THINK
ACT

BEYOND MAINSTREAM

CHEMICALS 2035 – GEARING UP FOR GROWTH

How Europe's chemical industry can gain traction in a tougher world

MAY 2015

Roland Berger
Strategy Consultants

THE BIG 3

*1 EUR 5,600 billion

is the revenue that the global chemical industry could earn in 2035 – if it continues to expand constantly at well above GDP growth rates in all major market segments.
p. 3

*2 13%

is the global market share to which Europe's chemical markets will shrink in 2035 (from 19% today) – challenging Europe's chemical industry in its home market.
p. 6

*3 56%

is the amount by which EU regulations for the chemical industry have increased since 2008 – driving up costs in Europe and creating an uneven international playing field.
p. 9

*4 Outlook for Chemicals 4.0 p. 13

Losing ground. The global chemical industry is expected to outgrow the increase in GDP, reaching a volume of EUR 5,600 billion in 2035. Yet European players are seeing their home markets shrink alarmingly.

The volatility and uncertainty of today's world has significant implications for chemical companies, which are called on to navigate a minefield of daily fluctuations in oil prices, increasing geopolitical tensions, growing customer demands and technological advances.

2035 may seem a long way away, but it is important to think about where the chemical industry will be 20 years from now. What long-term trends will shape its development? Will the differences between global regions become more pronounced? It has been evident for some time that Europe is losing ground in the global chemical industry, and that regions such as Asia and the Middle East are now in the driving seat. What is behind this shift? And is Europe doomed to fall even further back? Or is there something that companies can do to turn the tide? We believe there is!

Analysis of trends and growth drivers shows that the global chemical industry will grow faster than GDP between now and 2035. A All major segments will contribute to this growth, outperforming GDP by between 20 and 70%. B The real value forecast for the chemical market as a whole adds up to more than EUR 5,600 billion by 2035. Even so, it is noticeable that, compared to the 2030 study we published in 2011, growth expectations have edged down slightly as Asian growth is tempered. Also, the impact of shale gas was not considered to be so strong four years ago.

Asia dominates

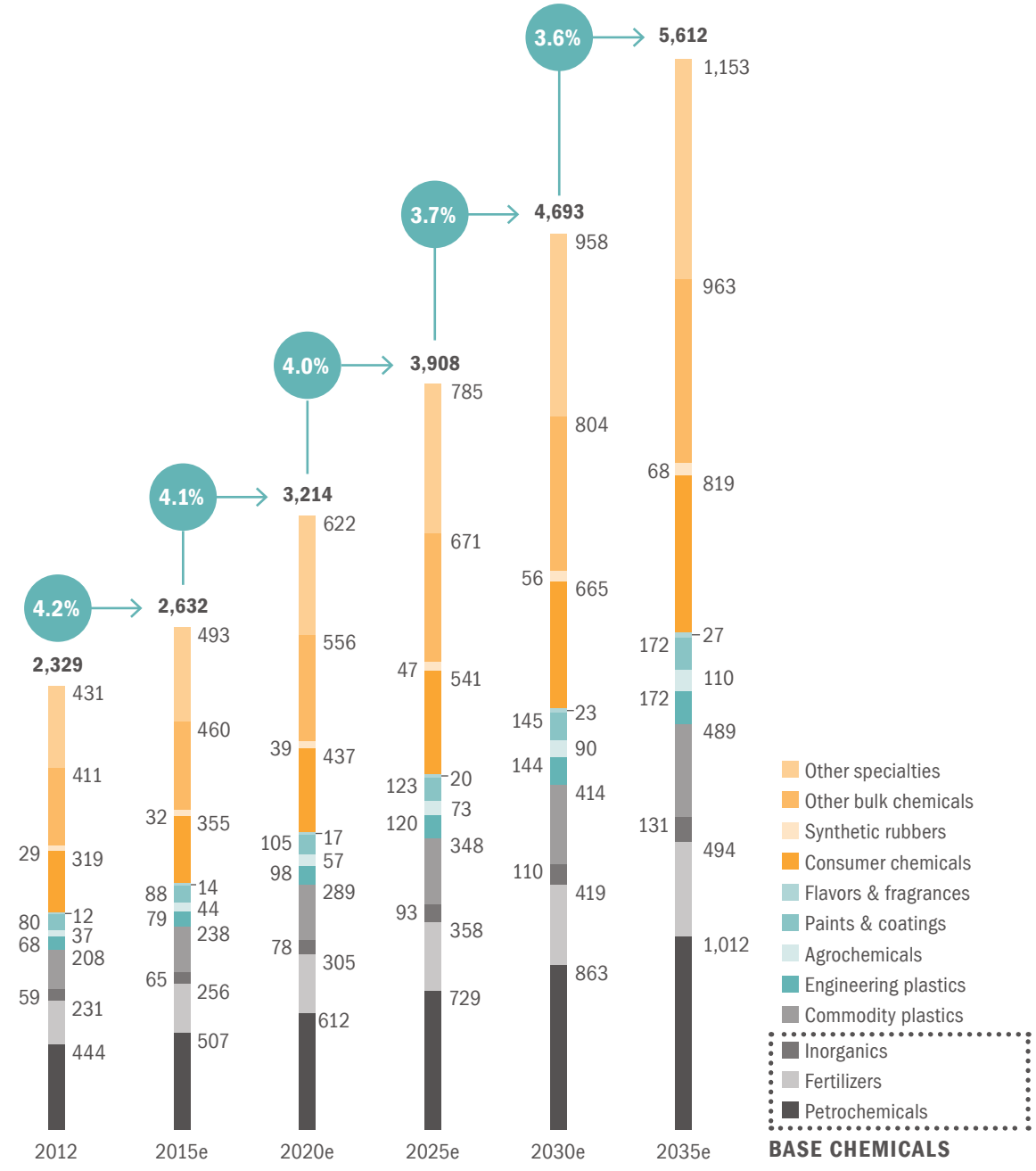
Today's chemical market is a EUR 2,300 billion business. Fueled by Asian supply and demand, it will more than double over the next 20 years. When the global chemical market reaches EUR 5,600 billion in 2035, Asia's share of worldwide chemical sales will have risen to 62%. Other regions will follow, albeit at a considerable distance: North America will corner around 14% of the market, with Europe just behind. C

