FABHIND®

# WASTE TYRE RECYCLING PLANT

## AS PER CPCB NORMS

# Waste Tyre Recycling Plant

## (5 TPD, 10 TPD, 12 TPD, 15 TPD)

### Raw Material

- **Waste Tire & Rubber Products**
  - ✻ Nylon Tire (80%)
  - ✻ Radial Tire (20%)
  - ✻ Conveyor Belt, Gaskets, Sheets etc.
- **Plastic Materials**
  - ✻ Plastic waste from households & hospitals
  - ✻ Electronic Scrap
  - ✻ Industrial Plastic Waste
- **Other plastics like LDPE, LLDPE, HDPE, PP, Nylon, Teflon, PS, ABS, FRP& Multilayered Plastic can be used in limited quantity**

### Products Obtained from Pyrolysis Process

✦ Pyrolysis Oil ✦ Carbon Black ✦ Steel Wire ✦ Hydrocarbon Gas


## ✦ Pyrolysis Oil

| | |
|---|---|
| Total yield obtained | 40 – 45 % |
| Flash Point | 60 – 93.3°C |
| Selling Price | Comparable to LDO (Light Diesel Oil) |
| Use | ✦ Furnace Industries<br>✦ Rolling Industries<br>✦ Casting Industries<br>✦ Road construction industries<br>✦ Crude oil distillation plant |

## ✦ Carbon Black

| | |
|---|---|
| Total yield obtained | 30 – 35 % |
| Also Known As | Charcoal |
| Use | ✦ Cement Industries<br>✦ Ink Industries<br>✦ Rubber Industries<br>✦ Carbon Briquetting Plant<br>✦ New Tire Manufacturing<br>✦ Rubber Runway<br>✦ Shoe Sole |

## ✦ Steel Wire

| | |
|---|---|
| Total yield obtained | 15 – 20 % |
| Ways to Obtain | ✦ Steel wire remains as by product, which can be obtained by Wire Puller machine after cooling down the reactor<br>✦ Steel wire can also be removed before adding the radial tire in the reactor, by Hydraulic Steel Wire Removing Machine |
| Use | ✦ Steel Scrap Industries<br>✦ Rolling Mill |

## ✦ Hydrocarbon Gas

| | |
|---|---|
| Total yield obtained | 5 – 8 % |
| Production Procedure | Small molecules vaporize & exit from the reactor, which can be used directly as fuel or can be condensed into liquid oil. |
| Use | ✦ Gas can be used directly as fuel for next day process |

## Plant & It's Components

- **Reactor**
- **Tanks**
  - Insulation Tank
  - Water Seal Tank
  - Carbon Holding Tank
  - Gas Tank
  - Underground Oil Tank
- **Condensing Unit**
- **Scrubber System**
- **Chimney**
- **Panel**

## Reactor

## Tanks

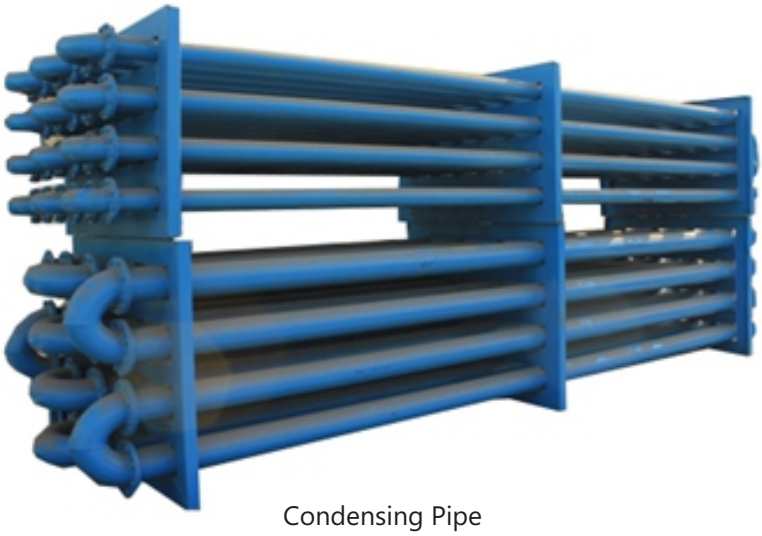
Carbon Holding Tank

Under- Ground Oil Tank

Water Seal Tank

Insulation Tank

## ✦ Condensing Unit



Condensing Pipe


Cooling Tower

## Chimney

## Scrubber System

## Panel


## Advantages of Pyrolysis Plant

- Purest quality of Pyrolysis Oil as finished product.
- Use of green technology to achieve environment friendly process.
- Automatic safety valve (pressure and temperature valve) used to improve safety, profitability & ease of operation.
- It is energy self-sufficient.
- No external fuel required for heating.
- It recovers energy and generates value from waste, in form of fuel, steel wire and charcoal.
- Reduces land pollution.
- Eco-friendly recycling of tires.
- Commercially viable process.
- A good substitution to LOD / Furnace oil.

