

Nabaltec

Making everyday life safer

Nabaltec has proved itself able to deliver revenue growth significantly ahead of the German chemical industry as a whole by concentrating on those applications benefiting from rising demand. Through a sustained programme of investment in capacity and product development and a reputation for quality, it has become the global leader in fine precipitated aluminium hydroxide used as environmentally friendly flame retardants.

FY16 profit dip a one-off

Nabaltec's successful FY15 performance carried over into FY16 as both the Functional Filler division, which supplies materials used as flame retardants, and the Technical Ceramics division, which supplies raw materials used in high performance refractories, showed modest revenue growth. However, profitability was adversely affected by a one-off non-cash adjustment to pension reserves and the temporary closure of the US subsidiary, Nashtec, in August 2016. Since then Nabaltec has supplied its customers in North America with product manufactured in its main European facility, resulting in increased costs. As a result of these two factors, group EBIT reduced by 16% year-on-year.

Key applications to drive growth

The German chemical manufacturers association expects minimal growth in national chemical production during FY17. In contrast, Nabaltec is well positioned to benefit from faster growth in demand for eco-friendly flame retardants for cabling. This is being driven by the EU Construction Products Regulation, which is intended to limit the generation and spread of fire and smoke in buildings and other civil engineering works and comes into force in July 2017. Management expects low single-digit revenue growth in 2017 primarily achieved through price increases in the Functional Fillers segment, coupled with more modest growth in the Technical Ceramics segment and a high single-digit EBIT margin for the year.

Valuation: Trading at a discount to the peer average

Nabaltec is trading at a discount to the mean of our sample of European specialty chemicals companies on all metrics. Since Nabaltec's revenue growth is above average this discount is unjustified, in our opinion. We see potential for share price appreciation as the group demonstrates that it is able to deliver a sustained improvement in EBITDA margins, realised in part through recommencing deliveries from the Nashtec site in early 2018.

Consensus estimates

Year end	Revenue (€m)	PBT (€m)	EPS (€)	DPS (€)	P/E (x)	Yield (%)
12/15	151.3	10.9	0.84	0.15	18.2	1.0
12/16	159.2	9.2	0.67	0.15	22.8	1.0
12/17e	165.5	12.4	1.02	0.19	15.0	1.2
12/18e	176.0	15.1	1.26	0.30	12.1	2.0

Source: Bloomberg

Materials

3 May 2017

Price **€15.27**
Market cap **€122m**

Share price graph



Share details

Code	NTG
Listing	Deutsche Börse Scale
Shares in issue	8.0m
Net debt as at end December 2016	€36.4m

Business description

Nabaltec develops, manufactures and distributes environmentally friendly, specialised products based primarily on aluminium hydroxide and aluminium oxide. It is one of the world's leading suppliers of functional fillers for flame retardants, ceramic raw material and ceramic bodies.

Bull

- Demand for halogen-free flame retardants driven by demand for safety of people and property, and environmental concerns.
- World leader in supply of halogen-free flame retardants based on fine precipitated hydroxides.
- Ability to finance capacity expansion and technology development.

Bear

- Refractory demand linked to global steel output.
- Cost of temporarily shipping product to US.
- Cash drain of capacity investment.

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Company description: High-tech white powders

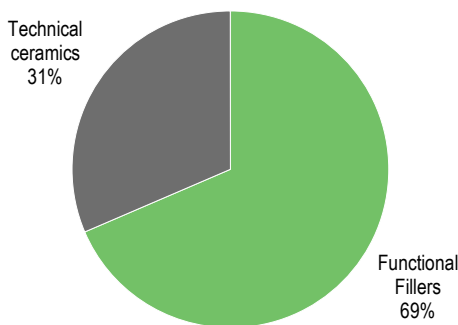
Nabaltec manufactures specialist inorganic chemicals that are used as halogen-free, flame retardant fillers; ceramic raw materials used in the refractory industry, technical ceramics and abrasives; and highly specialised ceramic raw materials used in ballistics protection. Its annual capacity totals around 250,000 tonnes.

