Evonik Catalysts – growth through acquisition in India

With the acquisition of Monarch Catalyst Pvt. Ltd., India’s largest catalyst producer, Evonik is significantly expanding its catalyst portfolio – Strengthening market presence in India and the Asian region – Monarch renamed Evonik Catalysts Pvt. Ltd.

Monarch has been part of Evonik’s Catalysts Business Line for almost one year now. “It’s time for Catalysts Insight to introduce Evonik Catalysts India Pvt. Ltd. (ECI) and take a look at the newest member of Evonik’s catalyst family,” says Wilfried Eul, head of the Catalysts Business Line. Though ECI has been part of Evonik for less than a year, the company has been operating successfully in this market for several decades. It was established in 1973 as
Editorial

Dear Readers,

In Catalysts Insight in June 2014, I commented on the fact that the market was being flooded with cheap money: “Playing with inflation is a dangerous game. Individuals, pension funds, and insurance companies are paying for governmental debts with negative returns on their capital.” Well, it happened and it will be even worse over the coming years with more cheap money from the ECB, even stronger creeping expropriation of savers and strong, well-managed economies in favor of highly indebted economies. The stock markets rejoice and investments in new chemical capacities also benefit from this. Since there is very little chemistry without catalysts, naturally this trend also helps our industry – if it wasn’t for the low oil prices and the reduced economic growth in China of “just” 7%. However, North America has been able to revive itself as an attractive chemical location and will also ensure the long-term competitiveness of this region. Though, the catalyst market is also continuing to grow in the areas of oil refining as well as industrial and petrochemicals. The return of Iran to the world economy will also have a positive impact.

The catalyst market segment “Life Sciences & Fine Chemicals” has its own dynamics, because there is only a weak dependence on petrochemical raw materials. In this area, demand is growing for cost-efficient active pharmaceutical ingredients and for agrochemicals to ensure that there is sufficient food for the increasing world population, especially in Asia and Africa. In addition, India and China have become the “drugstore of the world.” Active pharmaceutical ingredients, particularly generic drugs, intermediates, vitamins, agricultural active ingredients and many other fine chemicals are increasingly produced in these two large economies. Consequently, Evonik has strengthened its presence in this market (India) with the acquisition of Monarch Catalyst Pvt. Ltd. In Catalysts Insight 2015, we included just a short note about the signing of the contract. We will now make up for this and the new company Evonik Catalysts India Pvt. Ltd., which evolved from Monarch, will be the main focus of this issue.

Time to say goodbye

Dear Readers, in this issue of Catalysts Insight I would like to say goodbye to you all. After 7 years as head of Evonik’s catalysts business and 31 years working for Evonik and its predecessor Degussa, at the “relatively young” age of 61, I have decided to take early retirement on July 1, 2016. You will find an introduction to my successor, Dr Steffen Hasenzahl, on page 11. I would like to thank all customers, partners, suppliers, and friends of Evonik’s catalysts business for their loyalty and the great collaboration over the years and hope that you continue to create value together with Evonik’s Catalysts Business Line for the benefit of everyone concerned.

As always: Please share your opinions and tell us about topics that you would like to read about at www.evonik.com/catalysts

Enjoy this issue

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Monarch Catalyst Pvt. Ltd. by two Indian engineers, and produced nickel catalysts for oils and oleochemical products in the Dombivli industrial/chemical park near Mumbai (capital of the Indian state of Maharashtra). Monarch draws on its own in-house technologies in its production of dry reduced nickel catalysts for the hydrogenation of natural oils and fats (OFC). The company with its roughly 300 employees is now one of the world’s leading suppliers of this type of specialty catalysts.

In 1982, just ten years after its founding, Monarch began to recycle nickel from used catalysts (catalysts on silica-based support for the hydrogenation of both oils and fats, as well as metallic Raney-type nickel catalysts). Monarch purchased these used catalysts not only from its customers but also on the general market. Following a multi-year process optimization phase, focused on recovering base metals from different types of used catalysts, an economically attractive rate of metal recovery had been achieved. Recovering metals from spent catalysts not only solved an environmental problem, it helped customers to recycle their used catalysts and redirect the metal content back into the material cycle. Since these kinds of spent catalysts are often classified as hazardous waste, the recycling company needs special permits to ensure environmentally friendly processing. Innovations had been constantly integrated into the recovery process, which makes it increasingly cost-efficient. Customers were delighted, because Monarch passed the cost advantages on to them, both directly and indirectly, which allowed it to remain competitive in its market.

