



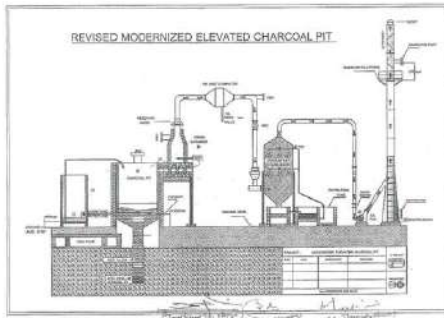
Tami Nadu Pollution Control Board

தமிழ்நாடு மாசு கட்டுப்பாடு வாரியம்

**PRESENTATION ON MODERNISED ELEVATED
CHARCOAL PIT TECHNOLOGY FOR CHARCOAL
PRODUCTION**

Presented by

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On

03.10.2024



Important Uses of Coconut Shell Charcoal

1 Activated carbon Produced From Coconut shell charcoal

Activated carbon derived from coconut shell charcoal has a wide range of applications as below:

- Water Purification
- Indoor and Industrial Air Filters
- Medical and Pharmaceutical Uses
- Gold Recovery
- Food and Beverage Industry
- Cosmetics and Skincare
- Gas purification in Oil and Gas Industry

2 Industrial Processes

Coconut shell charcoal is used as a fuel source in various industrial processes, such as metal smelting, brick making, and power generation.

3 Cooking and Grilling

Coconut shell charcoal burns hot and long, making it ideal for cooking, grilling, and barbecuing.

4 Miscellaneous

Coconut shell charcoal has various other uses, including in agriculture and as a component in certain cosmetics.



Conventional Charcoal Production Methodology



1. Carbonisation

Coconut shell contains about 65% to 75% of volatile matter and moisture which are removed during carbonization process. Coconut shells are subjected to partial burning (pyrolysis) in the absence of air in open earthen pits. This process generates emissions which mainly consists of CH_4 , CO, VOC and CO_2 and CO_2

2. Quenching

The partially burned shells are quenched with water to produce charcoal. The quenched water contaminates ground water

3. Charcoal Production

The resulting charcoal is then mainly utilised for activated carbon production.





Construction Details of Conventional Charcoal Unit

Earthen Pits

Brick-lined earthen pits, 3m in diameter and 4.5m deep, are used for charcoal production.



Processing Capacity

The size and number of pits vary based on the unit's processing capacity, ranging from 10 to 100 tons per day.

Single Pit Capacity

A single pit can process approximately 45 tons of coconut shells per day yielding about 15 T/day as product.

Operational Cycle

The operational cycle for a conventional charcoal pit is 72 hours.



Issues with Conventional Charcoal Production Plant

Environmental Effects

Inefficient Combustion

- Open earthen pits lead to incomplete combustion in pyrolysis resulting in lower charcoal yields, varying quality, and increased smoke emissions.

- Uncontrolled burning releases harmful gases such as CO, CH₄, VOC etc. and particulate matter, impacting air quality and contributing to climate change. No dispersion of the emissions.
- Disposal and seepage of quenched water contaminated with high concentration of dissolved organics and suspended solids may leach and cause soil degradation and groundwater pollution.
- Inviting public complaints.

Health Effects

Exposure to smoke and heat poses serious health risks to workers, including respiratory illnesses, eye irritation and skin allergies.



Reason for Changeover to Modernized Elevated Charcoal Pit

1

Public Protest

In October 2012, the Public in Kangeyam Taluk, Tiruppur District protested against the environmental impact of conventional charcoal production.

2

TNPCB Committee

The Tamil Nadu Pollution Control Board (TNPCB) formed a committee to address the concerns.

3

Recommendations

The committee recommended installing air pollution control systems and shifting to above-ground processing chambers.

4

NGT Intervention

- No. of cases filed before the Hon'ble High Court of Madras and the Hon'ble NGT (SZ).
- The National Green Tribunal (NGT) constituted an expert committee in October 2013 to find a permanent solution.



Reason for Changeover to Modernized Elevated Charcoal Pit

5

Above-Ground Technology

The expert committee recommended above-ground pyrolysis design as a feasible solution.

6

TNPCB Guidelines

As per the direction of the Hon'ble NGT (SZ) dated: 28.10.2016, the TNPCB constituted an internal committee, the TNPCB developed design and guidelines for above-ground charcoal units in 2017.

