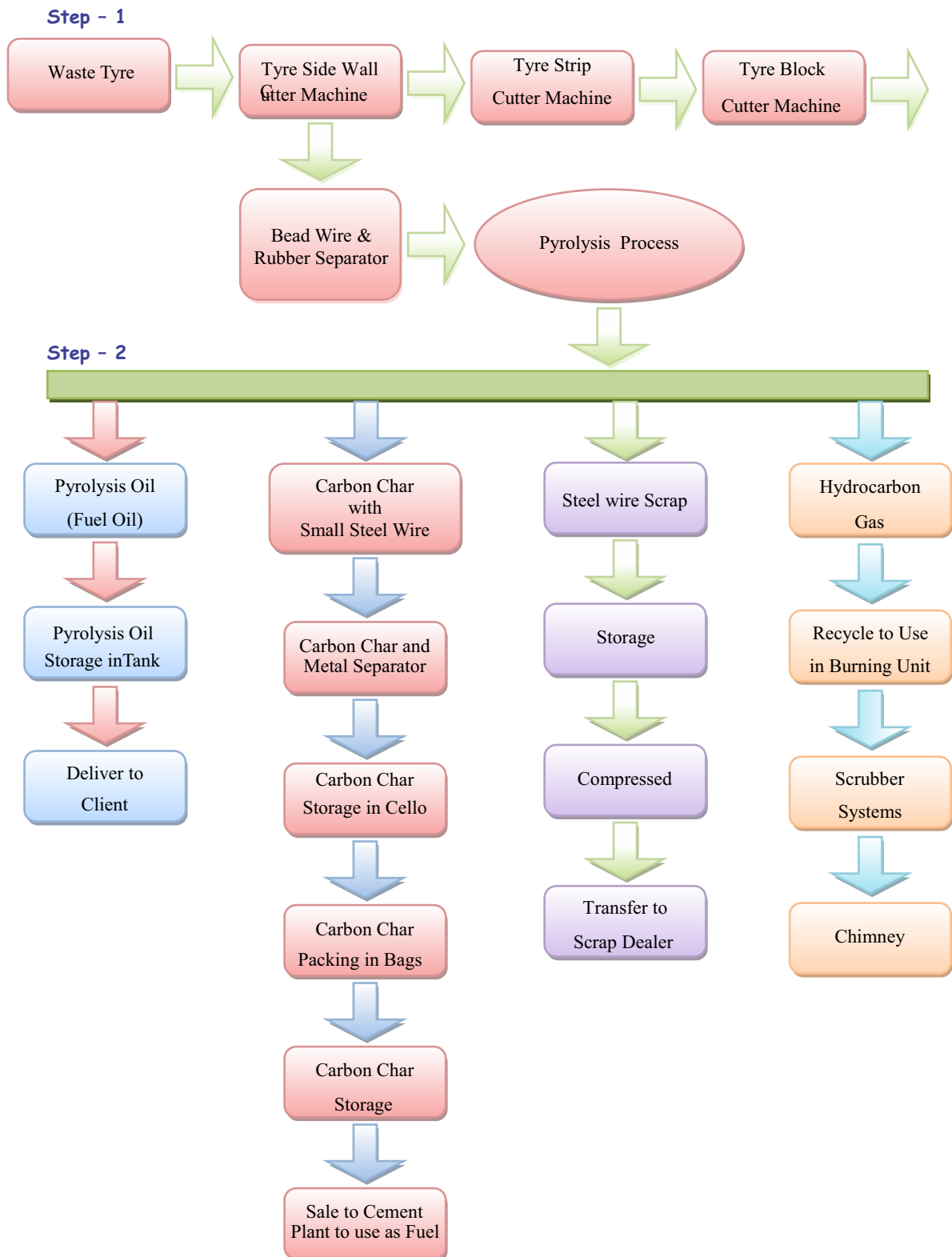
- Operating temperature of Reactor is between 250 to 400 degree Celsius.
- Total duration of pyrolysis process for 10 ton is between 18 to 20 hours.
- Pyrolysis of tyre is done in the absence of oxygen.
- Scrubbing of hydrocarbon gases and flue gases to prevent pollution.

Pyrolysis Plant needs following Machinery & Equipment

- Raw material handing section
- Pyrolysis reactor
- Indirect air heating chamber for reactor heating (oil and recycled gas based)
- Tyre cutting machines
- Automatic tyre pieces feeding system with screw conveyor
- Automatic carbon char discharge system with air cooled conveyor
- Carbon char storage cello
- Automatic carbon packing system with dust collector
- Electromagnetic metal separator
- Oil & gas Separator
- Gas condensation system
- Desulfurization system with venturi alkali scrubber
- Hydrocarbon gas cleaning system
- Gas storage balloon
- Extra gas closed burning chamber
- 25 KL Pyrolysis oil storage tank
- Cooling tower
- Electronic control panel
- Safety alarm systems
- Safety valves
- 100 foot long chimney
- Oil and water separator system
- ETP system for water purification
- UV Photolysis Odor purification system

Note: Equipment line in commercial pyrolysis plants is further modified to suite customer's requirements