Global growth rates are slowing down, however. Despite its significant lead, Asian expansion is easing off as the region's overall economic growth flattens. Europe is still trying to recover from the euro crisis, and the significant growth seen throughout the North American petrochemical value chain has had virtually no impact on other chemical sectors. Between 2030 and 2035, the entire global chemicals market will grow by only 3.6% – compared to 4.1% between today and 2020.

A

THE GLOBAL CHEMICAL MARKET WILL MORE THAN DOUBLE IN THE NEXT 20 YEARS, BUT OVERALL GROWTH RATES ARE SET TO DECLINE

Total chemical market real value forecast, 2012-2035e [EUR bn]

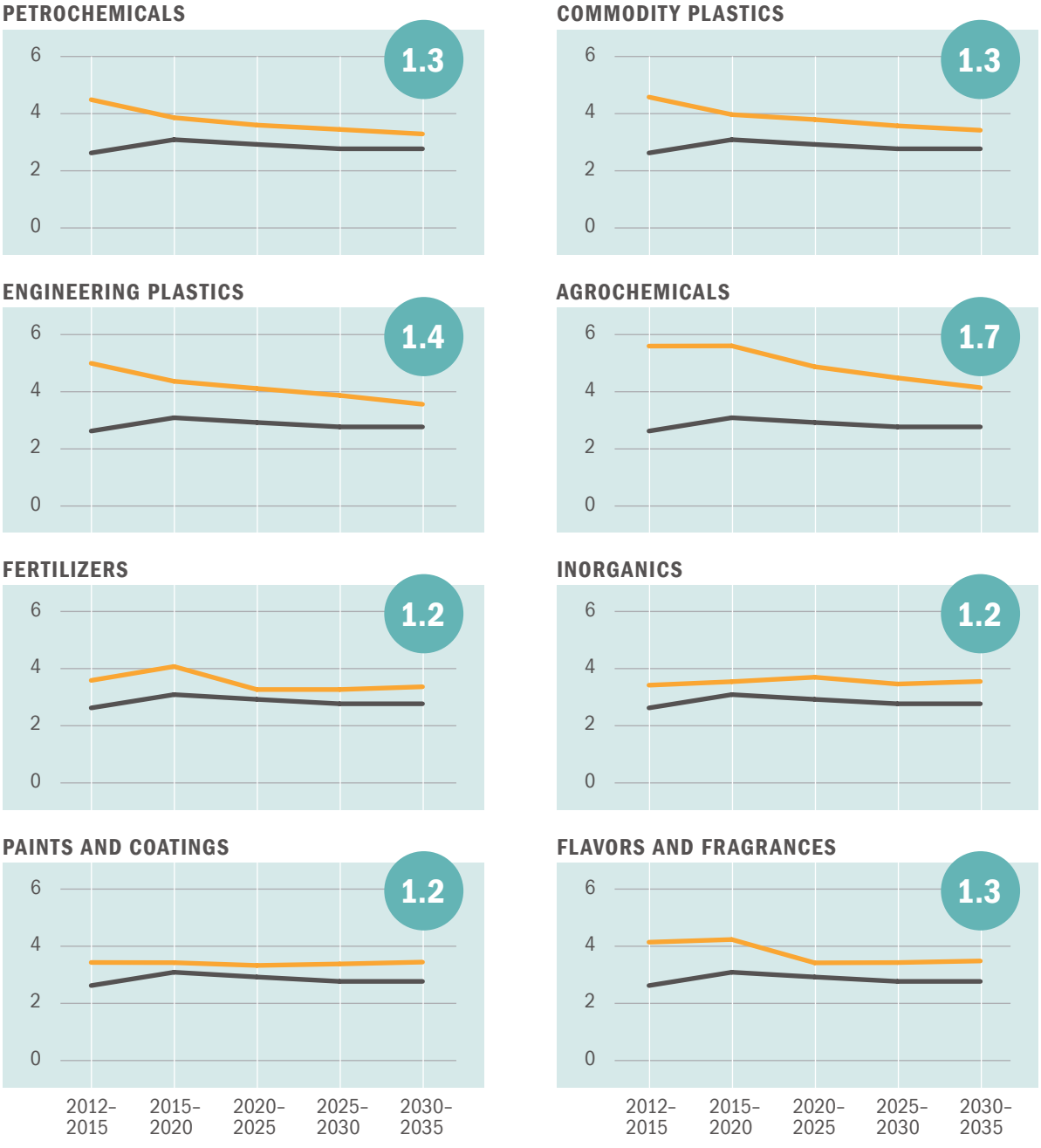


Source: Roland Berger

B

WORLDWIDE, EIGHT KEY SEGMENTS WILL OUTPACE GDP, WITH AGROCHEMICALS AND ENGINEERING PLASTICS DELIVERING THE STRONGEST GROWTH

Growth in chemical segments vs. global real GDP growth , 2012-2035e [%]

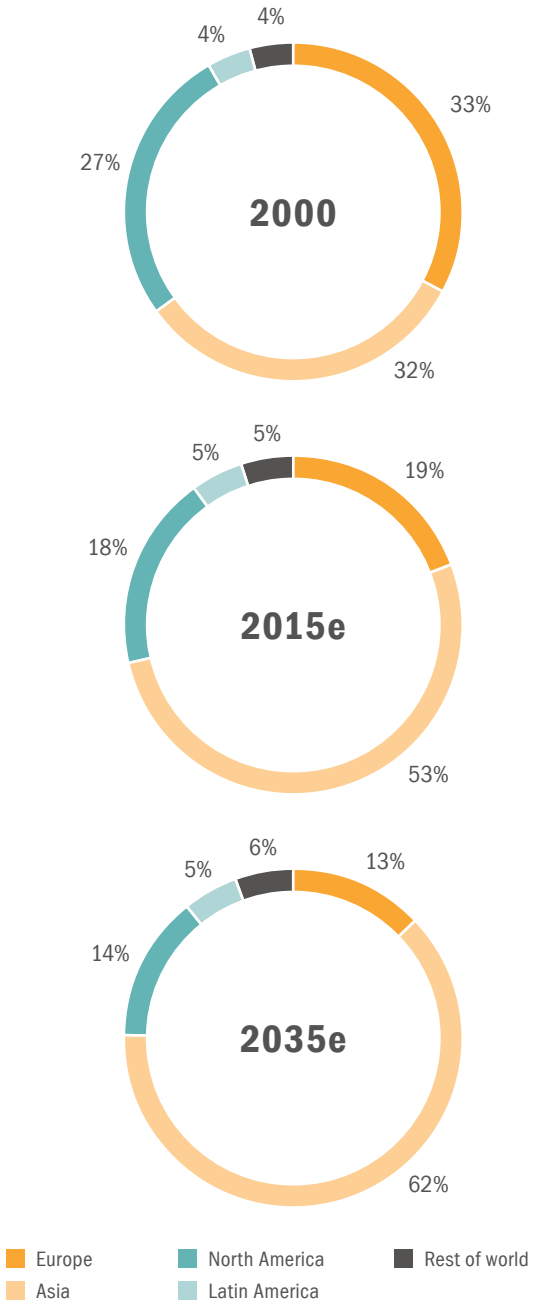


Source: Roland Berger

C

GLOBAL SALES IN EUROPE: DOWN FROM 33% IN 2000 TO JUST 13% IN 2035

Although its absolute sales numbers are growing, the European chemical industry is seeing its home market shrink alarmingly [% share]



Source: Roland Berger

Europe runs out of steam

Europe's chemical market is projected to expand by about 1.5% a year between now and 2035. Most of this growth will be in the downstream, higher-value-added segments such as agrochemicals and engineering plastics, both of which will outpace GDP growth.