Nabaltec's output is used in a diverse range of applications, many of which have been selected by management because they offer the opportunity for higher growth than the average for the German chemical industry as a whole. For example, demand for halogen-free flame retardants is growing because they reduce the production of hazardous fumes in the event of fire and are not subject to stringent regulations when disposed of because they do not contain hazardous substances such as bromine. Demand for higher purity aluminium oxide used to make the linings of steel manufacturing kilns is rising because the use of the oxide results in longer lasting linings, which improves steel manufacturing efficiency. Management estimates that Nabaltec is number one in the global market for functional fillers based on fine precipitated aluminium hydroxide and number three in Europe for technical ceramics. The company has achieved this position through its ability to supply consistently high-quality chemicals that result in technically superior end-products, the breadth of its product portfolio, its ability to develop patentable product applicable to niche growth segments and investment in capacity.

Nabaltec was formed in 1995 through the spin-off of the specialty alumina division of VAW aluminum AG and listed on the German Stock Exchange in 2006. It is headquartered in Schwandorf, Germany, where its European volume manufacturing facility is located. The other sites are in Kelheim, Germany, where there is a pilot plant for product development, and Corpus Christi, US, which is set up for volume manufacturing of fine precipitated aluminium hydroxide functional fillers. Nabaltec has a global network of around 60 agents, through which it supplies c 800 customers in around 60 countries. In FY16 73% of revenues were derived from exports. Nabaltec employs over 450 people.

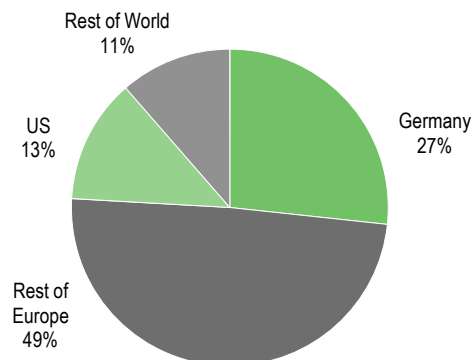
Revenues by division/geography

Exhibit 1: FY16 revenue split by division



Source: Nabaltec data

Exhibit 2: FY16 revenue split by geography



Source: Nabaltec data

Business description

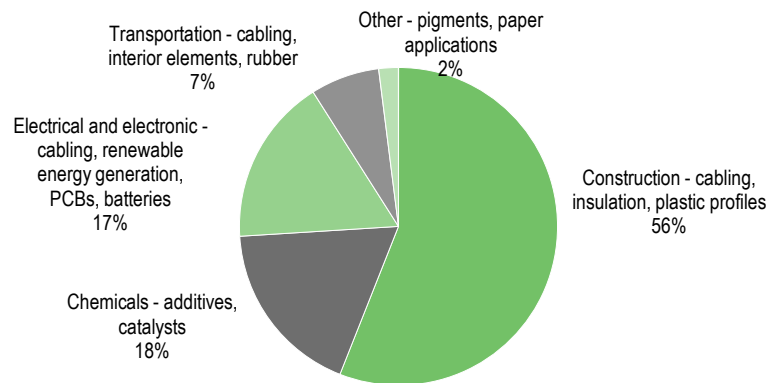
Functional Fillers

Nabaltec manufactures a range of flame retardants based on metal hydrates, primarily aluminium hydroxide, which is sold under the APYRAL brand. When plastic containing the retardant is exposed to a flame, the aluminium hydroxide splits into aluminium oxide and water. The

endothermic process absorbs energy from the ignition source and the water vapour released cools the surface of the plastic and dilutes any flammable gases in the surrounding area. The aluminium oxide residue acts as a barrier to prevent the release of further particulates from the plastic. It also shields the plastic from heat, which could cause further decomposition. Smoke reduction is particularly important for plastics such as PVC (polyvinyl chloride) as they release black, toxic smoke when burned. The retardant fillers make plastics safer without compromising the performance of the consumer product in which they are used.

Aluminium hydroxide is suitable for applications up to 200°C, while magnesium hydroxide is used for higher temperatures (up to 300°C). For the highest temperatures, ie up to 320°C, a newer material, aluminium oxide hydrate or boehmite, is used. Boehmite is supplied for use as a raw material in the manufacture of catalysts used in petrol refining. It is beginning to be used as a flame retardant in the plastic substrate of printed circuit boards and as the coating of separators in lithium-ion batteries, which improves thermal stability, thus improving battery safety. These batteries are key elements in electric powered vehicles and energy storage systems used in conjunction with renewable energy sources.