7

NGT Order

The Hon'ble NGT (SZ) ordered dated: 20.11.2020 in O.A. NO. 17, 24 etc., of 2013 that all charcoal units to shift to above-ground technology, with the recommendations and the conditions imposed by the TNPCB committee and design approved either by the IIT, Chennai or the Anna University as suggested by the Board or till then they are directed not to operate such units.



Extract of the Hon'ble NGT (SZ) ordered dated: 20.11.2020 in O.A. NO. 17, 24 etc., of 2013

The orders of the Hon'ble NGT (SZ) in O.A. NO. 17, 24 etc., of 2013 dated: 20.11.2020 ordered interalia as follows:

“i. ..The Charcoal units operating in the state of Tamil Nadu and other Southern States are directed to shift over to above ground level technology design approved either by the Indian Institute of Technology, Chennai or Anna University as suggested by the Board and till then they are directed not to operate such units.

ii. ... to conduct carrying capacity study before allowing these units to establish (or) operate in that area ...”



TNPCB DESIGN AND GUIDELINES FOR CHARCOAL UNITS VETTED BY THE ANNA UNIVERSITY

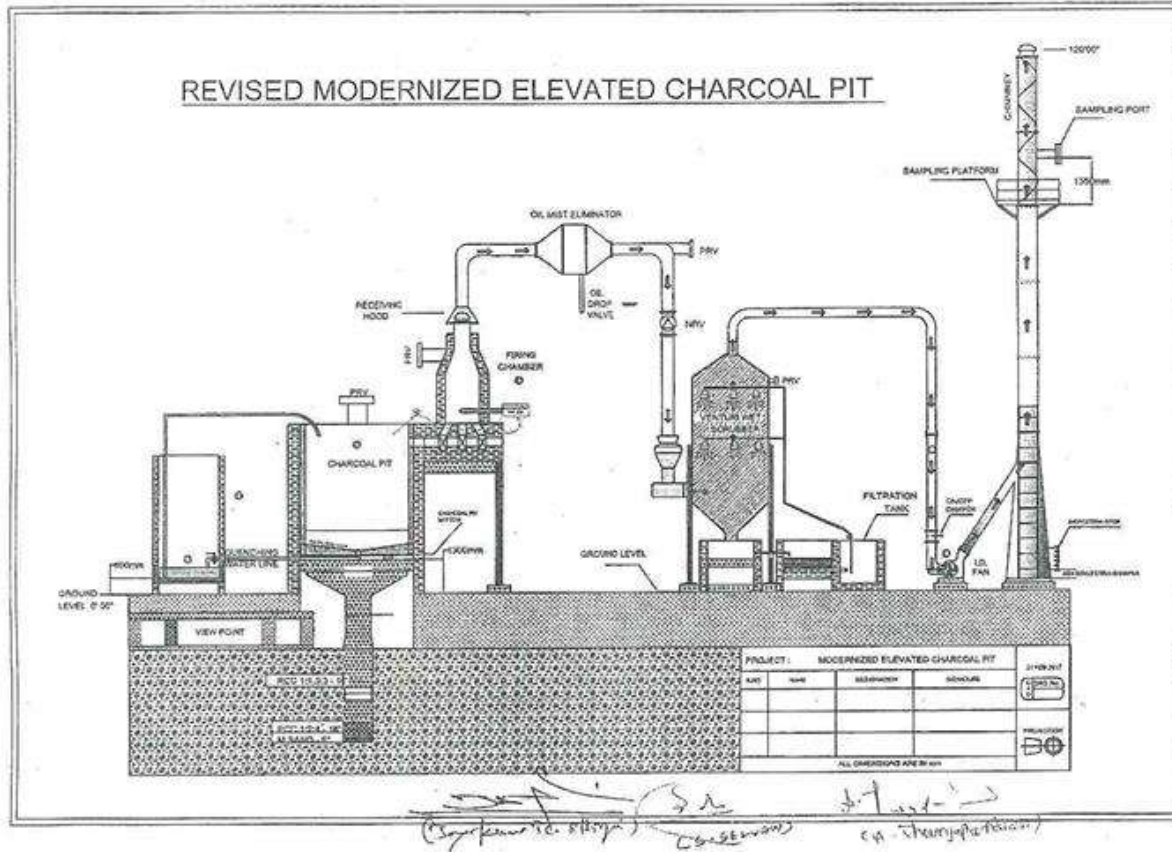
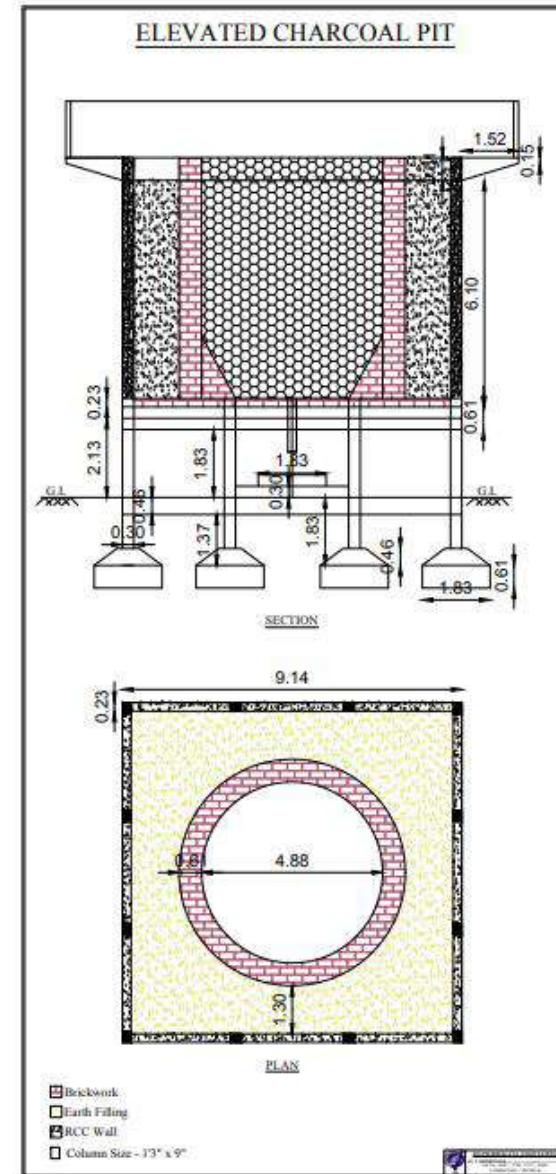


