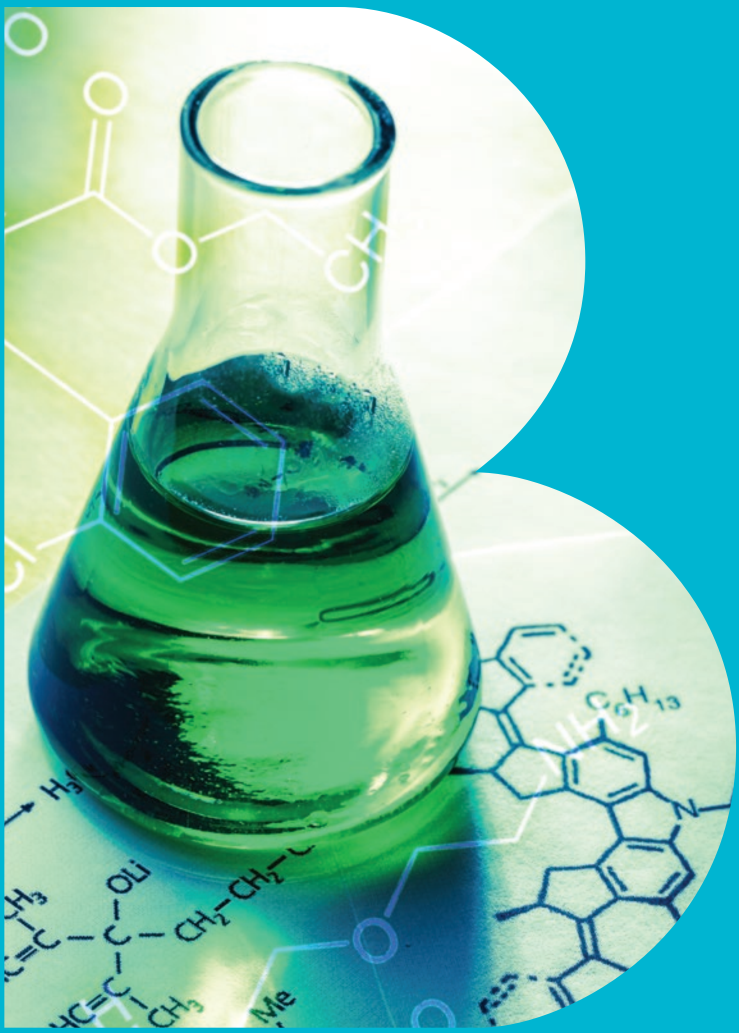
Roland Berger Focus

May 2017

The Chemicals Industry 2016

Lofty expectations... but will it deliver?



Roland Berger

50 YEARS navigating complexity

Management summary

In this annual review of chemicals company performance, chemicals volumes grew, returns to shareholders increased – and the industry strengthened overall. However, uncertainty abounds and significant disparities remain between "Winners" and others. In this document, we deep-dive into industry-level financials, and individually evaluate 10 chemicals industry players, to understand how different companies are navigating today's complexities to generate profitable growth and shareholder returns.

As an analytical underpinning for our strategy and operational support to the chemicals industry, we regularly monitor the financial performance of over 130 chemicals companies from around the world. This analysis provides insight into market positioning, business models, and transactions that lead to top quartile shareholder returns. With year-end 2016 financials reported, we can now highlight the latest relative performance measures to our clients.

The primary metrics we evaluate are the return on invested capital, the weighted average cost of capital, and underlying growth in capital. Revenue growth alone masks underlying changes in raw materials prices and does not effectively represent real growth in many segments of the industry. Companies that demonstrate the ability to grow, while achieving returns above the cost of capital typically generate higher shareholder returns than peers, and from the Roland Berger perspective, are the "Winners". Company management has a wide number of levers to influence performance with some of the most important being portfolio composition, pricing, and manufacturing/supply chain configuration.

