IChemE POP SIG Evening
30th November 2015, Kuala Lumpur

Process Safety in the Palm Oil Industry

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AOMG

ASEAN Oleochemical Manufacturers Group
Palm Oil at a Glance

PRODUCERS AND IMPORTERS
OF OIL PALM

The largest importer of oil palm is India, China and the EU, accounting for 50% of the global imports.

Malaysia and Indonesia account for 86% of the global palm oil production.

PRODUCER COUNTRY
- 33% Indonesia
- 22% Malaysia
- 4% Thailand
- 2% Colombia
- 1% Nigeria
- 7% Others

IMPORTS OF PALM OIL 2013
- 28% India
- 15% China
- 15% EU
- 6% Pakistan
- 3% US
- 3% Egypt
- 3% Bangladesh
- 2% Singapore
- 2% Iran
- 2% Russia
- 29% Others

OIL YIELD
PER TONNE PER HECTARE
- 3.9

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THE PALM OIL SUPPLY CHAIN

Upstream

Midstream

Downstream oleochemicals

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Characteristics of Asian companies

- Information hungry
- Information hoarders
- Thrifty
- Autocratic
- Satisfy legal requirements
- Short to medium term investment
- Successful
What will be covered

1. Process Safety in AOMG
2. Survey of Process Safety Management in member companies
3. Process safety – an ongoing journey
4. Improving process safety in the entire industry
5. Process safety leadership
1. Process Safety in AOMG

- What is AOMG?
- What makes it work?
- Areas of working together
- Process safety survey
What is AOMG?

- 15 Members from Indonesia, Malaysia & Philippines
- Represent the oleochemical industry to promote the formation of reliable and responsible production of oleochemicals without prejudicing normal competition between companies and countries.
AOMG members

Indonesia
1. PT Ecogreen
2. PT Musim Mas
3. PT Nubika Jaya
4. PT Soci Mas
5. PT Unilever Oleochemical Indonesia

Early multinational members from Europe/USA in Malaysia

Unilever
ICI
Akzo Nobel

Malaysia
1. Emery Oleochemicals
2. FPG Oleochemicals
3. Fatty Chemicals
4. IFFCO
5. IOI Oleochemicals
6. Natural Oleochemicals
7. Pacific Oleochemicals
8. Palm-Oleo
9. Southern Acids

Philippines
1. Chemrez

Henkel
P & G
What makes it work (1)?

- European legacy
- Modeled on APAG (The European Oleochemicals and Allied Products Group) a Sector Group of Cefic (European Chemical Industry Council)
- Assemble Industry Statistics viz capacity and utilisation
What makes it work (2)?

Shared concerns

eg Insurance issues

• Industry reputation low
• High premiums
• Not insurable

Improved after 1998

<table>
<thead>
<tr>
<th>1992 Bellows rupture in Johor</th>
<th>1993 Selangor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stearic acid warehouse fire</td>
<td>1994 Penang</td>
</tr>
<tr>
<td>1997 Explosion H2 generation plant in Selangor</td>
<td></td>
</tr>
</tbody>
</table>
What makes it work (3)?

**Commitment of CEOs**
- K H Tan FICheM E
  COO IOI Oleo
- Steve Goei
  CEO PT Soci Mas
- G C Tan FICheM E
  MD Pacific Oleo

**Commitment of Seniors**
- E C Goh
- F G Wong
- Y P Low
- K S Qua FICheM E
Working together : Process Safety

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Process Safety Workshop 2
Bali 2012

Process safety in fatty acid and fatty alcohol plants, PTW system, minimisation of solid & liquid waste and communication with the board
Process Safety Workshop 3
Kuantan 2013

Zero waste at BASF-Petronas Chemicals
Handling of hydrogen gas at Air Products
The world around us

26/7/12 Bunga Alpinia

25/3/13 Peter Greven Asia

Leak and lightning?
5 fatalities

Dust explosion
2 fatalities, 2 serious injuries
Handling of methanol by PETRONAS Chemicals Methanol Labuan
Industrial Dust Explosion Risk Management by BS&B Safety Systems
Layers of Protection Analysis (LOPA)
Methanol toxicity

Metabolism of methanol

\[
\begin{align*}
\text{Methanol} & \xrightarrow{\text{Alcohol dehydrogenase}} \text{Formaldehyde} \\
\text{Formaldehyde} & \xrightarrow{\text{Formaldehyde dehydrogenase}} \text{Formic acid} \\
\text{Formic acid} & \rightarrow \text{CO}_2 + \text{H}_2\text{O}
\end{align*}
\]