Twenty years later, in 2002, Monarch acquired the company Kallin Intermediate Pvt. Ltd. Kallin produced activated metal catalysts and supported precious metal catalysts, and therefore blended
in perfectly with the existing activities. In 2004, Monarch acquired a large site in the Maharashstra Industrial Park in Dombivli for the further expansion of its production facilities. At the new site, located not far from where the company was founded, Monarch built advanced facilities for the production of catalysts for the hydrogenation of oils and fats, activated metal catalysts, and precious metal catalysts, as well as facilities for recovering metals from used catalysts.

A key step in the OFC production was a fluidized bed reactor that was developed in-house and commissioned in 2005. Monarch thus became a pioneer in catalyst technology in India and one of the worldwide leading producers of catalysts for the hydrogenation of oils and fats. As a result of increased demand from the export market, Monarch was able to further expand its production site between 2005 and 2007. The synergy of its activities in base metal and precious metal catalysts, combined with decades-long experience in the catalyst industry, enabled the company to expand this global position and keep meeting new challenges. Monarch benefited from the fact that new production technologies were constantly being introduced, new catalysts and new markets were being developed, and at the same time, strict quality and environmental control regulations were fulfilled. To improve the quality and performance of the catalysts, the specialists at Monarch constantly made improvements to the production processes through intensive research and development. The focus of this work was always to offer customers a complete package: from technical support in using the catalysts in the customers’ processes, helping to solve problems, through to spent catalyst recycling. Here, as in other areas, all signs constantly pointed to expansion.

To continue this expansion strategy, the proprietors of this family-owned company made the decision to seek assistance from international partners, and entered into negotiations with Evonik in 2013. The outcome is well known: Evonik acquired Monarch Catalyst in June 2015. “Evonik’s motives,” says Eul, “were primarily to expand the portfolio with OFC catalysts, strengthen our market position in India, and expand the global presence of our catalyst business.”

Evonik’s Catalysts Business Line is a globally leading supplier of specialty catalysts, customer-specific catalysts, and catalyst components for the “Life Sciences & Fine Chemicals”, “Industrial & Petrochemicals”, and “Polyolefins” market segments. Monarch’s worldwide activities in the field of catalysts for hydrogenation of oils and fats expand Evonik’s catalyst portfolio in the relevant market segments. It also represents a boost for Evonik’s market position in activated metal catalysts and precious metal catalysts in India and the Asian market. The existing customers of Monarch will be served also in the future through the proven sales channels. Evonik’s production network for catalysts also includes the German sites in Hanau, Marl, and Rheinfelden, as well as the international sites Calvert City.
Humans’ use of oils and fats has become firmly established over the last few millennia, taking a variety of forms and also by using advanced technologies.

Today we use oils, fats, and oil derivatives in our everyday lives in a wide variety of ways — either directly as food or healthcare products, or indirectly in industrial applications by making products that meet countless consumer needs.

The primary sources of vegetable oils are fruits, nuts, and seeds, which are used for producing sunflower oil, palm oil, coconut oil, soybean oil, rapeseed oil, peanut oil, and castor oil. Other oils include those extracted from the germ of corn or rice. Specific geographic, climatic, and environmental conditions are responsible for concentrating oil production in specific regions on earth. Large quantities of palm oil are obtained from equatorial nations such as Malaysia and Indonesia. Castor oil, on the other hand, comes from dry regions in India, China, and Africa, while soybean oil is produced primarily in North and South America. Oils and fats are also obtained from animal sources — a major portion of this comes from meat, fish, and dairy products.

