



Market Update Chemicals & Materials

Q2 2018

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Chemical Industry Momentum Continued in Q2, But Raw Material Inflation to Limit Gains

Guest Columnist

Based on economic and industry reports through mid-July, we believe the business environment for the U.S. chemical industry strengthened further during the recently completed second quarter. The consensus by economists is that the U.S. economy grew in the quarter somewhat faster than the 2% annual rate estimated for the first quarter. Consumer spending, which accounts for about two-thirds of the economy, likely grew, including for automobiles. The domestic manufacturing sector also continued to expand during the second quarter.

Chemical industry's performance included persistent raw material cost inflation, including for oil and petrochemicals, while rising freight and logistics costs and availability issues also were headwinds especially for makers of specialty and consumer products as their ability to boost selling prices lag cost increases. The Trump Administration's proposal of potential tariffs on imports from China, including a significant amount of chemicals, would add to raw material cost inflation. On the plus side, currency exchange translation will again be a favorable factor to results for those companies with large overseas operations, although the U.S. dollar strengthened during the quarter and at current exchange rates, we expect foreign currency translation to turn to a headwind in the third quarter. Companies will also benefit from the tax reform law approved last December which included a permanent reduction in the U.S. statutory corporate tax rate from 35% to 21% starting in 2018.

The American Chemistry Council (ACC) reported its Chemicals Activity Barometer (CAB), a leading macroeconomic indicator based on chemical industry data, on a three-month moving average basis, expanded in June for the tenth consecutive month, and was 4.1% higher than a year earlier.

The global manufacturing sector, the largest customer base for the chemical industry, continued to expand during the just completed second quarter, although the growth rate, including for production, slowed each month of the quarter, according to the monthly worldwide PMI business surveys.

The U.S. manufacturing sector also continued to strengthen during the second quarter. According to the Institute for Supply Management's monthly reports for manufacturing activity, U.S. manufacturing

activity in June expanded for the twenty-second consecutive month and the reading for June was the strongest since February. The recent reports indicated tightness for labor availability and in supply chains, and continuing price inflation for raw materials.

The ISM manufacturing monthly reports indicated that the U.S. chemical products industry also expanded in each month of the second quarter. The industry's last monthly contraction was reported for September 2016.

The Federal Reserve Board estimated that industrial production climbed at a 6.0% annual rate during the second quarter, its third consecutive quarterly increase. Output for the chemicals industry in the quarter was estimated to have grown 5.5% after a 4.2% decline in the first quarter caused by weather related disruptions early in the year to basic chemicals and plastics plants. Production jumped 13% for the fourth quarter of 2017 as the industry recovered in the months after Hurricane Harvey.

Several "hard data" points indicate that chemicals production and shipments grew during the second quarter of 2018. According to the Association of American Railroads, the number of U.S. chemicals railroad carloads in the second quarter increased 4.6% from the year earlier period. This follows a 3.1% increase in the first quarter of this year and a 4.4% gain in the final quarter of 2017. Railroads carry about 30% of industry shipments.

Chlor-alkali industry production of chlorine and caustic soda, widely used chemicals, for the second quarter of 2018 climbed about 3% from the year earlier period. For the first half of 2018, output of each product rose about 1% despite weather related plant disruptions early in the year that reduced output. Plastic resins industry production and sales increased strongly in both April and May of 2018 versus the comparable months in 2017.

Prices for key basic chemicals, intermediates, and plastics averaged higher during the second quarter, mostly due to strong demand and tight supply conditions for some materials. These higher prices for chemicals products will remain a cost headwind into the second half of 2018 to buyers such as paint and specialty chemical producers as their ability to implement selling price typically lag rising input costs.

Notes:

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The monthly average of a global index published by S&P Global Platts of seven widely used petrochemicals, in March eased slightly for the second consecutive month from the recent peak in January but was still 6.3% above the year earlier level.

The domestic monthly contract prices for ethylene, the largest volume petrochemical monomer, declined in over the February to April period with the start-up of new industry capacity, settling about 25% below the recent peak in September that followed supply disruptions caused by Hurricane Harvey. The price on average for the second quarter was almost 13% lower than then first quarter and 17% lower than the year earlier period. Ethylene margins narrowed again in the second quarter on the lower prices. Spot prices in April were at times at the lowest in years, which may pressure contract prices lower for April.

Domestic prices trends for key derivative plastics were mixed during the first quarter. Polyethylene prices were flat to down in May depending on grade as increased supplies from the ramp-up of new plants. Makers were able to last raise prices in February following a smaller decline over the December and January period. Polyethylene makers include DowDuPont, LyondellBasell, and Westlake Chemical. A price increase in polyvinyl chloride was achieved ahead of the normal spring pickup of construction activity, although further gains will be difficult in the face of lower monomer costs. Vinyl producers include Westlake Chemical, the second largest U.S. vinyl resins producer.

