Energy and Transport

M. Sc. Aydin Karakaya
M. Sc. Bing Bai
Background

- There are almost 100 sedimentary basins all over the world which are not prospected.

- The reserves of the old oil fields are still very high.

- Unconventional oil fields have not yet planned and exploited.
## Reserves (Top 10)

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Countries</th>
<th>Reserves(^a)</th>
<th>Proportion</th>
<th>Product/day(^b)</th>
<th>Consumption/day(^c)</th>
<th>Export(^d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S. Arabia</td>
<td>262,600</td>
<td>17.85%</td>
<td>9.05</td>
<td>2,640</td>
<td>147</td>
</tr>
<tr>
<td>2</td>
<td>Venezuela</td>
<td>211,200</td>
<td>14.35%</td>
<td>2.52</td>
<td>746</td>
<td>759</td>
</tr>
<tr>
<td>3</td>
<td>Canada</td>
<td>175,200</td>
<td>11.91%</td>
<td>3.50</td>
<td>2,210</td>
<td>2,320</td>
</tr>
<tr>
<td>4</td>
<td>Iran</td>
<td>137,000</td>
<td>9.31%</td>
<td>3.58</td>
<td>1,850</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Iraq</td>
<td>115,000</td>
<td>7.82%</td>
<td>2.67</td>
<td>694</td>
<td>403</td>
</tr>
<tr>
<td>6</td>
<td>Kuwait</td>
<td>104,000</td>
<td>7.07%</td>
<td>2.21</td>
<td>354</td>
<td>145</td>
</tr>
<tr>
<td>7</td>
<td>A. Emirate</td>
<td>97,800</td>
<td>6.65%</td>
<td>2.50</td>
<td>545</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Russia</td>
<td>60,000</td>
<td>4.08%</td>
<td>10.58</td>
<td>2,200</td>
<td>275</td>
</tr>
<tr>
<td>9</td>
<td>Libya</td>
<td>44,300</td>
<td>3.15%</td>
<td>0.46</td>
<td>289</td>
<td>71</td>
</tr>
<tr>
<td>10</td>
<td>Nigeria</td>
<td>37,200</td>
<td>2.53%</td>
<td>2.18</td>
<td>279</td>
<td>529</td>
</tr>
</tbody>
</table>

\(^a\) Billion barrels  \(^b\) Billion barrels  \(^c\) Thousand barrels  \(^d\) Export (thousand barrels) to USA per day in Sep. 2011

Source: [IEA 12][EIA 11]
Supply Chain Management

Exploitation → Oil Refinery → Oil Depot → Transport → Gas Station → Retail
Motivation and Target

Motivation

- Great space for improvement
- Greater profit after optimization

Target

- Make human life easier
- More rational use of resources
- Environmental protection

Questionnaire
The Most Problematic Aspects in Supply Chain in Oil Industry

- Integration optimization
- Production and distribution
- Impact on the market
- Mode of transport
- Quality of oil
- Optimization from oil depot to gas station
- Optimization from refinery to oil depot
The Most Important Aspects in Supply Chain in Oil Industry

- Optimization from oil depot to gas station
- Optimization from refinery to oil depot
- Mode of transport
- Oil depot
- Logistics information exchange

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The Aspect of IT and Model

- Transport Cost
- Distribution and delivery in oil depot
- Optimization from oil depot to gas station
- Optimization from refinery to oil depot
Threat and Challenge

- The relationship between product and demand
- Monitoring and controlling
- The difficulty of integration from refinery to gas station
- Influence of politics and delivery guaranty
- Optimization of transport and oil depot
- IT and digital factory
The Result of Questionnaire

- **The primary Logistics**
  - 29%
  - Optimization from oil depot to gas station
  - 24%
  - Optimization from refinery to oil depot
  - 6%
  - Optimization of transport for oil depot
  - 5%
  - Product and distribution
  - 6%
  - Impact of market
  - 2%
  - Mode of transport
  - 7%
  - Quality of oil
  - 2%
  - Logistics information exchange
  - 7%
  - Oil depot
  - 1%
  - Transport cost
  - 1%
  - Distribution and delivery from oil depot
  - 1%
  - The relationship between product and demand
  - 7%
  - The difficulty of integration from oil depot to gas station
  - 2%
  - Influence of politics and delivery guaranty
  - 1%
  - IT and digital factory

- **The secondary Logistics**
  - 6%
  - Monitoring and controlling
  - 1%
  - Oil depot
  - 1%
  - Transport cost
  - 1%
  - Distribution and delivery from oil depot
  - 1%
  - The relationship between product and demand
  - 7%
  - The difficulty of integration from oil depot to gas station
  - 1%
  - Influence of politics and delivery guaranty
  - 2%
  - IT and digital factory
The Definition of Petrochemical Logistics

The petrochemical logistics include primary, secondary and tertiary logistics.