From a chemist’s perspective, oils are triglycerides — esters of glycerol and fatty acids — regardless of their original sources, and their composition does not vary, except with respect to the natural antioxidants they contain. Over the past 100 years, hydrogenation of oils has become extremely important, as it solidifies oils and fats, and extends their shelf life. The hydrogenation process utilizes a catalyst such as nickel, which acts on the double bonds of unsaturated fatty acid groups, by saturating them with hydrogen. The process turns (poly-)unsaturated fatty acid glycerol esters (such as those found in vegetable oils) into glycerol esters of saturated fatty acids. This transforms liquid oils into...
solid fats. In addition to solidifying the oils (raising their melting points), hydrogenation also improves shelf life and elevates the smoke point.

In terms of the function of an oil, a classification system has been developed for determining an oil’s suitability for human consumption, i.e., for dividing oils into edible oils and non-edible oils. Various types of hydrogenation processes come into play here.

**Hydrogenating edible oils:**
Edible oils are generally vegetable oils that undergo multiple processes to remove undesired components. To make them suitable for human consumption, most edible oils are refined by neutralizing, bleaching, improving their smell, etc. Oxygen in the air readily attacks fatty acid chains in triglycerides containing double bonds, and this manifests itself in a rancid smell that renders the oils unsuitable for use. Limiting the degree to which oil quality deteriorates means having to minimize the number of double bonds; one of the important steps in the process chain is hydrogenation, in which oils are converted to saturated components with the desired properties. The most suitable catalyst used today for hydrogenating oils and fatty acids is nickel on a porous, inorganic substrate — a system that offers a superior price-performance ratio.

Industrial-scale hydrogenation is used in a wide variety of applications, with nickel catalysts used for bringing the melting point of triglycerides up to the level desired for use in food. Examples include the following:
- fats for the baking industry (= shortening) (for pastry dough, for making cakes and baked goods soft, etc.)
- dessert ingredients that enhance compatibility with cocoa butter and chocolate coatings
- a solid base for the production of (vanaspati) ghee in India
- a component of easy-to-spread butters and/or margarines

**Hydrogenation of non-edible oils:**
Hydrogenating the C-18 unsaturated fatty acids (including isomers such as oleic acid, linoleic acid, or linolenic acid) obtained from cleaving triglycerides yields stearic acid, which has many uses in industry. Hydroxystearic acid (HSA), for instance, which is obtained by hydrogenating castor oil, is used in a variety of industrial applications. This is also a case in which the most suitable hydrogenation catalyst for converting unsaturated fatty acids is nickel on a porous, inorganic substrate — a system
that offers a relatively better price-performance ratio. Stearic acid manufacturers use selective nickel catalysts to fully hydrogenate unsaturated fatty acids. Stearic acids in which the content of unsaturated fatty acids is negligible (iodine value/I.V. < 0.5) provide the stability that end products need for use in high-temperature applications. Typical applications of stearic acid:

- in the form of metal stearates: treating metallic surfaces and surface finishing
- coating metals in pyrotechnic applications to prevent oxidation
- large-scale use in the production of rubber tires and other molded rubber products
- production of fatty alcohols, which are used in large quantities for manufacturing detergents, soaps, shampoos, shaving foam, etc.

- production of fabric softeners for sizing textiles (along with hydrogenated derivatives of castor oil). Known as biofuels, hydrogenated fatty acid methyl esters are used in large quantities as alternative fuels. The use of hydroxystearic acid is very common among manufacturers of lubricants, cosmetics, etc.

### Advanced catalyst technology: MONCAT™

The chemical and physical composition of every vegetable oil — edible or not — is different, as it has its unique contamination profile. These properties result from the region where the oil plant is grown and the predominant climatic conditions. These different characteristics of the oils, however, determine the choice of technology and catalyst for a given hydrogenation process to gain the converted oil.

Over the past four decades, Evonik Catalysts India (ECI) — formerly Monarch Catalyst (see cover story) — has used these circumstances and principles as a basis for its extensive development of the MONCAT™ family of catalysts, and, in so doing, has greatly advanced a comprehensive understanding of market and customer needs.

