Waste-based Feedstock for the Global Biofuel Market

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Key points

- **Waste based feedstock will play an increasingly vital role in meeting CARB's target to reduce CI in transport fuel**
- **Supply of waste based feedstock is however low relative to demand , can be pricey with attendant risk of fraud**
- **Sustainability certification using a proven &widely accepted standard is vital to ensure integrity across the supply chain & industry wide and globally.**
- **Presenting ECO Oil as a reliable &proven source of ISCC certified waste based feedstock , looking to expand its proven technology into EU /US.**

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LCFS Goal: Reduce carbon intensity of transportation fuel pool by at least 10% by 2020

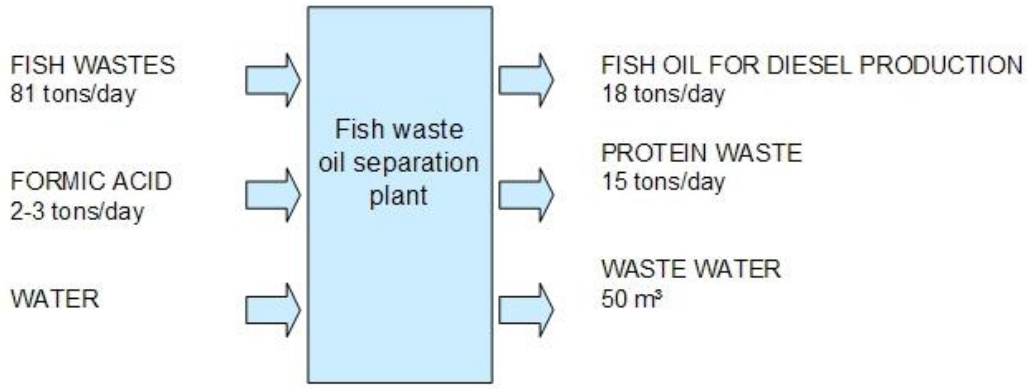
- Catalyst for demand
- Trail blazing
- Big impact on National & international Markets
- More than 58 pathways for Biodiesel & 158 for Ethanol
- Both biofuels & feedstock are being shipped in though feedstock is still a small proportion
- The proportion of feedstock will increase if conditions for local production of biofuels become more favourable

Feedstock Supply

- **The use of waste based feedstock in Bio ethanol is not widespread**
- **Availability of cellulosic or ligno cellulosic biomass is still limited and with serious commercial challenges.**
- **Hence , focus will be on feedstock for Biodiesel production**

Overview of Global supply of Waste based feedstock for Biodiesel feedstock supply

	Mln m tons	
Animal fats	3	**Mainly Category 1**
Used Cooking Oil	10	**Quantity commercially collected /used is much less**
Fish oil from Waste	1	**From Fish waste**
PFAD	2	
POME oil	*	**Unknown qty**
SBE Oil	0.1	**Potential to more than double**
Spent Husk Oil	*	**Usage limited**
EFB Oil	*	**New Development**



Source: Enerfish Report/ **Fish oil production** inputs and outputs at Hiep Thanh Seafood

In essence:

The demand for Low CI Waste based feedstock for Biodiesel far outweighs the current supply.

UCO :

- Global output of UCO is estimated at 10 mln m tons. The commercially available portion is valued at USD 4 B.
- The UCO collection and recycling program developed by the San Francisco Public Utility is a scheme worthy of emulation around the world

- EU ,where demand is currently estimated at around 3 million tons , is finding it difficult to get low cost certified supply of UCO.
- The positive impact of promoting Waste based Biodiesel is the prevention of a big part of UCO "going down the drain " or finding its way into the food chain .
- Some room for increase in Commercial supply of UCO

Animal Fats/Fish Oil
Supply of animal fats suitable for use in Biofuels is inelastic and is not expected to increase
Significantly.

Waste & Residue stream from Palm has room for significant growth particularly from EFB
& POME.
Spent Husk Oil is suitable only for burning/boiler feed due to high phosphorous content

SBE oil from Veg oil Refining industry has significant potential for growth
Assuming all Vegoil Refining waste can be collected and the residual oil recovered, the potential is around 1 mln tons.

ECO OIL Group

WHO WE ARE

The EcoOil Group is one of the business units of Kewalram Chanrai, a group of diversified global businesses and enterprises with a rich history spanning over 150 years. The Group has interests in a diverse range of industries – textiles, automotive, agriculture and vegoil residue recycling...

OUR VISION

To be the leader in the creation of sustainable value through the reuse of renewal residues in the vegoil industry.