Contract prices for propylene, the second largest volume monomer, rebounded during the second quarter after a sharp pull back in both February and March that followed a rapid run up of about 50% since last summer caused by supply issues. Prices for the second quarter averaged 2% lower than for the first

quarter, but about 28% higher than the year earlier quarter. We expect prices in July to decline on seasonally lower demand. These recent high propylene prices combined with supply issues for other products have resulted in increased prices for derivatives such as resins and solvents to buyers, including paint makers (Sherwin-Williams, PPG Industries, and Axalta).

Chlor-alkali prices have continued to increase in 2018. Caustic soda contract prices have risen over the past two years on stronger domestic demand and record annual exports in part due to capacity shutdowns overseas. Prices continued to rise during the recent second quarter, aided by industry production issues, and we expect more gains for at least the second quarter following additional recent announced price hikes.

Chlorine prices have risen modestly each quarter for the past year as producers achieved portions of proposed price increases. We believe seasonally stronger demand likely allowed producers to again achieve similar gains in the second quarter. Olin Corp. and Westlake Chemical are major chlor-alkali makers.

Titanium dioxide pigment prices and margins have greatly increased globally since bottoming early in 2016 as producers have been able to implement various regional price increases due to stronger industry supply/demand fundamentals, including due to some capacity closures. The slow starts to the U.S. and European paint seasons due to poor weather may limit further price gains for pigments during 2018. The leading producers are Chemours, Venator Materials (the former pigment business of Huntsman Corp.), and Tronox. The higher pigment prices have also negatively impacted important users such as paint and plastics makers.

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Digitalization, Chemical Distribution and the Chemical Value Chain – Part II

Chemical Producers and Chemical Distributors – Often a Story of Many Misunderstandings⁽¹⁾

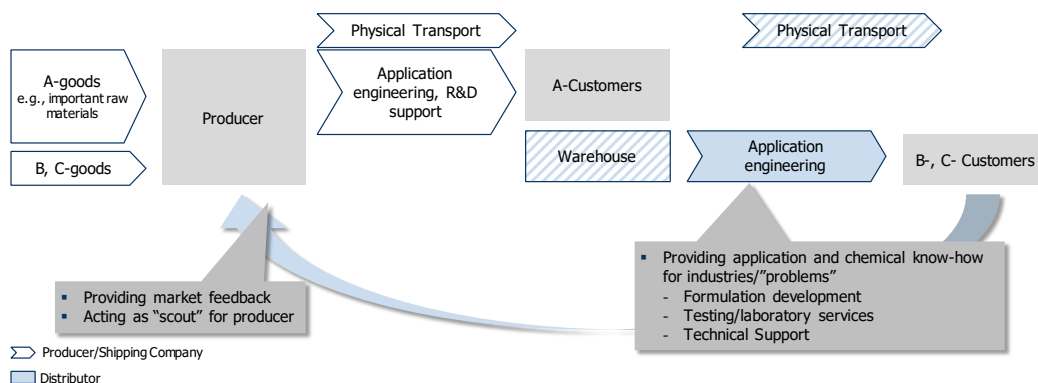
Till Knorr

Over the last decades we have seen distinct developments related to both producers and distributors. Whereas distributors are increasing geographic reach and application technology know-how, producers are primarily focused on growing their core business and have been increasingly divesting non-core assets. These trends are leading to distributors covering ever larger geographical areas and producers concentrating on a limited range of products/applications with (in total) smaller sales teams. Those two developments should generate various opportunities for mutually beneficial collaboration. However, it is surprising to see how often little knowledge about the other

side exists and how many prejudices still prevail. One minor reason might be a hazy positioning as commodities/specialties/full line distributor. Already difficult for producers, a distinct focus on commodities, specialties or both is extremely hard to achieve for distributors. (Due to the almost endless variety of chemicals and their applications sold to almost all industries.)

Nevertheless, distributors can work towards a better recognition by producers. Usually, producers see distributors as THE channel to serve small- to mid-sized customers. Whereas this view is clearly understandable, it is a little surprising that often the physical realization of the distribution is not recognized.

Typical Activities of a Specialties Distributor



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In contrast, distributors see their role without exception in exactly this physical distribution and, to a large degree, in the bundling of products for customers. Explanations for the different views probably come down to different perspectives due to one's own day-to-day work. Whereas bundling represents the customer perspective of a distributor, which is (rightly) neglected by most producers, the wish for serving and developing small customers of a producer is only part of the self-image of distributors. These different conceptions offer an opportunity to start discussing what a producer expects from a distributor and what a distributor can offer.