MONCAT™ products are now sold worldwide as hydrogenation catalysts for oils and fats (OFC) into all important countries and are used successfully in the corresponding industries. Special grades of MONCAT™, which are available for hydrogenating both, edible and non-edible oils, are hallmarked by their high yields and rates of conversion while offering an excellent price-performance ratio. The mission of ECI is to develop catalysts tailored to the needs of the user, to produce these catalysts on an industrial scale, and to continue

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<tr>
<th>Overview MONCAT™ Products</th>
<th>Ni-content</th>
<th>Reaction</th>
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<tbody>
<tr>
<td>MONCAT™ 1991</td>
<td>&gt; 21 %</td>
<td>Full hydrogenation of fatty acids</td>
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<tr>
<td>MONCAT™ 2021</td>
<td>&gt; 21 %</td>
<td>Full hydrogenation of triglycerides</td>
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<tr>
<td>MONCAT™ 2991</td>
<td>&gt; 21 %</td>
<td>Hydrogenation of monomer acids</td>
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<td>MONCAT™ 3921</td>
<td>&gt; 17 %</td>
<td>Partial hydrogenation of triglycerides</td>
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<tr>
<td>MONCAT™ 1051</td>
<td>&gt; 17 %</td>
<td>Sulfur promoted for high trans fats in special applications</td>
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improving them in close cooperation with customers. Offering customers and users excellent, timely service rounds out the MONCAT™ portfolio.

ECI originally produced a few metric tons of MONCAT™ products per year — a figure that has since grown to several thousand metric tons annually, underscoring the technological progress and success that ECI has enjoyed among its users throughout the world.

MONCAT™, in other words, is more than a symbol of excellent performance — it also stands for continuous development in close collaboration with our customers.

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The fundamentals of fat hardening can be found in a patent from 1901. Since the technology has been continuously developed, today several million tons of oils and fats are hardened every year. More stringent labeling regulations for fatty acids protect consumers today.

In the early days of the 20th century, a groundbreaking discovery was made in Herford (Germany) that has had an enormous influence on the way we eat. Back then, in 1901, chemist and biologist Wilhelm Normann invented a process to convert liquid oleic acid into solid stearic acid by means of catalytic hydrogenation on finely distributed nickel. One year later, the German Patent Office awarded Normann’s process Patent No. 141 029. This was developed over the following decades through technical advances and also the commitment of science and industry — but the fundamental features are still the same. With Wilhelm Normann’s process it is possible to realize more value with relatively inexpensive and easily available vegetable oils by converting them into products with improved properties. They are characterized by a higher melting point and the associated solidification, a longer shelf life, and higher temperature stability. This has made the production of important food, such as margarine, much cheaper and widely affordable for many people.

More recently, food legislators are increasingly distinguishing between favorable and unfavorable fatty acids — which also has consequences for producers and raw material suppliers, as they have to change their production and processing methods (e.g. changing the reaction conditions and/or the catalysts to achieve the desired or required saturation level of the fatty acids that are used). Favorable fatty acids are monounsaturated fatty acids — they maintain a normal blood cholesterol level in humans. Such desired fatty acids can be found in vegetable oils, margarine as well as in fish, fruit, and vegetables. On the other hand, unfavorable fatty acids are fats with completely saturated fatty acids and unsaturated trans fatty acids that can increase cholesterol levels and can cause cardiovascular diseases. Examples of these are butter, cheese, and meat from ruminants or even french fries. Various measures have been taken over the past years to draw consumers’ attention to this and to avoid unfavorable fatty acids in the future.

Measures to protect consumers against unfavorable trans fatty acids

- Since 2006, labeling of trans fatty acids on US foods
- Between 2003 and 2012, reduction in consumption of trans fatty acids by 78 percent in the US
- 2015 loss of GRAS (generally recognized as safe) status in the USA
- 2015 to 2020 ban on trans fatty acids in food within the scope of the European Action Plan from the World Health Organization (WHO)

The food and chemical industries are intensively involved in the implementation of this package of measures. Not only because of their social responsibility, but also because of the provision and development of suitable technical processes. For example, trans fat free food can be produced through the interesterification of fully hydrogenated oils (FHO) with unsaturated oils. FHO can be produced by hardening (hydrogenating) oil with the help of Evonik catalysts.