Flowchart for Pyrolysis Process





TECHNICAL SPECIFICATIONS

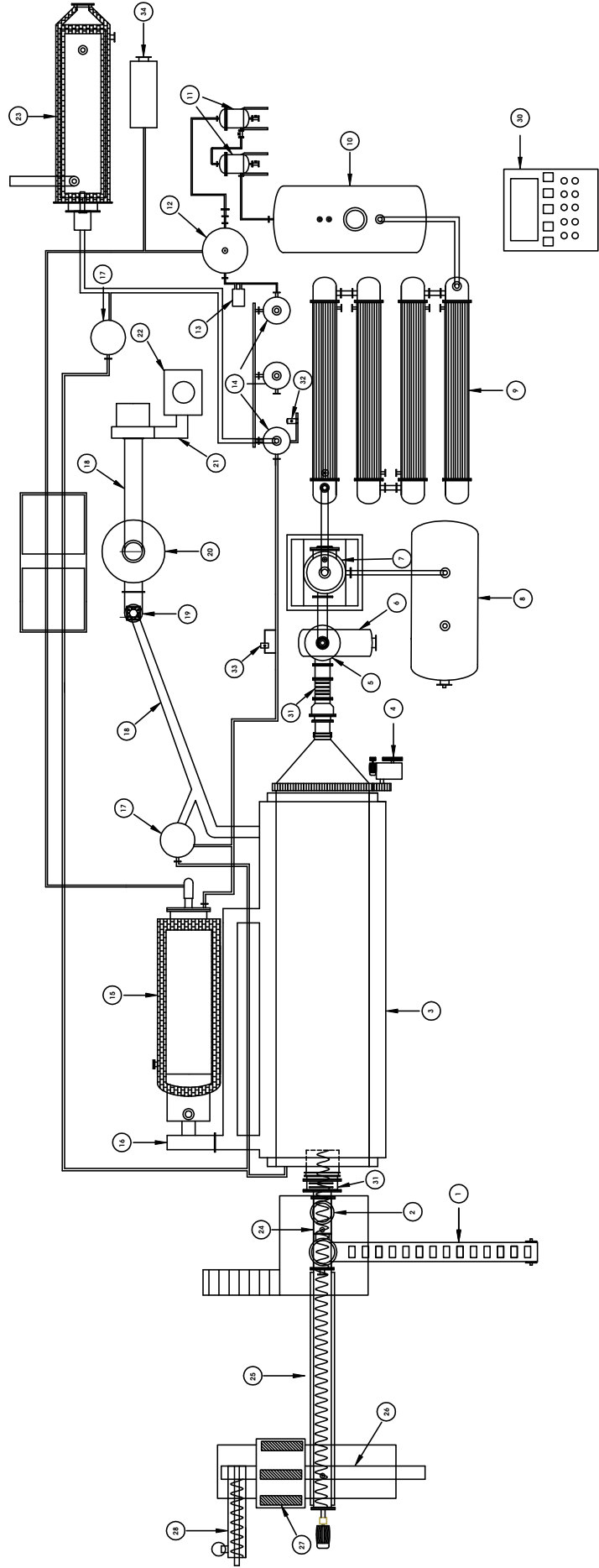
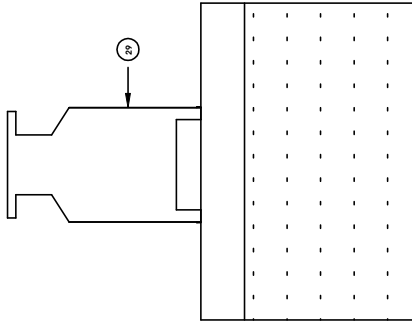
Material Load Capacity 10 TPD

| S.No | Item | Configuration & Dimension | Unit | Description |
|------|--|--|------|---|
| 1 | Main Reactor (10 Tons Material Loading Capacity) | 14 MM BQ Plate Single Side conical Type 12Tons | 1 | 2.8 Meter x 8.0 Meter Plate Thickness-14 MM BQ PLATE, with 16" door for maintenance. |
| 2 | Reactor main cover | 3.15 MM MS Plate and 75 x 40 channel | 1 | 3.3 Meter x 8 Meter |
| 3 | Reactor insulation inside | Ceramic Wool - 96 density | 2 | Ceramic Wool - 1260 Celsius, (25MM) - 2 Layer |
| 4 | Reactor insulation outside with Aluminum Sheet coating | Ceramic Wool - 96 density | 2 | Ceramic Wool - 1260 Celsius, (25MM) - 2 Layer with Aluminum sheet Jacket. |
| 5 | Reactor Gear box | Shricon Brand | 1 | 180 Center 10 HP Helical Gear |
| 6 | Hydrocarbon gas vacuum device | 5 MM MS Plate | 1 | Mono Block Centrifugal pump with 7.5 HP Motor |
| 7 | Extra Waste Gas burning system With Gas Burner. | 5 MM MS Plate, 1200 MM(D) x 4000 MM (L) | 1 | Double insulation with fire brick(1200 °C) and castable cement |
| 8 | Horizontal Condenser | 5 MM MS Plate , 600 MM (D) x 4000 MM (L) | 4 | Shell and tube type condenser with 38 tube - 51 OD |
| 9 | Insulation Tank | 5 MM MS Plate , 1000 MM (D) x 1800 MM(L) | 1 | Insulated and Cooled with water jacket |
| 10 | Heavy Oil Tank | 5 MM MS Plate , 600 (D) x 1500 (L) | 1 | 750 liter oil capacity |
| 11 | Oil and Gas Separator Tank | 5 MM MS Plate, 800 MM (D) x 3200 MM (L) | 1 | Fully Jacketed with 4" Water circulating coolant Area. |
| 12 | Indirect Heating system with Oil & Gas Burner and Hot Air Blower | 5 MM MS Plate , 1200 MM (D) x 4000 MM (L) | 1 | double insulation with fire brick (1200 °C) and castable cement, 7.5 HP blower with Water Coolant Jacket |

