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Natolin

Driving Growth for the European Chemical Industry

Advanced Materials Systems

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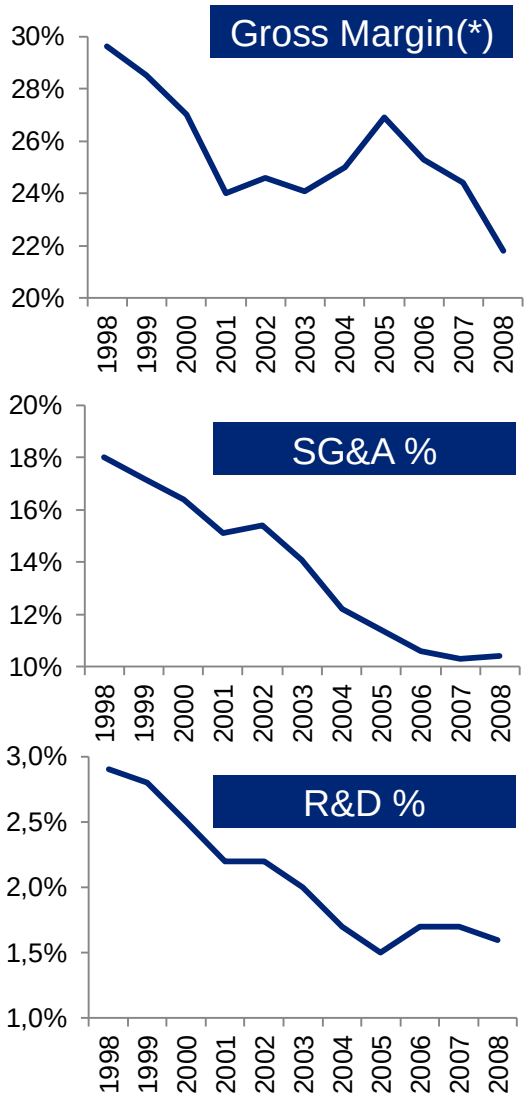
Regardless of the natural gas revolution, the chemical industry lost its growth engine in the last decade of the previous century, and needed a paradigm shift

20th century growth

- World War reconstruction
- Cold War and Space Race
- Rise of middle class quality of life in US, Europe
- Feeding an exploding world population
- Breakthrough science and technology advances
- New material discovery
- Replacing natural materials with synthetics
- Long development cycles and huge investments in assets

New molecules and materials create value

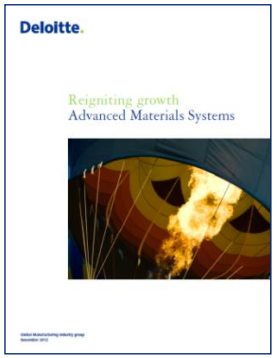
2009 The Decade Ahead



21th century growth

- Solution rather than science or material driven innovation
- Strong End Market orientation
- Enabling advanced materials and process technologies
- System Level Design and Engineering
- New Business Models
- Partnerships

Reigniting Growth: Advanced Materials Systems



There is an explosion of market opportunities to meet seemingly limitless wants and demands

1. Megatrends as defined by the World Economic Forum

The world now has a library of materials that can be used and combined in innovative ways to develop the solutions of the future

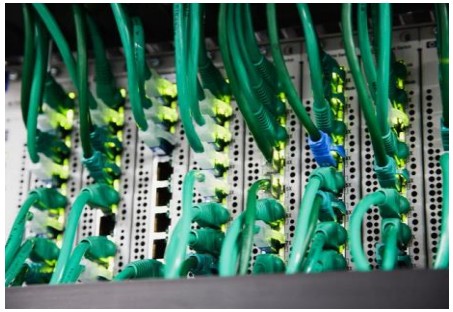
- Materials
- Process Technology
- Business Models
- Partnerships
- System-Level Engineering

A large portfolio of existing materials

Polymers

Metals

Ceramics



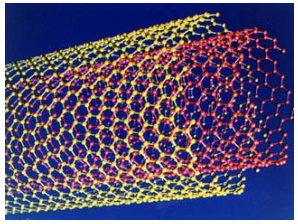
Semiconductors

Discovering new composition of matter, bringing new functionalities such as stronger, lighter, higher conductivity etc. represents the traditional innovation paradigm which is typically a more expensive pathway with longer time to market and higher risk in the quest towards a solution.

