ISCC Regional Meeting, South East Asia
Oct 24 2019 - Jakarta, Indonesia

POME - A Valuable Renewable Energy Resource
2 basic principles in the management of Renewable Resources.

• The harvest rates of the resources should equal or less than regeneration rates (sustained yield)
• The waste emission rates from the resource should equal or less than the natural assimilative capacities of the eco systems into which the wastes are emitted.

Otherwise it is - capital consumption and not sustainable development.
Bioenergy is renewable energy created from natural, biological sources. Many natural sources, such as plants, animals, and their byproducts, can be valuable resources.

Common Bio Energy sources are Bio Diesel and Ethanol, Produced from vegetable oil from plants

When Bio Energy is produced from Waste vegetable oil, the renewable energy has a double benefit of using waste resource for Energy creation.
Low Carbon Fuels
A Solution for Climate Change Issues

• Reduce greenhouse gas emissions.
• Protecting biodiverse and carbon rich areas.
• Minimise risk of emissions from indirect land use change
• Supports the circular economy.
• Safeguards social rights

Development of Low carbon fuels in transportation sector is a critical factor in the:
• Global effort to minimise the impacts of Climate change and
• To provide consumers with an alternate choice of clean fuel
ISCC - Objectives

• Providing sustainability solutions for fully traceable and deforestation free supply chains

• Supporting the use of all kinds of biomass in global supply chains.

• Contributing to the implementation of environmentally, socially and economically sustainable development.
ISCC Sustainability Principles

Ecological sustainability
- Protection of land with high biodiversity value or high carbon
- Deforestation free supply chains
- Environmentally responsible production to protect soil, water and air

Social sustainability
- Safe working conditions
- Compliance with human, labour and land rights

Compliance with laws and international treaties
- Monitoring compliance of certification regulations.

Monitoring of greenhouse gas (GHG) emissions
- Methods to calculate GHG emissions
- Monitoring of GHG reduction
- Compulsory for EU biofuels market

Good management practices
EU Commission directives encourages the development of bioenergy sources and have defined those feedstock that are eligible for special rebates in Europe.

The development of POME oil is in keeping with the sustainability principles of ISCC, and is qualified as waste under ISCC. According to Art. 3 (1) of EU Waste Framework Directive (WFD), waste is defined as:

1. Any substances or object which the manufacturer discards or intends or is required to be discarded
2. Raw materials or substances that is not intentionally produced, modified or contaminated.

Advanced Biofuel Renewable Energy Directives RED II Annexe IX of 2018 now includes Palm Oil Mill Effluent (POME) as a suitable feedstock for Biofuels.
Palm Oil Mill Effluent (POME) is a waste water/sludge arising at a palm oil mill during the palm oil production process.

This waste water is released to a system of ponds (POME ponds) to remove solids, oil and grease before discharging the water into waterways.

The small oil contained in the waste water (POME oil) settles on top of the POME pond and can be extracted (skimmed off) and used as feedstock for biofuel production.

Pome Oil has not been used in any significant volumes in the past due to the economic viability of the high cost of extraction and logistics. Pome Oil has been used in the Soap industry.

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• Processing of Palm fruit bunches from the palm trees generates waste

• Operations at the CPO Mills produce liquid waste water during
  1. Washing & Sterilizing fresh fruit bunches.
  2. Clarification, Separation, Cleaning, etc
  3. Pressing of empty fruit bunches & CPO
  4. Factory wash out

The liquid waste produced is called **POME - Palm Oil Mill Effluent**

Every MT of FFB produces **700 kg** of liquid waste POME
The CPO Manufacturing Process
Fresh Fruit arrives at the CPO Mills
The CPO Manufacturing Process
Fresh Fruit received in the CPO Mills
The CPO Manufacturing Process
Washing, Cleaning & Cooking of Fresh Fruit
The CPO Manufacturing Process
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Washing, Cleaning & Cooking of Fresh Fruit

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The CPO Manufacturing Process

POME – Flowing into the waste ponds

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The CPO Manufacturing Process
Typical POME waste ponds

Sambas, West Kalimantan

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The CPO Manufacturing Process
Typical POME waste ponds

Ketapang, West Kalimantan
The CPO Manufacturing Process

Typical POME waste ponds

Ketapang, West Kalimantan

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The CPO Manufacturing Process