| | | | | |
|----|---|--|---|--|
| 13 | Steam boiler 300 LBS With Insulated Pipe Line for Reactor Cooling | 14 MM BQ Plate, 600MM (D)x1500 MM (H) | 2 | With Ceramic Wool Insulation and Aluminum Jacket. |
| 14 | Gas tank | 5 MM MS Plate, 800MM x 1550 MM -3 nos | 1 | with Dish End and Vacuum Pump |
| 15 | Storage Oil Tank for boiler | 5 MM MS Plate, 600MM (D)x1500 MM (L) | 1 | 750 liter capacity |
| 16 | Storage Oil Tank for Indirect Heating System. | 5 MM MS Plate, 1250 (D) x 1500 (L) | 1 | 2000 liter capacity |
| 17 | Oil Tank for water seal tank | 5 MM MS Plate, 1200MM (D) x 2500 (L) | 1 | 3000 Oil tank capacity - 1 No's |
| 18 | Oil Tank for horizontal condenser | 5 MM MS Plate, 1500 MM (D) X 3000 MM(L) | 1 | 5000 Oil tank capacity - 1 No's |
| 19 | Water coolant pipe | 5MM MS C Class Pipe (13" X 16" - OD & 15"X 8" - ID) | 1 | 15 ft. jacketed pipe |
| 20 | Scrubber Pipe | 5 MM MS C Class Pipe | 1 | 60 Feet with 12 Inch Bend |
| 21 | Desulfurization System | 5 MM MS Plate 1500 MM (D) x 2250 MM(L) | 1 | with venture scrubber System |
| 23 | Raw material feeding System with bucket conveyer | 400 x 8 MM , Thick rubber belt conveyer | 1 | D Type Gear with 3 HP 1440 Electric Motor, High 15 Feet without fabrication stand |
| 24 | Input and out put Screw conveyer for tyre and carbon char | 5 MM Thickness | 1 | 450 OD 1800 Length with water coolant jacket with Gear Motor 5 HP |
| 25 | Bellow Compensator 14" | Bellow Compensator 16 " SS 202 Material | 2 | 2 No's |
| 26 | Flap Valve | 300 x 300 x 5 MM with gear motor | 2 | 1 HP Motor 2 No's Valve |
| 27 | Gate Valve | 1 No's | 1 | Manual gate valve 300x300x5MM |
| 28 | Automatic Carbon discharge System | 5 MM MS Pipe | 1 | 14" Pipe Screw Covered with 24" Pipe jacket and 12 Feet long with water coolant systems, 5 HP Gear Motor |
| 29 | Electro Magnetic metal separator | Magnet Belt and 5 MM MS BOX | 1 | Drum separator Unit 450 Drum size with 1 HP Gear Motor |

| | | | | |
|----|----------------------------------|--|---|---|
| 30 | Carbon Bag Filling System | Magnet Belt and 5 MM MS BOX | 1 | 8 Feet Pipe Screw with 3 HP Electric Motor |
| 31 | Panel board | Reactor Panel board with 10HP VFD Drive | 1 | Total motor Controller, Temperature and Pressure indicator and controller with indication light and Ringing hooter and LED Flow Diagram Indication. |
| 32 | Submersible Water pump | Atlas brand | 1 | 5 HP 3 Phase Electric Motor for cold water supply in condenser |
| 33 | Gear pump | Atlas brand | 1 | 3 HP 3 Phase ABB Motor for oil transfer |
| 34 | Mud pump | Atlas brand | 1 | 3 HP 3 Phase ABB Motor for scrubber systems |
| 35 | Chimney Self Supported | 5 MM MS plate and C Class Pipe,750 bottom OD and 300 Top OD. | 1 | 100 Feet with 30 feet step for taking Gas Sample -1 No's |
| 36 | Gas Blower | MS PLATE | 1 | 0.5 HP Motor 3 Phase for fire chamber |
| 37 | Gas burner | 5MM MS PIPE,100 MM (D)x 450 (L) MM. | 1 | WITH 1" Air flow Connection. |
| 38 | Cooling tower | Fiber body , 8.5 x 8.5 feet | 1 | Capacity 100 TR with Aluminum blade fan ,3 HP 2880 RPM Motor |
| 39 | Hardware(GI pipe And Ball Valve) | As per annexure I | 1 | Hardware for reactor pipe and pipe fitting |
| 40 | Electric Motor | Standard make | 1 | As per annexure II |
| 41 | Installation charge | at your side | | |
| 42 | Foundation | As per drawing | 1 | Price not including in basic Price |

