Breaking new ground in the petrochemicals sector
innovation and growth

Louis Besland
Partner

AT Kearney
A.T. Kearney is a global top management consulting firm focusing on turning strategies into reality

A.T. Kearney company profile

- **Tradition** – Founded in 1926 in Chicago
- **Global footprint** – 57 offices in 39 countries
- **Local** - Strong presence in the Middle East
- **Resources** – Over 3,000 global employees

Overview of work

- **Industries** – Wide breadth spanning
  - Energy, Process & Utilities
  - Government
  - Telecom
  - Consumer Goods & Retail
  - Financial Institutions
  - Automotive
  - Transportation
  - Healthcare
- **Competencies** – Ranging from Strategy, Operations, Transformation

We use strategic insight, tailored solutions and a collaborative working style to help clients achieve sustainable results

Source: A.T. Kearney
We deliver Immediate Impact and Growing Advantage through our collaborative, authentic and forward-thinking style.
Navigating Global and regional trends
Customer Collaboration and Innovation
Sustainable and profitable downstream development
# Agenda of today

<table>
<thead>
<tr>
<th>Topic</th>
<th>Speaker</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Navigating Global and Regional Trends</td>
<td>• Thomas Rings • Dr. Bernhard Hartmann</td>
<td>15:00 – 15:40</td>
</tr>
<tr>
<td>2 Customer Collaboration and Innovation</td>
<td>• Dr. Tobias Lewe • Richard Forrest</td>
<td>15:40 – 16:20</td>
</tr>
<tr>
<td>Break</td>
<td></td>
<td>15 min</td>
</tr>
<tr>
<td>3 Building Sustainable and Profitable Downstream Industries</td>
<td>• Dan Starta • José Antonio Alberich</td>
<td>16:35 – 17:15</td>
</tr>
<tr>
<td>4 Q&amp;A and closing</td>
<td>• Louis Besland</td>
<td>17:15 – 17:30</td>
</tr>
</tbody>
</table>
Thomas Rings  
Head of Global Energy and Chemicals Practice

Dr. Bernhard Hartmann  
Head of Asian Energy and Chemicals Practice

Source: A.T. Kearney
Navigating global and regional trends that will transform the Chemical Industry landscape

Thomas Rings and Dr. Bernhard Hartmann
Partners, A.T. Kearney
Global trends impact the Chemical landscape

Global chemical trends

1. Non-conventional feedstock
2. Industry shifts to “CHIMEA”
3. Fight for market access
4. Increasing volatility

Source: A.T. Kearney
Shale gas is becoming a material feedstock

1. Leverage non-conventional feedstock

Global shale gas reserves (in trillion m³)

Ethylene cost-curve per feedstock (2012, US$ per mt)

- China’s naphtha feedstock is high on cost curve
- US shale gas is becoming more cost competitive

Source: CMAI, Deutsche Bank chemical industry report, EIA, A.T. Kearney
Shale gas advantage is a game changer for NA

1. Leverage non-conventional feedstock: North America

Overview of profitability per region (% operating income)

North America Centric PetChem
- Nova
- LYB O&P Americas
- Westlake

Europe/Asia Centric PetChem
- Reliance
- PKN Orlen
- SinopecChem
- Total
- Mitsubishi

Specialty
- Eastman
- Evonik
- AkzoNobel
- DSM
- Clariant

Source: company reports, IEA World Energy Outlook, A.T. Kearney

Shift in global energy balance

- North America becomes a net exporter of natural gas by 2020 and of oil by 2030
- Natural gas demand will rise by 50% in 2035 of which almost half will come from shale gas

Q1-Q2 2012
- 2007
China is also considering to use shale gas…

1. Leverage non-conventional feedstock: China

Policies in 12th 5 year plan

- Clear shale gas classification
- Complete shale gas volume assessment
- Speed up exploration and development
- Set incentives and market based pricing
- Build new infrastructures

Shale gas production targets (bn m³)