Figure 1 Schematic Diagram of the continuous Charcoal Production Plant

Features of the Elevated Charcoal Pit Design

1 Elevated Charcoal Pit

The bottom of the elevated charcoal pit is 1200mm above ground level.



2 Air Pollution control measures

i. Firing Chamber:

Incineration of pyro gases in the firing chamber ensures complete combustion, so that VOC, CH₄ and CO are completely fired off and not let out into the atmosphere.



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ii. Wet Scrubber & ID Fan:

- Wet scrubber is used to control air pollution by removing particulate matter and harmful gases from the exhaust stream. It works by passing the exhaust through water, which captures and neutralizes pollutants before releasing cleaner air into the environment. The water is again recycled to the process
- ID (Induced Draft) fan is used to draw exhaust gases through the scrubber, ensuring effective removal of pollutants. It helps maintain proper airflow, reducing pressure in the system and enhancing the overall efficiency of the air pollution control measures.



VENTURI WET SCRUBBER WITH ID FAN

Contd...

iii. Oil mist eliminator

Oil mist eliminator is used to capture and remove oil particles from the exhaust gases generated during the production process. This helps prevent air contamination and improves the efficiency of the system by keeping equipment clean.



OIL MIST ELIMINATOR



3 Water Quenching Tank

- **The water quenching tank is positioned 600mm above ground level.**
- **Quenched water collected back and recycled to process.**

Features of the Elevated Charcoal Pit Design

4 Port hole

A platform with port hole arrangement provided in the chimney to monitor process emission.





B.P. No. 65 Dated: 22.08.2022

Protocol to be followed by the existing and proposed charcoal manufacturing Industries in view of compliance of Hon'ble NGT (SZ) order dated: 20.11.2020 in O.A. No. 17,24, etc. of 2013.