| COMPONENTS | QTY. | MATERIAL |
|---|------|----------|
| 01 Raw Material Feeding System With Screw Conveyor | 1 | BQ |
| 02 Electric Elevator | 1 | MS |
| 03 Main Reactor (10 Tons Material Loading Capacity) | 1 | MS |
| 04 Reactor Gear Box | 1 | MS |
| 05 Insulation Tank | 1 | MS |
| 06 Oil & Gas Separator Tank | 1 | MS |
| 07 Oil Tank For Gas & Oil Separator Tank 3 KL | 1 | MS |
| 08 Horizontal Condenser | 1 | MS |
| 09 Vertical Condenser | 1 | MS |
| 10 Horizontal Condenser | 2 | MS |
| 11 Pyrolysis Oil Filter | 1 | MS |
| 12 Storage Oil Tank for Indirect Heating System 2 KL | 1 | MS |
| 13 Steam Turbine | 1 | MS |
| 14 Gas Burner | 3 | MS |
| 15 Indirect Heating System with Oil & Gas Burner | 1 | MS |
| 16 Hot Air Blower Water Jacketed Blower | 1 | MS |
| 17 Steam Boiler 300 IBS With Insulated Pipe Line for Reactor Cooling | 1 | MS |
| 18 Vertical Scrubber | 1 | MS |
| 19 Vertical Scrubber | 1 | MS |
| 20 Desulfurization System | 1 | MS |
| 21 Water Separator | 1 | MS |
| 22 Steam Separator | 1 | MS |
| 23 Extra Waste Gas burning system With Auto Ignition Gas Burner | 1 | MS |
| 24 Input & Output Screw conveyor for fly ash | 1 | MS |
| 25 Auto Carbon discharge System | 1 | MS |
| 26 Carbon & Steel wire Handling Belt Conveyor | 1 | MS |
| 27 Electric Magnetic separator | 1 | MS |
| 28 Carbon Bag Filling System | 1 | MS |
| 29 Carbon Bag Filling System | 1 | MS |
| 30 Panel Board | 1 | MS |
| 31 Beltway 16" | 1 | MS |
| 32 Auto Released Pressure Valve | 1 | MS |
| 33 Auto Temperature Controller | 1 | MS |
| 34 Storage Oil Tank for LDO | 1 | MS |



(Annexure – II)

**ELECTRIC MOTOR
DETAILS**

| Sr No | Items | Configuration | | Description |
|-------|-----------------------------------|--|---|---|
| 1 | Mail Reactor Motor | 10 HP 1440 RPM | 1 | ABB Motor with Variable speed drive (VFD) |
| 2 | Hydro Carbon Gas Vacuum Pump | 7.5 HP 2800 RPM Electric Motor for Water pump | 1 | water pump 7.5 HP Motor |
| 3 | Hot Air Generator Blower | 0.5HP 1440 RPM | 1 | Extra Gas burner gas Blower Motor |
| 4 | Gas Pressure Burner | 0.5HP 1440 RPM | 1 | Extra Gas burner gas Blower Motor |
| 5 | Extra Gas burner gas Blower Motor | 0.5HP 1440 RPM | 1 | Extra Gas burner gas Blower Motor |
| 6 | Oil Burner 0.5 HP | 0.5HP 1440 RPM | 1 | Oil Burner |
| 7 | Indirect Heating System Blower | 10 HP 140 RPM | 1 | 10 HP 1440 RPM ABB Motor |
| 8 | Dust Blower | 10 HP 140 RPM | 1 | 10 HP 1440 RPM ABB Motor |
| 9 | Belt Conveyer | 3 HP 1440 RPM Gear Motor | 1 | 3 HP Gear Motor |
| 10 | Input Screw Conveyer | ABB Motor | 1 | 5 HP Gear Motor ,5 HP 1440 RPM Gear Motor |
| 11 | Flab Valve | 1 HP Gear Motor | 1 | 1 HP Gear Motor |
| 12 | Flab Valve | 1 HP Gear Motor | 1 | 1 HP Gear Motor |
| 13 | Carbon Screw | 5 HP 1440 RPM Gear Motor 4" Reduction | 1 | 5 HP Gear Motor |
| 14 | Magnetic Belt Conveyer | 1 HP Gear Motor | 1 | 1 HP Gear Motor |

| | | | | |
|----|------------------------|--------------------------------|---|---|
| 15 | Boiler Pump | 2 HP Motor 3 Phase | 2 | Water Pressure Pump |
| 16 | Submersible Water Pump | 1 HP Gear Motor | 1 | 1 HP Gear Motor |
| 17 | Carbon Screw | 5 HP 1440 RPM | 1 | 5 HP 1440 Direct Drive Motor |
| 18 | Submersible Water Pump | Atlas Brand | 1 | 5 HP 2880 RPM Motor |
| 19 | Gear Pump | Atlas Brand with ABB Motor | 1 | 3 HP 3 Phase ABB Motor for Oil Transfer |
| 20 | Mud Pump | Atlas Brand with ABB Motor | 1 | 3 HP 3 Phase ABB Motor for Scrubber Systems |
| 21 | Cooling Tower | Capacity 100 TR 8.5 x 8.5 feet | 1 | 5 HP 2880 RPM Motor |

