



Germany

Europe's Prime Location for Innovation and Production

March 2008



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Chemical sites



Investors welcome



The chemical industry plays a central role in the German economy. The sector offers about half a million secure jobs to highly qualified staff. It is an innovation engine in Germany, the "land of ideas".

German chemical firms develop and produce new materials as the basis for innovations in many other

industries. The chemical industry thus contributes to the further improvement of the quality of life and prosperity - for instance with ultra-light materials that enhance the energy efficiency of cars or with environmentally-friendly methods for the production of life-saving drugs.

Although Germany imports almost all raw materials, we are the leading exporter of chemical products worldwide owing to the men and women who work and do research in German chemical firms; this reflects the competence and excellent qualification of our skilled labour. The modern infrastructure in our country and the central location of Germany in the heart of Europe are further important factors. The many globally leading international firms which do business in Germany make use of the most modern technologies and are successful at all levels.

Germany is open to new investors. The highly-qualified staff is the major argument in favour of Germany as a business site, whose dynamic market also offers excellent economic prospects.

The team of Invest in Germany looks forward to providing advice and support to you.



Michael Glos

Federal Minister of Economics and Technology

German chemistry – driver of innovation in the heart of Europe

Germany is a leading chemical industry location. With sales of €174bn, the German chemical industry is clearly No. 1 in Europe and No. 4 worldwide. In 2007, Germany exported chemical products worth €130bn. This outstanding performance is the result of continuous efforts. The German chemical industry was early to adopt an international orientation and is today well positioned globally.



Decisive success factors are the excellent know-how and innovation ability of the German chemical industry. The country ranks among the major locations for chemical research and development. After the US and Japan, most chemical patents come from Germany. In the OECD comparison of research and development spending, German chemistry comes third.

All markets in Europe can be reached from Germany in a very short time. Except for Switzerland, all neighbouring countries are members of the EU. This means huge sales markets without barriers, just around the corner.

A further advantage is the globally unique concept of chemical parks. German chemical parks offer a highly developed, chemistry-specific infrastructure and a wide range of services specifically tailored for chemical companies. Businesses can focus entirely on production as well as research and development, with competent chemical park operators taking care of all other tasks.

Companies wishing to gain ground in the European market should use the advantages of Germany as the chemical industry location. The success stories of many German and foreign companies in Germany are the best proof. Come and see for yourself.



Professor Dr Ulrich Lehner

President, Verband der Chemischen Industrie
(German chemical industry association)

Ready and waiting

Germany has a lot to offer potential investors, says John Baker, global editor at ICIS

As a location for investment in chemicals - and associated sectors such as biotechnology, nanotechnology and solar energy - Germany has a strong case to make.

The German chemical industry is well established and plays a leading role on the global stage. And, in recent years the sector has returned to a period of strong sales and earnings growth, which looks set to continue.

The German chemical industry boasts no fewer than six of the top 40 global producers, lead by such illustrious names as BASF, Bayer, Evonik (formerly Degussa), Linde and Merck. The Bayer spin-off Lanxess makes up the top half dozen. Total industry sales last year were expected to be in excess of €165bn.

Thus, a substantial and well maintained production base is ready and waiting for investors to tap into. Germany has no fewer than 55 chemical sites, the majority of which welcome investors to take advantage of raw materials integration, logistics and services provision and a more than adequate supply of available land. We investigate this further in the following pages on infrastructure (pages 5 to 15).

The country's location at the heart of Europe is also a boon, making it a good location for exports to the rest of Europe and, indeed, North America and Asia, especially China, from northwest European ports. Germany exports around 70% of its production in value terms, and is, in fact, the world's largest exporter of chemicals. Over 70% of its €100bn-plus export business goes to Europe, with 11% to North America and 8% to Asia.

In domestic terms, Germany also offers an attractive location to invest. With 80m inhabitants, it is the EU's largest country by population and one of the world's top economies. Recent years have seen the economy recover, in tandem with mainland



Europe as a whole.

But it is not just the manufacturing base and access to markets that should put



The German chemical industry is well established and plays a leading role on the global stage

John Baker, global editor, ICIS custom publishing

Germany on any investor's shortlist as a viable location. Access to intellectual power and a well educated workforce is another, as producers seek to use innovation as a key competitive edge against lower cost manufacturers in the Middle East and Asia.