Inhibition by fomepizole

Metabolic acidosis and tissue injury
Process Safety Workshop 5
Bangkok 2015

PSM 1. Contractor management 2. Mechanical integrity
Working together: Sustainability

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Working together : GHS
Working together: Energy Efficiency
2. Survey of process safety management in member companies

AOMG Process Safety Committee

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Background

- OECD document for Corporate Governance for Process Safety, June 2012
- At 2 levels viz Head of Company & Frontline
- 5 sections
  1. Leadership and Culture (8 questions)
  2. Risk Awareness (7 questions)
  3. Information (10 questions)
  4. Competence (7 questions)
  5. Action (7 questions) Total 39
Corporate Governance for Process Safety
OECD Guidance for Senior Leaders in High Hazard Industries

http://www.oecd.org/chemicalsafety/corporategovernanceforprocesssafety.htm

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# Self-Assessment Questions for Senior Leaders

**How well are you doing at managing process safety?**
The following self-assessment aims to show how well your organisation is managing process safety. In line with the principles of corporate governance of process safety, the questions are intended to be answered by senior leaders: at this stage don’t pass the question set to your HSE manager, but answer them yourself as best you can. Once you have done so, you should then discuss with your staff how to address any gaps, get more information, or find out the status of ‘work in progress’ to address known gaps. The questions are intended to be answered using ‘traffic light’ scores:

1 = Yes, and I can easily demonstrate this
2 = Uncertain, I would need to find out, or this is already work in progress
3 = No, I think there is a gap

<table>
<thead>
<tr>
<th>Leadership and Culture</th>
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</thead>
<tbody>
<tr>
<td><strong>Leadership &amp; Culture</strong></td>
</tr>
</tbody>
</table>

- Do you have a policy on corporate governance for process safety which describes the management expectations, required commitment, and corporate activities in relation to process safety?
- Do you include process safety on the agenda for all board meetings?
- Do you have a designated board member responsible for process safety?
- Do you and senior leaders actively work to remove any barriers to the reporting of ‘bad news’ up the management hierarchy, and promote an open culture for communicating process safety issues (e.g. by providing direct communications routes from the shopfloor to senior leaders, or from the national board to overseas HQ)?

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Gap analysis

“Heads of companies ticked ‘yes’ for many items but frontline staff did not always agree”

<table>
<thead>
<tr>
<th>No</th>
<th>Section</th>
<th>Gap %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leadership &amp; Culture</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Risk Awareness</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Information</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Competence</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Action</td>
<td>45</td>
</tr>
</tbody>
</table>
## Highlights

<table>
<thead>
<tr>
<th>No</th>
<th>Section</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leadership &amp; Culture (30%)</td>
<td>Safety policy not well communicated?</td>
</tr>
<tr>
<td>3</td>
<td>Information (20%)</td>
<td>MOMG members participate in CICM’s RC Awards. Not winning a process safety award pushed them to focus on process safety.</td>
</tr>
<tr>
<td>5</td>
<td>Action (45%)</td>
<td>People at plant may not always be able to get their process safety recommendation or proposals approved.</td>
</tr>
</tbody>
</table>
Keys Findings 1

• The difference between process safety and OSH (occupational safety and health) is not always clear.

• Insurance companies risk survey programmes are more geared towards process safety as their focus is on security of assets and continuity of business. People are also protected as a result.

• Formal Process Safety Management training is recommended to cover the gaps in piecemeal PSM activities and to build a good foundation over a few years for process safety.
Key Findings

1. Formal PSM Training
2. Senior managers should pay more attention to front line production managers on their process safety concerns and formalize a channel for early ‘bad news’ to prevent it from becoming disastrous.
3. Management of contractors is a difficult area and is recognized by all, particularly by production managers.

10/7/15 Berkasi, Indonesia
Gas pipeline failure
17 fatalities, 44 injured

6/10/15 Kundang
Dust explosion fire
23 injuries
Photo: 14 people were killed and 42 injured at a dust explosion at the Georgia sugar refinery, US, in 2008.