- 2015: 3, 7, 3
- 2020: 65, 28
- 2035: 63, 219

...but coal seems to be a more immediate option

1. Leverage non-conventional feedstock: China CTL

<table>
<thead>
<tr>
<th>Application</th>
<th>Capacity (in MMT)</th>
<th>2011</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal-to-Liquid</td>
<td>+700%</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Coal-to-Gas</td>
<td>+465%</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>Coal-to-SynGas</td>
<td>+60%</td>
<td>74</td>
<td>119</td>
</tr>
<tr>
<td>Coal-to-Calcium Carbide</td>
<td>+8%</td>
<td>26</td>
<td>28</td>
</tr>
</tbody>
</table>

Jet fuel | LNG | Clothing, timber, fuel | Acetylene

Source: NSDR, HTSEC, KBR, Chemical Engineering(China), China 12th 5-year plan, China Coal Research Institute, Duke University, A.T. Kearney
Following customers’ shift to the East

2 Industry shifts to CHIMEA

<table>
<thead>
<tr>
<th></th>
<th>Automotive</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2010</td>
</tr>
<tr>
<td>Asia</td>
<td>34%</td>
<td>40%</td>
</tr>
<tr>
<td>Europe</td>
<td>33%</td>
<td>21%</td>
</tr>
<tr>
<td>North America</td>
<td>23%</td>
<td>16%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>10%</td>
<td>8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>New players emerging in Fortune 500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2003</td>
</tr>
<tr>
<td>Emerging</td>
<td>19</td>
</tr>
<tr>
<td>Established</td>
<td>481</td>
</tr>
</tbody>
</table>

Industry’s center of gravity is shifting to CHIMEA

Chemical market value
(1985 – 2025E, € bn)

<table>
<thead>
<tr>
<th>Region</th>
<th>1985</th>
<th>2009</th>
<th>2010</th>
<th>2025E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>480</td>
<td>1,871</td>
<td>2,353</td>
<td>4,276</td>
</tr>
<tr>
<td>Europe</td>
<td>216</td>
<td>834</td>
<td>1,147</td>
<td>2,749</td>
</tr>
<tr>
<td>NAFTA</td>
<td>144</td>
<td>508</td>
<td>578</td>
<td>671</td>
</tr>
<tr>
<td>RoW</td>
<td>48</td>
<td>396</td>
<td>455</td>
<td>544</td>
</tr>
</tbody>
</table>

Top 10 chemical players
(rank by turnover)

1. Bayer
2. BASF
3. Hoechst
4. ICI
5. Dow Chem.
6. DuPont
7. Ciba-Geigy
8. Montedison
9. Rhone-Poul.
10. Monsanto

BASF
Dow Chem.
ExxonMobil
Sinopec
SABIC
Ineos Group
Shell
DuPont
LyondellBasell
Total

Source: CEFIC, Chemical Week, Verband Chemische Industrie, Chemical & Engineering News, annual reports, A.T. Kearney
Fight for market access will intensify

3 Fight for market access: China net exporter

Chinese Polymer net imports (% of total demand)

Will China become a net exporter? ... and when?

Schematic chemicals trade flows

Now and near future...

If China and US become exporters

Impact on high cost feedstock regions like Europe and North Asia could be dramatic

Source: CMAI, Shell, Chemical Week, A.T. Kearney
Chinese SOEs are pursuing their autarky goal

3 Fight for market access: Chinese growth and investments

Revenue 2009 and 2011 (in US$ bn)

- Sinopec: 188 (33%) +110%
- PetroChina: 166 (20%) +90%
- CNPC: 53 (16%) +49%
- CHEMHINA: 38 (11%) +23%
- SGC: 28 (8%) +75%