Exhibit 3: Analysis of application areas for Functional Filler products



Source: Nabaltec data

Demand for non-halogenated flame retardants is growing because of tightening fire safety requirements and increasing attention on the reduction of fumes. This is of particular concern in areas where it is difficult for people to escape quickly, such as tunnels, airports and high-rise buildings and for electronic products that may be taken onto aircraft. In July 2017, the Construction Products Regulation comes into force throughout the EU. This makes it mandatory for new cabling supplying electricity or being used for control or communication purposes to meet the EN 50575 standard regarding performance when subjected to fire. In addition, the enhanced RoHS (Restriction of Hazardous Substances) directive, which comes into force in July 2019, bans the use of polybrominated biphenyls and polybrominated diphenyl ether as flame retardants for plastics in most electronic goods. Polybrominated biphenyls were withdrawn from the market in the early 1970s because of [concerns about toxicity](#). Currently 18% of plastics are treated with halogenated flame retardants compared with 12% (source: Arbeitsgemeinschaft PVC und Umwelt, EFRA) that are treated with halogen-free flame retardants, giving ample opportunity for growth as the industry switches to halogen-free substances. A report published by the Freedonia Group in 2015 noted that the global market for flame retardants totalled 2.2m tonnes in 2013, of which 31.8% (c 700k tonnes) were based on aluminium hydroxide. The report forecast a 4.4% CAGR for aluminium hydroxide type retardants through to 2023. In contrast, production volumes for the German chemical industry as a whole rose by only 0.5% year-on-year during 2016 but prices fell by an average of 3%. (source: VCI (Verband der Chemischen Industrie eV)).

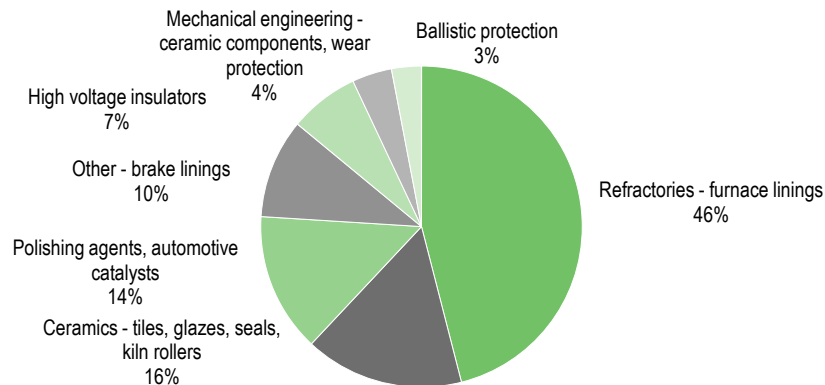
Nabaltec is the world-leader with regards to the volume of fine precipitated aluminium hydroxide sold as a functional filler. This places it ahead of Huber Engineered Materials, CHALCO, INOTAL

and KC Corporation. It has achieved this position through the quality and reliability of its products, its long-term relationship with customers and sustained investment in R&D and capacity.

Technical Ceramics

Nabaltec offers a wide range of specialist branded aluminium oxides, which are used as raw materials for various applications in the ceramics industry. It also manufactures products tailored to specific customer requirements. Aluminium oxide is used in the manufacture of industrial ceramics because the resultant ceramic material has good insulation properties, is very hard and can withstand extreme changes in temperature without expanding or contracting, which improves the lifetime of products. Aluminium oxide powder is also used in high-performance applications outside the ceramics industry, eg as a replacement for asbestos in brake linings, engine catalysts and for polishing powders. Nabaltec’s materials are characterised by their highly consistent properties, which result in enhanced mechanical, thermal, electrical and chemical performance of the finished ceramic products.

Exhibit 4: Analysis of application areas for Technical Ceramics products



Source: Nabaltec data

Nabaltec also offers semi-finished, ready-to-press ceramic bodies based on its own aluminium oxides with additional mineral dopants chosen as appropriate for specific applications. These high-performance ceramics have low shrinkage properties so the dimensions of the finished shape are the same as those defined by the mould, as well as extremely high mechanical strength. Their low weight and extremely high hardness makes them suitable for use as ballistic protection for personnel and vehicles. Their resistance to wear and chemical attack makes the ceramic bodies ideal for seals and other components used in the chemical industry. Their electrical insulating properties and high thermal conductivity make them valuable materials in the electrical engineering and electronics industries. The ceramic material is also resistant to high temperatures, temperature cycling and wear.