Merely seeing distributors as an extended sales arm means missing chances of benefitting from their physical infrastructure or their knowledge of untapped markets. The same applies to know-how. Producers require distributors to be just as knowledgeable about applications as they are about products; distributors, however, view application know-how as much more important due to the benefits it provides customers. Producers should take advantage of this application know-how and leverage their distributors to expand into new markets and develop new solutions.



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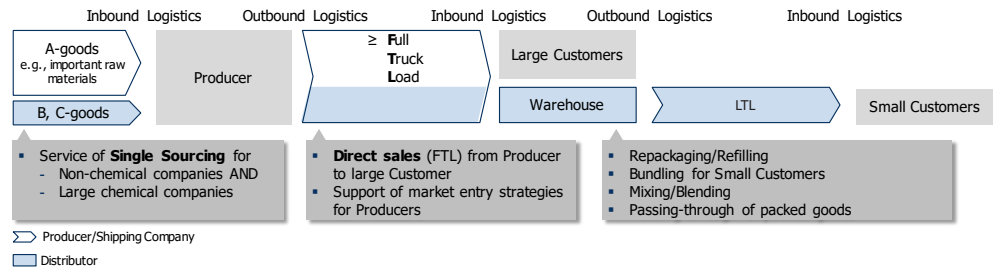
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Typical Activities of a Commodity Distributor



Equally, distributors should more often accept the role as an extended sales arm for the producer as it helps to ingratiate themselves and create the potential for additional opportunity down the road. Distributors should focus on identifying areas that

create value for producers even if they may be outside the normal scope of business. Examples include offering lab and warehouse space in countries where the producer does not have an established presence or helping to reduce administrative costs.

Systematic Approach to Distributor Management

As long as producers and distributors lack an understanding of each other's business model, it will be difficult to facilitate a mutually beneficial relationship. Reaching a point of understanding will be difficult if the overwhelming majority of one's business (and attention) dictates different priorities. However, for a systematically run business, successful distributor management can be done along a few simple rules.

It all starts with the "ordinary" business strategy, including focus products, target customers, regions etc., followed by a respective resource allocation to make the plan work. (Step 1: Build on your business strategy) Business as usual. And as long as key customers or key regions are concerned – planning should be easy. But, whenever one of the following situations turns up, a distributor might be of help (Step 2: Identify relevant areas):

- A new market shall be developed by a large number of small customers ("tail end")
- A large number of small customers ("tail end")
- A market has become too small to justify full sales resources
- Customers ask for complexity-increasing additional services

And, the classic rule of thumb, always think about handing over the last 20% of customers, since they usually don't contribute to profits.

Next, search for distributors with expertise in the required applications or regions. Big full-line distributors are always a choice, but there are several specialists in a variety of fields. When discussing with the selected distributors, a combination of the above-mentioned situations might be addressed. (Step 3: Select the right support). However,

besides distributors there are different options. These include using agents, sharing staff with other businesses or dropping the business altogether.

Assuming the producer and distributor agree to work together, the most difficult issue is to manage the business relation in a trustful manner. (Step 4: Manage the relationship) It is important to clearly define targets and the way to measure their fulfilment as well as to agree upon the depth of information exchange. Even more important is the definition of the most critical issues in such a relationship: how to proceed if a market or a customer grows above a critical threshold or giving technical and specialist support/training. This is the last moment when both parties can clearly announce and write down their particular expectations from the relationship. It is understandable if a producer wants to take back customers grown above a certain threshold – but it is also understandable that the distributor who has put all his effort in growing this customer wants a reward for this achievement. Possible solutions could be a joint discussion with the customer about the best way to serve him in the future and/or some profit sharing for a defined number of years to come between distributor and producer. Thus, for a distributor it is quite helpful to recall from time to time one's positioning in the value chain. But this is no one-way-road. A producer has to accept, that a distributor is managing complexity and needs a certain budget (i.e. margin) to do so. This has to be addressed in the contracts as well.

As long as all this is done right at the outset, both parties are able to develop a trust-based relationship.

1 Based on "CHEMICAL DSITRIBUTION – Findings at the distributor-principal interface" by Stratley

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Re-inventing Chemistry – An Industry in Transition

After founding the Journal of Business Chemistry in 2004, we are proud to present the 15th volume of the Journal of Business Chemistry (JoBC) this year. Since then, 41 issues have been published with 160 contributions. In precise terms: 69 research papers, 63 articles within the practitioner's section, 27 commentaries and one interview have been submitted, reviewed, edited, and finally been made available for the business chemistry community. The Journal of Business Chemistry was established to examine the chemical and related industries in order to shed light on their management and industrial characteristics. The industry has changed significantly since its beginnings in the 19th century and will continue to change in the future – an industry in transition.