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In the hydrogenation of sugars to polyols, Evonik assists its customers from the chemical reaction, through process optimization, to recycling of the separated catalysts.

Whether used in foods, pharmaceuti-
cals or cosmetic products, polyols have a broad range of applications. The “sugar alcohols”, a group of organic compounds (derived from natural sugars) with several hydroxyl groups (-OH), are used in such products as tooth-friendly sugar substitutes in chewing gums, toothpaste, and mouthwash. Other application fields include moisturizers in hand creams, as well as synthesis components for other products like vitamin C. Because of their versatility, the market for polyols is several million metric tons large and growing at an annual rate in the mid-single-digit percentage range. Outside Europe, most of the producers of sugar alcohols are located in Asia, as well as in North and South America.

To produce polyols, a starchy raw material is extracted from corn, cassava root, or potatoes, and is then converted to sugar. The sugar is hydrogenated to the end product using hydrogen under high pressure and at high temperatures. A catalyst is needed because the hydrogen molecule requires high activation energy for the reaction. Evonik offers three heterogeneous Raney-type nickel catalysts specifically for this application: MC 813, MC 814, and KALCAT™ 6104. These products can be used, for example, for the production of the sugar alcohol sorbitol (see Figure 1), which is used to produce L-ascorbic acid (vitamin C) and other organic molecules. The plant type and technical design of the hydrogenation reactors determine which of the catalysts is used. Many equipment manufacturers prefer Evonik catalysts, because they guarantee excellent selectivity and activity, together with a high rate of reuse (number of cycles). Evonik continuously strives to further improve the nickel catalysts and design them to specific customer needs.

Customers benefit not only from the high-quality products but also from Evonik’s technical customer service. Evonik’s support staff train users on site in the correct handling of the catalysts and provide information for optimal process management, all the way to disposal and metal recovery from the spent catalyst. Evonik Catalysts India (ECI) buys used nickel catalysts from customers on the basis of the market price for nickel (see article on page 9).

To further improve its service in the key Asia-Pacific region, and especially in Southeast Asia, Evonik has established a catalysts sales office in Singapore on April 1, 2016.

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Recycling spent catalysts and materials containing base and precious metals contributes considerably to sustainable development and environmental protection. Evonik Catalysts India (ECI) has always embraced this idea, and is complementing its activities with corresponding recycling and environmental protection measures at its manufacturing site in Dombivli.

Used catalysts are typically classified as waste materials, often as hazardous to health and the environment. Since they frequently contain organic solvents and reaction products, they may get classified as combustible, corrosive, reactive, and sometimes even toxic. But they may also contain precious metals or other valuable metals. In 1982, Evonik Catalysts India (ECI), formerly Monarch Catalyst (see also the cover story), began construction of a plant for metal recovery for all types of used and deactivated catalysts that contain nickel. The plant allowed ECI to obtain economically attractive metal yields from used catalysts. Since then, this method of recovering metals has helped customers dispose of spent catalysts that are generated in their plants, and at the same time, obtain value for reusable metals. A recycling process organized in this way allows further use of the metal extracted by ECI as metal salt solutions, which sets in motion an indirect metal cycle with corresponding cost advantages for customers. In providing this service, ECI continues to be one of the leading nickel catalysts suppliers in India, with many – and steadily increasing – satisfied customers. These eco-friendly processes are part of ECI’s responsible care, in which the used nickel-based catalysts are the raw material for nickel salts to be converted in fresh catalysts again. This process helps the environment, and creates significant added value for its customers.

In 2005, the company launched another recycling process for used precious metal catalysts that is also able to recover the smallest recyclable concentrations: The processes at ECI are designed in such a way that they can extract precious metals from used material with an average metal concentration of below 0.1 weight percent.

Today, ECI operates an extremely efficient precious metal recovery plant that is able to extract such metals as palladium (Pd), platinum (Pt), rhodium (Rh), and ruthenium (Ru) from solid and liquid materials at high yields. In the precious metals cycles, each spent catalyst material undergoes customer-specific processing and the precious metal is given back to the customer for the production of fresh catalysts.

