New Technologies In Palm Oil Industry

A Green & High Value Realization Approach

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WHAT WE DO

Using our patented nanotechnology platform, we produce renewable green chemicals and advanced performance materials from wastes
NANOTECHNOLOGY PARK

9 Hectare Production Site In Senawang, Negeri Sembilan, Malaysia

FACILITIES

- 100,000 Tonne/Annum Pre-Treatment Facility
- 120,000 Tonne/Annum Green Chemicals Facility
- 3 Kg/Day Nanographene Facility

THE ADVANCED MATERIAL: NANO GRAPHENE

Thin ▪ Light ▪ Super-strong ▪ Conductive ▪ Flexible

A small quantity of this multi-functional, versatile product can enhance and bring new properties to established materials such as plastics, polymers, lubricants, metals – from enhanced electrical and thermal conductivity to exceptional mechanical load bearing capacity and performance.

Product Features

- 50,000 times smaller than the diameter of human hair – thinnest material known to science
- 5 times the thermal conductivity of copper
- 300 times stronger than steel
- More flexible than plastic (can be bent, crumpled and wrinkled)
- Surface area as high as 2,600 m²/g
Closing The Loop

- **POME**
  - Forward Osmosis
  - Concentrated POME
  - Anaerobic Digester
  - Gas Purification
  - Graphene Production
  - CO₂
  - CH₄ + CO₂
  - CH₄
  - High Purity Hydrogen

- **Sludge Oil**
  - Esterification
  - Trans-esterification
  - Palm Methyl Esters
  - Ultrasonic Blending
  - Green Oil
  - Field Chemicals
  - High Performance Plastics

- **As Produced Nanofibers**
  - Stack Platelets
  - Natural Stacked Platelets
  - High Performance Lubricants
  - Commodity Plastic Monomers
  - Commodity Plastic Monomers

- **Ultrasonic**
  - Separates Graphene Planes
  - Stronger & Conductive Plastics
  - Micro Electronics
  - Single To 5 Layer Graphene Platelets

- **Lithium Battery**
  - Composites
  - Oilfield Chemicals
  - High Performance Lubricants
  - L.E.D.s
  - Solar
ENHANCED GREEN BASE OILS

TYPICALLY USED WHEN
Lubricants are lost to the environment
Where biodegradability or low toxicity is specified.
Food grade lubricants

VISCOSITY INDEX ✔
FLASH POINT ✔
POUR POINT ✔
SULFATED ASH ✔

Palm Waste Base Oil
Nanotechnology
Additives
Product
Generates 1000x increase in surface area
and million times increase in nano particles

Green Machining Oils

IMMEDIATE ENHANCEMENT OF CURRENT PRODUCT
PLAT NANO ADDITION IN LUBRICANTS GIVES BETTER:

- THERMAL CONDUCTIVITY
- FRICTION REDUCING CAPABILITY (80%)
- ANTIWEAR PERFORMANCE (33%)
- VISCOSITY STABILITY
- INCREASED LOAD BEARING CAPABILITY (40%)
Benefits To Plastics By Enhancing Currently Used Oleochemical Additives With Graphene

**Functional Application**

- ENHANCED THERMAL STABILITY
- BETTER TENSILE STRENGTH
- INCREASED TOUGHNESS
- INCREASED IMPACT STRENGTH
- IMPROVED FR PERFORMANCE
- IMPROVED STIFFNESS
- BETTER BARRIER PROPERTIES
- HIGHLY RESISTANT TO ABRASION
- SUPERIOR ELECTRICAL CONDUCTIVITY
- CHEMICAL STABILITY
- RIGIDITY

Graphene Enhanced Oleochemicals For Automobiles
Graphene Enhanced Biodegradable Oilfield Chemicals

<table>
<thead>
<tr>
<th>Base Oils &amp; Lubricants</th>
<th>Drilling Related Fluids</th>
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<tbody>
<tr>
<td>Increased thermal conductance</td>
<td>Better back flow prevention</td>
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<tr>
<td>Reduced friction by 80%</td>
<td>Increased oil flow</td>
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<tr>
<td>Reduced wear &amp; tear 33%</td>
<td>Increased heat transfer</td>
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<tr>
<td>Stable viscosity</td>
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<tr>
<td>Higher load bearing</td>
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Enhanced Value Oleochemicals

- Lower oxidation degradation
- Lower Pour Point
- Lubricating Effect
- Biodegradable corrosion inhibitor