Although absolute sales are increasing, Europe's share of the chemical market is declining sharply. Already down from 33% in 2000 to 19% today, the continent will be left with a global market share of just 13% in 2035 – behind even North America. 2

A Roland Berger Strategy Consultants health check in response to this alarming forecast reveals significant warning signs for key industry indicators: Total chemical imports to the EU are outstripping exports as the region becomes less and less competitive. Red flags are evident in particular for raw materials and energy-intensive parts of the industry. Relative capital spending has dipped to historic lows. Extra capacity is seldom added, and most permanent shutdowns are in Europe.

Europe's deteriorating position in chemicals is manifesting upstream – in petrochemicals and inorganics, for example – mainly due to higher feedstock and energy costs. While other regions rapidly expand upstream production, Europe is consolidating. This year alone, the Middle East plans to open five new steam crackers for ethylene production, and Asia six. To add insult to injury, Europe has the highest plant closure rate, which peaked at 71.4% of global shutdowns in spring 2011.

Yet despite all these negatives, our health check also identified favorable fundamental factors in Europe's industry. Deeply integrated chemical parks and advanced energy efficiency technology demonstrate just how sophisticated the European chemical industry is, as do high levels of R&D spending and world-class productivity – a clear sign that the industry has for some time been used to facing the heat of global competition.