Existing Extraction units

- Serving Malaysian Vegetable Oil Refiners since 1983
- Operating 3 recycling veg oil residues plants in Malaysia
- Recycles 90% of the Spent Bleaching Earth generated by Vegetable Refineries in Malaysia

Existing Extraction Units

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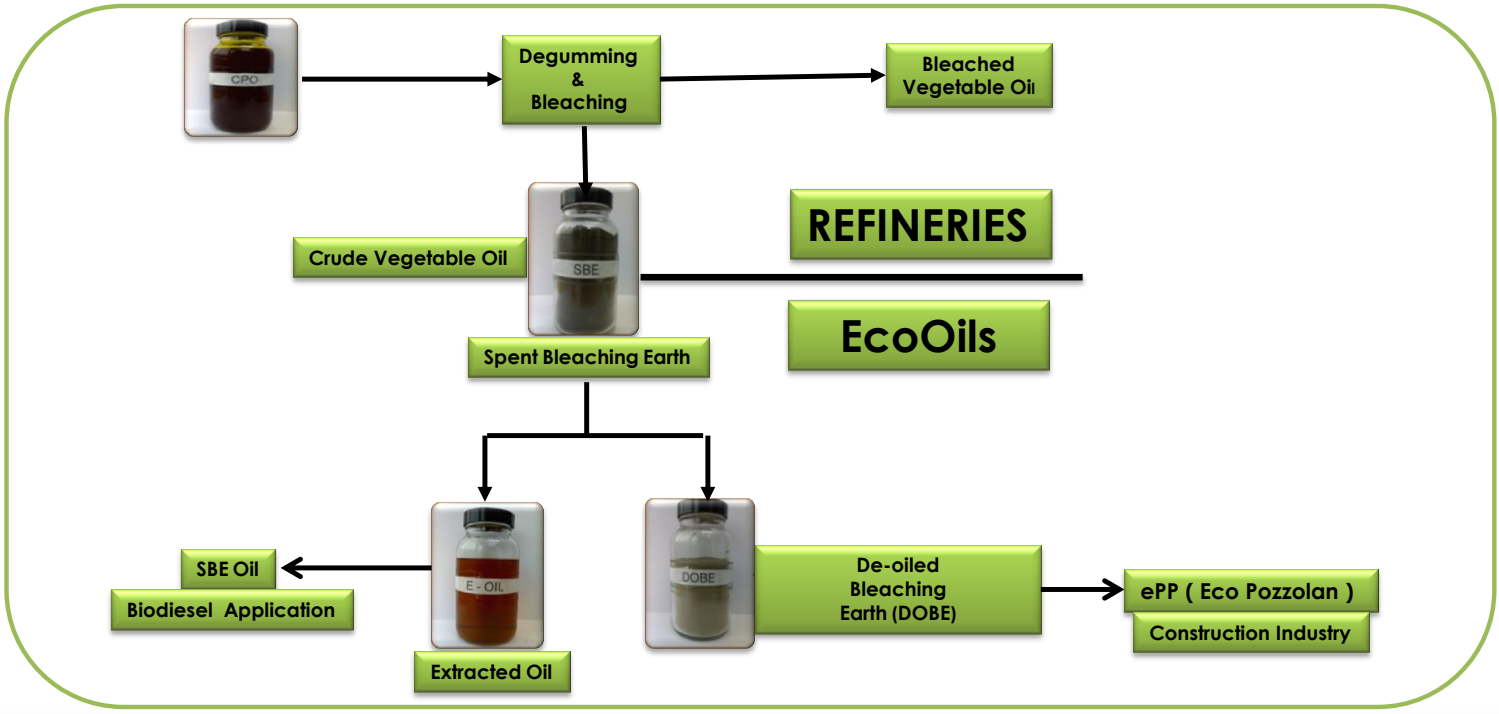
Extraction Model

- **Collect Spent Bleaching Earth (SBE) from all local refineries for recycling**
- **Employ patented extraction process with ZERO WASTE concept**
- **Recover oils that are suitable as feedstock for biofuels production**
- **Environment friendly activities/SBE that was dumped in landfills is recycled to useful products**

Extraction Model



Certification.

Eco Oil recognized the need for Certification .

Amidst allegations of fraud , the need , particularly in the Waste based feedstock market, for a robust , proven &reliable Certification system acceptable across the supply chain and between markets /market segments was recognized as vital.

The Certification system must have the capacity to understand the needs of the stakeholders and ensure that the system is practical without compromising the integrity of its principles and Criteria.