ECI is authorized accordingly by the Indian Ministry of Environment and holds the necessary licenses to import and recycle waste materials from other Indian states and even from foreign countries. Moreover, all refining techniques and operative steps at ECI meet Evonik’s and all legal ESH requirements and are designed to global standards. In its recycling activities, ECI does not limit its attention to the local Indian market. Its objective is also to support international customers, especially in Southeast Asia, in the recycling of base and precious metals. The company’s environmental guidelines facilitate this goal and are just as vital to its approach to customers in the Asian markets as to the protection of the environment.

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Mr. Davey, it has been well over a year now since Evonik bought Monarch Catalyst in Dombivli (India). From today’s standpoint, what is your view on the acquisition?

Monarch’s catalysts business simply fits in very well with Evonik’s catalysts business. On the one hand, Monarch’s catalysts for oil and fat hydrogenation broaden our portfolio – Monarch had excellent know-how in this area and a leading position globally. On the other hand, it strengthens our position in India for non-ferrous metal catalysts and precious metal catalysts – markets which both companies were active in. Evonik is a leading company in the field of catalysts and catalyst components for the market segments of “Life Sciences & Fine Chemicals”, “Industrial & Petrochemicals” and also “Polyolefins”. For us, the acquisition represents a definite boost for our positions in the two market segments I mentioned first. Monarch acquisition has also helped Evonik in the adjacency – with Oil & Fats Catalyst in the portfolio, we are able to tap these markets. The company now runs under the name Evonik Catalysts India Pvt. Ltd. For us, it means more than just switching name signs – it represents the integration of our Indian subsidiary in our global network of catalyst production sites around the world and it gives the company a warm welcome.

When a major international company like Evonik takes over a much smaller company in India, it surely comes along with a lot of challenges, right?

First of all I must say that with its products, Monarch Catalyst was also a globally active company and remains so as Evonik Catalysts India. All customers around the world continue to receive the service they were accustomed to. It is of course part and parcel of an acquisition like this that you have a clash of different national cultures and corporate cultures, which can certainly result in interesting interpretations. But I can very confidently say that we came together with a great deal of mutual respect for one another because we recognize each other’s strengths. It opens up new opportunities for our new Indian colleagues, and having the might of a major specialty chemicals group behind you helps to open certain doors. Evonik also benefits from the know-how of the colleagues here in India, and above all their connections to customers and users. And, who knows – there’s still space at our premises in Dombivli for further investments by Evonik.

How do you view the development of the catalysts market in India – in general, and for Evonik in particular?

We believe that this acquisition fits in well with the changes in India. In India, politicians give economic growth high priority. The Indian subcontinent has proven its great potential on many occasions. We would love to see new dynamics unfold here. Catalysts are one of the biggest value drivers in the chemical industry – they are responsible for making processes and products more efficient. Along with positive economic development, we are also expecting to see positive development in the market for catalysts. For Evonik, the Catalysts Business Line is a pearl in the portfolio – and we are pushing for its growth worldwide.
New Head of Evonik’s Catalysts Business Line

As of July 1, 2016, Dr Steffen Hasenzahl will be the new Head of the Catalysts Business Line at Evonik Resource Efficiency GmbH, and thus successor to Dr Wilfried Eul.

After studying chemistry at the University of Stuttgart (Germany) and the University of Cincinnati (Ohio, USA), he returned to the University of Stuttgart to earn his doctorate. Hasenzahl began his career in 1995 as a scientist in Research and Applied Technology for Chemical Catalysts and Zeolites at the former Degussa AG in Hanau (Germany). He became head of the Zeolite Catalyst team only two years later. In the year 2000, he took on the team leadership for the newly created silica application lab for Pharameceuticals and Cosmetics. Four years later, he moved to Parsippany (New Jersey, USA), where he first worked as Marketing Manager for Degussa Corporation, and then served as Director of Marketing for the global non-impact printing business of the former Inorganic Materials Business Unit since 2007. After returning to Germany in 2008, Hasenzahl held a variety of management positions, such as Director of Marketing, Vice President of the Performance Solutions Market Segment, and Vice President of Performance Solutions and Technology Solutions, before becoming head of the Special Oxides Product Line in the Silica Business Line of the Evonik Resource Efficiency Segment. Hasenzahl has published numerous patents and publications, and is a three-time recipient of the Evonik Innovation Award. He is married and has three children.