Nabaltec is the third largest supplier of technical ceramic materials in Europe, behind Almatix and Alteo, but ahead of Silkem and Huber Engineered Materials. Similarly to the Functional Fillers segment, Nabaltec has achieved this position through the quality and reliability of its products, its long-term relationship with customers and its sustained investment in R&D and capacity. Around half of Nabaltec’s technical ceramic output goes to refractories, where it helps support efficient and sustainable steel production. There is a big difference between the consumption of high-performance speciality aluminas per tonne of steel in Japan (1.3-1.5kg/tonne), which has the most advanced technology, Russia and Central Europe (0.7-0.8kg/tonne), and China and India (> 0.4kg/tonne). This suggests there is potential for the wider adoption of longer-lasting refractories based on higher purity aluminium oxide (referred to as reactive aluminium oxide), were China and India to shift to more efficient production techniques. A report from Roskill published in 2016 noted that the global speciality aluminium oxides market totalled 2.815m tonnes in 2015 and forecast a CAGR of c 4% until 2021, driven primarily by demand for refractory materials. Nabaltec is the

market leader globally in ready-to-press aluminium oxide-based ceramic bodies. However, we note that this market is relatively small, with the principal competition being from companies manufacturing the ceramic bodies in-house.

Strategy

Market-leading positions in growth markets

Nabaltec has identified markets that have good growth prospects (as discussed above) and seeks market-leading positions within these markets. Management estimates that Nabaltec is the largest provider globally of flame retardant fillers based on fine precipitated hydroxides (see above) and is the third largest provider in Europe for aluminium oxide used in refractories, technical ceramics and abrasives and is seeking to grow this area of the business. It is already the market leader globally in ready-to-press ceramic bodies, having invested in a state-of-the-art production facility for these in Schwandorf, although this is a very niche market. The key to achieving these market-leading positions is Nabaltec's reputation as a reliable supplier of consistently high-quality and innovative materials, which underpins its long-term relationship with customers. In addition, Nabaltec has had access to funding that has enabled it to invest in capacity and product development. It has invested more than €160m in infrastructure since 2006. The need for relatively high levels of investment in this industry is a significant barrier to entry.

Globalisation

As the markets served are global, Nabaltec has developed sales channels to address this. In addition to the network of agents, it established a direct sales office in Japan in Q116 to serve the Asia-Pacific market. North American customers are served more efficiently from the Corpus Christi facility, when operational, because the cost of transporting functional filler material and lower value technical ceramics materials is relatively high compared to the sales price.

Product portfolio expansion

Nabaltec is constantly looking for ways to add new products to its portfolio. Through its participation in various European industry bodies, the company is able to identify major trends in its primary markets at a very early stage and on a global scale. It also works closely with customers to develop products optimised to their requirements, by either modifying the qualities of existing products to meet specific needs, or evaluating new applications for existing materials. Nabaltec often undergoes long and intensive approval procedures with its customers, especially for new products. This typically leads to long-term supply relationships and constitutes a significant barrier to entry. Examples of new products include boehmites, which offer flame retardant properties at even higher temperatures, softly calcined aluminium oxides for use in high-quality abrasives, raw materials for alternative energy storage and electric vehicles and Nabacast, a new class of patented cement free materials for making longer-lasting refractories.

Swift response production planning

Since it takes time to switch from one production process to another, Nabaltec has implemented a customised system for planning work and assigning batches with different volumes to equipment of the appropriate capacity. This enables it to optimise margins when demand fluctuates and batch sizes change.

Recent newsflow: Nashtec

In August 2016, Nabaltec suspended production of fine precipitated aluminium hydroxide at its US subsidiary, Nashtec, because its main supplier of raw materials in the US, Sherwin Alumina, was obliged to discontinue output because of Chapter 11 proceedings. Since then, Nabaltec has supplied its customers in North America with product manufactured in its European facilities. In March 2017 Nabaltec acquired the outstanding 49% in Nashtec that it did not already own. Management has already begun to retool the site with the intention of resuming supply to US customers from the site in early 2018.

Management

Johannes Heckmann (CEO)

Mr Heckmann was appointed CEO in January 2017. He has been a member of management at Nabaltec since 1995 and was appointed to the management board with responsibility for production and R&D at the time of the IPO in 2006. Prior to joining Nabaltec, Mr Heckmann worked as a project manager for AKW Amberger Kaolinwerke and at Schindler Aufzüge.