- The **primary** Logistics is the distribution of refined oil from refinery to Oil depot.

- The **secondary** Logistics is the distribution of refined oil from oil depot to gas station through wholesale.

- The **tertiary** Logistics is the distribution of refined oil from gas station to consumer through retail.
The Process of Petrochemical Logistics

- Primary logistics
- Secondary logistics
- Tertiary logistics

Wholesale

Retail
Solution and Innovation

Demand forecasting and algorithms
a. The method of mathematics
b. The method of Bullwhip Effect
c. Optimization with Software

Location routing problem
a. The selection of location
b. The calculation of routing
c. Comparison and simulation

Warehouse management
a. Optimization for location of oil depot
b. Optimization of delivery and inventory
c. Risk management

Simulation and emulation for SCM
a. Application of Dosimis
b. The computational analysis and improvement
Requirements of Petroleum

• **1. Supply and demand forecasting (algorithms) for the oil depot**
  • Finding a method to calculate the supply and demand quantity of output from oil depot.
  • The forecasting must be concerned about mathematical method.
  • You can also use the method of mathematical modeling to forecast the supply and demand quantity.
  • Other methods to forecast the supply and demand quantity from oil depot. (E.g. history statement or other methods etc.)

• **2. Supply and demand forecasting (algorithms) for the gas station**
  • Finding a method to calculate the supply and demand quantity of gas station. (monthly or yearly)
  • You must use some mathematical methods to create an equation for the supply and demand forecasting. (The factor of the influence must be listed and analyzed.)
  • You can also use the method of mathematical modeling to forecast the supply and demand of gas station.
  • The Optimization of the demand forecasting for gas station.

• **3. Location Routing Problem for the petrochemical industry (LRP)**
  • Finding an optimization routing between oil depot and gas station.
  • LRP e.g. based on the theory of LRP finding a way to create an optimal line to transport gasoline from oil depot to gas station.
  • The method of the LRP must be optimized. You can use some kinds of mathematical methods to create a new method, e.g. deterministic mathematical model, stochastic mathematical model, multi-objective genetic algorithms and fuzzy algorithms etc.
Requirements of Petroleum

4. The input and output of the gasoline (Oil Depot Management)
   - Finding an optimal way to store the gasoline
   - Create a Layout of oil depot with CAD, which must be based on the reality.
   - How can we take the gasoline (e.g. Super, Super Plus E10 etc.) into the oil depot? (Classification and management). E.g. Train, truck or other ways.
   - How can we take the gasoline out of the oil depot? (Process, method and traffic)
   - What is the process of the distribution between input and output of gasoline?
   - The placement of the fire facilities.
   - Establishment of pipeline facilities in the oil depot.

5. Supply chain management of the oil transport
   - Finding an optimal method to optimize the SCM in oil depot and distribution.
   - Based on the theory of SCM creating an optimized supply chain.
   - With the help of software optimizing a process of supply chain of oil depot.
   - Optimization of process between oil depot and gas station.

6. Simulation and emulation of the SCM of petrochemical industry
   - Make a simulation of the transport or distribution between oil depot and gas station.
   - Based on the lack of reality for the petrochemical industry making some simulation and optimize the supply chain.
   - Simulate and emulate a complete supply chain for petrochemical industry.
   - With the help of simulation or emulation software. (Dosimis, Plant Simulation, Simio or 3Ds Max etc.)

bing.bai@uni-due.de
Bioenergie Supply Chain

• Biomassekraftwerk: Kosten und optimale Anlagengröße
  – Investitionskosten, Transportkosten, Einzugsgebiet

• Standortplanung für Biomassekraftwerke
  – Unter welche Kriterien werden ein geeigneter Standort für eine Biomassekraftwerke bestimmt?

• Grünschnitt-Logistik: Sammlung, Transport und Lagerung
  – Wie funktioniert die Grünschnitt-Logistik?

• Vergleich der Verkehrsträger Straße und Schiene für Biomassetransport
  – Ökonomische und ökologische Vergleich der Verkehrsträger

• Bioethanol Supply Chain
  – Logistik zwischen Quelle und Senke

http://www.kularuhr.de/index.php/logistik.html
Kontakt: aydin.karakaya@uni-due.de