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Safe from start to finish

Evonik now transports activated metal catalysts (Raney-type) based on nickel, cobalt or copper in overseas shipping containers which the company has designed for this purpose. This ensures optimal transport safety.

As a founding member of the “Together for Sustainability” initiative, Evonik is committed to the highest standards of product safety in all areas of the value chain. This applies in equal measure to Evonik’s activated metal catalysts, which have long proven successful in such reactions as the hydrogenation of glucose to sorbitol, a low-calorie sweetener (see article on page 8). Because of their pyrophoric properties, activated metal catalysts can be transported only as an aqueous suspension and are shipped in steel drums. But they also present a special challenge: Due to the nature of hydrogen gas, which is continuously released from the catalyst suspension. Hydrogen is highly flammable and can cause explosions in the presence of oxygen, when an ignition source is present. To prevent an increase in pressure from the released hydrogen, the transportation drums are equipped with a pressure relief valve to allow the hydrogen to escape safely. But the problem is that the drums are shipped overseas to e.g. Asia or North America in standard freight containers. Such containers can hold up to 20 pallets of the catalyst, which emit an average of about 900 liters of hydrogen each day. If a standard box container is used, the concentration of hydrogen gas in the interior space increases rapidly and exceeds the lower explosion limit of 4.1 vol% of hydrogen within a few days. These results were obtained in tests using loaded containers under practical conditions. The ignition energy for the resulting mixture of hydrogen and oxygen is fairly low, which presents an unwanted risk of a possible explosion. Just the spark generation that could occur when opening the container door can lead to an explosion.

In the past, this risk was prevented by using ventilated sea containers that were originally used for transportation of green coffee. But the shipping company has decided to take them from the market because they are no longer seaworthy. New containers for transporting green coffee are no longer needed. Evonik employees saw this development early on and initially looked for alternatives among commercially available containers. But no suitable overseas shipping container could be found which passed the test procedure. Therefore a container has been specifically developed for Evonik. After calculating minimum airflow and air exchange an overseas shipping company was assigned to produce a prototype. This new “ventilated container” allows sufficient air exchange and directs the hydrogen gas safely outside. In tests under real conditions, it was proven that the container achieved hydrogen readings considerably below the lower explosion limit. These new containers developed by Evonik are now exclusively used for the transport of Evonik’s activated metal catalysts. They define the highest safety standards in the industry – above and beyond statutory requirements. In addition to the increased safety standards Evonik also ensures on-time delivery by using only shipper owned containers. Because the containers are stored at Evonik’s production sites, they are available for transportation at any time.

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Evonik chemical catalysts: More expertise, higher capacity

In February 2016 Evonik has commissioned a new unit inside its catalyst production plant in Marl (Germany) and a new building for catalyst scale-up, research and development.

Catalysts have been produced at the Marl site for over 75 years.

In the new scale-up and R&D building, the work will focus on further improvements of fixed-bed catalysts, which are predominately used in large-scale, continuous processes for the production of base chemicals. The new scale-up plant is devoted to develop catalyst recipes in a first step on laboratory scale. In a second step, pilot-scale equipment will be used then to transfer the processes to the industrial scale and optimize the recipes for robustness in commercial production.

Evonik has also invested in a new state-of-the-art production line for the optimized forming of commercial catalysts. The new line will significantly increase Evonik’s forming capacity in Marl. The material flow of the flexible multi-stage process was improved, and has virtually eliminated the need for manual transportation of materials. New analysis and measuring techniques enable precise management of the process. The plant is in full commercial production since commissioning.

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ORCS Conference 2016

Evonik Catalysts not only remains close to its customers but is also in close contact with basic research scientists.

The 26th ORCS Conference (Organic Reaction Catalysis Society, http://www.orcs.org) was held in Miami (Florida, USA) in March 2016. This event, which takes place every two years, is especially interesting for market players in the areas of "Life Sciences & Fine Chemicals" as well as industrial chemicals. It was once again an outstanding forum to obtain information about technical advances in the field of catalysis and to talk with people from industry and university research departments. Evonik Catalysts was well represented at this year’s conference with two presentations and one booth.