**Main models**

- RC-10 /12 (HALF DOOR )
- RF-10 /12 (FULL DOOR)

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# Compliance of required facilities and standard operating procedures for the production of Tyre Pyrolysis Oil for Batch Process along with time bound action plan for compliance of SOP.

| Sr. No. | Description of Guide Line | Compliance Status/Proposal |
|---|---|---|
| 1. | The feed to the pyrolysis reactor should be devoid of steel. After removal of steel wire the tyre can be put either in the form of crumbs or chips (which can be made simply by cutting without going for the shredding process). Further the feeding arrangement of the rubber crumb to the reactor should be mechanised. | It can be fulfilled by tyre steel de loading machine for wire removal and it can be shredded in to small chips(crumbs)by using tyre side wall cutter & tyre block cutter machine<br>Later on crumbs will be feed by conveyor belt and auto feeder in to the reactor equipments<br><br>➢ **Equipment to be used**<br>**I. Tyre steel wire de-voiding machine**<br>**II. Tyre side wall cutter machine**<br>**III. Tyre block cutter machine**<br>**IV. Conveyor system for tyre chips feeding**<br>**V. Auto feeder** |
| 2. | The initial heating of the reactor should be done by liquid fuel or gas. The flue gas should be released to the environment through a chimney of at least 30 metres height | *Oil burner system to be used for initial heating of the reactor . later on its own produced gas can be used for remaining process of the reactor<br>➢ **Equipment to be used**<br>**I. Oil burner system**<br><br>*30 meter height stack (industrial chimney)with its ladder (30 feet ) & platform for emission fuel gas after filtering it's from wet scrubber system equipment<br><br>➢ **Equipment to be used**<br>**I. 30 meter industrial chimney** |
| 3. | After initial heating, during the pyrolysis process, the pyro gas generated within the plant should be used as a fuel. | System already implemented in standard machine |
| 4. | Excess pyro gas if any should be flared through properly designed flaring system of adequate capacity considering the emergency situation in which the entire gas may have to be flared. The flaring should be done at a minimum height of 30 metre. | *30 meter auto gas firing chimney will be insulated for excess pyro gas flared considering the emergency situation in which the entire gas my have to be flared<br><br>➢ **Equipment to be used**<br>**I. Auto ignition system (30 mitre)** |
| 5. | Adequate instrumentation for measurement and control of temperature and pressure along with safety interlocks in case of increase of temperature or pressure to cut off heating of the reactor should be provided. Automatic control systems such as Programmed Logic Control (PLC) shall be adopted. It should be ensured that the reactor is under positive pressure all the time. | *Programmed logic control (PLC) System will be insulated to control of temperature and pressure along its safety interlocks like safety valves, ball valves , pressure analogue meter , temperature analogue meter equipments.<br><br>➢ **Equipment to be used**<br>**I. PLC based automatic control panel board** |
| 6. | In order to control fugitive emissions from the reactor during operation, proper sealing should be ensured. | Adequate Qualified Gland Rope & gland packing system has been used for proper sealing of reactor during operation. |

| | | |
|---|---|---|
| 7. | The collection of the oil from the condensers should be in closed vessel and storage also should be in closed tanks with suitable vents. There should be no manual handling of oil. Transfer of oil should be through pumps. | System already implemented in standard machine |
| 8. | At the end of the pyrolysis process the reactor has to be cooled before the removal of carbon. During this process, the reactor should be purged with nitrogen. | 50 degree Celsius temperature has been indicated by automatic control panel board which is indication of reactors door door opening<br>nitrogen purging system will be installed for removal of excess pressure from the reactor<br><br>➢ **Equipment to be used**<br>**I. Nitrogen Purging system** |
| 9. | The removal of carbon should be started after the reactor's temperature has come down to below 50 Degree C. | System already implemented in standard machine |
| 10. | The removal of carbon should be through a mechanised system and it should be ensured that no spillage takes place during the collection of the carbon in the bags. | *Carbon Powder will be removed from front door of reactor by its chute attached with close flange<br>It can be packed by flexible pipe or screw conveyor to hopper<br><br>➢ **Equipment to be used**<br>**I. Carbon removal chute**<br>**II. Pipe screw Conveyor, Flexible pipe**<br>**III. Carbon powder hopper** |
| 11. | Adequate number of sensors along with alarm system should be provided at suitable locations throughout the plant to detect any leakage of flammable vapours from the system. | System already implemented in standard machine |
| 12. | Adequate fire fighting system like sprinklers and fire hydrant with necessary pumping system and water storage should be provided | System already implemented in standard machine |
| 13. | The plot size should be adequate for storage of crumb or cut tyres, oil and carbon black in addition to the pyrolysis plant and accessories as well as enough space for movement of fire tender in case of any emergency. A minimum indicative size of small plant is about 3000 square metres | System already implemented in standard machine |
| 14. | The plant shall possess clearance certificates issued by concerned departments. | System already implemented in standard machine |
| 15. | The carbon black and the oil obtained from the process should be supplied only to actual users/processors. | System already implemented in standard machine |
| 16. | The waste water generated in the process from condensers or any scrubbers should be properly treated in an effluent treatment plant and the sludge generated should be sent to TSDF. | ETP Will be installed for treatment of Waste water & scrubber mud water . remaining & wastage of sludge will be sent to TSDF<br><br>➢ **Equipment to be used**<br>**I. ETP SYTEM** |
| 17. | Oil containing water condensate should be treated in suitable ETP. Oily sludge/residues should be disposed through TSDF | System already implemented in standard machine |

## ✦ Tyre Cutting Equipments

By using this tyre cutting machine whole tyre can be cut in to different size as per requirement in pyrolysis process .