Europe's decline is mainly the result of a structural "squeeze" in all parts of the chemical industry value chain. Five distinct drivers are impacting Europe – and altering the industry's entire global strategic agenda. D

D

FEELING THE PRESSURE

FIVE KEY DRIVERS ARE EFFECTING A SHIFT IN THE VALUE CHAIN, CAUSING EUROPE TO SUFFER – AND SHAKING UP THE INDUSTRY'S GLOBAL STRATEGIC AGENDA

KEY DRIVERS

1 FEEDSTOCK DISADVANTAGE

Middle East is integrating more downstream value chain links

US shale continues to undermine Europe's feedstock and energy position

Bio-based feedstock is not yet ready for large-scale take-off

2 CHEMICAL CLUSTERS OUTSIDE EU

China is developing large chemical parks to supply its growing manufacturing footprint

3 UNEVEN GLOBAL PLAYING FIELD

Ambitious European environmental policy is an extra challenge

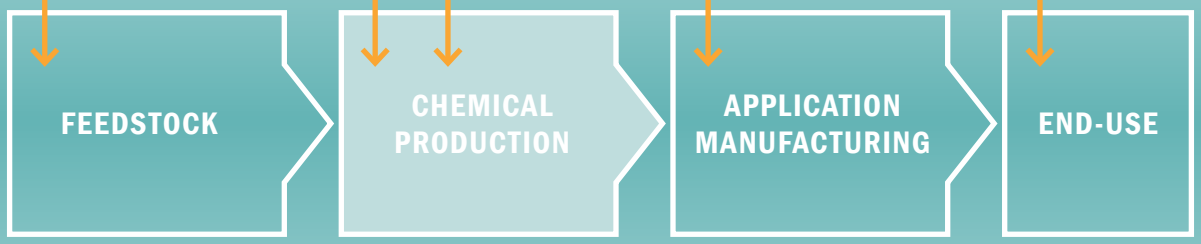
4 EU'S SHRINKING MANUFACTURING BASE

Local demand from EU manufacturing industry lags behind

Individual sectors are leaving Europe, e.g. textile and electronics more potentially to follow

5 DEMAND SHIFT

Changes in end-user demand require new products and business models



STRATEGIC AGENDA

> Middle Eastern companies like Sabic and OCI are leveraging feedstock access to expand their downstream position

> Western companies are shutting down crackers in Europe and investing in the US

> Growing local demand makes it attractive for Western companies to invest in Asia

> In Europe, chemical players focus on cost efficiency and cost cutting

> To avoid the commodity trap and eroding margins, many companies have turned to higher value-add segments like engineering plastics and life sciences

> Companies move to service business models and focus on the application

Source: Roland Berger

1. FEEDSTOCK DISADVANTAGE

Europe faces an increasingly strong disadvantage as two specific dynamics undermine its feedstock and overall energy position: the Middle East's downstream value chain integration and the rise of US shale gas.

The Middle East is snapping up more and more downstream links in the value chain – and increasing capacity accordingly – in order to squeeze more value out of its access to fossil resources. The region has thus emerged as a major competitor for the European chemical industry. Ready access to cheap feedstock, proximity to Asia and local government support suggest that this trend will continue. Ethylene, for example, accounts for nearly half of all petrochemical output in the region (21.7 million tons in 2013). And for good reason: The cost price of ethylene production in the Middle East is just USD 250 per ton – less than half of what it is in Europe.

At the same time, the rise of US shale gas is putting America's ethylene prices at levels structurally below those of Europe – at one third of European prices, in fact. Europe simply cannot match the feedstock and energy prices coming out of the Middle East and the US, and that is eroding its competitive position. This, in turn, is significantly impacting the bottom lines of players in the European chemical industry, which are heavily dependent on the cost of feedstock.

Middle Eastern companies such as Sabic and OCI are consciously leveraging their access to feedstock to improve their position and gain more market share. Sabic's acquisitions of DSM Petrochemicals, GE Plastics and other players constitute downstream investments. OCI, meanwhile, is building capacity in the US and Algeria and is expected to reach fertilizer capacity of 11.9 million tons p.a. by 2017.

Even European companies are shutting down domestic production to invest in the US, where feedstock is cheap. In May 2014, BASF announced a joint venture with Total Petrochemicals & Refining USA to convert a steam cracker in Texas to use natural gas feedstock instead of naphtha. The company is also evaluating plans to invest over USD 1.4 billion in a US methane-to-propylene complex to supply its North American operations. In 2012, Ineos announced expansions to its Texas ethane cracking capacity, and last year cooperated with Sasol to open a new unit that will be ready by the end of 2015. DSM has likewise shifted to the US, building a new polymerization plant to manufacture the Akulon polyamide 6 polymer for film grades used in flexible food packaging and other segments. This investment will let DSM capitalize on low-cost propylene derived from US shale gas.

Europe's bio-based feedstock activities are not yet big enough to offset these shifts in the feedstock balance. Prices are still too high and volumes too low. The sector's improving competitiveness is, however, attracting investment – EUR 1 billion in sugar beet, for example. Traditional chemical players and even new biotech and food/agrochemical companies are wanting a piece of the action. Coca-Cola, for example, is "working to completely eliminate the use of non-renewable fossil fuels" in its plastic bottles, while Unilever aims to halve the greenhouse gas impact of its products by 2020. Yet while bio-based feedstock is on many players' agendas, its large-scale application requires costs lower and properties superior to its fossil-based counterparts.

