COCONUT OIL AS A FUEL IN MARSHALL ISLANDS

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PIEPSAP Project Report 14

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~ Participating Pacific Islands Countries ~

*Cook Islands, Federated States of Micronesia, Fiji, Kiribati, **Marshall Islands**, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu*

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PACFIC ISLANDS ENERGY POLICY AND STRATEGIC ACTION PLANING

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Report by G. Zieroth, SOPAC

1. Background

During the PIEPSAP consultations the stakeholders repeatedly expressed the need to explore the option to use locally produced coconut oil as substitute fuel. Both the Minister of Resources and Development and the Minster of Public Works are particularly interested in decentralized coconut oil extraction that is seen to open a range of opportunities for economic development of the outer islands. It would contribute to rural income poverty alleviation and economic development. A higher proportion of the value of the production chain remains in the community. Coconut oil is a versatile product that can be used as cooking oil, fuel for diesel vehicles and boat motors (inboard and outboard) and fuel for electricity generators provided adequate technology is used and proper procedures are being followed. It can serve as a basis of cosmetics and other niche value-added products. Local communities producing the oil also have the option to generate cash income by trading surplus oil that is not used within the community.

The Ministry of R&D considers the coconut as a major resource of RMI and a key product which can improve rural development and income generation in outer islands. The “value chain” touches upon various sections in the ministry (agriculture, trade, buisiness promotion and energy) and takes a prominent role in the newly developed strategic plan for the ministry. This paper summarizes preliminary findings on coconut oil as a biofuel in RMI.

2. Outer Island Copra Production

Copra is mainly produced in outer atolls using traditional manual harvesting and sun trying methods. Access to coconut plantation is regulated within the villages; local leaders seem to take a royalty from the families that harvest nuts. Nuts are de-husked and cut manually. After open-air sun drying villagers pack the product in 100 pound bags that are stored until a buying ship arrives. Small families with limited labour produce 1 – 2 bags a months, larger families may produce more. The village access system may also limit production capacity. Current copra price is 12 US cts per pound (26 US cts/kg). For production landed directly in Majuro the factory gate price is 13.5 cts/pound. Tobolar reckons that at these prices include a subsidy of approx 6 – 8 cts per pound compared with the market price for coconut oil that small suppliers can achieve on the world market. The copra subsidy is considered a heavy burden to the government.

At present is not clear what the actual production capacity of the coconut plantations is. Many trees are, however, believed to be senile with low or no production. The government, with assistance from FAO intends to perform an inventory to determine the status of the plantations and the scope of a replanting program. Such a program would generate a substantial amount of biomass that has to be utilised or disposed off.

3. Copra as a Source of Rural Income

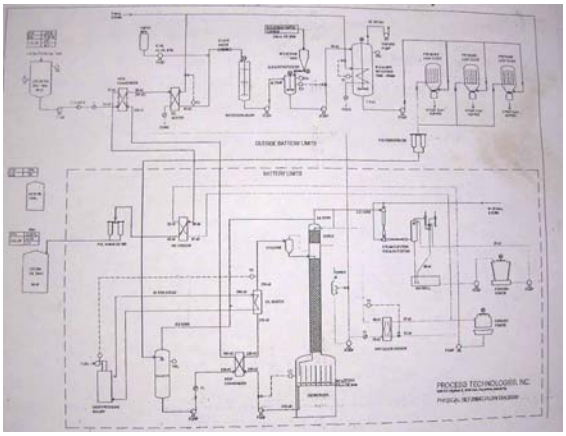
The Government owns 8 vessels that service the outer islands as supply ships and copra traders. Reportedly, only two vessels are operational at the moment. As a consequence of this limited capacity there are long waiting times until buying vessels get to the individual villages. The buying system also seems to encounter cash-flow problems that further limit the amount of copra being bought off the villages. It was reported that some islands have not had a chance to sell copra for several months. As the storage capacity at the village level is limited, and the availability of bags is constraint longer periods without copra outflow eventually inhibit copra cutting at village level. This deprives the communities of the most important revenue source and can lead to serious hardship. ADB reports that lack of regular income goes hand in hand with high prices for basic

food items. (a survey showed prices for 17 food items being 47 % higher than on the outer islands than on Majuro.

4. Oil Extraction

The private company PPI operates Tobolar Inc, the Majuro copra mill under a management contract. Current annual copra processing is in the vicinity of 4000 tons per year. (Figures for 2004 were 3466 tons for the first 9 months). At an extraction rate of 57%, this translates into a production of 2300 tons of crude copra oil. The production capacity of the plant is, however, is approx 15,000 tons of copra per year or 8500 tons of copra oil.