With this anniversary issue, we present Business Chemistry in all its facets. Therefore, we invited authors from the academic and industrial context to share their perspective on Business Chemistry and recent developments in the chemical industry, as we are celebrating the 15th volume of the Journal of Business Chemistry

The Journal of Business Chemistry provides an international platform for students, researchers, and practitioners in universities, research institutes, companies, associations,

public authorities, NGOs and consultancies. It enables the dialogue between academia and business. In so doing, scholars gain access to one of the most important industrial sectors and can obtain new academic insights with which to expand management research. Managers in the chemical and related industries benefit from both the academic perspective and the practitioner's view alike. We believe that this approach makes the Journal of Business Chemistry attractive to its readers by creating valuable insights.

In order to stay tuned about new issues and all activities around the Journal of Business Chemistry visit our website and subscribe for the JoBC newsletter at: <http://www.businesschemistry.org/for-readers/subscription/>. As a thank you for all readers we offer to send you a printed copy of the anniversary issue free of charge. Please indicate your address in the subscription process.

Authors interested in publishing in the Journal of Business Chemistry should submit their manuscript to contact@businesschemistry.org. For further information on the submission guidelines, please see <http://www.businesschemistry.org/for-authors/submission-guidelines/>.

The Journal of Business Chemistry (JoBC) – Reading Recommendations

Towards a Phenotype of the Amphibious Company: An Illustrative Case from the Chemical Company

Mattia Bianchi, Alberto Di Minin and Federico Frattini

The paper explores the phenotype of the amphibious company, which is intended as the fittest economic species in today's hypercompetitive business arenas and hence the most likely to survive and prosper. Four behavioral traits are proposed and discussed as distinctive of amphibious companies: doing different jobs well, diversifying in multiple

market arenas, brokering and bridging across business networks and absorbing knowledge from the outside. The paper illustrates these arguments through a paradigmatic case study of an Italian firm operating in the chemical industry, which has been able to survive a challenging crisis by adopting an amphibious behavior. Click [here](#) to view the full article.

Executive Editors, JoBC



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Lincoln International is not affiliated with Société de Chimie Industrielle in any way and the event details are meant for information purposes only.

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Optimal Ambidexterity and Exploration Valuableness: Balancing Short-term and Long-term Trade-off in Pharmaceutical Product Development

Osamu Suzuki and David Methé

One of the most challenging resource allocation tasks for managers is to balance short-term and long-term products development initiatives, since exploitative (i.e., short-term focused) resource allocation patterns prevent managers from recognizing the existence or significance of exploratory (i.e., long-term focused) opportunities. Recent research on organizational ambidexterity promises the potential to overcome this trade-off relationship, but they lack clear indications concerning the mix of exploitation and

exploration that would result in an optimal degree of ambidexterity. Through the analysis of a unique data set on development resource allocation patterns for 231 new pharmaceutical products, as well as on the economic value of those products, we show that pharmaceutical companies realize a higher exploration degree of valuableness and hence an optimal level of ambidexterity by allocating roughly 1.5 times more development resources to exploitative products than to exploratory ones. Click [here](#) to view the full article.

The Road Ahead: Digitalization Fuels Innovation

Martin Vollmer

Today, chemical companies are facing an increasingly challenging environment. Markets require more holistic solutions instead of focus being solely on the development of new molecules or products. Climate change, resource scarcity, technological advances, and rising customer expectations are forcing chemical companies to adjust to new realities, with the result that many are restructuring, increasing customer focus, and, perhaps most

importantly, creating distinctive capabilities that will provide a competitive advantage. These challenges, however, also offer new opportunities for growth. According to a survey by PwC, 71% of CEOs in the chemical industry believe there are more opportunities than there were three years ago, indicating that they are expecting – and gearing up for – a high pace of change. Click [here](#) to view the full article.

Managing Growth and Profitability in the Chemical Industry Interview with Hariolf Kottmann

Since 2008 Hariolf Kottmann, holding a PhD in organic chemistry, is Chief Executive Officer of the Swiss specialty chemical company Clariant. The JoBC team interviewed Hariolf Kottmann

about his perceptions regarding challenges for management as well as current developments arising from the chemical industry of change. Click [here](#) to view the full interview.

Société de Chimie Industrielle 100th Anniversary Celebration

Andrew Liveris, Former Chairman and CEO of Dow, will be the Keynote Speaker at Société de Chimie Industrielle's 100th Anniversary event on September 26, 2018. Société was founded in 1918 in New York as the American Section of a French parent. Today, Société is an independent organization involved in a

number of non-profit activities. The event will take place on Wednesday, September 26, 2018 at The Tap Room, The Yale Club of New York City from 5:30 p.m. to 8:00 p.m. EST. For information and registration please go to www.societe.org.

