Sustainability and Megatrends – the fuel for Innovation in the Chemical Industry

3RD INDUSTRIAL GREEN CHEMISTRY WORLD
MUMBAI, DECEMBER 6, 2013
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Megatrends and Sustainability

Clariant: Key Facts and Figures

Technology Platforms & Innovation Highlights

- Surfactants: Next Generation Crop Solutions
- Catalysts: CO₂ Capture and Conversion
- Biotechnology: Access to Biofuels and Bio-based Chemicals

Summary
Megatrends and Sustainability
Today’s global challenges

• World population is growing to >9 billion by 2050

• Buying power and wealth in the emerging countries are growing

• Demand is increasing for resources (fossil energy, minerals, water, renewables, nutrition, land)

• Environmental issues are becoming more evident (climate change, biodiversity, water supply, waste)

• Today mankind is consuming the resources of 1.5 planets and exceeding the Earth’s capacity to regenerate

Global megatrends reflect long-term changes and cause social, economic, and ecological challenges we are facing today
Clariant meets megatrends with its innovation power

**Environment Protection**
- Clean technologies
- Resource efficiency
- Climate change
- Avoiding waste

**Globalization & Urbanization**
- Mobility
- Construction
- Nutrition & health
- Life style

**Resources & Energy**
- Water
- Alternative energy sources
- Energy storage
- Renewable Raw Materials
The demand for chemicals – particularly for specialty and bio-based chemicals – will grow strongly until 2030.

**In 2030…**

- The global chemicals demand is expected to more than double.
- The share of specialty chemicals in total chemicals has significantly increased.
- >20% of chemicals sale are expected to be based on bio-derived chemicals.
- ~2/3 of the market is expected to be owned by Asia.

**Growth of global chemicals demand**

- Chemistry Industry
- Economy (GDP)
- Population

SOURCE: www.vci.de
Clariant: key facts and figures
A world leader in specialty chemicals

Clariant focuses on creating value by investing in future profitable and sustainable growth.

<table>
<thead>
<tr>
<th>Key Facts</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Sales 2012 (CHF m)</td>
<td>6038</td>
</tr>
<tr>
<td>EBITDA 2012 (CHF m) before exceptionals</td>
<td>802</td>
</tr>
<tr>
<td>End 2012 employees (incl. discontinued operations)</td>
<td>~21202</td>
</tr>
<tr>
<td>Represented in countries worldwide</td>
<td>76</td>
</tr>
<tr>
<td>Group companies worldwide</td>
<td>100</td>
</tr>
<tr>
<td>Business Units</td>
<td>7</td>
</tr>
</tbody>
</table>
Clariant in India

Clariant focuses on local market needs to be translated in novel product solutions

KEY FACTS

Employees

~2 800
including Contractors

Represented by

7 Business Units

Manufacturing Sites

5
Roha, Cuddalore, Kanchipuram, Kolshet, Mahape

R&D Center

1 Kolshet
Overview: 7 core Business Units

Additives

Catalysts

Functional Minerals

Industrial & Consumer Specialties

Masterbatches

Oil & Mining Services

Pigments
Sustainability is anchored in Clariant’s strategy and brand values

Environmental Targets 2020 (based on 2005)

<table>
<thead>
<tr>
<th>Target</th>
<th>Percentage</th>
<th>Description</th>
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<tbody>
<tr>
<td>Energy Consumption</td>
<td>-30%</td>
<td>Carbon footprint</td>
</tr>
<tr>
<td>Direct CO$_2$ Emissions</td>
<td>-40%</td>
<td></td>
</tr>
<tr>
<td>Waste Water</td>
<td>-40%</td>
<td></td>
</tr>
<tr>
<td>Water Usage</td>
<td>-25%</td>
<td></td>
</tr>
<tr>
<td>Direct and indirect emissions of Greenhouse Gases</td>
<td>-35%</td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>-45%</td>
<td></td>
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</tbody>
</table>

- Life-cycle thinking
- Strong focus on Green Chemistry
Technology Platforms & Innovation Highlights
Clariant’s Innovation Chain

**Group functions**

- Technology Platforms in R&D
  - Chemistry & Materials
  - Biotechnology
  - Catalysis
  - Process Technology

**Business Unit functions**

- Application Development
- Technical Service
- Marketing, Production

**Markets and Customers**

- 7 Business Units
  - Additives
  - Catalysts
  - Functional Minerals
  - Industrial & Consumer Specialties
  - Masterbatches
  - Oil & Mining Services
  - Pigments

**New Business Development**

- Engineering
- Intellectual Property Management
Clariant Innovation Chain

R&D Technology Platforms

Chemistry & Materials

Biotechnology

Catalysis

Process Technology

4 Global Research Competence Centers

Functional Chemicals & Colorants

Specialty Polymers

Surfactants

Interface & Formulation Technology

1 Project Center:

Advanced Materials
Competence Center Surfactants – combining interface phenomena & functionality

How to…

… Emulsify oil and water?  
… Reduce surface tension?  
… Improve wetting of surfaces?  
… Disperse solid particles?  