Roland Berger continues to offer advice and counsel to industry management on how to best navigate this complexity. In this review of Winners, we offer an overview of the chemicals industry 2016 performance. We will also highlight examples from each quadrant of our Winners framework, providing themes to inform future strategies. We trust you will find it informative.

Contents

Section 1:

Chemicals industry performance review

Update based on YE 2016 financials.

After 3 years of negative growth and sub-cost of capital returns, the chemicals industry demonstrated a marked improvement in 2016 versus 2015. Growth has returned. Over half of chemicals companies we analyzed have delivered returns above their cost of capital – a 7% improvement over 2015. Transaction volume is at record levels reflecting more aggressive portfolio management and business positioning despite high valuation multiples. A number of companies, many of which we classify as Winners, are setting the foundation for further enduring growth.

Beneath the surface, there are numerous challenges that keep us from declaring victory – yet. Current levels of growth are nowhere near historical levels. There are a number of industry sectors that continue to struggle and that may require further restructuring and consolidation. There are also a number of macro changes on the horizon. These include a wave of shale gas related expansions; the evolution of China's economic, energy, and environmental policies impacting global supply/demand; increasing nationalism and shifting rhetoric on global trade policy; and increasing political and economic uncertainty. Any of these could quickly impede the nascent recovery momentum.

GROWTH

Commodity price declines mask a volume increase of 1-2%

Although combined revenues for the 132 companies in our analysis declined by about 5% relative to 2015, the decline was driven largely by continued erosion in oil prices, from USD 49 per barrel on average in 2015 to USD 45 per barrel in 2016, as well as in other commodities, such as agricultural products. Corrected for the commodity price decline – which directly affects pricing for basic chemicals and a broad range of intermediates and polymers – the chemicals industry grew volumes by about 1-2%. Weighted average GDP growth in 2016 for North America and Europe, which reflects the revenue base for much of the data set, was about 1.75%. Hence, chemicals industry demand in 2016 largely tracked GDP growth.

MARGINS

Significant decline in Ag margins, offset by stronger performance in other sectors; flat overall

Despite the drop in revenue, the industry held EBIT margins at 10% of revenues, the same as for 2015. This implies an actual drop in total industry profit dollars over 2015. However, the total industry drop was driven by a strong contraction in agriculture, where continued macro headwinds resulted in median EBIT margins falling to 8.5% in 2016, almost half of their 2015 levels of 15.9%. This segment is now in the midst of substantial consolidation with the announced ChemChina/Syngenta, Dow/DuPont, Bayer/Monsanto, and DuPont/FMC transactions. In other industry segments (commodity, diversified, specialty), profit dollars increased by 2-3% from 2015 levels as margins expanded enough to offset the decline in revenues.

DEBT

Companies taking advantage of attractive interest rates to finance M&A

Chemicals companies took advantage of the industry's general performance tailwinds and continued low interest rates to increase their debt for the first time since 2013. Total industry debt increased by 8% over 2015-2016, driving higher debt-to-equity ratios and resulting in lowering the industry cost of capital from 8.1% to 7.6%. However, much of the debt was raised by a limited number of players to fund big-ticket merger and acquisition activity. Specifically, ten companies including Air Liquide, Evonik, and Dow Chemical, collectively issued over USD 24 billion in new debt.

A: Chemicals industry financial metrics[1].
In 2016, most chemicals companies delivered above their cost of capital, marking a 7% improvement over 2015.