Germany has built up a first-class base

of public and private research institutes and networks and has a highly educated population of degree and post-doctorate students from which

companies can recruit. Several examples of excellence are highlighted later on in this publication (see pages 20 to 29). The well-honed German concept of clustering – bringing

together like-minded producers, customers and centres of excellence - helps leverage these resources.

In the following pages, a much more detailed exposition should offer even less excuse for not putting Germany on that investment shortlist.

Overview

All the links are already in place

The chemical industry relies on a complex network of infrastructure to be cost-effective. Germany has this in abundance and is investing further

"Trains and boats and planes..." Perhaps Hal David knew more about the needs of the chemical industry than he thought when he penned these words for Burt Bacharach! Add in roads and pipelines and you have the arteries the industry requires to move its raw materials and end products around cost effectively.

For the chemical investor, Germany is well endowed with such logistical infrastructure. The country's western and eastern chemical complexes are served by olefins pipelines, and there are active plans to expand the network, both in the southern Bavarian region, and in the northwest.

New autobahn building is scheduled across northern Germany, and carriage of chemicals by train is seeing renewed interest and investment. Almost uniquely, Germany is also well served by river and canal networks, with the Rhine and Elbe rivers serving as major arteries for barge traffic to the north and northwest coastal ports. The Kiel canal additionally serves as a key waterway

between the Baltic and North Sea shipping.

But logistics infrastructure is not the only key to Germany's success as a chemicals powerhouse. Energy infrastructure is being renewed, with a series of new coal-fired power stations planned for the north of the country, and there are investments afoot to ensure greater flows of natural gas from Russia to the Baltic coast and German heartland.

The third major infrastructural strength in Germany is the chemical industry's own production complexes. Many of these today are integrated, multi-producer sites with a third-party management company looking after the efficient running of the services and utilities. It is a concept the German industry has embraced whole heartedly in the last decade, as many of the huge complexes have been affected by industry restructuring and M&A activity.

Regional initiatives – taking care of chemistry

Originating from the individual chemical companies and chemical parks, a number of regional chemical initiatives have evolved in Germany. Their concept is fairly easy: companies and park operators have teamed up to create and finance regionally organised groups of professionals, who take care of the chemical industry in their region. Most of them receive public and governmental support, thus creating true public-private partnerships.

Besides their main focus of marketing the chemical parks and attracting possible investors, these initiatives also manage networks of partners and partners-to-be; foster innovation, by means of contacts between companies and universities/colleges; and, last but not least, communicate and support chemical industry's opinion to the public and to the authorities.

So far, five regional initiatives have been established: ChemCoast, CeChemNet, ChemSite, ChemCologne and Bavarian Chemical Triangle. They all help to maintain the country's unique position.

All told there are some 55 chemical producing sites in Germany, with no fewer than 40 organised as chemical parks.

This chemical parks and sites concept, as it has become known, makes it easier for investors to come and "plug into" all the infrastructural requirements, a much cheaper option than a greenfield investment. The integration offered in terms of raw materials supply, energy and steam provision, waste and water treatment and shared maintenance and logistical services, is a real boon to potential investors and one that the site marketing arms are all too ready to promote.

Even the mighty Ludwigshafen Verbund site of BASF is now open to third-party investors settling there, and there are many other prime examples spread across the country.

Your link to the future

The Verbund concept at BASF's main Ludwigshafen site offers a tangible advantage for chemical production and is attracting investors

BASF's Ludwigshafen Verbund site, centrally located in the European Rhine-Neckar Metropolitan Region, is the world's largest integrated chemical complex under single management. Some 8,000 sales products with a total volume of 8.5m tonne/year are produced at the 1000ha site.

The concept of integration and networking, which BASF calls Verbund, is one of BASF's most important strengths. The linking of manufacturing plants creates value-adding chains of production, as by-products and waste from one plant serve as raw materials in other plants.

This is the so-called Production Verbund, the backbone of which is a dense network of more than 200 production plants connected to each other by over 2,000km of pipelines and more than 200km of rail track.

An effective logistical infrastructure complements the Verbund. Keystones

are the intermodal transport terminal (handling 300,000 units/year), the modern logistics centre (approx. 1m pallets throughput per year) and connection by block trains to Antwerp and Rotterdam, to the Mediterranean Sea and to eastern Germany. Furthermore, ethylene and propylene (under construction) pipelines link Ludwigshafen to other key chemical complexes.