Günther Spitzer (CFO)

Mr Spitzer was appointed CFO in January 2017 and is responsible for finance, administration and HR. He joined the business that would become Nabaltec, VAW aluminium's Schwandorf plant, in 1985 as a commercial employee, became the head of the finance department in 1998 and director of finance in 2009.

Dr Michael Klimes (COO)

Dr Klimes was appointed COO in January 2017 and is responsible for R&D/technical service, production and sales. On completion of his chemistry studies, he joined the Speciality Alumina division of VAW aluminum AG in 1992 as a sales manager. In 1995 he became the hydroxides sales manager at Nabaltec and has headed the Functional Fillers division since 2007. He served as chairman of the Phosphorus, Inorganic and Nitrogen Flame Retardants Association from 2009 to 2016 and is now vice chairman of the organisation.

Shareholders

The shareholder list is dominated by two families: that of the current CEO, Johannes Heckmann, and that of Gerhard Witzany, who retired from the management board in December 2016. The largest institutional investor, Invesco, holds a 5.1% stake.

Exhibit 5: Significant shareholders

Shareholder	Holding
Heckmann family	31.2%
Witzany family	29.9%
Invesco	5.1%
VPB Finance SA	4.7%
LRI Invest SA	3.3%

Source: Bloomberg

Financials

Exhibit 6: Financial summary

€000s	2014	2015	2016	2017e	2018e	2019e
Year end 31 December	IFRS	IFRS	IFRS	IFRS	IFRS	
Profit & loss						
Revenue	143,335	151,346	159,215	165,500	176,000	188,500
EBITDA	22,369	24,691	22,909	26,550	29,250	32,400
Operating Profit	12,673	14,521	12,230	15,500	18,050	21,250
Profit Before Tax (FRS 3)	8,522	10,850	9,162	12,350	15,050	18,600
Tax	(2,451)	(3,408)	(3,878)	-	-	-
Profit After Tax	6,071	7,442	5,284	7,400	8,100	9,910
Balance sheet						
Fixed Assets	112,499	117,108	127,013	-	-	-
Current Assets	66,314	84,784	75,685	-	-	-
Total assets	178,813	201,892	202,698	-	-	-
Equity	52,461	58,102	57,765	-	-	-
Non-current liabilities	88,960	101,621	111,520	-	-	-
Current liabilities	37,392	42,169	33,413	-	-	-
Total equity + liabilities	178,813	201,892	202,698	-	-	-
Cash flow						
Operating Cash Flow	22,042	22,448	29,829	-	-	-
Net Cash Flow	(2,886)	14,667	(6,279)	-	-	-
Closing net debt/(cash)	44,163	41,276	36,386	33,600	38,100	24,500

Source: Nabaltec accounts, consensus estimates from Bloomberg

Nabaltec's successful FY15 revenue performance carried over into FY16 as both divisions showed modest growth. However, profitability was adversely affected by a one-off non-cash adjustment to pension reserves and the temporary closure of the US subsidiary, Nashtec, in August 2016. Since then, Nabaltec has supplied its customers in North America with product manufactured in its European facilities, which has resulted in increased costs and a reduction in EBIT.

Income statement

Exhibit 7: Revenue and margin progression

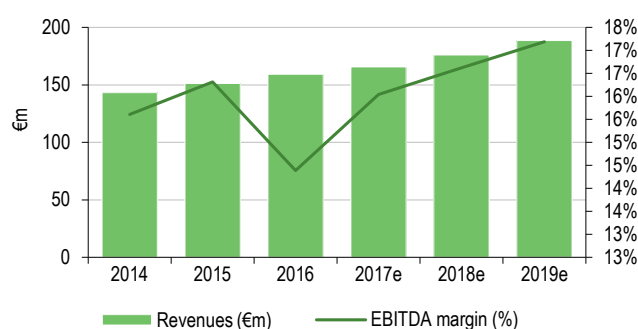
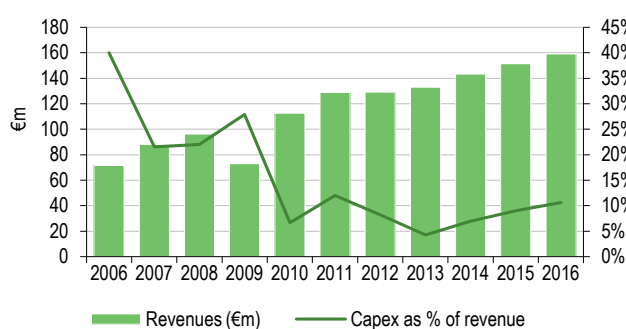