		2016	2015	2014	2014-2016 AVERAGE
GROWTH	Revenue growth [year-on-year]	-3%	-6%	-3%	-5%
PROFITS	EBIT margin	10%	10%	9%	10%
CAPITAL PRODUCTIVITY	Working capital [as % of sales]	14%	13%	14%	13%
	Asset turnover	0.8x	0.8x	0.9x	0.9x
RISK	Debt/EBITDA	2.3x	2.2x	2.2x	2.3x
	Debt/Equity	0.69	0.64	0.61	0.65
WINNER'S METRICS	ROIC-WACC	0.6%	-0.5%	-1.3%	-0.6%
	Invested capital real growth	-0.5%	-1.9%	-5.9%	-2.0%
	% of industry earning cost of capital (ROIC > WACC)	55%	48%	43%	45%

1) Includes 132 chemicals companies with publicly available finances and headquartered or listed in developed markets for the periods 12/31/2013-12/31/2016

Source: Capital IQ, Roland Berger

RETURNS ON CAPITAL

Returns edging above the cost of capital driven by specialty chemicals

The combination of broad-based industry margin improvement, with a slightly lower industry weighted average cost of capital, led to economic profits turning positive for the industry overall for the first time since 2011, signaling a healthier industry. More than half of companies in our analysis (55%) delivered a positive economic profit, compared to 43-48% over the last 3 years. → A Specialty Chemicals businesses drove industry performance, with pure-play Specialty Chemicals companies and Diversified Chemicals companies (which combine Commodity and Specialty businesses → B) seeing a 2% increase in their spreads year-over-year: from 0% to 2% for Specialty Chemicals and from -2.7% to -0.7% for Diversified Chemicals. The median economic profit spread in Agriculture continued to worsen to an 8-year low of -4.2% from -1.2% in 2015.

P/E MULTIPLES

Expectations of future performance increasing

Over 2015-2016, the chemicals industry saw an increase in its P/E ratio from 18.5 to 19.2[1]. This again speaks to the overall improved performance as well as increased market confidence in the industry delivering higher returns going forward. Of the five segments, Specialty showed the highest P/E ratio of 27.7 and Gases also had a higher-than-average P/E ratio of 23.8. Diversified lagged at 17.4, largely due to uncertainty around multi-billion M&A deals, while Ag's downturn due to falling crop prices translated to its lower P/E ratio of 15.2. For reference, Roland Berger's valuation of S&P 500 P/E ratio, on the basis of current year earnings, was 24.3 in the same period.

TSR

Chemicals industry shareholders generously rewarded in 2016

The chemicals industry's total shareholder return (TSR) was a solid 18% in 2016 versus a 12% return for the S&P 500[2,3]. → C Over the past 3 years, the chemicals industry delivered a TSR of 11% versus a 9% return for the S&P 500. The positive sentiment generated by the solid returns and growth performance described above was bolstered by the prospect of a "Trump Bump" (predicted strong US economic growth combined with improved tax policies leading to a commodities recovery), a more stable European market, a slower-growing but steady China, and reduced volatility in the crude oil price[4]. The greatest increases were seen with Commodity and Diversified Chemicals companies (23% and 24% TSR increases in 2016) whose commodity businesses had been the most impacted by the past 3 years lower oil prices and growth headwinds.