Typical POME waste ponds

Mesuji, Sumatra

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## Make up of POME

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Untreated POME</th>
<th>Regulatory Discharge Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range*</td>
<td>Water Bodies**</td>
</tr>
<tr>
<td>BOD</td>
<td>mg/l</td>
<td>8,200–35,000</td>
<td>100</td>
</tr>
<tr>
<td>COD</td>
<td>mg/l</td>
<td>15,103–65,100</td>
<td>350</td>
</tr>
<tr>
<td>Total Suspended Solid</td>
<td>mg/l</td>
<td>1,330–50,700</td>
<td>250</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>mg/l</td>
<td>12–126</td>
<td>50***</td>
</tr>
<tr>
<td>Oil and Fat</td>
<td>mg/l</td>
<td>190-14, 720</td>
<td>3,075</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>3.3–4.6</td>
<td>6–9</td>
</tr>
<tr>
<td>Max POME Produced</td>
<td>m³/ton CPO</td>
<td>4</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Source: Pedoman Pengelolaan Limbah Industri Sawit, Departemen Pertanian 2006, Permen LH Nomor 3 Tahun 2006
**Source: Environmental Ministerial Decree No. 51/2004, Appendix B/2
***Total Nitrogen = Organic Nitrogen + Total Ammonia + NO₃ + NO₂

Source: Directorate General Plantation, Ministry of Agriculture, 2011
POME in Ponds

0.6 – 1.5% of POME OIL are generated for every Tonne of Fresh Fruit Bunches processed.

- **POME OIL LAYER**: Located on top due to density difference – pure oil.
- **EMULSION LAYER**: Mixture between Oil and water or called as transition layer.
- **WATER LAYER**: Clearly separate between emulsion layer and imourities at bottom.
- **IMPURITIES LAYER**: Stays at bottom of ponds.

On the spot moisture checking.

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POME characteristics

95 - 96 % Waste water with BOD (25,000 - 65,000 MG/L) and COD (40,000-100,000mg/l)
Excellent feedstock for the manufacture of Biogas or Power

2 - 4 % Suspended & Total solid impurities.

0.5 - 1.5% Oils & Fats
Feedstock for Manufacture of Soap
Feedstock for Manufacturer of Biodiesel
1. POME in CPO Mills waste pond

2. Extract POME & pump into trucks – QC checking

3. Weighbridge

4. Loading into Barge or Vessel at Loading Port

5. Discharging POME at Port of Discharge

6. Unload POME into intermediate tank

7. Processing POME at facility

8. Processed POME stored at Final Storage tank

9. Weighbridge

10. Load into mother vessel for export by trucks

10. Load into mother vessel for export by direct piping

Laboratory Testing

Quality Approved

Supervisory Personnel

Volume Measurement

Direct Supplies by Land Transport

Waste Disposal

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POME Supply Chain Process

1. Palm Oil Mill Effluent in POME ponds at PKS
2. Extraction process at Mill’s Ponds
3. Transport from Mill to nearest Cont port or Jetty and warehouse
4. Transport from port to EFI Warehouse
5. Processing and Decanting Process
6. Export in Bulk or Container

1. POME in CPO Mill
2. POME extraction from ponds
3. Transport PAO to Jetty or Container port
4. Loading into barge or Container

5. Loading into mother vessel export
6. Loading into container export
7. Processing POME, Settling, draining and send to Storage
8. Unloading at into shore tank
• The Oils & Fats in POME form a top layer in the waste water pond.
• Thus effectively blocking aerobic reaction with the atmosphere.
• The entrapped POME produces and emits highly toxic Methane gases.
• Methane gas is 21 times more damaging than carbon di oxide.

There are 680 CPO MILLS generating this Waste Stream POME daily...

This is a serious Environmental Hazard

Environmental Authority working with the CPO Mills have initiatives to treat the waste water and clean up the ponds and thereby reduce toxic emissions.
POME oil as a feedstock for Biodiesel

• POME Oil is an established feed stock for Biodiesel
• POME Oil is an economical alternative
• POME Oil is a waste resource generated from the CPO process.
• POME Oil is now accepted for double counting in Europe.
• POME Oil extraction helps in reducing Environmental hazard

And yet
Development of POME Oil as a standard Feedstock poses operational & logistical issues that needs to be solved.
1. POME Oil is solid at room temperatures, mostly found in frozen form in the ponds.
2. POME is found in fragmented supply in the waste ponds strewn all over the Archipelago of Indonesian Islands.
3. POME is a waste product, found in waste ponds, together with impurities, waste water, open air debris, rain and nature.
4. Extracting and transporting POME requires heating the product at all stages of the logistics to keep it in liquid form.
5. Handling and transporting POME across the Java sea domestic water ways to reach mainland for processing.
6. Processing and storing POME Oil in heated shore tanks capable of export in shipping vessels in large volumes.
Intermediate tanks

2 x 40 MT
Storage Tank
Capacity 2x4000 MT
At WTA storage
Laboratory
Loading 6004 MT
Loading rate 150.6 m³/hour
Port of Panjang

MV BW Neon
Lampung
2018
Loading 6000 MT
Loading rate 150 m³/hour
Port of Panjang

MV Summer Ploeg
Lampung
2018
Thank You

Dr. Sive Sivandran
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Indonesia