

# COCONUT SHELL CARBONISATION/ WASTE HEAT RECOVERY TECHNOLOGY IN COCONUT PROCESSING IN SRI LANKA

G R Breag and P G Joseph  
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## Introduction

During the last decade the Overseas Development and Natural Resources Institute (ODNRI) - the scientific arm of the British Government's Overseas Development Administration (ODA) - has had a substantial involvement with the Sri Lankan Coconut Industry. The ODA has funded several technical cooperation programmes to improve the desiccated coconut, copra, coconut oil extraction and coir fibre industries and these were implemented jointly by the Sri Lankan Coconut Development Authority (CDA) and ODNRI. These programmes have been monitored and supervised jointly by both the South East Asian Development Division (SEADD) and ODNRI.

The broad objective of the collaborative programmes is to introduce new and improved methods of processing technology in the Coconut Industry in Sri Lanka with emphasis being placed on institutional building. As part of this wide programme of

work, the introduction of the waste heat recovery unit for the production of good quality coconut shell charcoal and provision of process heat was given a high priority in view of its technical, economic and environmental benefits. This technology has now been successfully introduced to the commercial arena in Sri Lanka.

## Traditional charcoal production

The traditional pit method of production has a charcoal yield of 25 to 30% of the dry weight of shells used. The charcoal produced by this method is of variable quality, and is often contaminated with extraneous matter and soil. During the process, over 50% of the gross heat content of the shells is lost and at the same time, a large volume of obnoxious smoke is evolved to the atmosphere. This smoke is not only a nuisance but is also a health hazard. In view of this, the operation of the traditional pit is either restricted or



not permitted at all in several areas in Sri Lanka to prevent environmental pollution and to minimize health hazards to people. The shell therefore is often transported several miles from the mills where it is generated for conversion to charcoal.

#### **Application of the Waste Heat Recovery Unit (WHU)**

The ODNRI batch coconut shell carbonisation with waste heat recovery unit (WHU) as developed virtually eliminates the smoke problem associated with the traditional pit method of charcoal production and simultaneously enables the heat generated during the process - normally lost to the surroundings - to be used in associated heat exchanger systems in the coconut industry. The WHU essentially has a chamber in which coconut shells are converted to charcoal and the gas evolved during the process is subsequently burnt in a furnace/heat exchanger system to provide process heat. The controlled carbonisation of shells in the WHU therefore replaces either imported fuel oil or locally felled wood, and subsequently reduces deforestation and associated environmental problems. In addition, the WHU both maximises the utilisation of shell feedstock for charcoal production and gives the processor a greater degree of self-sufficiency.

This technology has now been introduced by ODNRI in collaboration with the CDA and mills to the coconut industry in Sri Lanka. The scope for the application and status of the technology is discussed below.

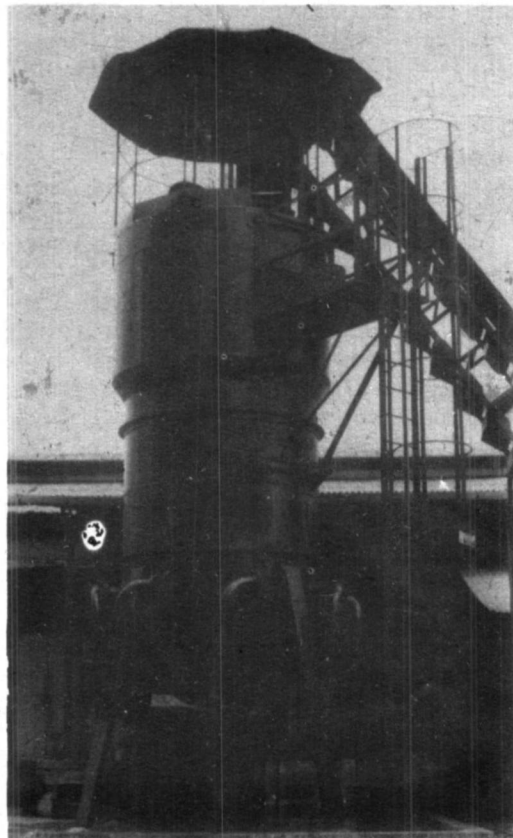
#### **Scope for the application of the technology**

In the coconut industry there are 66 desiccated coconut factories and 125 oil mills.

In each desiccated factory there is a steriliser unit which uses either oil or fire-wood and a number of furnace/heat exchanger/drying system. The majority of the systems used are wood-fired. Overall, the fuel consumption of the coconut industry is 90,000 MT of wood, 60,000 MT of coconut shells and 1,000 MT of fuel oil. These quantities will of course vary with the annual production but they indicate the considerable scope for the application of the WHU technology for the production of good quality charcoal and simultaneously generating process heat.

#### **Status of technology**

The first WHU was manufactured in the UK and was installed in a DC Mill in Sri Lanka in 1983. After completing successful trials two units were fabricated locally, partly funded by the CDA, and installed at a Cooperative DC mill. The CDA granted a soft loan for 10 more units to be installed in DC mills. To date, 21 WHUs have been locally manufactured; of these 18 have been installed and 15 are in commercial operation in desiccated mills and an oil mill. Financial returns on the application of the units at both the 1.5 and 3.4 MT scales of operation are extremely attractive.



The technology has been primarily applied in the provision of process heat for drying cut coconut kernels for desiccated coconut manufacture. Other applications of the technology for process heat include: (a) sterilisation of coconut kernels; (b) drying parings; (c) drying freshly cut coconut meat - thus by-passing copra production for the manufacture of good quality oil; (d) copra production and (e) firing multi-fuelled

boilers. A collaborative programme of work between the CDA/ODNRI to investigate all these applications is underway.

The production of oil from fresh cut kernels is currently being examined at Marawila Cooperative by CDA/ODNRI and the economic advantages of this method have been compared with the traditional copra drying and oil manufacturing process. A full study to produce copra from its associated weight of coconut shell is also underway and the economic and environmental impact if successfully applied would be realised. It is important to note that Sri Lanka produces approximately 150,000 MT of copra and approximately 40% (and above), of the associated shells are used in the curing process (see section above). The application of the WHU technology for both oil production from fresh kernels and copra manufacture clearly would maximise utilisation of coconut shell which is a valuable resource.

Based on commercial and experimental data the technical and economic prognosis is very

favourable for the application of this technology for desiccated coconut, copra and oil production in other coconut growing countries. There are also similar opportunities - as in Sri Lanka - to save foreign exchange through substitution of imported fossil fuels and to earn revenue by exporting shell charcoal and activated carbon.

#### **Regional application in other coconut growing countries**

Having successfully introduced the technology to the commercial arena in Sri Lanka, a Regional Workshop on Coconut Shell Carbonisation with Waste Heat Recovery Technology in Coconut Processing sponsored by the ODA, CDA and Asian & Pacific Coconut Community was held in Colombo in September, 1989. This was the first step of a wider ODA funded programme for the introduction of the WHU technology to the Region.

### **ADVISORY SERVICE TO THE ESTATE SECTOR**

The Coconut Research Institute has been entrusted with the responsibility of providing technical and advisory assistance to the coconut estate sector (50 acres and above) by the Ministry of Coconut Industries. Under this scheme the Coconut Research Institute endeavours to provide advice on cultivation aspects.

The estate sector was requested by a newspaper advertisement to register with the Coconut Research Institute for the above service. If you have not done so yet, please write to the Director, Coconut Research Institute, Lunuwila, giving the following information for registration.

- (a) Name of the Estate.
- (b) Location
- (c) Name and address of the owner
- (d) Person to be contacted at the estate
- (e) Extent under coconut.