

### Detail Technical Specification

Supply, installation and commissioning of waste plastic pyrolysis plant to process 100 kg plastic waste per batch (Batch processing time: 4-6 hours) and convert it to pyrolysis oil: 03 Units

1a) End user:

The waste plastic pyrolysis plants will be installed at Imphal East, Imphal West and Bisnupur district of Manipur as a part of the deliverable of the project "Installation & Commissioning of Integrated Rural Solid Waste Disposal System (iRSWDS)".

2a) Detailed specification for each unit:

Sl. No.	Name of component	Description of item	Quantity
1	Pyrolysis reactor	<ul style="list-style-type: none"><li>Configuration: Horizontal stainless steel (SS304 grade with 8 mm thickness) reactor with manual feeding. The outer insulation is jacketed with 80 mm (min) thick ceramic wool and clad with stainless steel sheets for protection</li><li>Reactor capacity: 100 kg plastic waste</li><li>Volume: 2.5 m<sup>3</sup> (min)</li><li>Size: 1150 (D) × 2400 (L) in mm (min)</li><li>Furnace at the bottom for heating</li><li>Thermocouple for temperature measurement at the inside of reactor, outlet pipe of reactor, exhaust gas pipe and furnace</li><li>Pressure gauge in the reactor chamber and gas pipeline</li><li>Automatic pressure release valve arrangement for Nitrogen / CO<sub>2</sub> purging for safety purpose</li><li>Full door opening for feeding material</li></ul>	1 No.
2	Heating system	<ul style="list-style-type: none"><li>Firing with independent burners</li><li>2A) One pyrolysis oil/LDO burner. Pyrolysis oil/ LDO burner to be provided with pumping unit comprising of 3φ gear pump along with filter and a 40 L capacity oil tank with intermediate piping</li><li>2B) One hydrocarbon/LPG gas burner with intermediate piping</li><li>All fabrication in MS (IS2062) and seamless tube of Schedule 20</li></ul>	2 Nos. of each type (2A and 2B)
3	Condenser assembly	<ul style="list-style-type: none"><li>Shell and tube type heat exchanger with provision for water inlet and outlet from cooling tower</li><li>The maximum temperature rise of cooling water in the condenser must not exceed 10°C</li></ul>	1 No.

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Indip Samanta  
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Nipen Chandra  
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a T&PC  
meeting.  
31/7/2020

		<ul style="list-style-type: none"> <li>No. of stages: 4 (min)</li> <li>Oil water separation tank mounted on stand connected for oil collection</li> <li>All fabrication in MS (IS2062) and seamless tube of Schedule 40</li> </ul>	
4	Oil Water Separator tank	<ul style="list-style-type: none"> <li>Capacity: 200 L (min)</li> <li>MOC: MS IS2062 of 5 mm thickness</li> <li>Safety device to prevent flashback into the reactor</li> <li>The level of the tank should be such that the separated oil is transferred to the oil receiver tank without any pumping</li> <li>Tank level indicator mounted on side</li> </ul>	1 No.
5	Oil Receiver tank	<ul style="list-style-type: none"> <li>Capacity: 100 L (min)</li> <li>MOC: MS IS2062 of 5 mm thickness</li> <li>Tank level indicator mounted on side</li> <li>Drain and discharge valve at bottom</li> </ul>	1 No.
6	Hydrocarbon gas collection tank	<ul style="list-style-type: none"> <li>Buffer tank to safeguard pressure build up with pressure gauge, pressure relief valve and diversion to use the gas in reactor heating or flaring system</li> <li>Capacity: 500 L (min)</li> <li>MOC: MS IS2062 of 5 mm thickness</li> </ul>	1 No.
7	Cooling Tower	<ul style="list-style-type: none"> <li>Recirculating type</li> <li>Range of cooling tower: 5-10°C for an inlet temperature of 35°C</li> <li>Fibre-reinforced plastic body and reservoir with capacity of 150 L</li> <li>Control valve to circulate water in plant condenser and distillation condenser</li> <li>1.0 hp, 1φ water pump for recirculation of water (Make: Crompton/Kirloskar)</li> <li>1.0 hp, 1φ air circulation fan with canopy cover</li> </ul>	1 No.
8	Chimney	ERW C class heavy duty pipe with bottom cone with diameter 100 mm, height 10 m and thickness 5 mm with canopy	1 No.
9	Control Panel	Manual operation with push button switch and indication lamps for burners, pumps, cooling tower fan, water pump, flare unit ignition and digital meters for temperature and pressure monitoring	1 No.
10	Flaring system for burning exhaust gases	Burner system with 0.5 hp blower	1 No.
11	Oil filtration system	<ul style="list-style-type: none"> <li>Three filtration stages: 100 μm, 50 μm and 20 μm</li> <li>Capacity: 5 LPM</li> </ul>	1 No.
12	Oil distillation unit	<ul style="list-style-type: none"> <li>Electric heating: 3 kW</li> </ul>	1 No.