Chemicals & Materials Index

(\$ in millions, except share price)

Company Name	Share Price	% of 52 Week High	Market Cap	Enterprise Value	LTM		YoY Revenue Growth	EBITDA Margin	Enterprise Value/LTM		
					Revenue	EBITDA			Revenue	EBITDA	
Commodity Chemicals											
Air Liquide	\$119.21	92.9%	\$50,821	\$67,366	\$23,590	\$5,580	1.3%	23.7%	2.94x	12.4x	
Air Products and Chemicals	164.21	93.7%	36,007	37,218	8,834	2,813	11.4%	31.8%	4.21x	12.5x	
Braskem	14.42	98.5%	11,384	19,247	13,394	2,990	(8.6%)	22.3%	1.46x	6.5x	
Cabot Corporation	62.99	91.8%	3,878	4,881	3,115	527	19.2%	16.9%	1.57x	9.2x	
Formosa Plastics Corporation	3.53	95.6%	22,468	20,405	7,329	1,124	15.6%	15.3%	2.82x	9.2x	
Fuchs Petrolub	56.45	98.3%	7,578	7,445	2,960	495	9.1%	16.7%	2.59x	15.0x	
K+S	21.79	74.6%	4,170	7,241	4,364	646	9.4%	14.8%	1.71x	11.5x	
Linde	195.97	87.2%	36,379	45,149	19,622	4,459	(2.4%)	22.7%	2.37x	10.4x	
LyondellBasell Industries	110.76	90.8%	43,122	48,386	37,624	6,927	17.8%	18.4%	1.29x	6.7x	
Mexichem	3.33	94.5%	6,941	11,560	6,695	1,356	21.2%	20.3%	1.69x	8.3x	
North Huajin Chemical Industries	1.03	58.8%	1,652	3,123	5,193	650	11.3%	12.5%	0.63x	5.0x	
Olin Corporation	28.84	74.2%	4,816	8,221	6,614	1,139	11.5%	17.2%	1.24x	7.3x	
Quaker Chemical Corporation	169.02	94.5%	2,253	2,228	858	118	10.3%	13.7%	2.60x	18.5x	
SK Discovery	28.36	37.2%	448	2,917	6,131	227	24.4%	3.7%	0.49x	9.2x	
Trinseo	73.85	86.5%	3,146	3,882	4,557	553	11.1%	12.1%	0.85x	5.5x	
Ultra Petroleum	1.05	10.3%	207	2,380	784	515	2.7%	65.7%	3.03x	4.6x	
Westlake Chemical Corporation	93.88	75.5%	12,172	14,840	8,504	2,156	22.6%	25.4%	1.75x	6.9x	
Specialty Chemicals											
Akzo Nobel	\$90.00	97.2%	\$23,023	\$26,810	\$10,879	\$1,057	32.4%	9.7%	2.54x	25.7x	
Albemarle Corporation	95.54	65.9%	10,361	11,212	3,288	938	17.0%	28.5%	3.41x	10.9x	
Ashland Global Holdings	83.81	96.7%	5,232	7,582	3,667	615	17.0%	16.8%	2.07x	12.3x	
Celanese Corporation	114.51	96.6%	15,455	18,734	6,854	1,555	22.1%	22.7%	2.73x	10.6x	
Chugoku Marine Paints	8.95	78.0%	573	535	762	40	5.3%	5.2%	0.70x	13.4x	
Clariant	23.39	78.9%	7,704	9,612	6,677	919	5.2%	13.8%	1.44x	9.6x	
DSM	101.57	97.2%	17,577	18,563	10,624	1,842	11.7%	17.3%	1.80x	10.9x	
Ecolab	146.07	97.1%	42,200	49,423	14,376	3,023	7.6%	21.0%	3.44x	16.3x	
Elementis	3.25	79.6%	1,504	1,753	821	159	23.2%	19.3%	2.22x	11.5x	