New processing technologies are revolutionizing Manufacturing

- Materials
- Process Technology
- Business Models
- Partnerships
- System-Level Engineering

Process technologies to make materials or to give materials new properties



Nanotechnology:

- Specific enabling process technology for Advanced Materials Systems with an attractive growth outlook
- Extracting greater performance or different properties from existing material: in medicine, energy and industrial applications

Industrial biotechnology:

- A new way of making existing materials
- Relevant for complex molecules in lower quantities
- Sustainable alternative pathways to traditional chemistry

Additive manufacturing:

- Distributed customized manufacturing
- Started with rapid prototyping but increasingly relevant for final products as well
- Produce unique 3D objects that can not be made any other way
- Scale-out vs. Scale-up

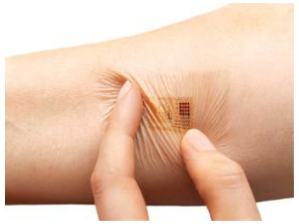
While investment in materials will continue, systems level design will become increasingly important

- Materials and processing technologies are by themselves not bringing breakthrough value
- When they are organized in a system – we tend to see them as a solution that does better in the market place

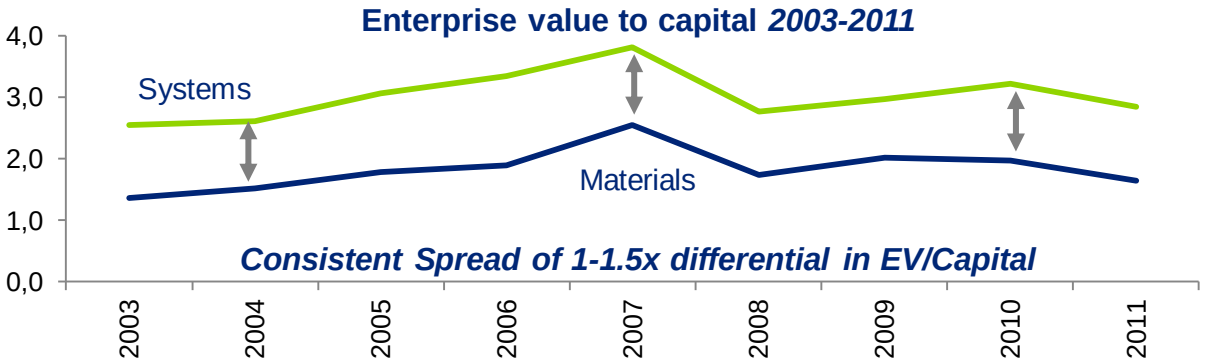
Materials
Process Technology
Business Models
Partnerships
System-Level Engineering







