# PROJECT PROFILE

# ON

# ACTIVATED CHARCOAL

## MONTH & YEAR
## JULY 2011


## PREPARED BY
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**This publication is supported by**

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# ACTIVATED CHARCOAL

## A. INTRODUCTION

The activated charcoal is the raw material required for the manufacture of activated carbon. The activated charcoal is manufactured by burning shells of fully matured nuts in limited supply of air sufficient only for carbonisation, but not for complete destruction

## B. PRODUCT USES AND SPECIFICATIONS

The Activated charcoal is the raw material required for the manufacture of Activated Carbon.

**Miscellaneous Applications**

Activated Charcoal is also used as a culinary fuel, as a fuel in smitheries for smelting of gold and silver, and as furnace fuel in iron and steel industries.

**Coconut shell Charcoal to recover Chromium from plating waste**

Studies at the Indian Institute of Technology (IIT), Madras, show that chemically Activated Charcoal effectively removes harmful chromium ions from plating wastes

The adsorption of chromium ions on Activated Charcoal from coconut shell waste is found to be superior to the widely used "filtrasorb" Activated Carbon, when tested in both bed reactors and column chromatography.

Chromium compounds are widely used in plating industry whose effluents contain 15 to 70 parts per million (ppm) of chromium ions. Hexavalent chromium ions are particularly detrimental to humans. The IIT product absorbs hexavalent chromate ions from plating waste and further treatment with sodium hydroxide helps recover 60 per cent of the adsorbed chromate ions

for reuse for passivation of plated components. In case the chromate ions are not required, they can be reduced to safer trivalent ions and precipitated out. The exhausted carbon can be completely regenerated for repeated use.

The IIT team first charred coconut shell waste with concentrated sulphuric acid, in the presence of oxidising chemicals such as potassium per sulphate and hydrogen peroxide that increase the surface area of carbon. The carbon was thermally activated at 800 to 850 degrees celsius for 30 minutes. The prepared carbon, after thermal activation, was found to remove 92 per cent hexavalent chromium ions, and the remainder was reduced to trivalent ions. As a result, there were no chromate ions in the effluent.

**Specification of Activated Charcoal:**

| | |
|---|---|
| Fixed carbon | 72% (minimum) |
| Ash content | Maximum 3% |
| Volatile matter | 15 to 17% |
| Moisture content | Maximum 5% |
| Size | Not more than 5% shall pass through a 0.63 cm mesh sieve |
| Colour | Uniformly black |
| Foreign matter including –un-burnt shells | Maximum 5% |

## C. MARKET POTENTIAL

The total production of Activated charcoal in India is estimated at about 90000 tonnes. There are about 40 units in India manufacturing this item. There is a good export potential for this item. About 8000 tonnes of activated charcoal is being exported. The export market for Activated charcoal is mainly concentrated in USA, Japan, Korea.

The overall growth rate in demand for Activated Charcoal can be reasonably considered as 9 to 10% per annum

In the case of the export market, the growth rate in demand is likely to depend upon the capability of the Indian units to penetrate the global market, in competition with countries like Sri Lanka and Philippines, who have a dominant share at present.

## D. TECHNICAL ASPECTS

### 1. INSTALLED CAPACITY

The installed capacity of the unit is 300 Tonnes of Activated Charcoal per annum on three shift basis, 8 hours per day, for 300 days.

### 2. PLANT AND MACHINERY

The following items of equipment are required.

| Machine name |
|---|
| Drum kiln with Chimney- Stationary with combustion arrangements |
| Cooler chambers |
| Waste heat recovery |

The total cost of the plant and machinery is estimated at about Rs.70.00 lakhs on turnkey basis.

### 3. MANUFACTURING PROCESS

The process of manufacturing Activated charcoal involves the following sequence of operations.

Activated Charcoal is produced from Coconut Shell.

In India, traditionally, charcoal making is done in simple mud pits and brick lined kilns.

The Activated charcoal is manufactured by burnings shells of fully matured nuts in limited supply of air sufficient only for carbonisation, but not for complete destruction. The output of charcoal in the traditional pith method is just below 30% of the weight of the original shells.

In India, the average output in the traditional method has been found to be 35 kg of Activated charcoal from 1000 whole shells. In other words, about 30,000 whole shells yields one tonne of charcoal.

Sometimes, especially when the processing is defective, the output is still lower and nearly 40000 shells are required to produce one tonne of Activated charcoal.

To obtain good quality charcoal, fully dried, clean, mature shells should be used. Now several modern methods are in vogue for the production of charcoal.

Process for Activated charcoal is basically simple process consisting of burning the shells in a limited supply of air, so that the shells are only carbonised and not burnt to ash.

