ACTIVTED CARBON FROM COCONUT SHELL
(CSC-AC Value Added Chain)

I. PRODUCT DESCRIPTION:

Activated Carbon (AC) is a carbonaceous material of porous carbon element made from anything, which carbonizes under combustion (direct or indirect fire/heat). The innumerable pores of AC make it highly useful for absorption of gases, liquids, vapors, solvents, dispersions and colloids. AC comes in granular or powdered form, thus giving different pore sizes (micropores, mesopores/medium and macropores), suitable for differed target substances. CSC-AC is generally microporous with high absorptive capacity and an ideal liquid or gas filter agent.

AC can be made out of wood, but coconut shell is a cheaper and widely available raw material considered as farm waste by-product.

II. RAW MATERIAL:

CSC-AC is sourced from mature coconut shells. Average shell recovery in the Philippines is fairly 50% of the 12 billion-nut production annually. The other half is used directly as fuel in copra making or DCN factories, or otherwise left as waste product in the farms. Supply of coconut shell in Southern Tagalog where there are copra producers and saturated with DCN factories is much lower than in Visaya and Mindanao.

III. MANUFACTURING PROCESS:

There are basically two steps:

(a) Carbonization (burning/pyrolysis) which produces mere charred coconut shell with poor absorptive power;

(b) Activation by selective oxidation of the charred shell in controlled atmosphere of steam and air that increases the absorptive capacity

The process essentially involves the creation of internal pores of various widths, bulk density, size distribution and hardness that account for the powerful forces, which hold the absorbed molecules on the surface of the carbon. The surface area of the internal pore structure measures the absorptive capacity.

Other absorptive agents are silica gel, zeolites an alumina, which are mined or produced from fossil resource.

IV. APPLICATION:

CSC-AC principally is used as filter and absorbent:

(a) Liquid treatments in the purification of water (industrial/drinking) to absorb undesirable organic compounds;

(b) Waste treatment in recycling waste water for washing/industrial purpose in ships/oil rigs, etc.;

(c) Decolorizing agent of industrial products like vegetable oils, syrup, synthetic detergents, alcoholic beverages, dry cleaning solvents and glycerin;

(d) Purifying agent of intermediate/finished pharmaceutical products like antibiotics, hormones, penicillin, vitamins;

(e) Recovery agent- Carbon-in-pulp (CIP) process for recovery of gold from gold ores;

(f) Air pollution control absorbent (1mm-7mm) of air particles, deodorizes air and removes poisonous gases (gas masks, cigarette filters);

(g) Ventilation control to remove odor, smoke, impurities in recirculated ventilation systems in public buildings, industrial plants, cooker hoods, private dwellings; also purification of atmosphere in fruit, meat and food storerooms from objectionable vapors/gases generated by the stored goods;

(h) Evaporation control agent that absorbs fuel vapors in automobiles, ship and other petrol-fueled vehicles;

(i) Recovery or conservation of the useful effect of solvents in some industrial units which otherwise evaporates easily and is lost in the process. AC retards or slows the evaporation process.

(j) As catalyst in variety of chemical preparation.

V. MARKET DEMAND:

(a) From 1995 to 1999, world export of AC had a growth average 62% from 45,007 MT (1995) to 72,984 MT (1999).

(b) In the same period, RP was the highest growth rater from 9,489 MT to 32,344 MT surging by 240%.

(c) Next highest exporter was Sri Lanka with an average of 16.12 MT. Its static performance is due to its limited supply of coconut shell due to its smaller hectarage.

(d) Demand centers are USA, Italy, Netherlands, So. Africa, Japan, So. Korea and Taiwan.

(e) Demand factors are attributed to recent policies and interests arising from:

- Economic growth and social development in industrialized countries
- Environmental awareness and anti-pollution/clear air legislations
- Requirements for food safety/SPS in trade
- Waste management regulation
- Anti-biological protection in conflict areas.

VI. PRODUCTION CAPACITY:

There are eight (8) active producers of coco charcoal and activated carbon in the country with a total production capacity of 88,458 MT a year of combined charcoal and activated carbon (CSC – 48,018; AC 40,440). Central Visayas has an installed 39,900 MT while Northern and Southern Mindanao have 40,000 MT.

VII. EXPORT PRICES:

Annual Ave. Prices (USD/MT)	COCO SHELL CHARCOAL	ACTIVATED CARBON
1999	252.57	1,002.65
2000	257.89	985.29
2001	215.37	940.09
2002	183.63	916.72
2003	183.61	935.31
2004 (Jan-Aug)	202.97	956.91

EXPORT PERFORMANCE:

RP exports of coconut shell charcoal for period January to August 2004 was 17,029 MT valued at USD 3,456.415

For the same period, AC shipped 21,110 MT earning USD 20,200,075.

VIII. DOMESTIC PRICES:

As of December 7,2004, AC manufacturers bought coco shell charcoal at P6,000.00 per MT/ P6.00 per kilogram in Luzon, or P5,500.00 per MT/P5.50 per kilogram in Mindanao. Last five years' average prices are as follows:

2000	P 4,643.40/MT / P4.64 per kg.
2001	4,500.00 / P4.50
2002	3,757.15 / 3.76
2003	4,343.48 / 4.34
2004	5,694.99 / 5.70

A piece of raw shell sells P0.10 a piece (or can be gathered free), or P0.50/ kg. (200 grms x 5). This is less than 1% of the current price of shell charcoal, making coco shell as cheap raw material for activated carbon.

For one metric ton of raw shell selling at P500.00 (P0.50/kg) out, 278 kilograms of shell charcoal is recovered that sells at current price of P1,668.00 (6000 x .278), or a value added of 233% from the lowly raw shell.

Otherwise, processing further of the shell charcoal to activated carbon yields a 30% AC recovery of 83.40 kg (278 kgs x 0.30) with export value of USD 79.42 (956.91 x .083), or P4,449.70 (@ 56.025), a further value added of over 166% from the raw charcoal.