Total annual cost savings resulting from this Verbund are estimated at €500m in Ludwigshafen. This cost structure does not come without a price tag. Between 2005 and 2009, the expenses have totalled €6bn on investments, modernisation and maintenance of plants and infrastructure at the site.

About one-quarter of the expenditure for new projects for the BASF group worldwide is dedicated to the Ludwigshafen

site, including measures to secure and strengthen the site's competitiveness.

Furthermore, BASF's spend on R&D in Ludwigshafen amount to €900m each year.

Most recent examples of such investments include a production centre for electronic materials, which started up at the end of 2007, as well as capacity for BASF's new plasticiser for soft PVC toys, medical devices and food contact applications, which came on stream in May 2007.

THE CO-SITING CONCEPT

To develop the site further, BASF is now actively looking for partners to enter long-term partnerships in Ludwigshafen. Clearly this offer is most attractive for investment projects that can benefit from the vast "product and energy Verbund" as well as the highly sophisticated know-how and services developed over generations. It is interesting to learn that BASF is even willing to enter into joint venture relationships to exploit win-win situations fully.

"In fact 50ha has been set aside for investments," says Bernhard Nick, recently appointed head of Verbund Site Management Europe and Site Manager of the Ludwigshafen Verbund site.

Further, BASF offers third party investment opportunities at its Schwarzheide site in the eastern part of Germany. "Recently the fifteenth company decided to set up its business at the Schwarzheide site," Nick adds.

Investors will furthermore benefit from rapid project approvals deriving from the excellent relationship developed with local authorities over the years. In 1993 a special administrative regulation was passed to accelerate approval procedures while still maintaining high environmental standards.

As an example, for BASF's major gas and steam power station a preliminary decision was available after only six months. When projects are smaller, the period can be considerably shorter.

Chem2biz start-up initiative

In 2004, BASF, the state of Rhineland-Palatinate and the City of Ludwigshafen set up a public-private partnership focused on chemistry-based technologies. Known as chem2biz, this provides a complete service for start-ups and small and medium size enterprises (SMEs) in the fields of chemistry, nanotechnology, new materials, biotechnology and process engineering.

Startups and SMEs can locate their businesses in a laboratory building on BASF's site, which offers ready-to-operate facilities. All SMEs within chem2biz are potential future investors at the Ludwigshafen Verbund site. Indeed, during the last three years, seven co-siting contracts have arisen from the chem2biz initiative.



Dow ValuePark at Schkopau



Germany is a key location for Dow in Europe. Active in the country since 1959, it is still investing heavily through acquisitions and capital projects

From humble beginnings...

For The Dow Chemical Company, Germany is the most important manufacturing base and national market outside the US. As such it is a key investment location in Europe.

It all started in 1959 with a sales office in Frankfurt/Main. The first production plants were built in Rheinmünster in the mid-1960s, followed by Stade in the early 1970s. The latter benefited from the nearby high-purity rock salt deposits, used primarily to produce chlorine – a raw material for a number of Dow's many products.

In the 1980s, Dow took over a facility in Ahlen and converted it into a highly productive polyurethane systems house.

After the reunification of Germany, Dow became involved in central Germany's "chemical triangle" around Halle (Saale) and Leipzig. In the framework of the largest German privatisation and restructuring project ever, Dow radically modernised the mostly outdated production facilities.

SAFE TRACK RECORD

Today, the central German plants are among the safest, most modern and most efficient

ones within the entire Dow network – and make Dow the largest plastics producer in the new federal states. With approximately 6,700 employees and a turnover of about €4.2bn in 2006, Dow is the leading US-based chemical company in Germany.

Dow's successful track record in Germany can be attributed to a number of factors. "The highly qualified, motivated and innovative German workforce – 'The Human Element'

"The Human Element'... is our most important asset"

Markus Wildi, president, Dow Europe

– is our most important asset," says Markus Wildi, president of Dow Europe. "The high educational level of our German workforce is one of the reasons why our performance in safety and environmental stewardship in Germany is among the best in the company."

Dow's R&D efforts also benefit

considerably from top talent in Germany, particularly as the company increasingly invests in research-intensive performance products. This is true for the development of innovative business models, too. For example, SAFECHEM Europe, a Dow subsidiary headquartered in Düsseldorf, offers innovative services and solutions for the safe and sustainable use of specific chemicals throughout Europe.