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		<ul style="list-style-type: none"> <li>Capacity: 50 L per batch</li> <li>Shell and tube type two stage condenser with water circulation line connected to the reservoir of cooling tower through the water circulation pump</li> <li>The oil temperature in the distillation unit must be controlled (up to 400°C) for distillation at different temperatures</li> <li>Setting and display of temperature from the main control panel</li> <li>Oil collection tank: 2 Nos. of 20 L each</li> <li>MOC: SS304</li> </ul>	
13	Catalyst	Suitable catalyst must be provided to control the rate of reaction	300 kg

**Supply, installation and commissioning of waste plastic pyrolysis plant to process 250 kg plastic waste per batch (Batch processing time: 4-6 hours) and convert it to pyrolysis oil: 01 Unit**

**1b) End user:**

The waste plastic pyrolysis plant will be installed at Senapati district of Manipur as a part of the deliverable of the project "Installation & Commissioning of Integrated Rural Solid Waste Disposal System (iRSWDS)".

**2b) Detailed specification:**

Sl. No.	Name of component	Description of item	Quantity
1	Pyrolysis reactor	<ul style="list-style-type: none"> <li>Configuration: Horizontal stainless steel (SS304 grade with 8 mm thickness) reactor with manual feeding. The outer insulation is jacketed with 80 mm (min) thick ceramic wool and clad with stainless steel sheets for protection</li> <li>Reactor capacity: 250 kg plastic waste</li> <li>Volume: 6.0 m<sup>3</sup> (min)</li> <li>Size: 1500 (D) × 3500 (L) in mm (min)</li> <li>Furnace at the bottom for heating</li> <li>Thermocouple for temperature measurement at the inside of reactor, outlet pipe of reactor, exhaust gas pipe and furnace</li> <li>Pressure gauge in the reactor chamber and gas pipeline</li> <li>Automatic pressure release valve arrangement for Nitrogen / CO<sub>2</sub> purging for safety purpose</li> <li>Full door opening for feeding material</li> </ul>	1 No.