Evonik Industries	35.45	95.0%	16,502	20,375	17,166	3,049	10.4%	17.8%	1.22x	6.9x	
Ferro Corporation	21.32	83.6%	1,794	2,600	1,549	237	25.0%	15.3%	1.68x	11.0x	
Ferrovial	20.36	90.5%	14,905	20,803	14,099	648	2.0%	4.6%	1.52x	22.4x	
H.B. Fuller Company	56.03	95.4%	2,836	5,137	2,744	315	27.4%	11.5%	1.87x	15.9x	
Hexcel Corporation	68.42	93.2%	5,988	6,888	2,091	476	7.0%	22.8%	3.29x	14.4x	
Hitachi Chemical Company	19.70	65.0%	4,103	4,405	6,190	795	19.7%	12.8%	0.71x	5.3x	
Kansai Paint	20.19	73.1%	5,194	6,131	3,782	456	25.3%	12.1%	1.62x	13.7x	
Kraton Corporation	45.56	84.4%	1,453	3,074	2,018	370	8.9%	18.3%	1.52x	8.3x	
Morgan Advanced Materials	4.41	93.9%	1,258	1,550	1,352	187	0.8%	13.9%	1.19x	8.6x	
NewMarket Corporation	378.74	86.5%	4,338	4,988	2,297	374	9.0%	16.3%	2.17x	13.3x	
Nippon Paint Holdings	37.30	78.9%	11,963	12,247	5,634	945	9.5%	16.8%	2.17x	12.8x	
Novozymes	50.56	92.3%	14,643	15,089	2,235	787	1.3%	35.2%	6.96x	19.8x	
PolyOne Corporation	43.13	90.8%	3,448	4,621	3,436	380	12.6%	11.1%	1.35x	12.2x	
PPG Industries	107.03	87.7%	25,903	29,987	15,370	2,429	7.0%	15.8%	1.95x	12.3x	
RPM International	63.54	97.2%	8,481	10,320	5,322	688	7.3%	12.9%	1.94x	15.0x	
Sanyo Chemical Industries	47.20	77.3%	1,041	1,057	1,482	189	9.7%	12.8%	0.71x	5.3x	
Shenzhen Capchem Technology	3.27	72.2%	1,239	1,256	304	57	21.8%	18.7%	4.33x	23.2x	
The Sherwin-Williams Company	438.62	97.3%	40,744	50,964	17,225	2,778	37.2%	16.1%	2.96x	18.3x	
Toray Industries	7.25	66.4%	11,603	18,524	20,277	2,327	10.8%	11.5%	0.91x	7.7x	
W. R. Grace & Co.	70.31	90.9%	4,728	6,589	1,806	431	8.0%	23.9%	3.65x	14.4x	
Wacker Chemie	135.74	67.8%	6,743	7,563	5,874	1,100	8.6%	18.7%	1.33x	6.5x	
Diversified Chemicals											
3M Company	\$201.39	77.5%	\$118,138	\$129,551	\$32,830	\$8,530	7.5%	26.0%	3.95x	15.2x	
Arkema	117.68	92.1%	8,984	10,589	9,821	1,673	7.1%	17.0%	1.11x	6.5x	
BASF	87.95	78.7%	80,784	96,048	75,583	14,078	6.9%	18.6%	1.31x	6.8x	
DowDuPont	66.46	86.2%	153,348	179,622	81,175	15,853	54.4%	19.5%	2.21x	10.6x	
Eastman Chemical Company	96.73	86.0%	13,666	20,244	10,055	2,331	9.3%	23.2%	2.01x	8.6x	
FMC Corporation	83.79	84.9%	11,281	14,051	4,099	1,143	59.5%	27.9%	3.43x	12.3x	
Huntsman Corporation	31.05	86.0%	7,417	10,581	9,071	1,421	17.5%	15.7%	1.17x	7.2x	
Kemira	12.37	87.9%	1,887	2,779	2,951	347	6.8%	11.8%	0.97x	8.2x	
LANXESS	76.06	89.8%	6,961	11,132	11,812	1,799	47.5%	15.2%	0.97x	6.4x	