2. CHEMICAL CLUSTERS OUTSIDE THE EU

Emerging economies like India and China are becoming increasingly self-sufficient in petrochemicals. Capacity expansion in the Asian region is expected to grow fast and will, for example, transform India from a net importer of polyethylene to a net exporter by 2016. Such moves will diminish export opportunities for regions such as the Middle East and put more pressure on the remaining import destinations, in particular Europe.

China is understandably the focus of attention right now. A decade ago, driven by increasing demand re-

sulting from the country's considerable population growth, the Chinese chemical industry began integrating downstream. The country has already built or is planning an array of chemical parks around consumer industries where the infrastructure is excellent and/or in close proximity to feedstock supply.

This all fits in with China's policy of reducing dependency on imports and building a strong, advanced and competitive chemical industry of its own.

3. UNEVEN GLOBAL PLAYING FIELD

Nearer to home, the European chemical industry faces an additional challenge that other regions do not experience to the same degree. The number of EU regulations in this industry – addressing everything from health and safety to environmental protection to renewable energy targets – has grown by 56% since 2008. Compared to the rest of the world, European environmental policy is more ambitious, but also more costly: These regulations drive up costs for the chemical industry, putting additional pressure on players' bottoms lines and impacting the structure of the market as a whole.

4. EU'S SHRINKING MANUFACTURING BASE

Demand for chemicals among Europe's industrial firms is falling as services replace manufacturing as the cornerstone of the economy. Asia in general and China in particular are happy to pick up the slack, and Western textile companies, for example, have long been moving production to Asia to meet this region's demand. The danger here, however, is that Europe's chemical companies could lose their premium customers, see their products become commoditized and watch their margins erode. To avoid this "commodity trap", many European players are therefore shifting downstream to application models that can realize higher profitability in segments like engineering plastics, food, personal care, agrochemicals and pharmaceuticals. The chemical industry as a whole – including the likes of DuPont, Dow, BASF and Merck – has thus been gravitating toward the life sciences, which are seen to be more profitable and less cyclical.

5. DEMAND SHIFT

Patterns of demand are shifting radically, causing many companies to gravitate toward the wider life sciences and – equally importantly – get closer to their customers. The global megatrend toward sustainability and eco-awareness, for example, is driving far-reaching changes in marine coatings to prevent ship fouling. Such coatings reduce drag by 40% and significantly reduce fossil-fuel consumption. The most widely used anti-fouling agent tributyltin (TBT) was banned early in the new millennium, however, and copper-based replacement solutions themselves posed a threat to marine ecosystems. The chemical industry is thus being forced to develop new, multi-featured solutions to meet the shipping industry's demand for durable, self-renewing anti-fouling agents with superior hydrodynamic properties.

In textiles, the benefits of digitization and robotics are eliminating many of the drawbacks that, in years past, saw much of Europe's textile industry head offshore in search of low-cost production. In response, key players are bringing production back onshore on a large scale – forcing chemical manufacturers to accommodate their customers' shift in the geographic focus of demand for digital textile ink and related process chemicals.

Similar themes echo across many industries: Automotive paint suppliers are now operating paint shops, while makers of dialysis machines run dedicated clinics and funding models. In the dawning "age of application", the chemical industry has no choice but to respond to customers' changing requirements, providing solutions rather than mere products.

Chemicals 4.0 – the silver lining? The European chemical industry must prepare now for its journey toward multi-feedstock supply, a heavily digitized industry set-up, and a genuine focus on customer applications and new business models.

There is no question about it: The driving forces described above will radically alter the chemical industry in Europe. This is not the industry's first transformation, however, but its fourth, E which is why we call this the "age of application", or "Chemicals 4.0". What is different this time is that the coming age will affect every link in the value chain: feedstock, manufacturing and the customer.

In the years before 1980, the "age of feedstock" saw a chemical industry driven by the way it used and optimized feedstock. The last two decades of the 20th century then ushered in the "age of value chain focus", where a focus on core business triggered a process of specialization. Companies focused on businesses in which they had a competitive edge and grew these activities by investing in R&D and technology, especially in Europe and North America. Players like DuPont, which covered everything from oil and gas to pharmaceuticals before 1980, began to zoom in on their core businesses. In DuPont's case, these were specialty chemicals, crop protection and plant biotech. In the late 1990s, companies saw the major categories of chemicals become increasingly commoditized as refineries and base chemical plants with low-cost feedstock emerged in the Middle East, for example. Pressure on margins, cyclical patterns, limited options for differentiation and modest growth prospects prompted companies to rethink their portfolios. The "age of life sciences" dawned in which companies built portfolios around pharmaceuticals, healthcare, agrochemicals and nutrition, often in combination with specialty and performance chemicals.