… Act as a lubricant?  
… Provide cleaning?  
… Stabilize foam?  
… Find “green” solutions?

Solid - liquid  
Liquid - liquid  
Liquid - gas
Competence Center Surfactants – combining interface phenomena & functionality

Green Chemistry Solutions
- Renewable resources
- Biodegradability & hybrid systems

Cosmetics & Personal Care
- Emulsification, cleansing & conditioning
- Creams, gels & lotions
- Shampoos & conditioners

Industrial & Home Care
- Detergents, rinse aids & softeners

Agriculture
- Adjuvants
- Emulsification
- Dispersion

Metal Working
- Emulsification & dispersion
- Corrosion inhibition
- Lubrification

Oil Industry
- Demulsifiers & foamers
- Corrosion inhibitors
- Wetting agents

Mining
- Collector & flotation agents
- Explosive emulsifiers
Surfactants for Crop Solutions

Synergen® OS is a novel crop protection adjuvant based on renewable raw materials
- Based on renewable raw materials
- Biodegradable
- Enhanced Performance
- Higher Efficiency
Clariant Innovation Chain

R&D Technology Platforms

- Catalysis
- Chemistry & Materials
- Biotechnology
- Process Technology

Global Competence Fields

- Catalyst Design
- High Throughput Screening
- Piloting & Scale-up
- Manufacturing Processes
MuniCat:
Strategic alliance of Clariant and TU Munich

iC4 Project Cluster: joint forces to capture and utilize CO₂
The new Audi A3 g-tron using SNG as fuel derived from CO2
The Technology Chain of ETOGAS and Partners

ETOGAS Power-to-Gas Plant

Renewable Power → Electrolysis → Methanation → SNG → CO₂ → Steam

Source: ETOGAS
Clariant proprietary CO2-SNG catalyst

- Proprietary **catalyst technology** developed by Clariant
- Highly active & cost effective Ni/promotor catalyst
- Robust & proven life time
- Intermittent and start/stop operation
- Wide operation temperature window (200-500°C)
- DVGW conform natural gas in one reaction step
ETOGAS GmbH develops, manufactures and sells Power-to-Gas turn-key plants and is technology leader in this field.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Project Details</th>
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</table>
| **Alpha 25 kW<sub>el</sub>**<br>Pilot Technology | 2009 – 2012  
  • Completed |
| **Beta 6MW<sub>el</sub>**<br>Proven Technology | 2013 - AUDI  
  • Opening 25.06.2013 |
| **Gamma 1,2…10…20 MW<sub>el</sub>**<br>Advanced Technology | 2012  
  • Methanation 250kW<sub>el</sub> completed  
  • 2014  
  • Turn-Key 1,2 MW<sub>el</sub> |

Source: ETOGAS
Clariant Innovation Chain

R&D Technology Platforms

Biotechnology

Global Competence Fields

Genetic Engineering

Molecular Biotechnology

Enzyme Technologies

Biofuels and Derivatives

Bio-based Specialties

Bio-based Chemicals

Chemistry & Materials

Catalysis

Process Technology
sunliquid® offers a competitive path to cellulosic sugars and downstream products, e.g. Bioethanol

Key features and advantages:

- Flexible on feedstocks (e.g. wheat straw)
- High process yield
- Conversion of C6 and C5 sugars
- No fossil energy needed for EtOH production
- Nearly carbon neutral
- No food versus fuel competition
sunliquid® - 2G platform for biofuels and bio-based chemicals
Summary

what is precious to you?

Public

Martin Vollmer
Clariant International Ltd
06.12.2013
Megatrends and Sustainability – the fuel for Innovation in the Chemical Industry

Product solutions based on sound science – chemistry, biotechnology, catalysis, and other disciplines – will pave the way into a sustainable future.

There is unlimited room for new ideas!