- **Existing charcoal units (i.e. prior to the Hon'ble NGT (SZ) order dated 20.11.2020 passed in O.A. NO. 17, 24 etc., of 2013) – To adopt design and guidelines as suggested by the Board vetted by the Anna University.**
- **Proposed charcoal units (i.e. established after the Hon'ble NGT (SZ) order dated 20.11.2020 passed in O.A. NO. 17, 24 etc., of 2013) – To adopt siting criteria and design and guidelines as suggested by the Board vetted by the Anna University.**
- **Existing and proposed units – Protocol to be followed as per B.P. No. 65 Dated: 22.08.2022.**



Siting Criteria for Elevated Charcoal Units



Habitation

No charcoal manufacturing unit is allowed within 1 km of approved habitation.



Highways

Units must be at least 500m away from national or state highways.



Wildlife Sanctuaries

Units cannot be located in declared wildlife sanctuaries or reserved forests.



Distance Between Units

A minimum distance of 1 km must be maintained between two charcoal manufacturing units.





Air Pollution Control Measures

- **A water scrubber arrangement is attached to a stack of minimum height 10m for flue gas treatment.**
- **Waste heat energy from the flue gas can be used for drying raw materials and other purposes**
- **The assembly of continuous process method shall be housed within a closed shed with suitable access.**
- **Loading of raw materials and unloading of finished products shall be mechanized.**



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Fugitive Emission Control

- **Compound wall shall be provided on all sides of the unit to a minimum height of 4 meters from the ground level.**
- **Raw materials within the premises shall not be stacked beyond a height of 3 meters from the ground level.**



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Standards for charcoal units

- Emission standard – particulate matter not more than 150mg/Nm³
- National Ambient Air Quality standards-CPCB Notification No.B-29016/20/90/PCH/dt.18.11.2009.
- The Noise Pollution (Regulation and Control) Rules 2000 as notified by MoEF, S.No.123 (E) dated: 12.02.2000.

Green belt development

- The industry should plant three rows of spreading crown & fast growing of evergreen thick foliage tall trees all along the boundary.



Other requirements

- **Stack/Ambient Air Quality/Ambient Noise Level surveys to be periodically conducted and reports should be furnished to TNPC Board.**
- **Maintain good housekeeping practices where ever possible within the unit premises to control fugitive dust emission.**
- **Buffer stock of raw materials (coconut shells and other biomass) of not more than 10 days requirement shall be stored within the unit premises.**
- **Raw materials and finished products shall be stored separately and all steps shall be taken to comply with the fire safety procedures enacted in law.**
- **Adequate measures of safety for workers working in the charcoal units shall be taken. Personally protective devices such as mask, helmet, safety shoes, etc shall be provided to workers.**
- **Local body clearance for the establishment and operation of the unit with other statutes.**

Best Practices - Coconut Shell Crusher & Carbonizer





Backward integration

- In case of existing activated carbon manufacturing units undertaking backward integration of charcoal manufacturing (By adopting continuous process) will not be insisted for siting criteria
- However air pollution control measures, fugitive emission control, standard for charcoal units, green belt development and other requirements shall be fulfilled.



Ambient Air Quality/Stack Monitoring survey results – At Elevated charcoal unit



TAMILNADU POLLUTION CONTROL BOARD
District Environmental Laboratory, Tiruppur – 1.



STACK MONITORING SURVEY – Report of Analysis

Report No. 56 / AAQS/2023 - 2023 Date: 06.11.2023

- 1. Name of the Industry : M/s. Sri Ram Industries.,
- 2. Address of the Industry : 445/2, Periyakadu, Kuppagoundenvalasu, Alambadi (PO), Kangayam - 638 701. Tiruppur Dt.
- 3. Date of Survey : 26.10.2023
- 4. Type of Industry : Textile Processing

Stack Monitoring Survey Results

Sl. No	Stack attached to	Stack Temp °C	Velocity in (m/sec)	Discharge rate in Nm ³ /hour	Pollutants (mg / Nm ³)		
					PM	SO ₂	NO _x
1.	Elevated Charcoal Firing Chamber	62	3.5401	3257.607	70	13	15

Test Performed	Test Method
PM10	IS 5182 : (Part 23) – 2006
SO2	Modified West – Graeke / IS 5182 : (Part 2) – 2001 RA: 2012
NOx	Jacobs – Hochheiser / IS 5182 : (Part 6) – 2006 RA:2012

Dy. Chief Scientific Officer,
District Environmental Laboratory,
Tamil Nadu Pollution Control Board,
TIRUPPUR.