1 Includes 99 companies with meaningful P/E ratio for 2015 and 2016.

2 Aggregation of all chemicals companies in the analysis.

3 Total shareholder returns account for capital gains and dividends.

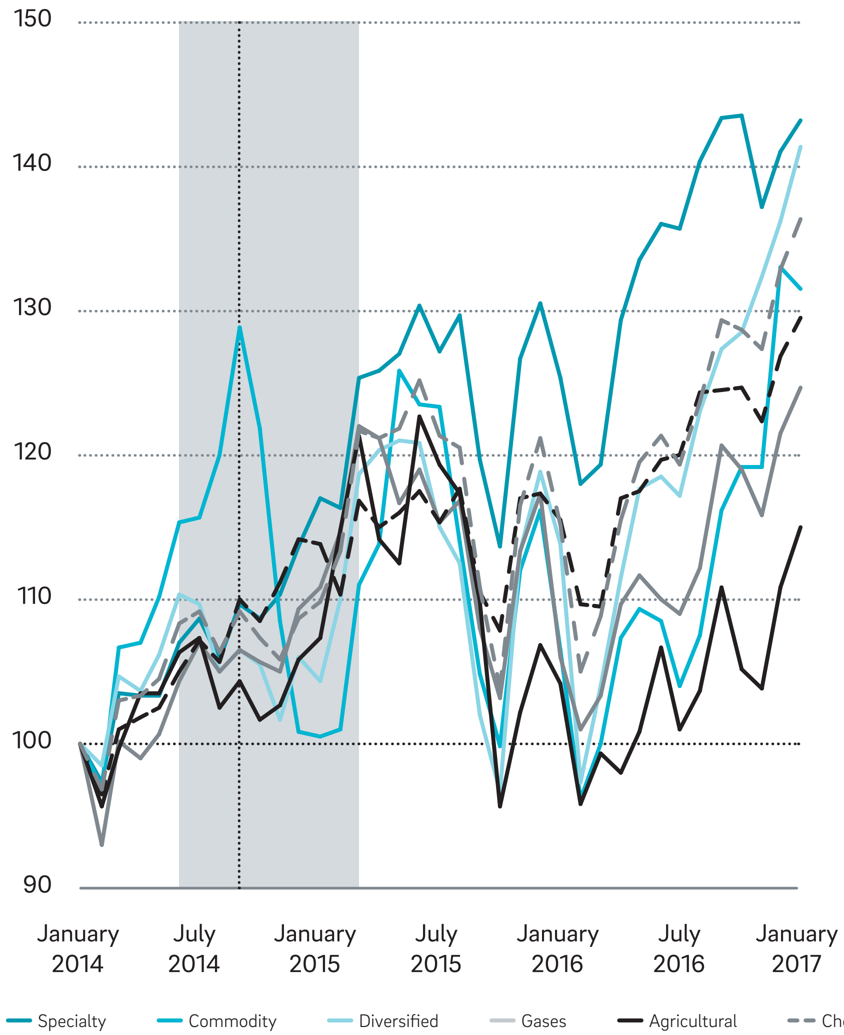
4 Roland Berger expects the oil price to remain in the USD 45-55 band for the foreseeable future. This thesis is detailed further in our Think:Act publication *Lower for much longer*.

B: Chemicals industry participation models.
We looked at Chemicals companies divided into five industry segments (based on Capital IQ classification).

		EXAMPLES
COMMODITY CHEMICALS	Companies that primarily produce industrial chemicals and basic chemicals including, but not limited to: plastics, synthetic fibers, films, commodity-based paints and pigments, explosives, and petrochemicals	> Chevron Phillips Chemical Co. > Hexion Inc. > Olin Corp. > LyondellBasell Industries N.V.
DIVERSIFIED CHEMICALS	Manufacturers of a diversified range of chemical products, often combining large volume commodities and high margin specialty chemicals	> BASF > Solvay SA > DuPont > Dow
SPECIALTY CHEMICALS	Companies that primarily produce high value-added chemicals used in the manufacture of a wide variety of products including, but not limited to: fine chemicals, additives, advanced polymers, adhesives, sealants, specialty paints, pigments, and coatings	> Evonik Industries > Ashland Inc. > Balchem Corp. > OMNOVA Solutions Inc.
INDUSTRIAL GASES	Producers of a wide range of gas products and associated systems including but not limited to: propane, hydrogen, oxygen, nitrogen, for industrial applications	> Air Products and Chemicals, Inc. > Praxair > Air Liquide SA
FERTILIZERS AND AGRICULTURAL CHEMICALS	Producers of fertilizers, pesticides, potash, or other agriculture-related chemicals	> Monsanto Company > Syngenta AG > FMC Corp.

Source: Capital IQ, Roland Berger

C: Value of USD 100 invested[1].
The Chemicals industry delivered higher Total Shareholder Returns than S&P 500 in 2016.



