Eco Friendly Surfactant MES for Laundry Detergents
Alternative to LAS (Methyl Ester Sulphonate)

4th May, 2015 SEPAWA NORDIC 2015
Hiroshi Kimura
LION ECO CHEMICALS SDN BHD
1. Introduction of LION ECO CHEMICALS SDN. BHD.
2. What is MES?
3. Characteristics of MES
4. Application of MES for Detergent
5. Summary
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LION’s Business Activities in Asia

Japan
South Korea
China
Hong Kong
Taiwan
Thailand
Hong Kong
Malaysia
Singapore
Indonesia
Philippines
Company Profile

- Established: 2007
- Shareholder: Lion Corporation (100%)
- Product: **MIZULAN** (Methyl Ester Sulphonate (MES))
- Commencement of Commercial Production: 2010
- Capacity: 25,000 t/y ⇒ 50,000t/y (September, 2013)
Content

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What is MES?

Methyl Ester Sulfonate (MES) is an anionic surfactant derived from oil and fats.
MES Molecule Structure

MES molecule structure

Methyl ester group

Sulphonic group

Alkyl chain group
How to Produce MES

Trans Esterification

\[
\begin{align*}
\text{CH}_2\text{OCO-R} & \quad \rightarrow \quad R-\text{CH}_2-\text{C} \quad \rightarrow \\
\text{CH}_2\text{OCO-R} & \quad \rightarrow \quad \text{OCH}_3
\end{align*}
\]

Sulphonation

\[
R-\text{CH}-\text{C} \quad \rightarrow \\
\text{OCH}_3
\]

\[
\text{SO}_3-\text{Na}
\]

Palm Oil

Methyl Ester

MES

Palm nut
MES Products from LION ECO CHEMICALS

MIZULAN P-82 (Granule)  
Active Matter : 75%

MIZULAN FL80 (Flake)  
Active Matter : 90%

REACH Registration No: 01-2119763801-37-0000 (Nov. 2012)
RSPO Certificate No: SGS-RSPO/SC-MY14/01449 (July 2014)
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1. High Detergency in Low Concentration
2. High Detergency in High Hard Water
3. Higher Biodegradability
4. Global Environment Friendliness
Palm Oil Based MES Characteristics

1. High Detergency in Low Concentration
2. High Detergency in High Hard Water
3. Higher Biodegradability
4. Global Environment Friendliness
**High Detergency at Low Concentration**

MES has potential for reducing surfactant content

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Concentration of surfactants/ppm

Conditions: Terg-O-Tometer 120 rpm 15 min., 35°C, 180mg/L as CaCO₃, Krefeld 10D (cotton), ASH 250ppm, Zeolite 300ppm
Palm Oil Based MES Characteristics

1. High Detergency in Low Concentration
2. High Detergency in High Water Hardness
3. Higher Biodegradability
4. Global Environment Friendliness
Water Hardness Around The World

<table>
<thead>
<tr>
<th>Area</th>
<th>Water hardness (CaCO₃ ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peru</td>
<td>250-300</td>
</tr>
<tr>
<td>Argentina</td>
<td>100-600</td>
</tr>
<tr>
<td>Chili</td>
<td>300-400</td>
</tr>
<tr>
<td>Brazil</td>
<td>50</td>
</tr>
<tr>
<td>Poland (Warszawa)</td>
<td>300</td>
</tr>
<tr>
<td>Switzerland</td>
<td>350</td>
</tr>
<tr>
<td>UK (London)</td>
<td>300</td>
</tr>
<tr>
<td>Germany (Dusseldorf)</td>
<td>250</td>
</tr>
</tbody>
</table>

Table: Area Water hardness (CaCO₃ ppm)

- Peru: 250-300 ppm
- Argentina: 100-600 ppm
- Chili: 300-400 ppm
- Brazil: 50 ppm
- Poland (Warszawa): 300 ppm
- Switzerland: 350 ppm
- UK (London): 300 ppm
- Germany (Dusseldorf): 250 ppm
Water Hardness Around The World

