A different world – Chemicals 2030

November 2011
Because the chemical industry is becoming more volatile than ever, Roland Berger has assessed its market dynamics.

Motivation for the Roland Berger market study "Chemicals 2030"

How to assess a dynamic market …

- Chemical markets develop in complex and diverse ways
- End-consumer and intermediate demand is shifting
- The last two years demonstrated the extremely increased volatility of the chemical industry
- Market diversity of chemicals offers varying opportunities and challenges by segment and region

- Leverage Roland Berger experience and industry insight to build a consistent market model
- Forecast the chemical industry in 2030 by volume and value
- Allow flexibility in thinking and reflect reality through a scenario-based approach
- Understand forces behind the reshaping industry and the strategies that win

… in a quantitative and qualitative manner

Source: Roland Berger
The study has been developed by our global chemicals experts network in cooperation with academic partners and major companies.

Roland Berger contribution to the Chemicals 2030 study

**ROLAND BERGER CHEMICALS EXPERTS**

<table>
<thead>
<tr>
<th>Region</th>
<th>Experts</th>
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<tr>
<td>NAFTA</td>
<td>Antonio Benecchi</td>
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<td>SCANDINAVIA</td>
<td>Jan Beckeman</td>
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<td>SOUTH-EAST ASIA</td>
<td>Anthonie Versvlijs</td>
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<td>FRANCE</td>
<td>Michel Jacob</td>
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<td>LATIN AMERICA</td>
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<td>GERMANY</td>
<td>Veit Schwinkendorf</td>
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<td>Alexander Keller</td>
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<td>Walter Pfeiffer</td>
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<td>David Stern</td>
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<td>IBERIA</td>
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<td>Roberto Crapelli</td>
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<td>JAPAN</td>
<td>Masugi Kaminaga</td>
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<td>CEE and CIS</td>
<td>Uwe Kumm</td>
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<td>Codrut Pascu</td>
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<td>Vladimir Preveden</td>
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<td>Charles-Edouard Bouée</td>
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<td>Jennifer Wilson</td>
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**ROLAND BERGER NETWORK**

Preliminary results have **been discussed** with our highly respected networks:

- **Business network** incl. major chemicals companies
- **Academic network** incl. Roland Berger university chairs

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Note: Only Partners and Principals mentioned

Source: Roland Berger
Industry trends, growth numbers and rival strategies will characterize the future chemical industry

1. **TRENDS**
   - External and internal trends will shape the industry and impact profitability and growth

2. **NUMBERS**
   - Limited high-growth options will increase company focus so that margins are maintained

3. **STRATEGIC RIVALRIES**
   - Rivalries between different strategies and geographical regions will shape the industry
Eight key industry trends will transform the chemical industry towards generally lower profit margins and lower growth

General conclusions on key industry trends – In 2030, …

1. **Sustainability** has become part of the corporate DNA on a global scale, like HSE has today

2. **Demand shift** has accelerated and chemicals companies have continued to follow their (end) customers into all emerging regions

3. **New competitors** not only play a dominant role in their home markets, but also heavily tap into the mature markets to advance their technological skills

4. **New business models** have become more distinctive and chemicals companies step into (downstream) customer industries to increase profitability

5. **Innovation** is still a key differentiator, but only in specialties – shorter product life-cycles and simultaneous introductions have led to increased focus on R&D effectiveness

6. **Commoditization** has also affected several products and segments, that are currently still distinguishing

7. **Biotechnology** has created a paradigm shift in chemicals production with its feedstock alternatives and entirely new production routes

8. **Feedstock access** remains a key challenge: the feedstock and energy balance has shifted to bio-based countries and feedstock access determines one's competitiveness

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1) Health, Safety and Environment

Source: Roland Berger
Each segment will be affected, but by different trends and in different ways

Assessment of trends by selected segment

<table>
<thead>
<tr>
<th>Impact by segment</th>
<th>Petrochemicals</th>
<th>Inorganics</th>
<th>Commodity plastics</th>
<th>Engineered plastics</th>
<th>Fertilizers</th>
<th>Agrochemicals</th>
<th>Flavors &amp; fragrances</th>
<th>Paints and coatings</th>
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<td>8. Feedstock access</td>
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Source: Roland Berger
The study starts with the chemicals landscape in 2010, a EUR 2 tn turnover industry – Our study covers 98% of the market

Global chemical market value by segment and region, 2010 [%]

Segment split [%] (Total: EUR 2.0 tn) | Geographical split [%] (Total: EUR 2.0 tn)
--- | ---
Industrial gases | Rest of the World\(^3\)
Consumer chemicals\(^2\) | Europe
Synthetic rubbers | Asia
Other bulk chemicals\(^1\) | 43%
Other specialties | North America (NAFTA)
Paints & coatings | Latin America
Flavors & fragrances
Inorganics
Commodity plastics
Engineered plastics
Fertilizers
Agrochemicals
Petrochemicals

1) Other bulk chemicals includes intermediates
2) Consumer chemicals include soaps, detergents and cosmetics
3) Rest of the World include Middle East, Africa and Oceania

Source: Cefic; DB; JP Morgan; Tata strategic; Roland Berger Chemicals 2030 market model
The market will more than double in the next 20 years even though growth levels will decrease

Total chemical market real value forecast, 2000-2030F [EUR tn]

CAGR [%]  5.0%  4.9%  4.8%  4.6%  4.3%  4.2%

1.3     2.0     2.0     2.0     2.0     4.9

COMMENTS

• NAFTA and Western Europe will grow slightly (only 2% p.a.), just below expected GDP growth

• Asia, Middle East and Latin America will drive the chemical industry's future growth (5-7% p.a.)