15/1/13 Hulu Trengganu

- Palm oil mill steriliser explosion
- 4 fatalities

4/7/14 Kidurong

- Welders fell into a water-filled palm oil tank, 2 fatalities

15/8/14 Cutting FFB from tree, struck electrical line & electrocuted in Sabah

- 2/8/14 As above, cutting pole stuck in transformer & electrocuted in Johore
- 26/7/14 Mechanical buffalo overturned on slope. Victim crushed and died
- 25/3/11 Died being wedged between FFB cages as he pulled them from steriliser
4. Improving Process Safety in the entire Palm Oil Industry

1. Identify pockets of excellence and key persons
Indication of process safety in place
4. Improving Process Safety in the entire Palm Oil Industry

1. Identify pockets of excellence and key persons

2. RSPO (Roundtable on Sustainable Palm Oil) P&C (Principles & Criteria) 4.7
Growers and millers should ensure that the workplace, machinery, equipment, transport and processes under their control are safe ...
4. Improving Process Safety in the entire Palm Oil Industry

1. Identify pockets of excellence and key persons ↓

2. RSPO (Roundtable on Sustainable Palm Oil) P&C (Principles & Criteria) 4.7 & 4.8

3. DOSH must publish full investigations
<table>
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<tr>
<th>TITLE</th>
<th>HITS</th>
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<tbody>
<tr>
<td>Bolt And Nut Failure At The Slew Ring Of The Tower Crane</td>
<td>89</td>
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<tr>
<td>Floor Of Supermarket Under Construction Collapse At Pulau Sebang Melaka</td>
<td>290</td>
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<tr>
<td>Tower Crane Boom Bent</td>
<td>886</td>
</tr>
<tr>
<td>Kes Kegagalan Passenger/Material Hoist Di Tapak Pembinaan Di Putrajaya</td>
<td>977</td>
</tr>
<tr>
<td>Kes Kemalangan Permanent Gondola</td>
<td>767</td>
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<tr>
<td>Kes Kegagalan Struktur Bumbung Kanopi Di Sabah</td>
<td>767</td>
</tr>
<tr>
<td>Welding Failure Of A Gondola Arm Structure</td>
<td>1117</td>
</tr>
<tr>
<td>Pilot Wire Breakage During Cable Installation Works</td>
<td>1249</td>
</tr>
<tr>
<td>Safety Alert Penyelenggaraan Kren Menara Bagi Komponen Slewring</td>
<td>1431</td>
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<tr>
<td>Fire And Explosion Of Natural Gas Pipeline In Sarawak</td>
<td>2223</td>
</tr>
<tr>
<td>The Failure Of Corrosion Inhibitor Piping System</td>
<td>1424</td>
</tr>
<tr>
<td>Lift Overrun Up Incident</td>
<td>2009</td>
</tr>
</tbody>
</table>
FIRE AND EXPLOSION OF NATURAL GAS PIPELINE IN SARAWAK

Fire and explosion of a 36" diameter natural gas pipelines occurred on June 10, 2014, at approximately 1.30 am. At about 5.00 am, the fire is extinguished after fuel sources of natural gas in the pipeline was thoroughly burned. This event does not result in any loss of life or injury to humans (public or worker). However, the impact from the explosion and fire formed a crater of about 10 metres in diameter and 3 metres depth. It also caused crops surrounding area of 500 metres radius from the center of the explosion to burnt out. During that time, there was no work activity is in progress, nor arson activity identified.

This incident caused by the release of gas from the pipeline through a welded joint between two pipes. This failure was due to the low strain capacity of the girth weld at joint that was subjected to external loading (such as soil movement and vibration loads by heavy vehicle). Fracture at the weld joint was resulting from welding defects and flaws. Type of consumables (electrodes) used, expertise of welders and welding technique implemented caused this condition to happen. These inherent defects have not been identified and translated effectively through Non-Destructive Test (NDT) performed on respective welded joint.

From the results of the investigation made on these events, emphasis on the integrity of the welding should be given, particularly for welding works of the underground gas pipeline. Therefore, attentions to the following point must be considered:

- Preparation of a thorough and accurate Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) should consider all the elements required by the respective welding design code.
- The welding work carried out should be effectively and thoroughly supervised in ensuring compliance with welding techniques, procedures and materials used as specified in the provided WPS and PQR.
- A competent person must interpret and evaluate accurately and transparently the results of the non-destructive tests of welding conducted.
- The effectiveness and usability of a detection system of gas relief from underground gas pipelines and its control measures over such events should be provided and monitored from time to time.
4. Improving Process Safety in the entire Palm Oil Industry

1. Identify pockets of excellence and key persons ↓

2. RSPO (Roundtable on Sustainable Palm Oil) P&C (Principles & Criteria) 4.7 & 4.8

3. DOSH must publish investigations

4. Start an IChemE Palm Oil Processing SIG (Special Interest Group) ↑
5. Process safety leadership is vital
5. Process safety leadership is vital

Senior executives are the weakest link in PSM

– Don’t understand risk
– Trust absolutely the system design
– Make business decisions without understanding the impact on process safety management
– Don’t know how to challenge what they are being told
– Have a strong bias towards messages about success
Process Safety in the Palm Oil Industry

Thank you – Questions?
What was covered

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