Exhibit 8: Revenue and capex development



Source: Nabaltec accounts, Bloomberg consensus estimates

Source: Nabaltec accounts, Bloomberg consensus estimates

Total revenues rose by 5% (€7.9m) year-on-year during FY16 to €159.2m as both divisions showed modest growth. Revenues from Functional Fillers grew by 7% to €109.1m, driven by an increase in volumes. Boehmite revenues rose by 69%. Although boehmite does not represent a meaningful percentage of the total currently, this extremely strong growth indicates the potential for this new, high-margin product category. For the same period, revenues from Technical Ceramics increased by 2% to €50.1m, driven by volume growth, particularly in reactive alumina for longer-lasting refractories.

Cost of materials as a percentage of revenues reduced by 1.7pp to 50.7% because of a greater proportion of higher-value products and favourable gas prices during H216. Personnel costs increased by 18% (€4.9m) to €31.7m. This was partly due to an increase in the number of staff employed from 444 at end FY15 to 460 at end FY16, and partly due to a one-off non-cash item related to the impact of changes to the management board on pension reserves. Other operating expenses increased by €1.9m to €26.2m because of higher freight and other costs relating to the temporary closure of Nashtec, higher sales commissions and the expansion of sales activities in Asia and the US. EBIT margin fell by 1.8pp to 7.7%, EBIT by 16% (€2.3m) to €12.2m. Net interest payments fell by €0.6m, reflecting complete repayment of all bilateral loans, although this was partly offset by a €0.5m rise in income tax, which included a €0.8m adjustment in the losses carried forward associated with Nashtec. Management maintained DPS at €0.15, demonstrating its confidence that the dip in profits in FY16 is a one-off related to the temporary closure of Nashtec.

Balance sheet and cash flow

Net cash flow from operating activity was 30% higher in FY16 compared to FY15, even though EBIT was lower, because of favourable working capital movements. Net debt reduced by €4.9m during FY16 to €36.4m at the year end, cutting gearing from 71% to 63%. While gearing remains relatively high, it reflects the high levels of investment currently being made in the manufacturing facilities. The net total investment in FY16, which includes government grants, was €16.8m (FY15: €13.9m). Around three-quarters of the investment (€13.7m) was devoted to the Functional Fillers division for enhancing the production process, reducing energy consumption and increasing capacity for fine precipitated aluminium hydroxide. The €5.3m investment in the Technical Ceramics division was spent primarily on expanding capacity for high value-added products and optimising production processes. This level of investment is a relatively high proportion of the cash generated from operations (€22.9m net operating income before changes in working capital in FY16). However, it is necessary to provide sufficient capacity and to keep the product portfolio focused on growth niches, especially as new applications such as electric vehicles and renewable energy storage solutions are identified.

Catalysts and the future

VCI does not expect strong growth in German chemicals production in the coming year, with a growth rate of 0.5%. In particular, it expects political uncertainty and mounting economic risks in foreign markets to inhibit growth within the industry. However, Nabaltec is well positioned to benefit from faster growth in demand in eco-friendly flame retardants in cabling. This is being driven by the EU Construction Products Regulation, which is intended to limit the generation and spread of fire and smoke in buildings and other civil engineering works and comes into force in July 2017. Management expects Nabaltec to remain on a moderate growth course in 2017 with low single-digit revenue growth achieved primarily through price increases in the Functional Fillers segment accompanied by more modest growth in Technical Ceramics. Management expects a high single-digit EBIT margin for the year. It notes that investments will be higher than FY16, primarily because of expansion and modifications at Nashtec and transferring R&D and prototyping capability from Kelheim to Schwandorf.

Nabaltec ended FY16 with an order book totalling €37.1m, compared to €25.9m at end FY15. While this is encouraging, some of this growth is attributable to the longer delivery times needed because of the temporary shift of production from the US to Germany.