TSR[3] [%]	2016	2015	2014	2013-2016
Specialty	14	7	17	13
Commodity	23	6	1	9
Diversified	24	9	4	12
Agricultural	10	-3	7	5
Gases	17	-4	11	8
Chemicals[2]	18	5	10	11
S&P 500	12	1	14	9

1) Total shareholder returns account for capital gains and dividends; 2) Aggregation of 132 chemical companies in the analysis;
3) 12/31/2015-12/31/2016, 12/31/2014-12/31/2015, 12/31/2013-12/31/2014, 12/31/2013-12/31/2016

Source: Capital IQ, Roland Berger

Section 2:

Highlighted performers and sector themes

Companies in Roland Berger's Winners quadrant delivered the strongest returns.

Consistent with prior years, those companies in Roland Berger's Winners quadrant (driving growth at above the cost of capital) delivered the strongest returns. → D
Over the years, the Winners tend to exhibit four characteristics: corporate scale, strategic coherence, business leadership, and proven ability to execute. → E
Strategic coherence requires a clear and focused portfolio while **business leadership** is defined by a superior value proposition and ability to capture value in segments of focus. **Financial scale** is having access to investment capital at competitive costs and economies of scale across operations. **Proven ability to execute** is earned over a number of years, and provides investors the confidence that plans will be successfully delivered.