Major 2012 investments of Chinese players

<table>
<thead>
<tr>
<th>Description</th>
<th>Value (US$ bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33% stake in 5 U.S. shale gas fields</td>
<td>2.2</td>
</tr>
<tr>
<td>20% stake in Shell assets in Groundbirch</td>
<td>1.0</td>
</tr>
<tr>
<td>Take over of Molopo's coal steam gas assets</td>
<td>0.5</td>
</tr>
<tr>
<td>Acquisitions of Total’s Colombian Assets</td>
<td>1.0</td>
</tr>
<tr>
<td>New production facility investment in Gansu</td>
<td>7.9</td>
</tr>
<tr>
<td>Production facilities for para-aramid (5-year)</td>
<td>5.5</td>
</tr>
<tr>
<td>Acquisition of Canada’s Nexen Inc. (Under Approval)</td>
<td>15.1</td>
</tr>
<tr>
<td>33% stake of Tullow in 3 areas in Uganda</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: IEA, company websites, press research, A.T. Kearney
MNCs in China will need to better manage risks

3 Fight for market access: risks, challenges and uncertainties

### Financial support
- Direct subsidies to SOEs
- Preferential financing to SOEs from national banks
- R&D funding for local players
- Lower capital cost for SOEs

### Commodity pricing
- Non-transparent reward of oil import and wholesale licensees
- Adjusted prices of oil products for Chinese SOEs

### Regulation
- Enforcement of environmental and safety laws
- Toxic chemicals’ registration
- Local content regulation

Source: European Chamber of Commerce China; A.T. Kearney
Global economy more susceptible to crises

4 Increasing volatility

More frequent boom/bust cycles (World GDP growth %, p.a.)

- 1973-74 Oil crisis
- 1980 Latin Am. debt crisis
- 1994 Economic crisis in Mexico
- 2000 Dot-com bubble
- 2008 Subprime mortgage crisis
- 1979 Energy crisis
- 1997 Asian financial crisis
- 11 Sept 2001

What’s next?

- Currency Devaluation
- Military Conflict
- Global Pandemic
- Country Disintegration
- Renewable Energy Crisis
- Political Instability
- Real Estate Bubble
- Technical Breakthrough

High feedstock volatility despite no shortages

4 Increasing volatility: feedstock price volatility

Oil resources and production costs
USD 2010 / Barrel
billion barrel

Key drivers for feedstock price volatility
- Short term production fluctuations
- Macro-economic uncertainty
- Speculation and decoupling of oil and gas prices

These trends lead to four strategic questions

Strategic imperatives for chemical players

Global chemical trends
- Non-conventional feedstock
- Industry shifts to CHIMEA
- Fight for market access
- Increasing volatility

Implications for chemical players
- Changed product trade flows and more volatility
- Alternative feedstock may drive volatility further
- State-driven players will change the landscape
- New target markets and customers

Strategic questions
1. What is the right business model to compete in?
2. How to secure access to a long term sustainable and low cost feedstock position?
3. Which regional and customer markets to serve?
4. How to withstand market unpredictability and volatility?

Source: A.T. Kearney
We see three business models to compete on

The chemical industry structure in 2025

<table>
<thead>
<tr>
<th>Petrochemicals</th>
<th>Basic Chemicals</th>
<th>Polymers</th>
<th>Specialties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Integrated players**

2. **Asset driven players**

Key success factors
- Access to low cost feedstock
- Low cost manufacturing
- Access to markets
- Manage supply/demand balance
- Supply chain excellence
- Ability to fund growth investments

3. **Focused specialty players**

Key success factors
- Customer intimacy
- Innovation capability
- Complexity management
- Supply chain excellence

Source: A.T. Kearney
GCC players have to balance global and local development

Global expansion
- Current business model
  - React quickly to supply demand trends
  - Certify market access around the world
- Extend business model downstream
  - Build capabilities in innovation & technology
  - Develop intimacy with different industrial customers

Local economic development
- Local employment
- Diversification from oil
- Development of knowledge economies