Chemicals & Materials Index

(\$ in millions, except share price)

Company Name	Share Price	% of 52 Week High	Market Cap	Enterprise Value	LTM		YoY Revenue Growth	EBITDA Margin	Enterprise Value/LTM	
					Revenue	EBITDA			Revenue	EBITDA
Mitsubishi Chemical Holdings Corporation	\$8.56	71.7%	\$12,147	\$30,318	\$33,998	\$4,731	9.8%	13.9%	0.89x	6.0x
Pidilite Industries	15.92	94.0%	8,082	7,934	932	204	8.0%	21.9%	8.77x	40.0x
Solvay	127.25	85.2%	13,147	17,361	12,710	2,382	4.2%	18.7%	1.41x	7.4x
Sumitomo Chemical Company	5.56	69.7%	9,093	18,425	20,128	2,636	12.7%	13.1%	0.91x	5.8x
Ingredients Chemicals										
Balchem Corporation	\$99.78	95.4%	\$3,214	\$3,362	\$635	\$153	12.6%	24.0%	5.29x	22.1x
Cambrex Corporation	61.45	90.7%	2,044	1,872	587	186	13.6%	31.8%	3.19x	10.0x
Chr. Hansen Holding	97.94	92.3%	12,885	13,645	1,264	426	8.6%	33.7%	11.14x	33.1x
Frutarom Industries	102.16	99.3%	6,085	6,766	1,502	309	21.6%	20.5%	4.94x	24.8x
Givaudan	2,289.09	95.1%	21,094	22,887	5,276	1,031	5.0%	19.5%	4.34x	22.1x
International Flavors & Fragrances	131.16	83.3%	10,368	11,804	3,579	797	11.5%	22.3%	3.30x	14.8x
Sensient Technologies Corporation	68.57	84.7%	2,899	3,621	1,402	266	3.1%	19.0%	2.58x	13.6x
Symrise	88.19	95.7%	11,448	13,210	3,566	716	5.7%	20.1%	3.82x	19.0x
Chemicals Distribution										
Aceto Corporation	\$3.23	19.6%	\$99	\$354	\$737	\$55	15.5%	7.5%	0.48x	6.1x
Brenntag	57.96	92.9%	8,956	11,140	13,953	893	8.9%	6.4%	0.82x	12.9x
IMCD	69.96	96.7%	3,666	4,222	2,486	218	23.3%	8.7%	1.95x	22.5x
Nagase & Co.	15.27	77.7%	1,912	2,450	7,176	330	9.5%	4.6%	0.34x	7.2x
Nexeo Solutions	9.82	88.2%	881	1,690	3,999	196	14.0%	4.9%	0.42x	8.6x
Sinochem International Corporation	1.00	62.1%	2,091	5,050	9,485	546	2.0%	5.8%	0.59x	10.2x
Univar	27.12	84.9%	3,835	6,371	8,539	619	6.0%	7.2%	0.75x	10.3x
Mean		83.6%					13.5%	17.7%	2.29x	12.3x
Median		87.7%					10.3%	16.9%	1.80x	10.9x

Source: Bloomberg, CapitalIQ and company filings, as of 08/27/2018

Commodity Chemicals

Specialty Chemicals

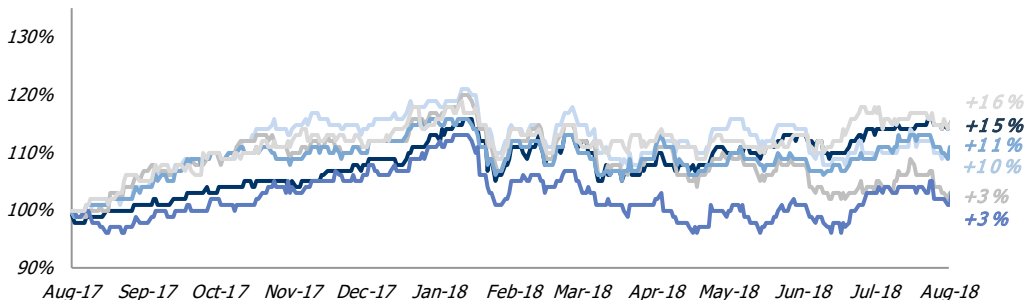
Diversified Chemicals

Ingredients Chemicals

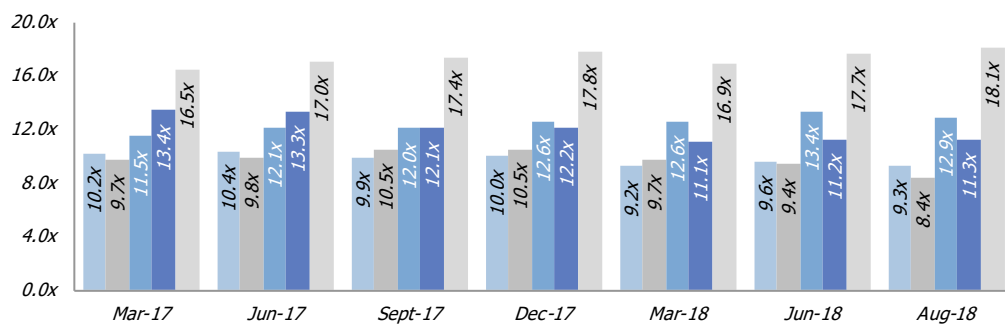
Chemicals Distribution

S&P 500

Chemicals & Materials Index – LTM Relative Stock Price Performance



Chemicals & Materials Index – LTM TEV / EBITDA Multiples



M&A Transaction Recap (Selected Announced Transactions)

