Schwechat Refinery Visit

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SVP Refining & Petrochemicals
Vienna, Austria
November 7, 2018
Safety is our top priority

Process safety

OMV is in the 1st quartile of the Concawe Manufacturing benchmark for Process Safety performance.

1st quartile of Concawe European Downstream Oil benchmark for occupational safety.

OMV Downstream Lost Time Injury Rate substantially below industry benchmark.

Successful turnaround of Petrobrazi refinery in 2018 with up to 5,000 additional contractor employees without any incident requiring medical treatment.
Schwechat refinery emissions in 2017 contribute less than 1% to total Austrian emissions

**SO₂**
- 2005: National emissions of SO₂ (Others) = 3,350
- 2017: National emissions of SO₂ (Others) = 335
- Schwechat refinery emissions = 0.85%

**NOₓ**
- 2005: National emissions of NOₓ (Others) = 3,051
- 2017: National emissions of NOₓ (Others) = 920
- Schwechat refinery emissions = 0.89%

**VOC**
- 2005: National emissions of VOC (Others) = 852
- 2017: National emissions of VOC (Others) = 677
- Schwechat refinery emissions = 0.42%
Schwechat refinery and Borealis plant – close proximity and synergies

Schwechat

- Sole refinery in Austria (9.6 mt), supplying half of the domestic demand
- Crude supplied from Trieste port via pipeline as well as domestically (10% equity crude intake)
- Wide range of crudes (heavy, medium, light)
- Product pipelines: e.g. Jet fuel pipeline to Vienna airport

Borealis

- Leading polyolefin producer
- “Across the fence” with operational synergies
- Key customer for OMV’s ethylene and propylene
- Strong contributor to OMV’s profitability
Downstream Oil Value Chain

2017 figures

**Crude supply**
- Equity crude production: 4.3 mn t
- Crude from third parties: 11.7 mn t

**Refinery production**
- Crude oil refining: 16 mn t (90% utilization rate of 17.8 mn t refining capacity)
- Purchase of semi-finished products: 1.4 mn t
- Purchase of finished products: 4.0 mn t

**Product supply and logistics**
- Storage
- Rail/truck/ship

**Petrochemical/ commercial/ retail sales**
- Retail: 6.2 mn t
- Business-to-business: 9.5 mn t
- Aviation: 1.9 mn t
- Petrochemicals: 2.2 mn t

Customer allocation in %
- Wholesale: 53%
- Captive market: 47%

1 10% internal consumption to be deducted.
2 Volume includes blending components and excludes purchase of products for OMV Petrol Ofisi
3 OMV Petrol Ofisi divested in June 2017
4 Retail and petrochemical sales

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5 | Schwechat Refinery Visit, November 7, 2018
# Schwechat refinery: 60 years old

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958</td>
<td>Opening of the Schwechat refinery</td>
</tr>
<tr>
<td>1963</td>
<td>Vacuum distillation unit</td>
</tr>
<tr>
<td></td>
<td>Crude oil distillation plant 2</td>
</tr>
<tr>
<td></td>
<td>Catalytic cracking plant</td>
</tr>
<tr>
<td>1991</td>
<td>Direct supply of jet fuel to Vienna airport</td>
</tr>
<tr>
<td>2003</td>
<td>Hydrogen plant is built</td>
</tr>
<tr>
<td>2005</td>
<td>Expansion of the ethylene cracking plant</td>
</tr>
<tr>
<td>2007</td>
<td>Commissioning of the flue gas desulfurization and denitrification plant</td>
</tr>
<tr>
<td>2009</td>
<td>Construction of the Thermal Gas Oil Unit (TGU)</td>
</tr>
<tr>
<td>2010</td>
<td>Site Integration Residue Transfer Schwechat - Burghausen completed</td>
</tr>
<tr>
<td>2014</td>
<td>Expansion by 30% of butadiene capacity to 60 kt</td>
</tr>
<tr>
<td>2018</td>
<td>Re-oil® pilot plant</td>
</tr>
</tbody>
</table>

[https://www.youtube.com/watch?v=Y7Oi7B6jPA&feature=youtu.be](https://www.youtube.com/watch?v=Y7Oi7B6jPA&feature=youtu.be)

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Crude oil processing can be divided into four essential stages:

1. **Distillation**
   - Natural gas
   - Refinery gases
   - CRUDE OIL

2. **Desulfurization**
   - Naphtha desulfurization
   - Kerosene desulfurization
   - Gasoil desulfurization
   - Vacuum gasoil desulfurization

3. **Upgrading**
   - Butadiene plant
   - FCC C3 cut
   - Catalytic cracker
   - Thermal cracker
   - Claus unit