MINIMUM LAND REQUIREMENT FOR PLANT : 100 ' X 150'(FEET)
AND RAW MATERIAL LEND 100' X 150, AND OTHER OFFICE
SPACE

TECHNICAL PARAMETER

| S.N | Items | Model |
|-----|------------------------------------|-------------------------|
| 1 | Equipment type | IENT10 |
| 2 | Raw material | Nylon / Radial Tyre |
| 3 | Structural form | Horizontal rotation |
| 4 | 24-hour Capacity | 10ton |
| 5 | Oil yield [40 to 45 % oil] | 4.1 ton |
| 6 | Steel scrap [15 to 20 %] | 1.8 ton |
| 7 | Carbon [30 to 35 %] | 3.8 ton |
| 8 | Operating pressure | Normal (0.3 To 0.5 Kg) |
| 9 | Material of Reactor | B.Q. Plate SA 516 Gr.70 |
| 10 | Thickness of Reactor | 14 mm |
| 11 | Rotate speed | 0.4turn/minute |
| 12 | Total power [only pyrolysis Plant] | 50 KW |
| 13 | Mode of Water cooling | Circular cooling |
| 14 | Cooling area of condenser | 130 Sq. Meter |
| 15 | Kind of transmission | VFD drive |
| 16 | Noise dB (A) | ≤85 |
| 17 | Size of Reactor (D×L) | 2800 x 800 mm |
| 18 | Working form | Intermittent operation |
| 19 | Lend requirement | 40,000 Sq. Ft. |
| 20 | Delivery time | Within 2 to 3 months |
| 21 | Installation Time | 40 to 60 Days |

Model and Price list:

| Sr. No | Model (Ton wise) | Capacity in kilo liter | Load in tons | Shell diameter (MM) | Shell Length (MM) | Plate thickness (MM) | Price INR | Condenser Nos | Coolant area Sq. Mtr | |
|-------------------------------|---|------------------------|--------------|---------------------|-------------------|----------------------|-----------|---------------|----------------------|--|
| 1 | IENT 10 | 52 KL | 10 | 2800 MM | 8000 MM | 14 MM | 1.10 Cr | 2+2 | 130 sq. Meter | |
| List of Optional Items | | | | | | | | | | |
| 1. | Tyre Side Wall Cutter | | | | | | ₹ | 1,40,000.00 | | |
| 2. | Tyre Strip Cutter | | | | | | ₹ | 3,25,000.00 | | |
| 3. | Tyre Block Cutter | | | | | | ₹ | 2,25,000.00 | | |
| 4. | Tyre Bead Wire Separator | | | | | | ₹ | 3,75,000.00 | | |
| 5. | Bead wire ring and tyre 3 pieces cutter | | | | | | ₹ | 3,25,000.00 | | |
| 6. | UV Photolysis Odor Purification System (ducting as per actuals) | | | | | | ₹ | 3,50,000.00 | | |
| 7. | Water & Carbon Separation System from Oil (reconditioned) | | | | | | ₹ | 5,50,000.00 | | |
| 8. | Automatic Carbon Char packing machine | | | | | | ₹ | 4,50,000.00 | | |
| 9. | Carbon Char Briquette making plant 5 TPD | | | | | | ₹ | 12,00,000.00 | | |
| 10. | "ETP" (Effluent Treatment Plant) | | | | | | ₹ | 4,00,000.00 | | |
| 11. | Water Softer | | | | | | ₹ | 1,50,000.00 | | |
| 12. | Hydrocarbon Gas Storage Balloon | | | | | | ₹ | 9,75,000.00 | | |
| 13. | Generator 100 kw | | | | | | ₹ | 4,50,000.00 | | |
| 14. | Fire Fighting system with all equipment's | | | | | | ₹ | 3,50,000.00 | | |
| 15. | 20KL Oil Storage Tank | | | | | | ₹ | 2,50,000.00 | | |

TERMS CONDITIONS & PAYMENT PLAN

Booking Amount Rs.10,00,000.00

- **40% at order confirmation**
- **55% at delivery time * 5 % after installation.**

EXCLUSIONS

- **Taxes: Excise & Vat as applicable**
- **Installation charge Rs. 2,00,000.00**
- **Engineers all meals, hotel & local transportation**
- **Transportation from our factory to client location**
- **Foundation and civil work will be provided by client and pollution clearance**
- **Steel Structure, water pipes, exhaust gas pipes, electrical cables**
- **Any insulation on pipes, extra storage tanks, fire fighting equipment's**
- **Loading & Unloading, cranes, tools & helpers**
- **Air tickets & visa charges (in case of overseas client)**
- **In case of location study & planning, air tickets, meals, hotel**