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2	Heating system	<ul style="list-style-type: none"> <li>Firing with independent burners</li> <li>2A) One pyrolysis oil/LDO burner. Pyrolysis oil/ LDO burner to be provided with pumping unit comprising of 3<math>\phi</math> gear pump along with filter and a 40 L capacity oil tank with intermediate piping</li> <li>2B) One hydrocarbon/LPG gas burner with intermediate piping</li> <li>All fabrication in MS (IS2062) and seamless tube of Schedule 20</li> </ul>	2 Nos. of each type (2A and 2B)
3	Condenser assembly	<ul style="list-style-type: none"> <li>Shell and tube type heat exchanger with provision for water inlet and outlet from cooling tower</li> <li>The maximum temperature rise of cooling water in the condenser must not exceed 10°C</li> <li>No. of stages: 4 (min)</li> <li>Oil water separation tank mounted on stand connected for oil collection</li> <li>All fabrication in MS (IS2062) and seamless tube of Schedule 40</li> </ul>	1 No.
4	Oil Water Separator tank	<ul style="list-style-type: none"> <li>Capacity: 300 L (min)</li> <li>MOC: MS IS2062 of 5 mm thickness</li> <li>Safety device to prevent flashback into the reactor</li> <li>The level of the tank should be such that the separated oil is transferred to the oil receiver tank without any pumping</li> <li>Tank level indicator mounted on side</li> </ul>	1 No.
5	Oil Receiver tank	<ul style="list-style-type: none"> <li>Capacity: 250 L (min)</li> <li>MOC: MS IS2062 of 5 mm thickness</li> <li>Tank level indicator mounted on side</li> <li>Drain and discharge valve at bottom</li> </ul>	1 No.
6	Hydrocarbon gas collection tank	<ul style="list-style-type: none"> <li>Buffer tank to safeguard pressure build up with pressure gauge, pressure relief valve and diversion to use the gas in reactor heating or flaring system</li> <li>Capacity: 500 L (min)</li> <li>MOC: MS IS2062 of 5 mm thickness</li> </ul>	1 No.
7	Cooling Tower	<ul style="list-style-type: none"> <li>Recirculating type</li> <li>Range of cooling tower: 5-10°C for an inlet temperature of 35°C</li> <li>Fibre-reinforced plastic body and reservoir with capacity of 250 L</li> <li>Control valve to circulate water in plant condenser and distillation condenser</li> <li>2.0 hp, 1<math>\phi</math> water pump for recirculation of water</li> </ul>	1 No.

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		(Make: Crompton/Kirloskar) • 2.0 hp, 1φ air circulation fan with canopy cover	
8	Chimney	ERW C class heavy duty pipe with bottom cone with diameter 150 mm, height 10 m and thickness 5 mm with canopy	1 No.
9	Control Panel	Manual operation with push button switch and indication lamps for burners, pumps, cooling tower fan, water pump, flare unit ignition and digital meters for temperature and pressure monitoring	1 No.
10	Flaring system for burning exhaust gases	Burner system with 0.5 hp blower	1 No.
11	Oil filtration system	• Three filtration stages: 100 µm, 50 µm and 20 µm • Capacity: 5 LPM	1 No.
12	Oil distillation unit	• Electric heating: 5 kW • Capacity: 75 L per batch • Shell and tube type two stage condenser with water circulation line connected to the reservoir of cooling tower through the water circulation pump • The oil temperature in the distillation unit must be controlled (up to 400°C) for distillation at different temperatures • Setting and display of temperature from the main control panel • Oil collection tank: 2 Nos. of 30 L each • MOC: SS304	1 No.
13	Catalyst	Suitable catalyst must be provided to control the rate of reaction	500 kg

### 3 Scope of supply & incidental services:

a) Waste plastic pyrolysis plant - 100 kg/batch: 03 units

b) Waste plastic pyrolysis plant - 250 kg/batch: 01 unit

Batch processing time: 4-6 hours

The supplier shall be required to perform the following services:

- Complete installation and commissioning of the goods,
- Onsite demonstration to Scientists/ Technicians/ Staff is to be provided by Supplier for operation and maintenance of the equipment to the complete satisfaction of the user department,
- Supplying at least one number of operation & maintenance manual (hard printed copy) with each of the pyrolysis plant,

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- d) Necessary cabling from control panel to each individual equipment items must be provided.

**4 Inspection and Acceptance Tests required:**

Trial run and full load test will be conducted for 7 days at each location to the complete satisfaction of the end user in the presence of Scientists/Technical Officers from CSIR-CMERI.

**5 Other Terms and Conditions:**

- a) CSIR-CMERI, Durgapur shall conduct the inspection and/or test the goods to confirm their conformity to the Tender Specifications at vendor's premises (Pre-dispatch inspection).
- b) CSIR-CMERI, Durgapur reserves the right to inspect, test and, where necessary, reject the Goods after the goods arrival at the final destination shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by CSIR-CMERI, Durgapur prior to the goods shipment.
- c) The Director, CSIR-CMERI, Durgapur shall be the final authority to reject full or any part of the supply which is not confirming to the specification and other terms and conditions.
- d) No payment shall be made for rejected goods. Rejected goods must be removed by the supplier at their own cost and replaced within two weeks of the date of rejection.

**6 Minimum Pre-Qualification Criteria:**

None

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