The tricky part of this operation is to set the optimum condition for carbonisation to the correct degree. The Activated charcoal manufactured by these methods is of inferior quality, containing a lot of impurities. Moreover, the emission of a lot of smoke and flue gases during the process causes atmospheric pollution.

The most modern method for Activated Charcoal manufacture is to use waste heat recovery technology. In this process, the flue gases evolved during carbonisation are burnt in a furnace, producing process heat for application in the Coconut Processing Industry.

Thus, besides producing good quality charcoal, the smoke problem is reduced considerably. This technology has been successfully introduced in Sri Lanka.

**Drum method**

Mild Steel Drum kiln is used for carbonization of shells.

The drum consists of three sets of six 1" dia holes provided at its bottom, middle and upper layers. A detachable chimney is also provided at the top of the drum. The manufacture of charcoal requires optimum carbonization of raw shells in a limited supply of air so that there is neither unburnt shell nor ash due to complete combustion.

The steel drum is filled with raw shells after placing temporarily a 4 inch diameter wooden pole along the axis of the drum. The wooden pole is then removed, leaving a hollow space which allows the flow of smoke during carbonization.

To start carbonisation, a piece of burning rag is dropped to the bottom of the drum through the hollow space. When the fire is well underway, the cover with the chimney is placed into position and the upper and the middle sets of holes are closed.

Carbonisation which starts at the bottom progresses as it goes up as well as radially from the hollow space. When carbonisation is complete in 3 particular zones, a persistent glow can be seen in all the six holes of a set. When the

bottom most set of holes indicate this situation, the middle set of holes is opened and the bottom set closed.

The progressive carbonization results in reduction in volume of contents and therefore, more shells are added from the top. When the middle region is carbonised well, the top set of holes is opened while the middle set is now closed.

A further addition of raw shells is done to fill the volume reduction to maximise capacity for burning. When the top region is well carbonised, the top set of holes is also closed, resulting in complete stoppage of air inflow to the drum. The drum is then cooled for about 8 hours after which the product is ready for discharge.

**Shell Charcoal and Copra Production using waste heat recovery technology**

Now there are modern methods for commercial production of shell charcoal.

The Coconut Development Board is in the process of introducing the WHU technology in India. The WHU technology could be effectively applied in the copra making and desiccated coconut manufacturing unit.

The waste heat unit technology is one such method for production of good quality charcoal. The waste heat unit technology reduces the smoke emission for a few minutes per day at startup and produces clean carbonised charcoal. The gas evolved during carbonisation is burned in a furnace producing heat energy for application in the coconut processing industry.

The important advantage is that the utilisation of waste heat unit technology maximises the carbonization of shell feed stock for charcoal production. The waste heat unit technology is today available indigenously.

In this, the heat generated from the flue gases could be utilised in the drying operation, widespread adoption of this technology would consequently result in gains to both the processor and the national economy.

## 4. RAW MATERIAL

**RAW MATERIAL REQUIREMENTS:**

Basis: One tonne of Activated charcoal

Coconut shell 40,000 coconut shells weight, about 113 Gms each- 4.5 MTs

Raw material cost Rs.2250 per MT. For 300 MTs 1350 MTs @ Rs.2250 per MT = Rs.30.38 Lakhs at 100%

## 5. LAND & BUILDING

Land required 1 acre cost Rs.15.00 Lakhs and Building required 4000 sq.ft cost Rs.32.00 lakhs

## 6. UTILITIES

**Power:**

The total power requirement of the unit will be 35 HP. Fuel requirement is 100 litres of Furnace oil per day.

**Water:**

Water is required only for human consumption

***Man power*:**

| Category | Nos. | Monthly Salary | Total monthly Salary |
|---|---|---|---|
| Supervisor | 3 | 9000 | 27000 |
| Skilled | 3 | 7000 | 21000 |
| Helpers | 6 | 5000 | 30000 |
| Accounts/Office Assistant | 1 | 6000 | 6000 |
| | | | 84000 |
| Add : Benefits | 20% | | 16800 |
| Total | | | 100800 |

Total wages per annum [Rs. lakhs] Rs.12.10 lakhs

## 7. IMPLEMENTATION SCHEDULE

If financing arrangement is made available the project can be implemented with in one month's period.