4. **Blending**
   - Hydrogen
   - Hydrogen to desulfurization
   - Butadiene
   - Butane
   - Propane
   - Ethylene
   - Propylene
   - Crude C4
   - Butadiene
   - Propane
   - Butane
   - Butane
   - Euro Super 95
   - Jet A1
   - Diesel
   - Premium Diesel
   - Fuel oil extra light

5. **Products**
   - Hydrogen
   - Ethylene
   - Propylene
   - Crude C4
   - Butadiene
   - Propane
   - Butane
   - Butane
   - Domestic fuel oil
   - Heavy fuel oil
   - Bitumen
   - Sulfur
   - Sulfuric acid
   - District heating
   - Electricity

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Schwechat Refinery Visit, November 7, 2018
Simplified, crude oil processing can be divided into four essential stages

- Distillation
- Desulfurization
- Upgrading
- Blending
Schwechat turns the heavy end of the barrel into high value products

<table>
<thead>
<tr>
<th>Distillation</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>87% Distillates</td>
<td>3% Distillates</td>
</tr>
<tr>
<td>13% Vacuum residue</td>
<td>3% Fuel oil component</td>
</tr>
<tr>
<td>3.5% Heavy component</td>
<td>3% Bitumen</td>
</tr>
</tbody>
</table>

- Gasoline & Diesel blending
- Steam cracker feedstock
- Low sulfur
- High sulfur
- Power & steam generation
- Coker feedstock
Flexible crude intake in OMV refineries

Processed crude oil quantity 2017

- Austria: 5%
- Libya: 19%
- Kazakhstan: 19%
- Azerbaijan: 8%
- Russia: 7%
- Iraq: 7%
- Romania: 22%
- Others: 13%

Processed crude oil quality 2017

- Light
- Medium
- Heavy

2 Heavy crude API < 24; Light crude API > 34
According to US SEC
## Schwechat refinery provides the full range of products

### Petrochemicals

<table>
<thead>
<tr>
<th>Ethylene</th>
<th>Propylene</th>
<th>Butadiene</th>
<th>Aromatics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic chemical used to produce plastics (polyethylene)</td>
<td>Basic chemical used to produce plastics (polypropylene)</td>
<td>Basic chemical used to produce synthetic rubber</td>
<td>Basic feedstock for Benzene extraction</td>
</tr>
</tbody>
</table>

### Fuels

<table>
<thead>
<tr>
<th>Propane/Butane</th>
<th>Gasoline</th>
<th>Jet A1</th>
<th>Diesel</th>
<th>Heating Oil Extra Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid gas used as a heating and transportation fuel</td>
<td>95/100 octane unleaded fuel with max. 0.001% sulfur content; contains bio components</td>
<td>Fuel of the highest quality for aircrafts</td>
<td>Fuel with max. 0.001% sulfur content for passenger cars and trucks; contains bio components</td>
<td>Heating fuel with max. 0.001% sulfur content for domestic use</td>
</tr>
</tbody>
</table>

### Others

<table>
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<tr>
<th>Bitumen</th>
<th>Sulfur</th>
<th>Sulfuric acid</th>
<th>Electrical current</th>
<th>District heating</th>
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<td>Material used to make roads and for use in construction</td>
<td>Basic material for the chemical and fertilizer industries</td>
<td>Basic material for a variety of applications such as fertilizer industries</td>
<td>Electrical current from combined heat and power generation in the power plants</td>
<td>Heat distribution to the district heating network in Vienna and surrounding areas</td>
</tr>
</tbody>
</table>
20% of the volumes produced in Schwechat are transported efficiently via pipeline

Transported volumes in 2017

PIPELINE  20%  ROAD¹  45%  RAIL  27%  SHIP  8%

¹ including volumes transported via truck from St. Valentin storage (supplied via pipeline from refinery)
Innovative OMV refining processes

Bio-oil co-processing

- Conversion of used plastics (PE, PP, PS) into synthetic crude oil with low content of heavy components
- Crude is further processed in Schwechat refinery
- Pilot plant commissioned in Q1/2018
- 100 kg of plastics are converted into 100 liters of synthetic crude oil
- EUR 10 mn investments
- Process is patented internationally (e.g. Europe, USA, Russia, China)
- Next step - design of a demonstration and commercial plant

2020 EU target: at least 10% of transport fuels should be from biofuels
- Current level: 5-6% through blending fuels with ethanol and FAME diesel
- Possible to achieve the 2020 target only by blending hydrogenated vegetable oil (HVO); expected global HVO market shortage
- OMV is developing a configuration to process bio-oils (e.g. domestic rapeseed oils, used cooking oil, algae based oil) in the refinery
- Cost advantage due to estimated cheaper feedstock costs and independence from HVO suppliers
- Continuous production will be possible starting 2022

ReOil® - Transformation of plastic waste into crude oil

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The energy for a better life.