IMO 2020
Oil Market reactions & bunker specifications:

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Cosmo Oil
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Cosmo Oil & its Crude procurement

- 3 refineries with 360kbd CDU capacity.
- 6 time chartered VLCC(3 with scrubber).
- Minimal HSFO yield by Coker enhancement.

### Domestic Market Share in 2017

<table>
<thead>
<tr>
<th>Company</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>JX</td>
<td>33.2%</td>
</tr>
<tr>
<td>Tonen General</td>
<td>15.9%</td>
</tr>
<tr>
<td>IDEMITSU</td>
<td>15.1%</td>
</tr>
<tr>
<td>SHELL</td>
<td>15.0%</td>
</tr>
<tr>
<td>COSMO</td>
<td>13.5%</td>
</tr>
<tr>
<td>TAIYO</td>
<td>4.7%</td>
</tr>
<tr>
<td>KIGUNAS</td>
<td>2.6%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

- **April 2017**
- **April 2018**

### Refineries and Terminals

- Hakodate Terminal
- Sakaide Terminal
- Cosmo Matsuyama
- Chiba Refinery
- CM Aromatics
- Maruzen Petrochemical
- Sakai Refinery
- Yokkaichi Refinery
IMO 2020 & Market: Material Balance

Marine Fuel Mix Base Case (mbpd)

(Source: IEA)
IMO 2020 & Market : Market Reaction

Singapore Refining Margin ($/bbl)

(Source: Platts)
Key Issues

1. Global Crude Slate
   ✔ World has lost 3 million b/d heavy crude since late last year.
   ✔ US shale production is expected to keep increasing over one million bbl/day for next five years.
   ✔ Global Crude slate has been getting lighter by 0.4 API in last two years.

2. Scrubber Implementation
   ✔ 2,800 installation by Jan 2020.
   ✔ Still best economic option in 5 years time scale.

3. Refinery Optimization
   ✔ FCC refineries swing production between VLSFO & FCC gasoline.
   ✔ Gasoline/VLSFO matters more than Diesel/VLSFO.
Refinery Optimization & Quality Issue

Production Patterns of 3.5% HSFO

- Crude
- CDU
- VDU
- HT
- DDS
- FCC
- ULSFO-DM
- VLSFO-DM
- LCO
- CLO
- HSFO

*ULSFO: Sulfur 0.10% Fuel Oil
*VLFSO: Sulfur 0.50% Fuel Oil
*DM: Distillate Marine Fuel
*RM: Residual Marine Fuel
(MEP74/WP.8 Annex 2)
Refinery Optimization & Quality Issue

Production Patterns of 0.5% VLSFO

Blending Diagram

- ULSFO: Sulfur 0.10% Fuel Oil
- VLSFO: Sulfur 0.50% Fuel Oil
- DM: Distillate Marine Fuel
- RM: Residual Marine Fuel

(MEPC74/WP.8 Annex 2)
FCC (Fluid Catalytic Cracker).

✔ The unit is to take LSVGO as feed to yield low octane gasoline.

✔ FCC refineries swing production between VLSFO & FCC gasoline.

✔ Gasoline/VLSFO matters more than Diesel/VLSFO.
FCC existing capacity

USA
FCC 6.5 mmbd
CDU 18 mmbd

ASIA
FCC 7.2 mmbd
CDU 33.0 mmbd

Europe
FCC 8.5 mmbd
CDU 38 mmbd

Middle East
FCC & RFCC 0.74 mmbd
CDU 7.5 mmbd
## Refinery Optimization & Quality Issue

<table>
<thead>
<tr>
<th></th>
<th>Paraffinic</th>
<th>Aromatic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viscosity</strong></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Pour point</strong></td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Combustion quality</strong></td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td><strong>FCC Catalyst fines</strong></td>
<td>-</td>
<td>Positive (from FCC)</td>
</tr>
<tr>
<td><strong>Stability</strong></td>
<td>Potential Compatibility issue</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Stable
Refinery Optimization & Quality Issue

Potential Compatibility Issue

Multene

asphaltene

resn

Micellar structure = stable

Exposure to high temperature, Blending of two different fuel.

Multene

Collapse of micellar structure

Agglomerate

“Sludge”

Aromatic

Blend

Paraffinic

Aromatic

Blend

Paraffinic

Aged
Compliant Fuel: Trial for Quality Assurance

Trial for Quality Assurance.
✓ Majors & independent refineries are providing various samples of compliant fuel (VLSFO).
✓ Trial test has been conducted by various entity in each region to check the compliant fuels performance.
✓ Those tests include, sulfur contents, homogeneity of fuel, compatibility between different batches of fuel and remaining fuels, SOx emission, and so on.
✓ NO MAJOR Problem has been reported so far.
Distinction of Bunker Fuel market.

- Huge regional gap between supply & demand.
- Blending materials are globally traded & transported into bunker hub.
- The least captive and most stretched logistics & distribution.
Conclusion

- IMO 2020 will be a big opportunity for refineries to optimize its production among, mo-gas, mid distillate, and VLSFO.
- Such an optimization would bring a variety of “VLSFO” and its blending materials.
- In comparison to other petroleum products, Bunker fuel supply in international hubs has the least captive and the most stretched logistics & commercial stream.
- The compatibility of the bunker fuel could be risk as variety of paraffinic & aromatic blending material will be coming into bunker blending pool.
- A Good bunker supplier is cautious in blending procedure, keeps its production and blending history traceable.
- The bunkering fuel industry would need simple and practical measures and words in the contract, to secure the traceability of bunker fuel.
Thank you!