TAMILNADU POLLUTION CONTROL BOARD
District Environmental Laboratory, Tiruppur – 1.



INFERENCE REPORT ON A.A.Q.S./S.M.

- 1. Name of industry : M/s. Sri Ram Industries., 445/2, Periyakadu, Kuppagoundenvalasu, Alambadi (PO), Kangayam - 638 701. Tiruppur Dt.
- 2. Pollution Category : Red / Small
- 3. Date of A.A.Q. Survey : 26.10.2023
- 4. Predominant Wind Direction : NW - SE
- 5. Weather condition : Clear Sky

STATUS OF POLLUTANTS LEVEL

AMBIENT AIR QUALITY :-

1. Total No. of A.A.Q. stations monitored : 5

No. of A.A.Q. stations in which Pollutants Level exceeded the Boards standards : NIL

Maximum and Minimum values of Pollutants Level observed:

Sl. No	POLLUTANT	Values in microgram/m ³		BOARD'S STANDARD (As per consent order)
		Minimum	Maximum	
1.	PM ₁₀	38	51	100
2.	PM _{2.5}	26	-	60
GASEOUS POLLUTANTS:-				
(i)	SO ₂	4	7	80
(ii)	NO ₂	10	13	80

II. STACK MONITORING:-

1. Total No. of Stacks Monitored : 1

2. No. of Stacks in which Pollutants level Exceeded the Boards standards : NIL

Dy. Chief Scientific Officer,
District Environmental Laboratory
Tamil Nadu Pollution Control Board
TIRUPPUR.

Inference: AAQ/SM survey parameters – within the limits prescribed by the Board



Comparison of Conventional method and Elevated charcoal pit

Sl. No.	Effects of conventional method	Advantages of Elevated charcoal pit
1	Burning of Coconut shells in the pits below ground level without proper APC measures releases harmful gases such as CO, CH₄, VOC etc. and particulate matter, impacting air quality.	The controlled burning process in elevated pits with APC measures comprised of Closed firing chamber, wet scrubber, ID fan and Oil mist eliminator significantly reduces smoke and ash emissions, minimizing environmental pollution.
2	Disposal and seepage of quenched water contaminated with high concentration of dissolved organics and suspended solids may leach and cause soil degradation and groundwater pollution.	Collection of quench water in impervious tanks and reuse for quenching results in less consumption of water and curtail the contamination of soil degradation and ground water pollution.



Comparison of Elevated charcoal pit and continuous process technology

Sl. No.	Effects of Elevated charcoal pit	Advantages of Continuous process technology
1	Ineffecient Combustion results in less yield of charcoal and of varying quality.	Continuous combustion of coconut shells in a controlled airflow system, ensuring optimal combustion conditions for high charcoal yield and high quality charcoal.
2	Water is used for quenching.	No water is used for quenching.
3	Wet scrubber arrangement is provided for flue gas treatment before letting the air into the atmosphere.	Waste heat energy from the flue gas can be used for drying raw materials and other purposes.



Instructions from the Board Dated: 08.07.2024 in compliance with the NGT orders – To conduct Carrying capacity

- The isolated charcoal units shall conduct the carrying capacity study by engaging NABET approved consultant
- Carrying capacity shall include the base line data of AAQ and Ground water quality in that area by engaging NAAC approved laboratory.
- The report shall have impact assessment study on the Environment by the unit for emission and effluent discharge in that area considering the facts of with/without the pollution control measures provided in the unit.
- The isolated charcoal unit may be permitted to establish/operate in the location if the AAQ and Ground water quality parameters in that area satisfy the standards prescribed by the Board after the outcome of the study report.



Conclusion:

- Coconut shell charcoal production, particularly through elevated pit technology, avoids the present Air and Water pollution issues of conventional charcoal production process.
- By utilizing a readily available renewable resource and minimizing environmental impact, this approach offers a viable alternative to traditional charcoal production methods.
- Focusing on the elevated charcoal pit technology that enhances efficiency and minimizes environmental impact.



Thank you