**Water Hardness in North Europa**

<table>
<thead>
<tr>
<th>Area</th>
<th>Water hardness (CaCO₃ ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peru</td>
<td>250-300</td>
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</tr>
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<td>UK (London)</td>
<td>300</td>
</tr>
<tr>
<td>Germany (Dusseldorf)</td>
<td>250</td>
</tr>
</tbody>
</table>

Water hardness in North Europa (CaCO₃ mg/L):  
- **Helsinki**: 70 mg/L  
- **Stockholm**: 350 mg/L  
- **Warszawa**: 300 mg/L  
- **Copenhagen**: 350 mg/L  
- **Dusseldorf**: 250 mg/L  
- **UK**: 300 mg/L
High Detergency in Hard Water

MES has potential for reducing chelating agents.
Palm Oil Based MES Characteristics

1. High Detergency in Low Concentration
2. High Detergency in High Water Hardness
3. Higher Biodegradability
4. Global Environment Friendliness
Biodegradability of MES

Test method: OECD 301C
Source: METI (Ministry of International Trade and Industry) in Japan
Lion Japan Japan referred to METI data base, made this figure

MES is good biodegradability
Palm Oil Based MES Characteristics

1. High Detergency in Low Concentration
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Global Environment Friendliness

Carbon Neutral

MES is sustainable raw material
1. Introduction of LION ECO CHEMICALS SDN. BHD.

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Application of MES for Powder Detergent

Even by partial substitution, MES increases detergency of LAS based detergents.

Conditions: Krefeld10D (Pigment, sebum/cotton), Terg-O-Tometer, 25°C, Water hardness 90 ppm (CaCO3), Concentration(ppm):Surfactant 200, Na₂CO₃ 250, Zeolite 300
Application of MES for Powder Detergent

Effect of Partial Substitution with LAS in Hard Water

Even by partial substitution, MES increases detergency of LAS based detergents

Conditions: Krefeld10D (Pigment, sebum/cotton), Terg-O-Tometer, 25°C
Concentration (ppm): Surfactant 200, Na₂CO₃ 250, Zeolite 300
MES for Post Addition Process

Model Production Flow for Powder Detergent
Powder Detergent with MES in Asia

- **BEAT DRUM** (Korea)
- **Pao Machine Wash** (Thailand)
- **TOP Super White** (Malaysia)
- **TOP Super white** (Singapore)
- **Top** (Japan)

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**TOP** is enhanced with Methyl Ester Sulphonates (MES), a high-performance and environmentally friendly plant-based surfactant, providing high detergency while being carbon neutral and easily biodegradable in waste water.
Substitution for LAS in Liquid Detergent

Detergency increases dramatically with only 25% replacement from LAS to MES

Conditions: Krefeld10D (Pigment, sebum/cotton), Terg-O-Tometer, 25°C, Water hardness 100 ppm (CaC03), Concentration(ppm):Surfactant 200, Mono ethanol amine 10
Liquid Detergent Formula with MES for Low Temp. Area

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Proposal 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAS (%)</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>MES (FL80)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AES</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>AE(EO=7)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Citric acid</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Water</td>
<td>Balance</td>
<td>Balance</td>
</tr>
<tr>
<td>Total Surfactant (%)</td>
<td>21</td>
<td>19</td>
</tr>
</tbody>
</table>

Appearance

- 5°C (1month): Clear, Clear
- 0°C (1month): Clear, Clear

Formula pH: 7.5-8.5

MES has potentiality to reduce total surfactant contents with same detergency

Condition: Dosage 2,000ppm, Water hardness 250ppm, Bath ratio 30, Water temperature 25°C, Washing time 10mins
MES for Direct Mixing Process

Model Production Flow for Liquid Detergent

Water ° Surfactant ° Stabilizer ° MIZULAN FL80

Mix1 ° Preservative ° Pigment ° Enzyme ° Perfume

Mix2

Packaging

MIZULAN (Flake)
Liquid Detergent with MES in South East Asia

Top liquid (Malaysia)

Appearance (25°C)

*Clear
*Free flow liquid
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1. MES is an anionic surfactant derived from palm oil and has several characteristics, for example, high detergency in low concentration or hard water and global environmental friendliness.

2. MES improves the detergency even by partial substitution of surfactants.

3. MES is applied to existing powder and liquid detergent process easily.
Tack sa mycket!
Thank you so much