Oil is extracted in two stage expellers and crude oil stored in a storage tank (3000 tons capacity)



Current Refining Process

The mill has tried various refining process and after a partial rehabilitation the refining process that is used for the cosmetics/soap production line consists of the following steps:

1. Settling tank
2. Screening of foots and particles
3. Heating

4. Injection of phosphoric acid (de-gumming)
5. Bleaching (bleaching earth)
6. Vacuum dryer (water removal)
7. Filter
8. Cooler

In addition a deodorizer is being proposed in order to enhance the quality of the feedstock for soap/cosmetics production.

Refined Oil Storage

Crude Oil Storage 3000 tons

5. Biofuel Experience

Tobolar has been pioneering the use of strait coconut oil (CNO) as a diesel replacement for two years. Three new unmodified diesel vehicles have been using CNO. 2 Mazda BD 2900 pick-up trucks run on refined oil, a Mitsubishi Canter 3 ton truck runs on crude CNO. Unfortunately, there are no parameters of the test run recorded but Tobolar management informed that so far there were no technical problems following normal operation and maintenance procedures. The 3 tons truck was inspected during the mission, it was operating on 100 % CNO (no evidence of diesel oil use). Engine performance appeared to be normal for the 2800 cc naturally aspirated diesel and there was no visible exhaust smoke through the full throttle range. The vehicle has so far done 52000 km on CNO.

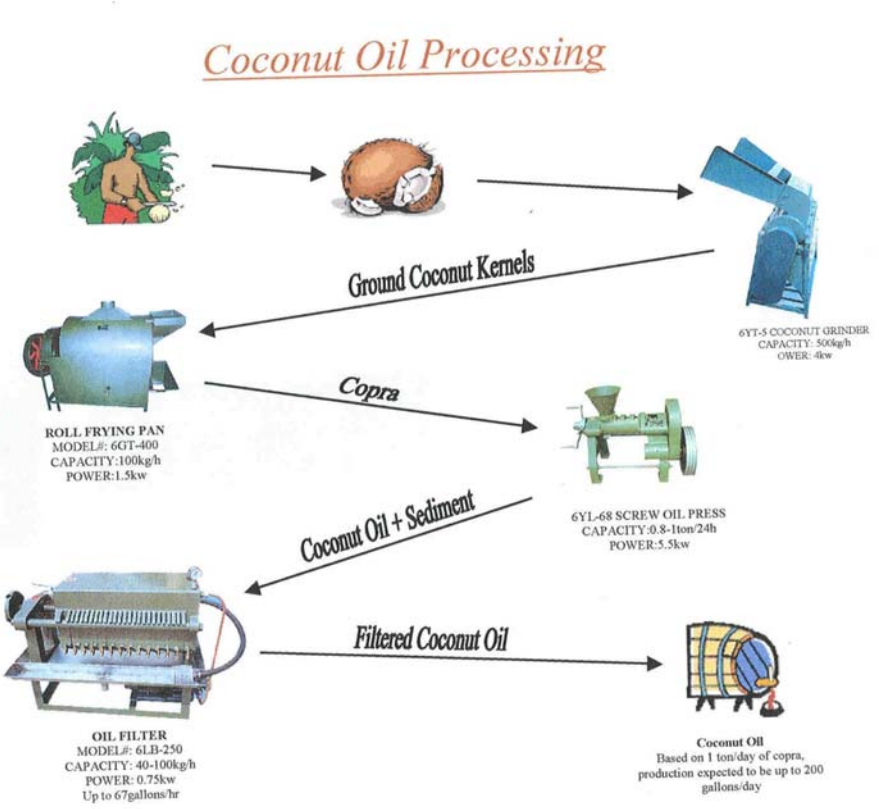
3 Ton Truck

2800 cc Mitsubishi Diesel

Engine Plate

Obviously the warm climate prevailing in the Marshall Islands facilitates operation of the CNO use as a diesel substitute without any engine modifications. The current retail price for CNO ex Tobolar is US$ 2 per Gallon, 1 US$ below the diesel pump price.

Tobolar also runs a 25 HP Yanmar outboard diesel engine on CNO, reportedly without problems. Company management has investigated other engines as well and intends to import small, simple single cylinder diesel outboards (up to 12 HP) from PRC. Also under investigations are possibilities to locate CNO extraction to outer islands. Tobolar also negotiates a bulk supply of CNO to the military base as a generator fuel.



6. Recommendations

The opportunities crated by coconut oil should be further investigated, in particular the possibilities to produce and use diesel substitute on outer islands. Activities should include a technical and socio-economic assessment of rural electrification options using CNO versus solar electrification including a pilot project under controlled parameters. Given the experiences already made in RMI, the country could become a biofuel knowledge center for the Pacific Islands. All parties consulted in RMI including the Minister and Secretary for R&D supported this idea.