- **-Have the ability to evolve**
- **-Procedures in place to ensure highest quality (who audits the auditors?)**
- **-Cost efficient**
- **-Fully approved by the Regulatory Authorities**
- **-Support special requirements (such as full traceability/full segregation)**
- **-A common standard for different feedstocks (fungible). Important for a producer like Eco Oil that is also exploring the extraction of EFB oil, Spent Husk Oil.**

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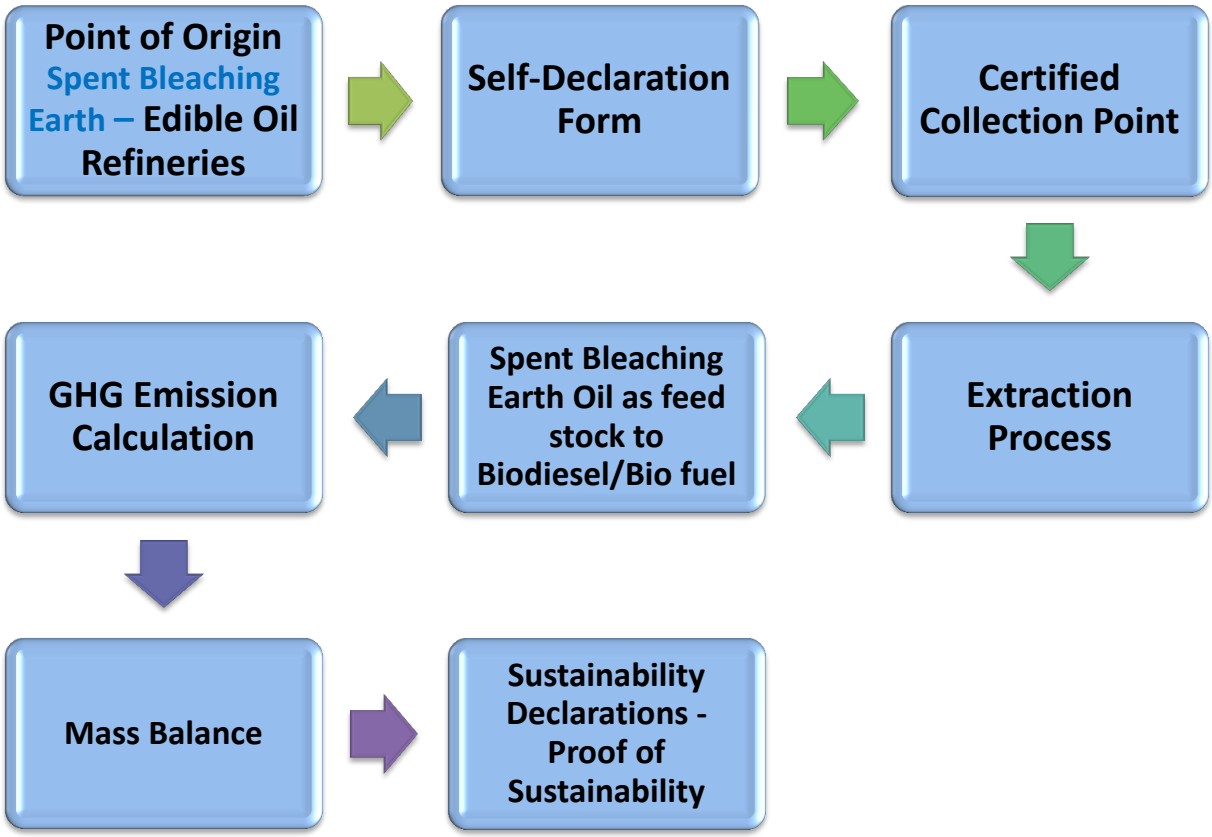
SBE OIL - ISCC CERTIFICATION PROCESS



Eco Oil –ISCC Certification

- **Eco Oil chose ISCC as its Certification System.**
- **In its early phase , ECO was subject to due diligence by its clients. After ISCC certification , such due diligence became unnecessary**
- **Demand for Ecooil products increased and the company expanded/in process of expanding the number of plants to 5 .**
- **Studies are in process on replicating its patented technology in EU & in USA.**

Typical GHG - % Savings - Eligible for Double Counting

- **GHG Emissions - 550 kgCo2/MT SBE Oil**
- **% Savings : Calculation as per EU directive 2009/28/EC-ISCC – 70%**

  SBE Oil GHG Emissions : 550 KgCO2/MT = 15 g CO2/MJ

  Biodiesel emissions : Conversion process from SBE Oil to Biodiesel : 10 g CO2/MJ

  Total Emissions : 15 + 10 = 25 g CO2/MJ

  $$\textit{GHG saving potential [\%]} = \frac{\textit{GHG emissions fossil fuel} - \textit{GHG emissions biomass}}{\textit{GHG emissions fossil fuel}} \times 100$$

  = (83.8 – 25) X 100 *(biofuels for transport 83.8 g CO2/MJ)*
  83.8

  = 70.16

- **Meets double counting criteria for Biodiesel feedstock**

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Future Expansion

REPLICATION

- EU
- Indonesia
- USA

ORGANIC WASTE

- Explore other Vegetable oil waste

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Thank you