Evaluation of Expenses and Gross Profit

| S.N | Other Contingent Expenses (per month) | | | Amount (₹) |
|-----|--|------------------|---------------------|---------------------|
| 1 | Postage and Stationery | | | 2,000.00 |
| 2 | Telephone | | | 5,000.00 |
| 3 | Traveling and freight | | | 15,000.00 |
| 4 | Consumables | | | 10,000.00 |
| 5 | Repair and Renewals | | | 10,000.00 |
| 6 | Insurance fire and Employee | | | 10,000.00 |
| 7 | Rent | | | NIL |
| | Total Amount 1 | | Total | 52,000.00 |
| | Utilities (per month) | | | |
| S.N | Personnel | Salary (₹) | Person. | Amount (₹) |
| 1 | Plant operators | 10000 | 2 | 20,000.00 |
| 2 | Maintenance engineer | 15000 | 1 | 15,000.00 |
| 3 | Semi-skilled workers | 6500 | 5 | 32,500.00 |
| 4 | Watchman | 10000 | 2 | 20,000.00 |
| 5 | Additional perquisites @ 20% | | | 18,800.00 |
| 6 | Waste Tyre 10000 kg. per day x 24 days x Rs 14/= per Kg including cutting | | | 33,60,000.00 |
| 7 | Pyrolysis Oil 180 kg. per day x 24 day x Rs 42/- | | | 181440.00 |
| 8 | Power 50 HP 24 hours x 24 days x Rs 7.50/- (8000 Unit) | | | 60,000.00 |
| 9 | Water | | | 7,000.00 |
| | Total Amount | | Total Amount | 37,14,740.00 |
| | Total Recurring Expenditure (per month) Rs. Total Amount 1 + Amount 2 | | | 37,66,740.00 |
| | Turnover per Monthly | Presented | Per Month | |
| 1 | By selling Oil 4100 Kg*24 days*Rs. 42/-Kg. | 40% to 45% | 41,32,800.00 | |
| 2 | By selling steel scrap 1800kg*24days*rs18/= Kg. | 15 %to 20% | 7,77,600.00 | |
| 3 | By selling Carbon 3800Kg *24days*Rs 1.5 /kg | 30%to 35% | 1,36,800.00 | |
| 4 | Gas Around Recycling | 5% to 10% | Nil | |
| | Turnover per Month | | 50,47,200.00 | |
| | Total Recurring Expenditure (per Monthly) Rs. | | 37,66,740.00 | |
| | Profit gross Per Month | | 12,80,460.00 | |

Semi Continues Tyre Pyrolysis Plant
Total appoximate Investment in One Plant [without land]

| S.No | Details | | Approximate Price in ₹. |
|------|--|-----------------|-------------------------|
| 1 | 10 Tons Machine Cost material Loading 10 Tons Each process | With tax | 65,00,000-00* |
| 2 | Transportation cost | Trailer/ trucks | 1,50,000-00 |
| 3 | Pipes insulation | | 2,00,000-00 |
| 4 | Oil Storage Tank 20 KL. | | 2,50,000-00 |
| 5 | Foundation cost only Machine | As per drawing | 3,00,000-00 |
| 7 | Extra Water Tank 50,000 Ltr. [spare water] | As per drawing | 2,50,000-00 |
| 8 | D.G. Generation set [50 KW] | Standard | 4,00,000-00 |
| 9 | Office Equipment's, furniture & Security System | | 2,25,000-00 |
| 10 | Steel structure and pipes | | 3,00,000-00 |
| 11 | Electric Connection/Cable/Wiring | | 1,50,000-00 |
| 11 | Bank loan CA Charge | | 50,000-00 |
| 12 | Raw material Investment working capital | | 15,00,000-00 |
| 13 | Other Expenses (tools , fire fighting etc.) | | 2,00,000-00 |
| 14 | Installation charge | | 2,00,000-00 |
| 15 | Land & building Investment | | AS ACTUAL |
| | Estimated Project Cost | | 106,75,000-00* |

TEST REPORT OF BEAD WIRE

| | | |
|------------|--|--------------|
| Carbon | 0.67 - 0.73% | 0.60% min. |
| Maganese | 0.40 - 0.70% | 0.40 - 0.70% |
| Silicon | 0.15 - 0.03% | 0.15 - 0.30% |
| Phosphorus | 0.03% max. | 0.04% max. |
| Sulfur | 0.03% max. | 0.04% max. |
| Copper | Trace | Trace |
| Chromium | Trace | Trace |
| Nickel | Trace | Trace |
| Coating | 66% Copper 34% - Zinc 98% Brass , 2% Tin | |

TEST REPORT OF PYROLYTIC CARBON CHAR

| | | |
|--------------------------------|-------|---------|
| 1. Inherent Moisture (ADB) (%) | 0.75 | IS 1350 |
| 2. Ash (ADB) (%) | 11.60 | IS 1350 |
| 3. Volatile Matter(ADB) (%) | 2.80 | IS 1350 |
| 4. Fixed Carbon (By Diff) | 84.85 | IS 1350 |
| 5. Phosphorous as P(%) | 0.009 | IS 1350 |
| 6. Sulphur as S(%) | 2.80 | IS 1350 |
| 7. GCV(K Call Kg) | 7235 | IS 1350 |