Balance feedstock position & financial capability

Source: A.T. Kearney
Customer collaboration and innovation

Dr. Tobias Lewe and Richard Forrest
Partners, A.T. Kearney
GCC has been successful in building a world-class petrochemical industry in a few decades

GCC petrochemical evolution
Historical drivers of GCC petrochemical growth now appear at risk

GCC growth drivers

Historical growth drivers
- Abundance of natural resources
- Favorable geographic location
- Extensive government investment
- Low cost labor force
- JVs to bring external know-how

Global chemical trends
- Non-conventional feedstock
- Fight for market access
- Industry shifts to CHIMEA
- Increasing volatility

Source: A.T. Kearney
Major GCC players have started to address these future challenges via innovation and collaboration.

Innovation and collaboration initiatives

- **SABIC and Cambridge Univ.** – partnership to develop new chemical technologies
- **Pearl GTL technology** – World’s largest GTL plant by Qatar Petroleum and Shell
- **Borouge innovation center** – innovative plastics solutions tailored to Middle East needs
- **KAUST** – collaborative research to catalyze Saudi economic diversification
- **Global Bridge Initiative** – technology CoEs for Kuwaiti public and private organizations
- **KACST** – R&D centers of excellence in Saudi Arabia

Source: company / organization websites, A.T. Kearney
Our recent C3X study confirmed the importance of the Chemicals industry in the Gulf region

- Yearly survey among global chemicals majors and their customers since 2008
- Analyses the chemical industry based on managers’ market perspective

Source: C3X, A.T. Kearney
All players agree on the raising importance of collaboration along the Chemicals value chain

Degree of collaboration in the value chain

<table>
<thead>
<tr>
<th>Feedstock supplier</th>
<th>Chemicals manufacturers</th>
<th>Chemicals customers</th>
<th>End consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Today: 35%</td>
<td>Today: 55%</td>
<td>Today: 67%</td>
</tr>
<tr>
<td></td>
<td>In 5 years: 59%</td>
<td>In 5 years: 82%</td>
<td>In 5 years: 94%</td>
</tr>
</tbody>
</table>

Chemicals manufacturers view

|                     | Today: 74%               | In 5 years: 90%     |

Customers view

|                     | Today: 74%               | In 5 years: 90%     |

Source: C3X, A.T. Kearney
However, lack of people, strategy, processes, governance and trust are main obstacles to collaboration.

Customer point of view

1. undefined strategy
2. undefined strategy
3. lack of trust in outside parties
4. ineffective management processes
5. ineffective governance

Source: C3X, A.T. Kearney
Even when collaboration exists, processes lack of consistency and expected payback is still short term.

### Repeatable processes for collaboration

<table>
<thead>
<tr>
<th>Feedstock supplier</th>
<th>Chemicals manufacturers</th>
<th>Chemicals customers</th>
<th>End consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistently deployed</td>
<td>82%</td>
<td>72%</td>
<td></td>
</tr>
<tr>
<td>Consistently deployed</td>
<td>36%</td>
<td>36%</td>
<td></td>
</tr>
</tbody>
</table>

**Customers view**

<table>
<thead>
<tr>
<th>Inconsistently deployed</th>
<th>46%</th>
<th>Consistently deployed</th>
<th>36%</th>
</tr>
</thead>
</table>

**Chemical manufacturer view**

<table>
<thead>
<tr>
<th>Inconsistently deployed</th>
<th>74%</th>
<th>Consistently deployed</th>
<th>44%</th>
</tr>
</thead>
</table>

### Collaboration benefits measurement

- **Within 1 year**: 24%
- **Within 2 - 3 years**: 52%
- **Within 4 - 5 years**: 18%
- **More than 5 years**: 0%

**No benefit expected** 6%

Source: C3X, A.T. Kearney
Building a strong Customer/Manufacturer collaboration is an opportunity to foster innovation.