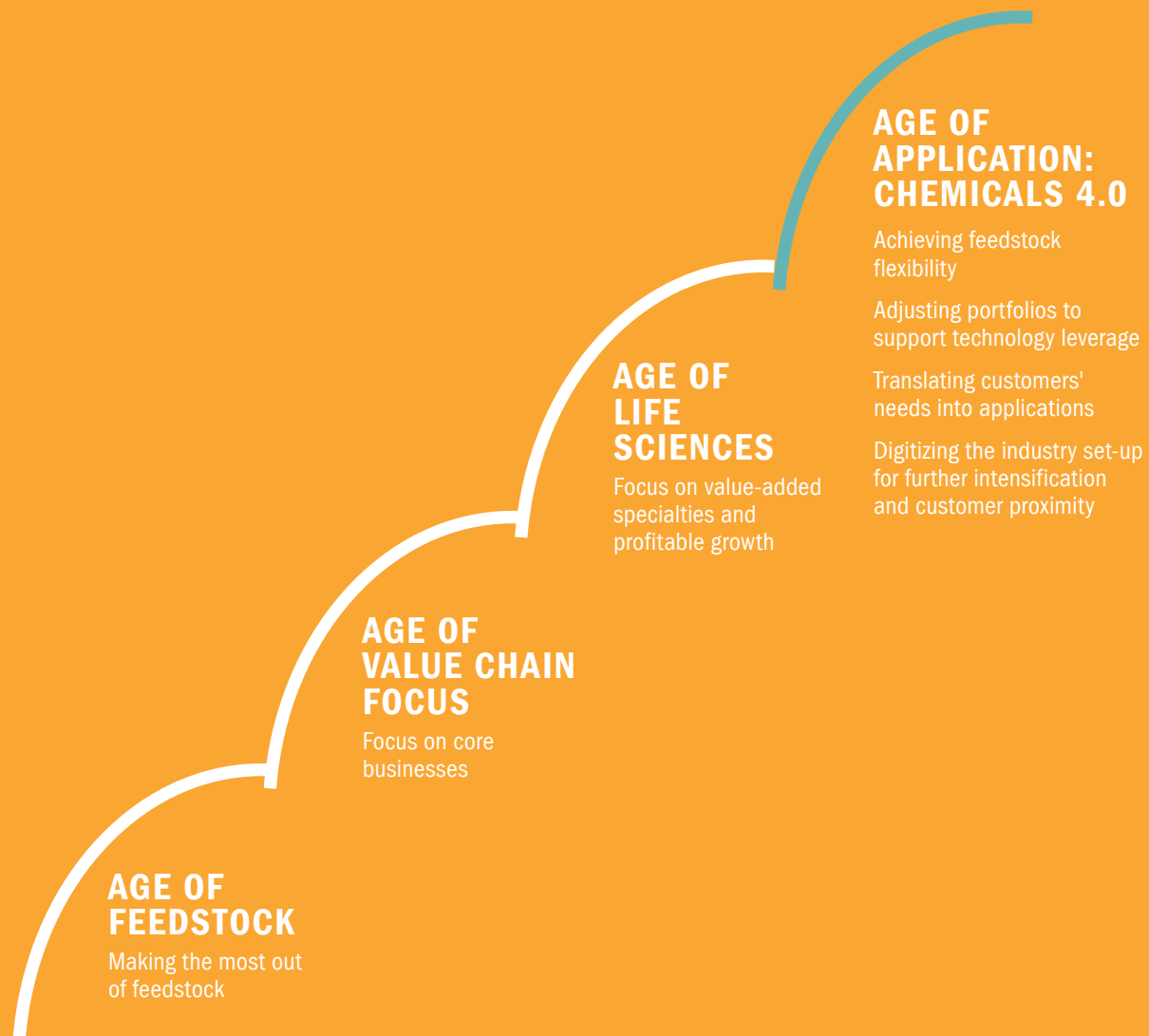
Yet this is not the end of the road. Further pressure on the value chain and a number of megatrends are now heralding another new age for the chemical industry: "Chemicals 4.0". G The challenges ahead will also yield opportunities and will drive transformation at every link in the value chain. Clearly, morphing into life science outfits cannot be the solution for every company: An overcrowded life science space with every pharmaceutical, agrochemical, biotech and chemical firm jostling for position would ultimately prove self-defeating. More fundamentally, what matters is learning to add value for customers with solutions that translate demand into suitable applications.

In short, this new age will be all about the optimized use of resources and feedstock, process intensification, digitization of the industry and a focus on adding value for the customer. F These advances will be driven by trends in healthcare, digitization, sustainability, organic products and individualization that are changing the face of demand. The clouds ahead could have a silver lining after all, it seems.