TEST REOPRT OF HYDROCARBON GASES

| Gas Composition | Percentage of total Weight of tyre |
|----------------------------------|------------------------------------|
| 1. CH ₄ | 1.513% |
| 2. CH ₃ | 0.295% |
| 3. C ₂ H ₄ | 0.3999% |
| 4. C ₃ H ₅ | 0.25% |
| 5. CO | 0.38% |
| 6. CO ₂ | 0.3% |
| 7. H ₂ S | 0.1% |
| 8. H ₂ | 0.01% |

Test Report of Tyre Pyrolysis Oil

| No. | Test item | Value | Reference standard |
|-----|---|---------|---------------------|
| 1 | Density (20°C) mg/cm ³ | 0.9072 | GB/T1884 |
| 2 | 90% Distillation temperature °C | 402 | GB/T6536 |
| 3 | Net thermal value kJ/kg | 38275 | Bomb method |
| 4 | Hydrogen-carbon ratio (atomic ratio) | 1.36 | Components analysis |
| 5 | Flash point (closed cup) °C | 66 | GB/T261 |
| 6 | Ignition point °C | 54 | GB/T261 |
| 7 | Self-ignition point °C | 310 | DL/T706 |
| 8 | Pour point °C | -8 | GB/T3535 |
| 9 | Kinematic viscosity (40°C) mm ² /s | 3.29 | GB/T265 |
| 10 | Carbon residue % | 1.2 | GB/T268 |
| 11 | Nitrogen content % | 0.64 | Components analysis |
| 12 | Saturated vapor pressure KP | 1.6 | GB/T8017 |
| 13 | Boiling point °C | 107-493 | GB/T6536 |
| 14 | Cold filter plugging point °C | -6 | SH/T0248 |
| 15 | Ash % | 0.01 | GB/T508 |
| | Moisture % | No | GB/T260 |
| | Sulfur content % | 1.31 | GB/T380 |
| | Filter impurities, mg/100ml | 1.5 | GB/T5 |

| Items | Specifications | Normal Batch Type Plants | 10 TPD Semi Continuous System (PF-8-Y-13) | Continuous System 15 TPD (PF-15-Y-13) |
|----------------------|--------------------------|---|---|---|
| Pre-Pyrolysis | The Material Requirement | Whole Tire or 4 cuts (occupy more space, waste of energy & money) | Manual Cutting System, Set of Machines including bead wire & rubber separator for better steel price, need to cut 50*50mm | Shredder, PS1200, 3t/h, need to cut 20*20mm, to 50mm size tyre pices |
| | Equipment Material | MS steel | 16MnR High grade steel | Q245R, Highest Grade of Commercial Steel |
| Pyrolysis | Type of Working | 24 hours or more for One Batch | 1.5 process also can be achieved in 24 hours | Continuous 24 hours |
| | Control System | Normal Control panel | Piano type 2 control panel | Control panel with SIEMENS module |
| | Running Time | 24 hours, cooling time is big issue | 16-18 hours per process (start to finish) | 24x7, 24 days in a month, 6 days for maintenance |
| | Heating Type | Direct Heating is unsafe, Generates Ash, Dirt, Smoke & Pollution | Indirect Air Heating System made of steel, fully safe and clean, no pollution at all | Indirect air heating system, fully safe and clean, no pollution at all |
| | Fuel | Coal and Wood | System generated Pyrolysis Oil for startup heating after that syngas from system for further process | System generated Pyro Oil for startup heating after that syngas from system for further process |
| | Acceptable Materials | Tyres | Tyre and any kind of Rubber Waste/Scrap | Crumb Rubber or Rubber Granules |
| | Furnace | Open Furnace Direct Uneven Firing under the Reactor (Unsafe) | Fully Closed Hot Air Blast Chamber, Made of High Grade Steel with 2 Speed Pyrolysis Oil Burner, Waste Heat Recovery Boiler (WHRB) | Closed Hot-air stove with 2 speed Pyrolysis Oil Burner, Waste Heat Recovery Boiler (WHRB) and Air Preheater |
| | Reactor Feeding Capacity | Maximum Size Claimed to be 10 tons per Batch but can not fill more than 7-8 ton maximum if tyre are cut in pcs. | 10 ton feeding of 50 mm pieces of cut tires, full utilization of space, energy & man power | 15 ton per day guaranteed continuous feeding in 24 hours |
| | Raw Material Feeding | Through Big Door with Manual Tyre Feeding, chances of gas leakage and explosion (Unsafe) | Fully Compact & No Doors, Automatic Feeding through Screw Conveyor with Air Lock Flap Valve and Steam Inlet, (Safe Options) | Auto feeding through screw conveyor with air lock flap valve and steam inlet feeding material preheater |
| | Reactor | Horizontal 2.6mts x 6.6mts, fire bricks insulation | Horizontal 2.8 mt x.8 mts ,with Hot Air Flow direction plate in reactor, glass wool insulation | Horizontal, screw conveyor inside for better efficiency 1.5 mtr x 12 mtr |
| | Catalyst | Needed in some systems | Not needed | Not needed |
| | Oil Condensing | 2 Condensers | 4 Big Units of Condensers | 6 Units of Condensers |
| | Carbon Discharge | Manually, after opening the reactor door, create lots of mess & pollution | Semi automatic discharge closed conveyor with water cooled screw slag, carbon discharge at 150 degree, Fully clean, No mess. No pollution | Automatic discharge conveyor with water cooled screw slag |