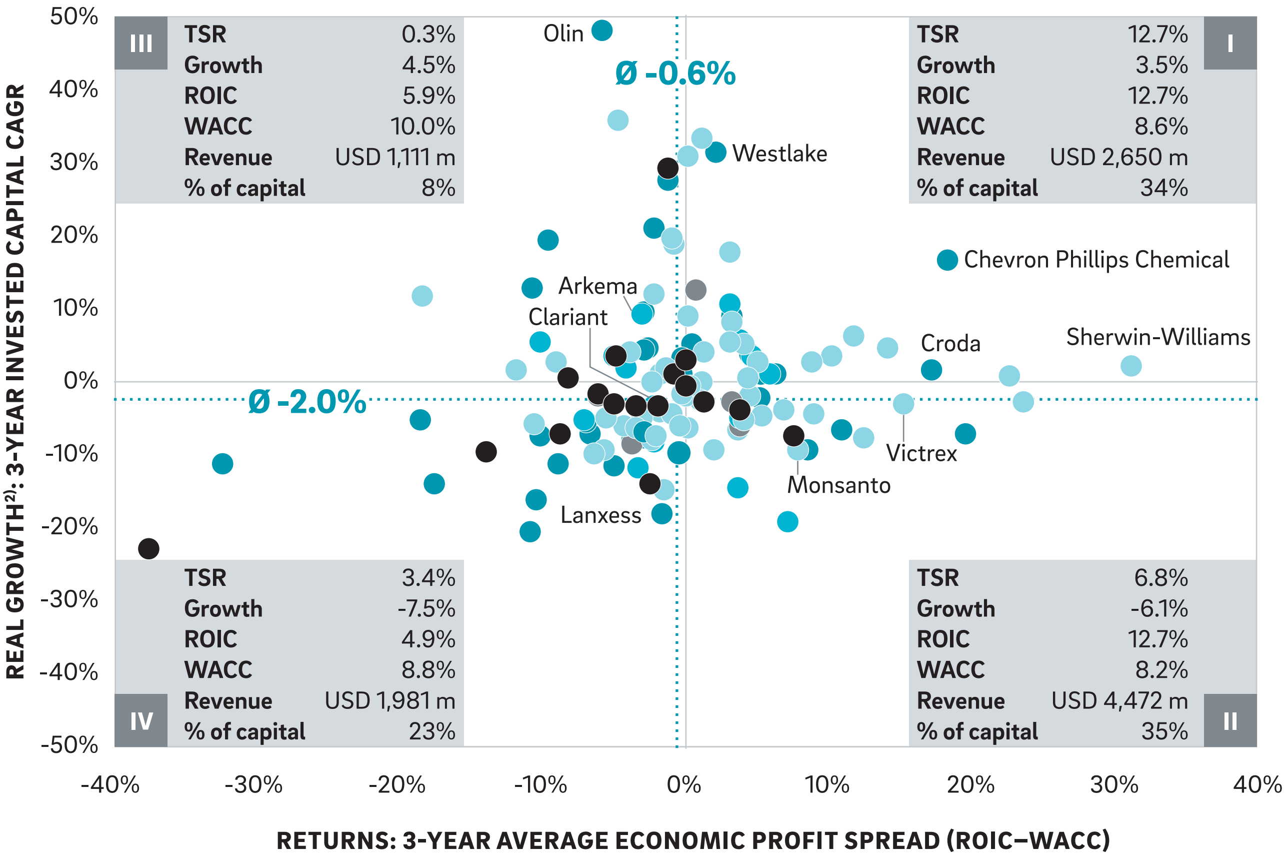
WINNERS

Examples of consistent winners over the 2014-2016 time period were Westlake, Croda, Chevron Philips Chemical and Sherwin-Williams.
Westlake continued to outperform the average chemicals industry on a growth and returns basis through aggressive but focused M&A activities. In 2016, Westlake purchased Axiall for USD 3.8 billion in the process took on an additional USD 3 billion in debt. Historically, Axiall had been an underperformer in the Roland Berger framework, with EBIT margins as low as 1% in 2016 and invested capital decreasing at a CAGR of 10% over 2014-2016. Westlake has defined a focus to improve the underlying Axiall financial position and capture synergies in an effort to maintain its Winners status.
Croda International posted EBIT margins of 24% and real invested capital growth of 4% over 2014-2016. This strong performance was influenced by its very clear, customer-centric business model, which supports customers through locally based sales and service. Through proximity to customers, Croda has been able to develop local market insight and innovate products for local use. Also, by moving closer to customers and expanding presence in other regions, Croda captured value in fast growing markets and grew its Asian business at a CAGR of 16% over 2014-2016 while the overall business grew at a CAGR of 9%.
Chevron Phillips Chemical has a focused portfolio and assets in low cost geographies. Its North America and Middle East locations have strong cost positions and the recent divestiture of K-Resin styrene-butadiene copolymers business to Ineos enabled Chevron Phillips to continuously focus on advantaged product lines.
Sherwin-Williams has long outperformed the average chemicals industry's economic profit with its ROIC ranging from 23% to 44%, given an effective value chain approach and direct customer engagement. It has also participated in industry consolidation by acquiring various paints and coating companies since 2007 and effectively capturing synergy values. Recently, Sherwin-Williams agreed to buy Valspar for more than USD 11 billion, which further strengthens its position through increased scale and better access to big retailers.
The above winners illustrate characteristics of the "playbook" for leaders: focus, investment, and disciplined execution.

CASH GENERATORS

In slower growth environments, "value over volume" is typically a valid strategy and company performance has rewarded shareholders. In a number of years, companies classified as cash generators often deliver TSR close to those of the Winners.
Monsanto took advantage of its data-driven, integrated solution that set it apart from the industry and positioned itself as a higher value player in a relatively commoditized industry segment. While the revenue for the ag industry declined at 8% p.a. since 2014, Monsanto saw its revenue decline at 5% p.a. amid downward price pressure from distressed farmers. Monsanto also managed its costs effectively and maintained stable EBIT

D: Chemicals industry financial performance (Winners' matrix) over 2014-2016[1].
Companies in Quadrant I – the "Winners" – continued to deliver higher TSR performance than their peers.