E

CLIMBING THE EVOLUTIONARY LADDER

THE LONG-TERM VIEW REVEALS STEP CHANGES IN THE DEVELOPMENT OF THE CHEMICAL INDUSTRY

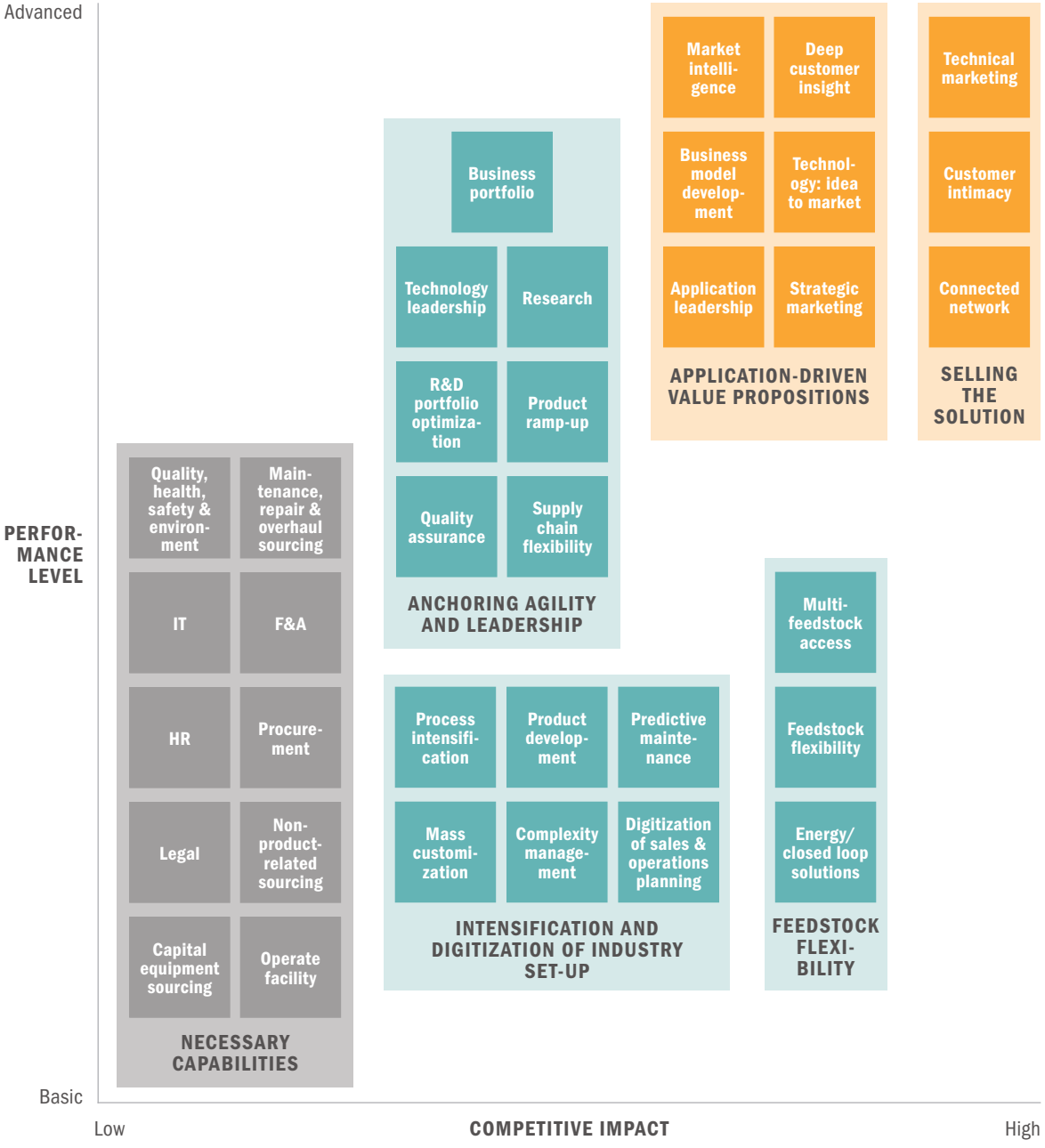


Source: Roland Berger

F

COMPETENCIES REQUIRED FOR THE AGE OF APPLICATION

Chemicals 4.0 joins the dots between customer needs, technological realization and feedstock flexibility



Basic competency Competitive competency Critical competency

Source: Roland Berger

G

GEARING UP FOR GROWTH

THE AGE OF APPLICATION: CHEMICALS 4.0 BRINGS TOGETHER THE BENEFITS OF TRUE CUSTOMER INTIMACY, ADVANCED TECHNOLOGIES, DIGITIZATION AND FEEDSTOCK FLEXIBILITY