• China will surpass Europe and NAFTA as the largest chemicals region in the world, but also India and other Asian countries remain interesting growth areas

Note: Value forecasts are not corrected for inflation after 2010, i.e. 2010 price levels

Source: Roland Berger Chemicals 2030 market model
Plastics and specialty chemicals in Asia will be the most attractive high-growth segments remaining.

Total chemical market real value forecast by segment and region, 2000-'30F [%, EUR tn]

Source: Roland Berger Chemicals 2030 market model
The next decades will be shaped by rivalries between different strategies in chemicals

Profitability and type of chemicals business for selected companies, 2010

COMMENTS

- EBIT margins reach up to 27%
- Competing strategies seem connected to specific segments
  - In the basic and bulk chemicals segments, companies with feedstock access rival with cost leaders for market share and margin
  - In the specialty segments, companies with brands and/or customer access rival product technology and/or application leaders for market share and margin
- Most companies tend to focus on either low or high specialty portfolios – some companies operate multiple business models in many markets
The nature of the rivalry depends on the segment and puts a total EUR 1.1 tn of chemicals turnover in play

Schematic rivalries in the chemical industry and value in play [EUR 2030]

- In the basic and bulk chemicals segments, the rivalries are a global or continental game which mainly took place in the previous decades
- In the specialty segments, the rivalries are a local game, mainly played in Asia as main growth region – these rivalries will take place in the coming decades
- Private equity will play an important role and support Asian companies in acquiring technology from western companies to leverage their customer base

Note: Market value in play for the rivalry is calculated by assuming that all regions will have the same demand per capita as NAFTA has in 2030

Source: Roland Berger Chemicals 2030 market model
Demand shift to Asia will trigger rivalries between regions for market access or technology/application access

Rivalries for Asia – Schematic

**Market access**

Western chemicals companies bring technology or application leadership to Asia

They will battle for market access, e.g. through joint ventures, and will return with revenues and profit

**Technology and application access**

Asian chemicals companies have market access, but need technologies or applications

They will become active on the M&A market, enabled by private equity, and will return with acquired technologies

Source: Roland Berger Strategy Consultants
Uncertainties remain, but the recent crisis and our analysis suggest that the industry will weather potentially disruptive developments

Disruptive developments for the chemical industry

1. Large industrial zones in emerging economies will change the economic landscape

2. PI breakthroughs allow the chemical industry to produce more effectively and efficiently, thus remaining competitive in mature regions

3. Logistic costs and physical constraints show significant volatility, and recently even independence of crude prices

4. The Bio Based Economy (BBE) is about to break through, but many uncertainties exist about its impact on the chemical industry

5. Value chain optimization will lead to a paradigm shift in the chemicals business: more decentralized production

6. Political unrests, social turmoil and terrorism might stagnate growth, as recently happened in the Middle East and Northern Africa

7. Financial and economic uncertainties might hamper growth on a global scale – The recent crisis started in the US and spread rapidly

Source: Roland Berger
The scenarios deviate only slightly – General demand will only vary within a range of -10% to +20%

Scenario analysis

**GLOBAL PROSPERITY**
- Strong growth in mature markets, booming growth in developing world
- Increasing spend in mature markets, booming spend in developing world, strong demand for new products and innovation
- Innovation as a global differentiator, commoditization offset by R&D

**STEADY STATE**
- Moderate growth in mature markets, strong growth in developing world
- Stable spend in mature markets, increasing spend in developing world, focus on developing world for growth
- Innovation focus in mature markets and commoditization in developing world

**REGIONALIZED WORLD**
- Stagnation in mature markets, moderate growth in developing world
- Stagnating spend in mature markets, stable spend in developing world, localization of operations and footprint
- Limited innovation in mature markets, heavy commoditization (low-cost focus)

Model outcomes

- **EUR 5.8 tn** (GLOBAL PROSPERITY)
- **EUR 4.9 tn** (STEADY STATE)
- **EUR 4.3 tn** (REGIONALIZED WORLD)

Source: Roland Berger Chemicals 2030 market model
Chemicals companies around the globe should start preparing for the challenges ahead

Future challenges for chemicals companies

**PROFITABILITY**

- Trends impacting profitability:
  - Sustainability
  - New business models
  - Commoditization
  - Biotechnology
  - Feedstock access

- Geographical regions impacting profitability:
  - Mature markets will face increasing competition with continuing margin pressure

- Business model impacting profitability:
  - Choice of business model will determine future profitability

**GROWTH**

- Trends impacting growth:
  - Demand shift
  - New competition
  - Innovation
  - Feedstock access

- Geographical regions impacting growth:
  - Growth will be possible in Asia, which is close to consumption growth

- Business model impacting growth:
  - Choice of business model will determine future growth potential

Source: Roland Berger
Answering some key strategic questions will help chemicals companies prepare for these challenges successfully

Discussion points

- What strategy will get me profitable growth in Asia?
- How can I best prepare for the rivalries to come?
- Should I pursue single or multiple business models?
- How can I mitigate enduring volatility?
- How can I resist profit erosion in mature markets?

Source: Roland Berger