The 27th ORCS Conference will be held in San Diego (California, USA) in spring 2018.

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A solid first quarter 2016

Evonik did well in the first quarter in challenging business conditions.

“Following an exceptionally strong performance in 2015, our earnings are now back in line with the good level of the preceding years. Our business is still doing well and our products are in demand in the market”, said Klaus Engel, Chairman of the Executive Board of Evonik Industries.

Overall, the Evonik Group’s sales contracted by 9 percent to €3,106 million in the first quarter 2016 (Q1 2015: €3,425 million). While demand for Evonik products was stable overall, selling prices declined by 7 percentage points. Adjusted EBITDA was €565 million, 13 percent lower than in the exceptionally strong prior-year period (Q1 2015: €650 million). The adjusted EBITDA margin remained very good at 18.2 percent, compared with 19.0 percent in the prior-year period. Adjusted EBIT fell 20 percent to €389 million. Adjusted net income was €254 million in the first quarter, down 21 percent from €320 million in the first quarter of 2015. Net income declined 6 percent to €240 million (Q1 2015: €256 million).

Capital expenditures were €160 million in the first quarter of 2016, 15 percent below the prior-year level of €189 million. In the first quarter of 2016, the free cash flow was €161 million, compared with €179 million in the prior-year period.

Outlook confirmed

Evonik’s expectations for global economic conditions are unchanged: Overall the company anticipates slightly lower momentum in the global economy, with a year-on-year growth rate of 2.5 percent in 2016.

In these conditions, Evonik is confirming its outlook for the full year: Following a very successful year in 2015, the company expects to report slightly lower sales in 2016 and adjusted EBITDA of between €2.0 billion and €2.2 billion.

Segment performance

Driven by good global demand, the Resource Efficiency segment registered pleasing volume growth, but selling prices declined slightly overall. In the first quarter sales were virtually unchanged year-on-year at €1,120 million. Adjusted EBITDA improved 5 percent.

Figures 2015 Evonik group

<table>
<thead>
<tr>
<th>Sales</th>
<th>€13.5 billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active in over</td>
<td>100 countries</td>
</tr>
<tr>
<td>More than</td>
<td>33,000 employees</td>
</tr>
</tbody>
</table>
Trade show appearances, conferences and events

<table>
<thead>
<tr>
<th>Trade show appearance, conference, name of event</th>
<th>Date</th>
<th>Where</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemspec Europe</td>
<td>June 1 – 2</td>
<td>Basel, Switzerland</td>
</tr>
<tr>
<td>PEPP 2016: 24th Annual Polyethylene-Polypropylene Chain Global Technology and Business Forum</td>
<td>June 1 – 3</td>
<td>Zurich, Switzerland</td>
</tr>
<tr>
<td>Gordon Research Conference</td>
<td>June 12 – 17</td>
<td>Colby-Sawyer College, New London, New Hampshire, USA</td>
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<tr>
<td>The 16th International Congress on Catalysis (ICC 16)</td>
<td>July 3 – 8</td>
<td>Beijing, China</td>
</tr>
<tr>
<td>JSPC 2016 Summer Symposium</td>
<td>July 28 – 29</td>
<td>Nagoya, Japan</td>
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<tr>
<td>11th International Congress on Catalysis and Fine Chemicals (CAFC-T11)</td>
<td>September 5 – 8</td>
<td>Lyon, France</td>
</tr>
<tr>
<td>CPhI Worldwide 2016</td>
<td>October 4 – 6</td>
<td>Barcelona, Spain</td>
</tr>
<tr>
<td>CPhI India</td>
<td>November 21 – 23</td>
<td>Bombay Convention and Exhibition Centre, Mumbai, India</td>
</tr>
<tr>
<td>13th Global Petrochemicals Summit</td>
<td>November 27 – 29</td>
<td>Lisbon, Portugal</td>
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</tbody>
</table>

We would be happy to send Catalysts Insight to anyone you know.

Please send us the postcard or contact us directly:

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