FEEDSTOCK → **CHEMICAL PRODUCTION** → **MANUFACTURING (APPLICATION)** → **END-USE**

PORTFOLIO BUILT AROUND APPLICATIONS AND LEADING TECHNOLOGIES

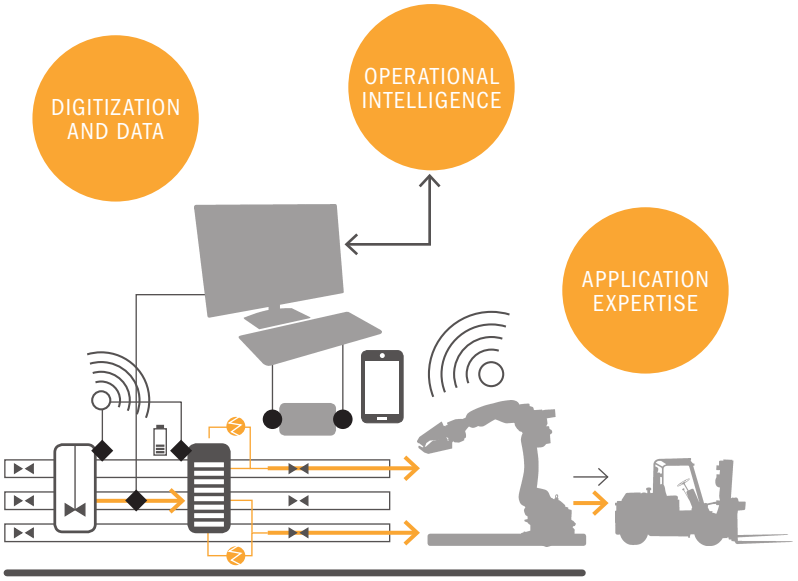
APPLICATION-DRIVEN INDUSTRY SET-UP

FEEDSTOCK FLEXIBILITY

(fossil-based, bio-based, precision farming, closed-loop recycling)

FUTURE RESOURCES

(wind, alternative/ non-conventional, solar, geothermal)



Process intensification | **Predictive maintenance** | **Translation of need into technology** | **Connected supply chain**

MASS CUSTOMIZATION

CUSTOMER NEEDS AND TRENDS

CUSTOMER

INTERNET OF THINGS

Source: Roland Berger

Europe's big break. The chance to combine existing strengths with future benefits in a digitized world.

Chemicals 4.0 opens up attractive opportunities for Europe. But it is not a plug-and-play package, and realizing this chance to reverse the erosion of the European chemical industry's market share and participate in the strong global market growth that, as we have seen, lies ahead between now and 2035 will be no easy task.

We see three key areas in which chemical companies can and must take resolute action if they are to realize the opportunities that present themselves. First, although different types of feedstock are already available, each company needs to sit down and work out exactly how to migrate to a genuine multi-feedstock supply that is scalable and adds value at the right price. Flexibility is key here as the lines between biotechnology, pharmaceuticals and chemicals become increasingly blurred – and as this opens the door to innovative new approaches. Second, the chemical industry has long been aware of issues such as process intensification, process intelligence and predictive maintenance. But have companies woken up to the full impact and potential of digitization and mobile information systems? To the consequences of connected logistics and operational intelligence? Connectivity in particular is becoming increasingly important across the entire supply chain to accommodate pivotal manufacturing themes such as late/mass customization and on-demand delivery. Third, and perhaps most important of all, companies must look at the capabilities and competencies they need to build up in order to translate true customer intimacy into application-driven innovation. They must develop a keen understanding of customers' needs, keep themselves agile and strive for technology leadership if they are to provide top-quality solutions and the innovative business models to go with them.

A sizeable share of a global chemicals market worth EUR 5,600 billion in 2035 is, we believe, a prize worth fighting for. And we also believe that Europe's chemical industry has everything it needs to rise to this challenge. The differentiators that set its chemical industry apart are precisely the strengths it can leverage to succeed in the new chemical age. Europe possesses deeply integrated industrial complexes on which to build the future. Many of the world's leading chemical companies are based here, have excellent R&D facilities and boast well-oiled, energy-efficient production facilities that deliver world-class productivity.

The key question is: While the manufacturing industry puts its back into realizing the vision of Industry 4.0, what will the European chemical industry do about Chemicals 4.0? About the challenges and opportunities inherent in digitization? Will the process industry and discrete production remain separate worlds? And if they do, what happens when customers themselves change and move on? Many of the new digital and data-driven technologies that will enable the forthcoming transition are still at a developmental stage. Fair enough. But is it wise to wait until the "finished product" – whatever that may be – is ready?

We believe that playing wait-and-see will rob Europe's chemical industry of the chance to avoid falling further behind Asia and, ultimately, North America too. The writing is on the wall. Only those companies that see and embrace the journey ahead as a learning process will one day understand – and reap – the full benefits. ◆

ABOUT US

Roland Berger Strategy Consultants

Roland Berger Strategy Consultants, founded in 1967, is the only leading global consultancy of German heritage and European origin. With 2,400 employees working from 36 countries, we have successful operations in all major international markets. Our 50 offices are located in the key global business hubs. The consultancy is an independent partnership owned exclusively by 220 Partners. **WWW.ROLANDBERGER.COM**

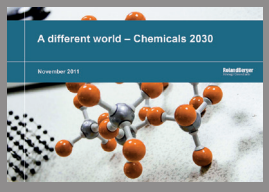
Further reading

RISK RE-AWAKENS
The conundrum posed by OPEC's excess supply

Roland Berger's study discusses how OPEC's decision to abandon its role as market manager amidst the current low price environment and oversupply context creates a new and increased level of risk for upstream operators.

THE WINNERS
How chemical companies deliver superior shareholder value

As part of our extensive strategy work in the chemical industry, we have observed that chemical companies deliver a very wide range of shareholder returns (dividends and capital gains). We thus set out to investigate how chemical companies create value for their shareholders.



A DIFFERENT WORLD – CHEMICALS 2030

In our “Chemicals 2030” study, Roland Berger Strategy Consultants developed both a qualitative and quantitative outlook on the industry trends, demand shifts and rival strategies that drive future growth and profits.

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