Challenges facing the Japanese Oil Industry
-what we have done & what we are going to do-

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1. Declining Oil Demand in Japan

Major Reasons behind the Structural Decline
1. Decreasing birthrate and aging population
2. Improving energy efficiency
3. Shift to other energy sources

2014-2030: Structural downward trend continues (▲ 1.7% p.a.*). (*) Resumption of nuclear power plants is not taken into account.

2030: About 60% of the peak demand in 1999

1973-74: First Oil Crisis
1979-82: Second Oil Crisis
1999: Peak of the demand (246mmkls)

2011-13: Temporary demand increase for power generation after the earthquake.
2. Curtailment of the Refining Capacity

- The relevant law was enacted in Mar 2009
- The Objective: Enhancing cracking ratio
- Progress of the capacity curtailment
  - 1st phase: Sep.2009 - Mar.2014 CDU: Δ1,000KBD

Refinery Operation Rate (2008-2017)

- JX Muroran Refinery: CDU: 180KBD → 0
  ⇒ Transformed to a chemical plant
- Teiseki Topping Plant: Kubiki Refinery 5→0

Source: METI data

Normalization of the S&D balance as a result
3. Measures to Strengthen the Competitive Edge

Challenges facing the Japanese oil industry
1) Declining Oil Demand since 2000
2) Deregulation of the Oil Industry in 1996

1) Shift to Petrochemicals
   - PET bottles produced from PX

2) Oil Products Export
   - Osaka Ref.-JX/Petro China JV

3) Enhanced Efficiency of Refinery Operation
   - Tunnels connecting the two refineries

4) Corporate Integration
   - Predecessors of JX
3. Measures to Strengthen the Competitive Edge

1) Shift to Petrochemicals

- Aromatics production from MOGAS components
- Upgrading FCC propylene to polymer grade

Petrochemical operations at JX refineries/plants

**JX’s Production Capacity (MMTA)**
- Paraxylene (PX): 3.1
- Benzene (BZ): 1.9
- Propylene (PY): 1.2* *(Including Refinery Grade 0.3)

**Global PX Capacity (MMTA)**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Capacity (MMTA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SINOPEC</td>
<td>4.2</td>
</tr>
<tr>
<td>2</td>
<td>Exxon Mobil</td>
<td>3.4</td>
</tr>
<tr>
<td>3</td>
<td>JX</td>
<td>3.1</td>
</tr>
<tr>
<td>4</td>
<td>BP</td>
<td>3.0</td>
</tr>
<tr>
<td>5</td>
<td>SK</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Source: IHS data

**Overseas Operations**
- **P.C. Aromatics** (Malaysia/Kerteh)
  - PX: 500kT, BZ: 190kT * Entitlement 10%
- **Ulsan Aromatics** (South Korea/Ulsan)
  - PX: 1,000kT, BZ: 550kT * Entitlement 50%
HS-FCC (High Severity-FCC)

Our proprietary technology for gaining higher Propylene yield

### Conventional FCC process v.s. HS-FCC process

<table>
<thead>
<tr>
<th></th>
<th>Conventional FCC</th>
<th>HS-FCC</th>
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</thead>
<tbody>
<tr>
<td>Reaction temperature(℃)</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>Reaction time(sec)</td>
<td>2~3</td>
<td>0.5</td>
</tr>
<tr>
<td>Yield(wt%) Propylene</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>50 (90octane)</td>
<td>35 (100octane)</td>
</tr>
</tbody>
</table>

Flow in Reactor:
- Up Flow Reactor: Flow: Upward (against Gravity)
- Reaction time: not uniformed
- Down Flow Reactor: Flow: Downward (same direction as Gravity)
- Reaction time: uniformed

Pilot Plant at Mizushima Ref.
3. Measures to Strengthen the Competitive Edge

2) Oil Products Export

- Main mission of the oil industry: stable supply to the domestic market
- Poor export facilities: less competitive to the Koreans on the offshore trading market
- The export volume has been gradually increasing:
  - utilizing surplus capacity
  - optimizing S&D balance

