Activated Carbon

Introduction

Activated carbon is a non-graphite form of carbon which could be produced from any carbonaceous material such as coal, lignite, wood, paddy husk, coir pith, coconut shell, etc. Activated carbon manufactured from coconut shell is considered superior to those obtained from other sources mainly because of small macropores structure which renders it more effective for the adsorption of gas/vapour and for the removal of colour and odour of compounds.

The activated carbon is extensively used in the refining and bleaching of vegetable oils and chemical solutions, water purification, recovery of solvents and other vapours, recovery of gold, in gas masks for protection against toxic gases, in filters for providing adequate protection against war gases/nuclear fall outs, etc.

Steam activation and chemical activation are the two commonly used processes for the manufacture of activated carbon. However coconut shell based activated carbon units are adopting the steam activation process to produce good quality activated carbon.

Process (Steam Activation)

The process of activation is carried out in two stages. Firstly the coconut shell is converted into shell charcoal by carbonization process which is usually carried out in mud-pits, brick kilns and metallic portable kilns. The coconut shell charcoal is activated by reaction with steam at a temperature of 900^{o}C -1100^{o}C under controlled atmosphere in a rotary kiln. The reaction between steam and charcoal takes place at the internal surface area, creating more sites for adsorption. The temperature factor, in the process of activation is very important. Below 900^{o}C the reaction becomes too slow and is very uneconomical. Above 1100^{o}C the reaction becomes diffusion controlled and therefore takes place on the outer surface of the charcoal resulting in loss of charcoal.

Product Specification

pH Value	6.5 - 7.5
Methylene Value adsorption mgm / gm	190 - 350
Adsorption capacity at % by mass (min)	45
Moisture (max.)	5%
Ash (max)	5%
Hardness	90

Project Cost (5 tones per day)

Cost Items	Amount (Rupees)
Land	Two acres (cost variable)
Building -12000 sq.ft. @ Rs.600 per sq.ft.	Rs.72 lakhs
Plant & Machinery	Rs.275 lakhs
Preliminary & pre-operative expenses	Rs.15 lakhs
Electrification	Rs.20 lakhs
Working capital (margin money)	Rs.50 lakhs

Machinery

Jaw crusher	Hammer mill	Vibratory feeder
Elevator	Carbonization kiln	Soaking tanks
Cyclones	Rotary kiln with heat recovery unit	Coolers
Centrifuge	Rotary drier	Micro pulverizer
Sieving machine	Pneumatic filling machine	

Note: The cash estimates and returns are variable.