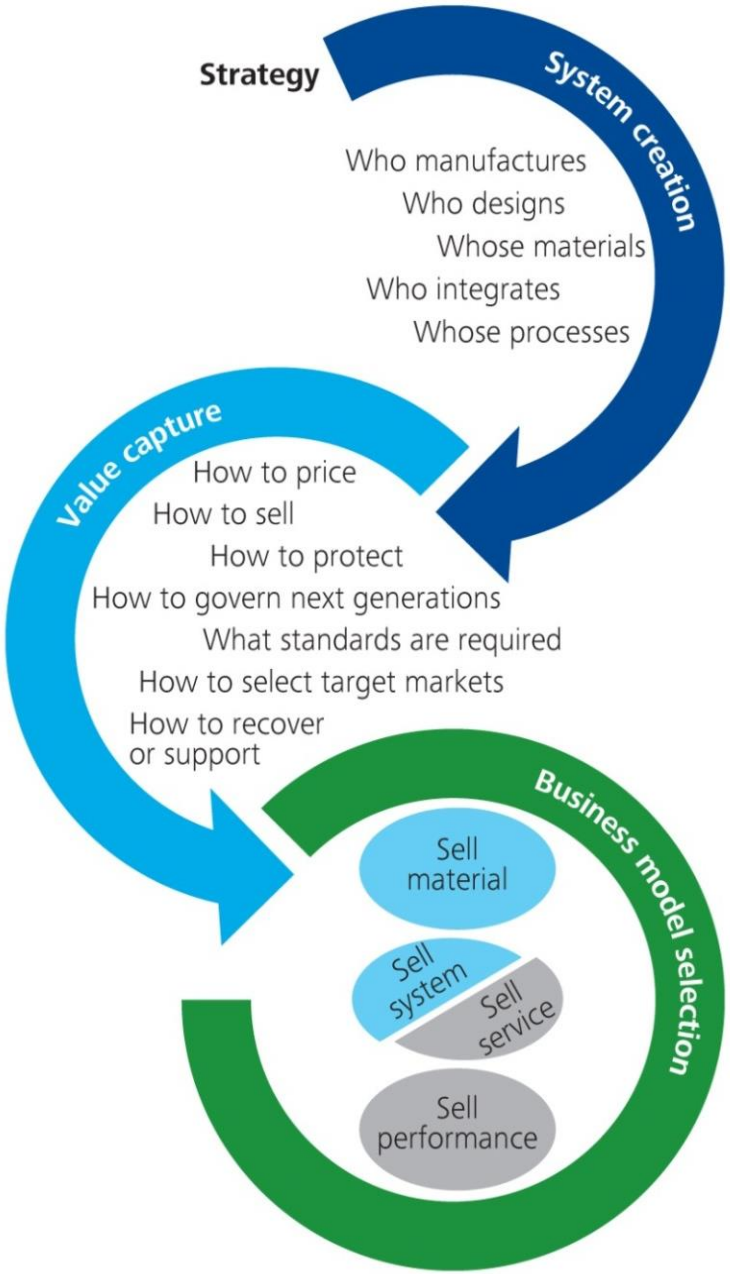

- Companies that deliver functional solutions outpace the value of traditional materials and components makers



For many chemical and material companies, it feels weird to move ahead engineering a system to provide a functional solution, away from the traditional business model of selling liquids and solids. In many cases there is no choice, as growing in the current model doesn't work anymore.

The Innovation Pathway evolves as questions around system creation, value capture and business models are answered

- Materials
- Process Technology
- Business Models
- Partnerships
- System-Level Engineering



System creation

Translation of market needs into performance requirements enables a system to be designed and managed for the opportunity

Value capture

Overall business objectives and core capabilities inform decisions around how to take a new functional solution to market

Business model selection

Business models are an integral part of the system and are as fundamental as the solution itself

The Advanced Materials Systems (AMS) framework provides companies with a structured approach to innovation and growth

Drivers of Performance	Challenges to Address
Demand	▪ How do you determine which megatrends and market opportunities apply to you? ▪ Is there a specific place where you should start? ▪ How do you translate market requirements to functional solutions?
Functional Solutions	▪ How do you define performance requirements and orient your system-level design, optimization, and testing approach? ▪ How do you approach material and process engineering (i.e. technology selection, development, and integration)? ▪ How do you establish a foothold? How do you sustain a viable technology roadmap?
Value Capture	▪ How do technical and commercial development activities reinforce one another? ▪ How should you assess and pursue business model alternatives? ▪ How do you develop and access a network of required capabilities? ▪ How do you protect your value potential across the system (AMS)?

Advanced Materials Systems (AMS) framework

Will the future of the European Chemical Industry be asset light?

Four scenarios to test our thinking about the future in 2030-2050

Fragmented Future

Green Revolution

Abundant Energy

High-Tech World