Valuation

As none of Nabaltec's European or North American competitors are listed, we use a sample of European companies involved in the manufacture of speciality chemicals or using specialist chemical processes to provide a service. Based on consensus estimates, Nabaltec is trading at a discount to the mean for this sample on all metrics. Since Nabaltec's revenue growth is higher than the mean, this discount, in our opinion, is unjustified. We see potential for share price appreciation as the group demonstrates that it is able to deliver a sustained improvement in EBITDA margins, realised through the successful implementation of price increases in the Functional Fillers segment and the recommencement of deliveries from the Nashtec site in early 2018.

Exhibit 9: Multiples for European chemicals companies

Company	Market cap (€m)	Current EV/sales	Next EV/sales	Current EV/ EBITDA	Next EV/ EBITDA	Current P/E	Next P/E	Sales CAGR (%)
Akzo Nobel NV	20,237	1.4x	1.4x	9.6x	9.2x	18.7x	17.8x	3.4%
Bodycote PLC	1,881	2.4x	2.4x	9.3x	8.9x	20.1x	18.8x	9.2%
Clariant AG	6,190	1.3x	1.2x	8.6x	8.1x	16.2x	15.0x	-
Croda International PLC	5,836	3.9x	3.8x	13.9x	13.0x	22.0x	20.4x	11.2%
Elementis PLC	1,300	1.7x	1.6x	8.9x	7.9x	15.9x	14.2x	7.8%
Encres Dubuit	14	0.5x	0.5x	4.4x	7.9x	61.4x	26.9x	-
Evonik Industries AG	14,332	0.9x	0.9x	5.7x	5.4x	15.5x	14.2x	7.1%
FUCHS PETROLUB SE	2,851	1.1x	1.1x	6.3x	6.0x	21.1x	20.2x	15.9%
Givaudan SA	16,513	3.8x	3.6x	16.7x	15.6x	25.1x	23.3x	5.6%
Holland Colours NV	60	0.7x	0.7x	5.9x	5.4x	12.9x	11.6x	8.8%
Johnson Matthey PLC	6,851	0.5x	0.5x	9.8x	9.2x	14.8x	13.8x	10.9%
Kemira OYJ	1,816	0.9x	0.9x	7.2x	6.4x	15.5x	12.8x	5.3%
Koninklijke DSM NV	11,912	1.7x	1.6x	10.3x	9.6x	18.2x	16.4x	2.2%
Nanogate AG	208	1.5x	1.4x	13.4x	10.4x	82.4x	48.2x	76.3%
ORAPI	41	0.4x	0.4x	6.8x	5.6x	11.4x	8.9x	17.9%
Symrise AG	8,377	3.2x	3.1x	14.9x	13.9x	26.5x	24.2x	18.7%
Umicore SA	6,003	0.5x	0.6x	11.0x	9.9x	21.9x	19.8x	8.5%
Victrex PLC	1,948	5.8x	5.4x	12.6x	11.6x	18.6x	16.8x	23.2%
Wacker Chemie AG	5,059	1.1x	1.1x	5.7x	5.4x	22.2x	17.6x	8.2%
Mean		1.5x	1.5x	9.1x	8.5x	18.6x	16.8x	10.2%
Nabaltec AG	122	1.0x	0.9x	6.0x	5.4x	15.0x	12.1x	19.2%

Source: Bloomberg. Note: Prices at 2 May 2017. Grey shading indicates exclusion from the mean.

Sensitivities

- **Sales:** As discussed, the length of time customers take to evaluate materials means that relationships tend to be long lasting. Moreover, Nabaltec is able to customise materials, making switching suppliers even more onerous.
- **Regulatory issues:** Currently Nabaltec is the beneficiary of regulatory changes as these are creating market opportunities, although the implementation of the 2017 Renewable Energy Act will have a detrimental effect because of an increase in electricity tariffs.
- **Technological change:** Changes in technology could lead to customers switching to alternative materials. Nabaltec addresses this risk by maintaining close contact with its customers and developing new materials for them, so this also represents an opportunity.
- **Environmental protection:** Nabaltec addresses the potential risk of exceeding admissible levels of noise and dust emissions or emitting hazardous substances through extensive environmental management based on ISO 14001. It also uses closed loop production processes so the amount of water and caustic soda used is minimised.
- **Economic cycle:** Demand for refractories depends on the strength of the global steel industry, which is subject to volatility.

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