SEGMENT	GROWTH	ROIC-WACC
Commodity	-2.4%	-2.1%
Diversified	-1.3%	-1.7%
Gases	-2.9%	0.9%
Specialty	-0.7%	0.4%
Agricultural	-3.2%	-2.0%

1) 2014-2016. Includes 132 companies with financials over December 31, 2013-December 31, 2016;
2) Real growth adjusted by historical rate of inflation: 1.0% p.a.

Source: Capital IQ, Roland Berger

E: Winners'characteristics explanation overview.
We have defined these characteristics and how they separate Winners from Underperformers.

1	**BUSINESS LEADERSHIP**	**Winners set the agenda in their areas of participation by combining:** > A comprehensive understanding of the core competencies they posses in each business > A business model grounded in these competencies > Focused participation in customer segments in which the business model offering is relevant
2	**STRATEGIC COHERENCE**	**Winners are the high value owners of their portfolio businesses, achieved by having:** > A clear strategic intent, describing what the company wants to be, and what it stands for > A portfolio of businesses that operates similar business models and supports the strategic intent > Strong competencies and industry knowledge at the corporate level to successfully run the portfolio businesses (parenting advantage)
3	**FINANCIAL SCALE**	**Winners are relevant to investors, driven by:** > Size which makes them more likely to be included in well-know financial indices > Clear risk-reward propositions to investors
4	**PROVEN ABILITY TO EXECUTE**	**Winners deliver results by executing along four key dimensions:** > Clear communication of the strategic intent and successful execution against it > Disciplined approach to identify and deploy competitive advantage to drive Business Leadership > Active portfolio management > Systematic standardization of processes and centralization of key functions to capture benefits of Strategic Coherence

Source: Roland Berger

margins of ~25% over 2014-2016 while the industry average declined from 17% to 13%.

Victrex, while historically a Winner, saw slow growth despite consistently delivering an EBIT margin of 40%. As a product development oriented company, Victrex invests about 5% of the group's revenue in R&D, as compared to an industry average of 1%. This technology-focused strategy over the 40 years enabled Victrex to become the clear market leader in PEEK.

Cash generators maintain a cost structure consistent with industry segment requirements and pursue selective and focused growth. Aspirations to grow via M&A must be carefully vetted in order to avoid dilution of usually narrow, but strong, capabilities.

PROFITLESS GROWERS

Given high EBITDA multiples, a major capital acquisition can expand the capital base resulting in high growth but below cost of capital returns post-acquisition. A migration to the Winners quadrant requires effective operations and merger synergy capture (see our recent publication, *Failure is Not an Option*).

Olin's acquisition of the Dow Chlorinated Products business increased Olin's capital base by 49%, creating corporate scale and business leadership potential. Successful integration of this business and capturing synergies will be key to Olin's transition to Winners positioning.

Arkema continued to grow the company through the acquisition, and effective integration, of Bostik in 2015 and has made good headway in improving margins post-acquisition. Portfolio clean-up has continued with the divestiture of oxo-alcohols. The markets have recognized this progress by rewarding Arkema shareholders with a TSR of 48% in 2016.

Profitless growers have often achieved significant capital growth through inorganic means. The ability to capture synergies for major acquisitions often determines if these firms migrate to Winners status, or end up as Underperformers.

UNDERPERFORMERS

The nature of underperformance in chemicals typically relates to either an incoherent portfolio, a failed acquisition, or an unattractive asset set.

Clariant has been working to improve its portfolio through transactions and performance improvement initiatives. In particular, Clariant's Plastics & Coatings division accounted for 44% of revenue in 2016 but posted an EBITDA margin of 14% – lowest of its four business segments. In order to improve profitability, it has committed to R&D and innovation, and repositioned its portfolio to expand in emerging markets and high growth areas.

Lanxess has been restructuring to achieve sustainable profitable growth. The firm's planned acquisition of Chemtura for USD ~2.5 billion will increase focus on the additives sector, while it will turnaround lagging business units or seek partners to improve their market position. Extremely disciplined execution will be critical to demonstrate Winners characteristics.