| Items | Specifications | Normal Batch Type Plants | 10 TPD Semi Continuous System (PF-8-Y-13) | Continuous System 15 TPD (PF-15-Y-13) |
|-------------|--|--|---|---|
| Pyrolysis | Steel Separation | Manually, steel wire are jumbled up and full of carbon & unburnt rubber, steel wire is too heavy requires special wire pulling machine. Hard to cut or to make compressed bale | Magnetic selector, electromagnetic steel wire separator, steel wire is in small pcs. and easily separated from carbon black, Easy to handle. (Steel & Carbon separation at same time) Bead wire is taken out from bead wire separator | Magnetic selector, electromagnetic steel wire separator, steel wire is in small pcs. and easily separated from carbon black |
| | Waste Discharge | No system to process the waste | No waste discharged, everything is recycled | No waste discharged, everything is recycled |
| | Waste Gas Processing | Water sealing & gas relay tank | Waste gas relay tank, waste gas-liquid separator, waste gas processor, water sealing tank, gas return to hot-air furnace | Waste gas relay tank, waste gas-liquid separator, water sealing tank, gas returning to hot-air furnace |
| | Smoke Processor | Draft Fan | Exhaust buffer, Exhaust processor | Exhaust buffer, Exhaust processor |
| | Waste Heat Recovery | Not possible in this system | (WHRB) Waste Heat Recovery Boiler with Burner | Waste Heat Recovery Boiler, Air pre-heater, raw material pre-heater |
| | Cooling | Water cooling | Extra large water cooling tower system with Water Softening System to neutralize hard water | Cooling tower system & Water Softener System |
| | Fuel Gas Emission Standard | Not possible to achieve because of its design, can not qualify pollution guidelines | As per Indian CPCB Guidelines, Extra' FGD" Flue Gas Desulfurization System is provided. | As per International emission Guidelines |
| | Water Pollution | Contaminated water contains Oil, carbon & other volatile materials, can not be processed by conventional tank cleaning system | Three water cleaning tanks & Effluent Water Treatment Plant (ETP System) assure & qualifies pollution standards (optional) | ETP System (OPTIONAL) |
| | Safety Systems | No proper safety systems | Auto cut off safety valves for pressure & temperature, Auto temptarure sound alarm System, Oil heating shut down control. Waste heat exchange boiler (with extra burner) generates continuous steam for cooling, gas pushing, pipes cleaning and regular plant maintenance. | PLC system, with all safety modules |
| Smell /ODOR | No system to Control Bad Smell from Air & Water (major problem for neighbours) | Very less smell because of its compact design and leftover smell from water & air can be removed by UV Photolysis Odor Purification System (OPTIONAL) | Very less smell because of its compact design and leftover smell from water & air can be removed by UV Photolysis purification system (OPTIONAL) | |

| Items | Specifications | Normal Batch Type Plants | 10 TPD Semi Continuous System (PF-8-Y-13) | Continuous System 15 TPD (PF-15-Y-13) |
|--------------------------------|-----------------------|--|--|--|
| Warranty | Performance Guarantee | 1 year for manufacturing defects but no performance guarantee | 1 year | 1 year |
| | Age of Equipment | 2 to 3 years after that reactors needs major repair or need be replaced | After 2-3 years welding required on the entrance of heating parts, After 6 years reactor needs to changed. | 8-10 years, after 3-4 years welding needed in the entrance of heating parts |
| Price Performance Ratio | Reason for Investment | Cheap in price but totally unsafe & immature technology, Price range US\$ 40000 to US\$ 50000 FOB China for basic plant (BAD INVESTMENT) | Commercially viable & safe plant , much more economical in caparison to fully continuous system, easy to operate and maintain, preferred in developing countries, Rs.1.1 Cr Ex Factory, India, (VALUE FOR MONEY) | Long Life Cycle, high efficiency, low labour cost, much preferred for safety and man power reasons. Price Rs. 4 Cr appox, good for large scale indutry |

NOTE

OUR SEMI CONTINUOUS PLANT IS HYBRID OF BATCH SYSTEM AND FULLY CONTINUOUS PLANT. ITS SIMPLE AND USER FRIENDLY

MODIFICATIONS IN DESIGN IS A CONTINUOUS PROCESS, SPECIFICATIONS ARE INDICATIVE AND COMPANY RESERVES THE RIGHT TO ALTER AND CHANGE AS PER REQUIREMENTS



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