## 8. ASSUMPTIONS

| | |
|---|---|
| Installed capacity per annum | Activated charcoal-300 MT |
| Capacity utilization-Year -1 | 60% |
| Year-2 | 70% |
| Year-3 | 80% |
| Selling price per unit | Activated charcoal-Rs.52000 /MT |
| Raw material | Rs.2250 per MT |
| Consumables/packing materials | Rs.2200 per MT |
| Power and Fuel-100% (Rs. lakhs) | Rs.22.35 lakhs at 100% |
| Wages & salaries -100% (Rs. lakhs) | Rs.12.10 lakhs |

| | |
|---|---|
| Repairs & Maintenance- p.m. | Rs.20000/- |
| Depreciation | Written down value method |
| General & administration Expenses per month | Rs.50000/- |
| Selling expenses | 3% on Sales |
| Interest on term loan and Working capital finance | 14% p.a. |
| Income tax provision | 34% on profit |

**LIST OF MACHINERY SUPPLIERS**

The technical know how would be supplied by the Equipment manufacturers and also by the Coconut Development Board, Kochi

1. A.L. Jacob & Sons, A.L. Jacob Road, Ernakulam, Cochin-28.
2. Vivega Engineers, 143-C, Nava India Road, Peelamedu, Coimbatore - 641 004
3. Ananth & Co. Bhavana, Shakthi Nagar, Irinjalakuda - 680 125.
4. Plant India, Vytilla Road, Palarivattom, Kochi - 682 025

**LIST OF RAW MATERIAL SUPPLIERS**

The raw material coconut shell can be procured locally from coconut shell dealers.

**FINANCIAL ASPECTS**

## 1. COST OF PROJECT

| | [Rs.lakhs] |
|---|---|
| Land | 15.00 |
| Building | 32.00 |
| Plant & Machinery | 70.00 |
| Technical know how fees | 2.50 |
| Other Misc. assets | 5.00 |
| Pre-Operative expenses | 12.00 |
| Margin for WC | 1.99 |
| | 138.49 |

## 2. MEANS OF FINANCE

| | |
|---|---|
| Capital | 50.49 |
| Term Loan | 88.00 |
| | 138.49 |

## 3. COST OF PRODUCTION & PROFITABILITY STATEMENT

[Rs.lakhs]

| Years | 1 | 2 | 3 |
|---|---|---|---|
| Installed Capacity (MT) | 300 | 300 | 300 |
| Utilisation | 60% | 70% | 80% |
| Production/Sales (MT) | 180 | 210 | 240 |
| Selling Price per MT | Rs.52,000 | | |
| Sales Value (Rs. lakhs) | **93.60** | **109.20** | **124.80** |
| Raw Materials | 18.23 | 21.26 | 24.30 |
| Packing materials | 3.96 | 4.62 | 5.28 |
| Power & fuel | 13.41 | 15.65 | 17.88 |
| Wages & Salaries | 12.10 | 12.70 | 13.34 |
| Repairs & Maintenance | 2.40 | 2.64 | 2.90 |

| | | | |
|---|---|---|---|
| Depreciation | 11.38 | 9.69 | 8.27 |
| Cost of Production | 61.48 | 66.56 | 71.97 |
| Admin. & General expenses | 6.00 | 6.30 | 6.62 |
| Selling expenses | 2.81 | 3.28 | 3.74 |
| Interest on Term Loan | 12.32 | 10.78 | 7.70 |
| Interest on Working Capital | 1.28 | 1.28 | 1.28 |
| Total | 83.88 | 88.20 | 91.31 |
| Profit Before Tax | 9.72 | 21.00 | 33.49 |
| Provision for tax | 3.30 | 7.14 | 11.38 |
| Profit After Tax | **6.41** | **13.86** | **22.10** |
| Add: Depreciation | 11.38 | 9.69 | 8.27 |
| Cash Accruals | 17.79 | 23.55 | 30.37 |

**4. WORKING CAPITAL:**

| | Months Consumptions | Values | % | Margin Amount | Bank Finance |
|---|---|---|---|---|---|
| Raw Materials | 1.00 | 1.52 | 25% | 0.38 | 1.14 |
| Finished goods | 0.25 | 1.28 | 25% | 0.32 | 0.96 |
| Debtors | 1.00 | 7.80 | 10% | 0.78 | 7.02 |
| Expenses | 1.00 | 0.51 | 100% | 0.51 | 0.00 |
| | | 11.11 | | 1.99 | 9.12 |

**5. PROFITABILITY RATIOS BASED ON 80% UTILISATION**

| | | | |
|---|---|---|---|
| Profit after Tax / Sales | = | 22.10 / 124.80 | 18% |
| Profit before Interest and Tax / Total Investment | = | 42.47 / 147.61 | 29% |
| Profit after Tax / Promoters Capital | = | 22.10 / 50.49 | 44% |

## 6. BREAK EVEN LEVEL

Fixed Cost (FC):

| | [Rs. lakhs] |
|---|---|
| Wages & Salaries | 13.34 |
| Repairs & Maintenance | 2.90 |
| Depreciation | 8.27 |
| Admin. & General expenses | 6.62 |
| Interest on TL | 7.70 |
| | 38.83 |
| Profit Before Tax (P) | 33.49 |

$$BEL = \frac{FC \times 100}{FC + P} = \frac{38.83}{72.32} \times \frac{80}{100} \times 100$$

43% of installed capacity

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