Collaboration benefits

- **Innovation**: Design and development of new products, services, processes and business models.
- **Supply chain mgt.**: Better information enabling efficient Operations planning, inventory and distribution optimization, leveraging better sourcing conditions.
- **Production**: Better production planning, capital spend optimization, product complexity management, specifications rework and joint process improvement.
- **Sales and marketing**: Joint value proposition definition, co-branding possibilities.

*(1) 66% of respondents, Source: A.T. Kearney*
Innovation is strongly and increasingly valued by customers...

Key buying criteria for clients over time

- Availability
- Delivery reliability
- Price (per performance)
- Product performance/ features
- Environmental sustainability
- Social sustainability
- Technical sales support
- Commercial sales support
- Supply chain services

Customers innovation vision

- New technologies: 79%
- Perception of company as innovative leader: 76%
- New applications: 74%
- New product features: 71%
- New chemical products: 71%
- New business model: 41%
- New special value-added, logistical services: 29%
- New special value-added, commercial services: 15%

Source: C3X, A.T. Kearney
… but not yet fully recognized by manufacturers who have a limited understanding of their customers.

Customers perceive a limited understanding from their manufacturers.

Only 43% of Manufacturers regularly meet their customer's customers.

Source: C3X, A.T. Kearney
Four main levers can be activated to generate significant value through better innovation management

Value levers of excellent innovation management

1. Increase growth through innovation
   - Idea
   - Project #1
   - Project #2
   - Project #3

2. Increase innovation efficiency and speed
   - Time-to-Market
   - Time-to-Profit

3. Improve product profitability
   - Cumulative profit

4. Build foundation for innovation (to support growth, efficiency, speed and profitability)

Source: A.T. Kearney
To be successful in innovation, it is key to develop a clear perspective on your value chain.

Potential innovation platforms identification

<table>
<thead>
<tr>
<th>Suppliers of raw materials</th>
<th>Chemicals</th>
<th>Formulations</th>
<th>...</th>
<th>OEM Automotive</th>
<th>Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential innovation platforms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of electric / magnetic technology to change color</td>
<td>Easy transform color and effects on panels</td>
<td>Chameleon car</td>
<td>Trendy</td>
<td>Well being &amp; personalization</td>
<td></td>
</tr>
<tr>
<td>Use of specific coatings to “self-clean”</td>
<td>Anti-dirt composite panels</td>
<td>Self cleaning car interior &amp; exterior</td>
<td>Low maintenance</td>
<td>Convenience</td>
<td></td>
</tr>
<tr>
<td>Use of metal hydride to reflect heat</td>
<td>Metal hydride systems for air conditioning</td>
<td>Reduced emissions</td>
<td>Environmentally friendly</td>
<td>A more sustainable planet</td>
<td></td>
</tr>
</tbody>
</table>

Source: A.T. Kearney
Value Chain collaboration can generate fruitful triggers in all the dimensions of innovation

Examples of successful value chain collaboration

<table>
<thead>
<tr>
<th>Early scouting</th>
<th>Product development</th>
<th>Extended leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Venture capital fund</strong> ($200mn) by Alstom, Schneider and Rhodia to identify and develop new Cleantechs</td>
<td><strong>Evonik and Daimler are partnering</strong> to develop Lithium Ion batteries for automobiles to increase driving range, pushed by customers needs</td>
<td><strong>Procter &amp; Gamble's strategy of open innovation now produces &gt; 35% of the company's innovations and billions of dollars in revenue</strong></td>
</tr>
</tbody>
</table>

Source: company websites, A.T. Kearney
Impact of best practice collaboration on ME petrochemicals could represent significant impact

**Expected customers impacts**

<table>
<thead>
<tr>
<th></th>
<th>Revenue</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without collaboration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With collaboration</td>
<td>+3-5%</td>
<td>-2-4%</td>
</tr>
</tbody>
</table>

**GCC additional potential**

- +3.0 ~ +5.0 bn revenue
- -1.7 ~ -3.4 bn costs
- +2.2 ~ +4.3 bn profit

Source: GPCA, A.T. Kearney