## ✦ Fuel Burner System

Pyrolysis process can be start by fuel oil without any use of wood

## ✦ Reuse Of Pyro Gas

Reuse of a pyro gas in same pyrolysis process by pyro gas burner and air blower

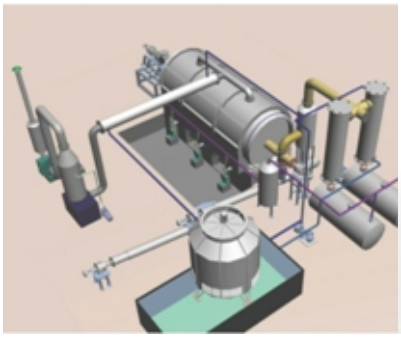
## ✦ 100 Feet Chimney for Fuel Gas Release

- ✦ Releasing filter gas & wood smoke at 100 feet
- ✦ Reduce air pollution
- ✦ Fulfill pollution control norms
- ✦ 100 feet chimney with fuel gas sample collecting platform at 30 feet

## ✦ Auto Gas Firing System

- Application & benefit
- Auto release &firing extra gas at 100 feet gas chimney
- Fulfill pollution control norms
- By burning the extra fuel gas in the presence of oxygen so it can solve the problem of gas odor

## ✦ Excess Pyro Gas Release System



PYROLYSIS PROCESS CONTROLLER

When the pressure recheas 0.6 BAR or temperature reaches 450 or if any there is any gas leak –the controller shuts off the to burner and the hooter comes on all data is transmitted by wifi to your mobile every 20 seconds

## ✦ Automatic Control PLC Panel


- Reactor temperature and a pressure can be controlled & indicate by PLC panel
- By help of PLC panel will get the accurate result of reactor door opening and cooling period & increase the safety in plant
- Safety valve 0.5 kg/bar, 1 kg/bar, 4 kg/bar fitted in the pyrolysis plant for release of excess pressure and make the plant safe
- In case of a running gas pressure is high during the process alarm system fitted in the pyrolysis plant will ringing the hooter & automatically control the temperature & gas pressure by the help of PLC panel.


## Desulfurization System For Smoke & Odor

- After feeding the Raw material inside the reactor preheating
- Is needed with some kind of external fuel like Pyrolysis oil.
- During the burning process of fuel heat smoke will be
- Generated from Reactor which is collected by scrubber pipe (12 Inch) and washed by scrubber coolant pipe and treated ceramic pipe present in scrubber tank which absorbed its smell and convert black smoke into white smoke and again white smoke wash with scrubber tank with spraying round pipe present in the tank which is contacted with Mud pump and Mud tank circulating the water.
- Remaining white smoke is sucked by dust blower and released at 100 feet chimney.

## Oil Transfer & Storage System

Fuel Oil can be transfer automatically by oil pump to the oil water separator tank (with excess gas release vent ) after few hours of setteling of oil & water only oil will transfer to storage oil tank water will be transfer to the ETP plant

## Nitrogen Purging Plant

- Application & benefit
- By using nitrogen gas in reactor increase saftey before opening reactor door
- Decrease cooling period of the pyrolysis process
- Helps to cool down carbon black & steel wire in the reactor
- It maintain efficiency y of the process
- Nitrogen purity is verry steady & reliable

## Oil Carbon Packing System


- Application & benefit
- It convey the carbon black from the reactor to the storage area
- Reducing dusting of carbon black in plant area
- Remove small steel particles
- 1000 kg of jumbo bag is filled by conveyer
- Fulfill pollution control norms
- Exposure of worker to fine carbon practical's
- By using carbon handling equipments & carbon packing device Exposure of worker to fine carbon practical's will be improved an
- at time of carbon powder packing worker is wearing mask , head cap , gloves , and safety shoes to avoid exposure of carbon particles

## ✦ ETP Plant

ETP plant in a pyrolysis process use to treat a remaining content of pyro water generated during the tire pyrolysis process and also treated wet scrubber water to pure and clean water and again reuse in wet scrubber system.

## ✦ Fire Hydrant System

- ✦ Tyre pyrolysis plant having fire hydrant system with sufficient
- ✦ Quantity of underground water tank and fire hydrant pump connected to the
- ✦ Surround fire hydrant pipe line in premises

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