Lack of a focused portfolio is a common theme among the underperformers, but many companies are transforming their portfolios to focus on higher performing divisions or to focus investments in repositioning underperforming units. The private equity industry has been able to facilitate this migration by acquiring businesses where a singular performance focus can yield returns acceptable to their investors.

In summary, 2016 was a year of strengthening performance for the chemicals industry as a whole. Raw material prices have stabilized, growth (albeit slow) has returned, and returns to shareholders were impressive. Beneath this narrative there are numerous moving parts and future challenges. Whether the industry can alter its trajectory to enduring value creation will require: returning growth to prior levels, executing value-creating M&A, continued aggressive cost reduction through digitization, and resolving manufacturing and supply chain challenges. Early indications are positive with a number of "Winners" demonstrating a road map. As a participant in the industry, you should understand where you stand relative to the four archetypes outlined above, in order to best inform your strategic priorities. Roland Berger is honored to be the trusted partner of chemicals industry management as it addresses these challenges.

Think:Act Booklet
The Winners
How Chemical companies deliver superior shareholder value

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

Think:Act Booklet
The gauntlet is thrown
The Dow-DuPont merger

The Dow-DuPont transaction is an activist-driven response to demands to create more value for shareholders. The merger creates an industrial behemoth with over USD 120 billion in market capitalization and over USD 80 billion in combined revenue, that is expected to be broken up into three independent, publicly-traded companies focused on Agriculture, Material Sciences and Specialty Products.

Section 3:

Roland Berger Winners' metrics

Appendix.

When developing their expectations of financial performance of a company, investors, both implicitly or explicitly, are analyzing its profitability and growth potential, and adjusting these metrics for risk. Typically, investors will develop a financial forecast to build a free cash flow model. Revenue growth will be used as the growth metric, EBIT margin percentage as the profitability metric, and the cost of capital representing the risk adjustment. We believe the best metric to analyze growth is the real growth in the invested capital of a company, which represents the capital on a company's books which finances its assets. It is a better metric to measure growth compared with revenues, which is more commonly used. Revenue trends can be misleading due to price volatility, driven by raw material fluctuations (common in the chemicals industry as evidenced in the current cycle) or supply and demand dynamics. Invested capital growth measures the growth in assets and represents additional investment into the enterprise, and is not as affected by raw material price changes. We believe the best metric to measure risk-adjusted profitability takes the difference between the return on invested capital (ROIC) and the weighted average cost of capital (WACC). → F It is better than EBIT margin because it is a normalized metric, which measures not only profitability, but the amount of capital required to generate the profitability. EBIT margins provide no perspective on the capital intensity of a company and therefore may be misleading when comparing companies with different business models.

F: The right metrics to measure growth, profitability, and risk.
Definition of economic profit in Winners analysis.

INVESTED CAPITAL

Total Debt + Total Equity

RISK-ADJUSTED PROFITABILITY

ROIC – WACC

ROIC
(Return on Invested Capital)

$$\text{ROIC} = \frac{\text{NOPAT (Net Operating Profit After Tax)}}{\text{Invested Capital}}$$

WACC
(Weighted Average Cost of Capital)

$$\text{WACC} = \frac{[(\text{Cost of Equity} \times \text{Equity}) + (\text{After Tax Cost of Debt} \times \text{Debt})]}{\text{Invested Capital}}$$

Source: Roland Berger

Imprint

WE WELCOME YOUR QUESTIONS, COMMENTS AND SUGGESTIONS

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About us

Roland Berger, founded in 1967, is the only leading global consultancy of German heritage and European origin. With 2,400 employees working from 34 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.

Navigating Complexity
For the past 50 years, Roland Berger has helped its clients manage change. Looking at the coming 50 years, we are committed to supporting our clients conquer the next frontier. To us, this means facilitating navigating the complexities that define our times by providing clients with the responsive strategies essential to success that lasts.

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