Oil Products Export (FY2000-2013)

- JV with Petro China
  - Osaka International Refining Co.
  - Established: October 2010
  - Shareholders: JX 51%, Petro China 49%
  - Function: Export oriented
  - Refining Capacity: 115kBPSD

Source: METI data
3. Measures to Strengthen the Competitive Edge

3) Enhanced Efficiency of Refinery Operation

Major reasons behind weakness of the refineries

1. Stringent regulations on safety & environment
2. Higher personnel cost
3. “Aged” and “small” size → manageable
4. Insufficient cracking capacity ratio

How to cope with the “aged”

✓ Refinery Age ≠ Mechanical Availability (MA)
✓ Mechanical Availability (MA) > Maintenance Index (MI)
✓ Safety consciousness and technical capability of refinery staff / operators

How to cope with the “small size”

✓ Integration of adjacent refineries
  ★1 Mizushima: Nippon Oil & Japan Energy refineries
    Started from 2003 → JX
  ★2 Chiba: Cosmo Oil & Kyokuto Oil refineries
    Starting from 2015 under a JV co.
3. Measures to Strengthen the Competitive Edge

4) Corporate Integration

Reorganization of Oil Companies in Japan

Sources for synergy effect under corporate integration
- Expansion in scale
- Elimination of overlapping
- Mutual complementation

Integration in 2015(?)
4. New Business Development

1) The Areas where Japanese Oil companies explore new opportunities
   (1) Power & Gas Business on the domestic market
   (2) Refining & Marketing Business in Southeast Asia
   (3) Renewable Energy Business like PV and wind power in and out of the country

2) Strategy of JX for New Business Development
   (1) To explore opportunities in energy related areas (oil, coal, gas&power)
   (2) To utilize core competence built up through existing operation
   (3) To develop sizable business to make up for shrinking domestic operation
Thank you for your attention!
Summary of JX Group Operations

**Energy Business**
- Market share of domestic sales of petroleum products: Approx. 37%¹ (No.1 in Japan)
- Market share of domestic sales of lubricant products: Approx. 37%² (No.1 in Japan)
- Paraxylene supply capacity: 3,120 thousand tons/year (No.1 supplier in Asia)

**Oil and Natural Gas Exploration and Production Business**
- Crude oil and natural gas sales volume (a project company basis): Approx. 120 thousand barrels/day (B/D)
- Worldwide business activities in such areas as Malaysia, Vietnam, North Sea (UK), Middle East and others

**Metals Business**
- Equity entitled copper mine production: Approx. 130 thousand tons/year *⁵
- Refined copper production capacity: 1,170 thousand tons/year *⁶
- Electronic Materials; Products with world No.1 market shares


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Corporate profile

CDU Capacity : 1,424 KBD / 2013FY

Net Sales : 121 billion US$ / 2013FY

Operating income : 2 billion US$ / 2013FY

**ENEOS** Gas Stations : 11,000 in Japan

Domestic Fuel Oil Sales : 71 million kiloliters

Market share : 37 % in Japan
JX Nippon Oil & Energy has 7 refineries and 5 plants in Japan.
Michio Ikeda is Executive Vice President of JX Nippon Oil & Energy Corporation in Japan. He began to work for Mitsubishi Oil Company in 1974. In the first 24 years of his career with the company, he was mainly engaged in crude oil acquisition, petroleum products trading, and overseas project development. In 1998, he was assigned to corporate planning, where he was chiefly involved in two mergers, or one with Nippon Oil in 1999, and the other with Japan Energy in 2010. The outcome of the two mergers is JX Nippon Oil and Energy Corporation, a leading refiner-marketer and an integrated energy supplier in Japan. He was named as Senior Vice President in 2010, and as Executive Vice President in 2012. He has been sitting on the board of the company since 2007.