Date	Target Company	Target Description	Acquiring Company
Aug-18	Brands of FMC Corporation	Comprises four brands in the herbicide and insecticide categories	Crystal Crop Protection
Aug-18	KMG Chemicals	Provider of specialty chemicals and performance materials	Cabot Microelectronics
Aug-18	ARLANXEO Holding B.V.	Provider of high-performance synthetic rubber materials	Saudi Arabian Oil Company
Aug-18	Antimony Oxide Business	Antimony Oxide Business of Great Lakes Chemical Corporation and Lanxess AG	United States Antimony Corporation
Jul-18	Polypag AG	Manufacturer and developer of polyurethane foam systems	Sika
Jul-18	Athlon Solutions, LLC	Provider of specialty water and process treatment chemicals	Halliburton Company
Jul-18	LCY Chemical Corp.	Manufactures and sells petrochemicals	KKR & Co.
Jul-18	Arysta LifeScience Corporation	Develops, markets and distributes agrochemical solutions	UPL Corporation
Jul-18	Polinox Ind. Com. LTDA	Manufactures peroxides and mold release waxes	Akzo Nobel
Jul-18	Linde	Comprises the majority of Linde's North American gas businesses	CVC Capital Partners
Jul-18	Inhance Technologies	Provider of fluorine-based material technologies	Aurora Capital Partners
Jul-18	Praxair	Comprises a number of Praxair's European industrial gas businesses	Taiyo Nippon Sanso Corporation
Jun-18	Mondo Minerals	Provider of talcum powder	Elementis
Jun-18	Italmatch Chemicals	Manufacturer of performance additives	Bain Capital
Jun-18	S.C. Fabryo	Produces decorative lacquers and paints	Akzo Nobel
Jun-18	Epoxy Technology	Manufactures adhesives and coatings	Meridian Adhesives Group
Jul-18	Walco Corporation	Manufactures and converts adhesive-backed solutions	ADDEV Materials
Jun-18	Clariant	Develops, manufactures and distributes specialty chemicals	Saudi Basic Industries
Jun-18	PlastiComp	Manufactures pre-compounded reinforced thermoplastic pellets	PolyOne
Jun-18	SI Group	Manufacturer of chemical intermediates and specialty resins and solutions	Addivant USA
May-18	ESIM Chemicals	Manufacturer of agricultural and crop protection chemicals	Sun Capital
May-18	JemPak Corporation	Manufactures lubricants, specialty fluids and greases	Henkel Canada
May-18	Yantai Wanhua Chemical	Manufactures and sells chemical product	Wanhua Chemical Group Co.
May-18	Frutarom Industries	Manufactures ingredients in the food and beverage industry	International Flavors & Fragrances
Apr-18	Afton Chemical - Metalworking Fluid Business	Metalworking fluid operations carried out in Bedford Park, Illinois	Italmatch Chemicals
Apr-18	Bayer - Seeds and Crop Protection Businesses	Manufacturer of crop protection chemicals	BASF
Apr-18	COFCO Biochemical	Manufactures natural ingredients for the food and health sectors	COFCO Biochemical
Apr-18	Royce International	Manufacturer of specialty epoxy resins, curing agents and additives	Gabriel Performance Products
Mar-18	Akzo Nobel - Specialty Chemicals Business	Manufacturer of specialty chemicals	The Carlyle Group
Mar-18	Tencate Advanced Composites	Manufactures and distributes carbon fiber composite materials	Toray Industries

Market Intelligence

08/06/2018: Arboris, a Savannah, Georgia-based pine chemicals company, is in a sale process with JPMorgan advising. The company generates around USD 40m in EBITDA. Arboris held some conversations with a few strategics in recent months, including **Ingevity** and Ardian-backed French pine chemicals company **DRT**. The process subsequently broadened to include financial sponsors.

07/31/2018: Elementis Plc, the UK chemicals company, announced today that its board is exploring options in relation to the acquisition of Dutch talc products company Mondo Minerals, as major Elementis' shareholders have expressed concerns about the transaction. Elementis had announced in June that it has agreed to buy Mondo Minerals from Advent International at an enterprise value of USD 600m.

07/18/2018: Evonik Industries, the German specialty chemical company, has sent out preliminary information memoranda for the sale of its methacrylates business. Evonik has mandated Barclays to run the process; CVC Capital, Apollo Global Management, The Blackstone Group and The Carlyle Group are expected to show interest.

07/12/2018: German chemical company Lanxess may sell its water treatment business to AEA Investors, AGIC Capital or a Chinese company. Lanxess kicked off the sale of Lanxess Purification Technologies (LPT) in early March and hired Bank of America Merrill Lynch (BAML) to advise on the sale. The overall division reported EUR 374m EBITDA before exceptional costs on EUR 2.1bn revenues in 2016.

Source: Mergermarket, CapitalIQ, company filings, investor presentations and earnings transcripts

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