BUYING AND INVESTMENT

The focus on specialty businesses is at the core of the company's acquisition strategy. In 2007, Dow acquired Wolff Walsrode with locations in Bomlitz/Walsrode and Bitterfeld. It was merged with Dow's Water Soluble Polymers business to form the new Dow Wolff Cellulosics business unit focusing on the development, production and marketing of products based on cellulose, a renewable raw material.

Also in 2007, Dow acquired a systems house for epoxy resins in Baltringen near Ulm. In this business, again, the knowledge of employees is crucial to provide specialised

Dow Germany

2 solutions and tailor-made epoxy resin products for a wide range of applications.

"Close and effective relationships with government authorities and the communities in which we operate are another key factor that has helped Dow systematically expand its production locations," says Wildi. "Stade is a good example: since construction started in October 1969, the Stade site has become one of the largest chemical facilities in Lower Saxony. During this time period, we have invested almost €3bn in this integrated site on the Bützflether Sand."

"Or look at Dow's central Germany site in Schkopau where we are currently constructing a special-purpose adhesives and insulating materials facility for the automotive industry as well as a new solution styrene butadiene rubber (SSBR) plant," Wildi adds. The high quality synthetic rubber produced in this facility is utilised primarily for tyres and other engineering rubber products, such as tubings or gaskets. SSBR is one of the fastest growing segments of the global rubber market.

There are certainly numerous other factors making Germany an attractive investment location. The country's location at the heart of the EU offers excellent access to top-tier customers, many of whom are Germany-based.

At the same time, Germany is ideally located for serving markets in the East. "Our German sites in particular serve as a stepping stone for the rapidly expanding markets in central and eastern Europe," says Wildi. "As part of our strategy, we are aiming to develop the emerging markets in eastern Europe including Russia, where we have recently set up our first production lines and joint ventures."

INNOVATION ADVANTAGE

"Another advantage is the highly differentiated research activity conducted in Germany which is really broad in scope," Wildi continues. Dow is working very closely with a number of renowned universities and private research institutions on both joint development projects as well as the recruitment of highly qualified talent. "Furthermore, Dow actively contributes to the growth of local innovation clusters as we are convinced that concentrated research

and industrial efforts will soon reach a critical mass to break much more ground and accelerate growth," Wildi adds.

Examples are the "CFK-Valley" in Stade, which aims at bringing together local competencies in carbon fibre-reinforced plastics, and the competence centre for cellulose chemistry at the Walsrode IndustriePark. Another strong network is the "polymer technology" innovation cluster in central Germany. Members are universities, research institutions, a number of smaller and medium-sized enterprises, and Dow as a leading science and technology company. The objective of this network is to foster the development and commercialisation of cutting-edge technologies.

CLUSTERING BENEFITS

"The cluster principle also governs Dow's ValuePark concept," Wildi points out. The first ValuePark was designed to be an integral aspect of the central German restructuring project. Parts of the grounds were set apart



"Infrastructure in general is a major advantage in Germany"

Markus Wildi, president, Dow Europe

for partner companies. A number of suppliers, converters, and logistics companies settled in the Schkopau ValuePark along with the Fraunhofer pilot plant centre for polymer synthesis and processing. Being located next to one another helps simplify logistics and leads to a more efficient use of the site infrastructure. The ValuePark concept has also been implemented successfully at other Dow locations.

"Infrastructure in general is a major advantage in Germany. The excellent road and rail network as well as the waterways make our locations perfectly accessible," says Wildi. Other critical factors are the pipeline connections between our locations in northern and central Germany as well as the Rostock Baltic sea port. "Extensive investments in this pipeline network helped make up for location-related drawbacks as compared to chemical plants along the Rhine valley," Wildi concludes.

Dow Walsrode

Despite a change of ownership, IndustriePark Walsrode is still...

... Open for

Industriepark Walsrode is under new ownership following the €540m purchase by The Dow Chemical Company in July last year of site owner Wolff Walsrode, a long-time subsidiary of Bayer. But being part of the new \$1bn turnover Dow Wolff Cellulosics business does not change the fact that the park, located at Bomlitz in the north of Germany between Hanover and Hamburg, is still on the look out for new investors.

"We have 30ha of land prepared and ready for occupation", says site manager Alf Wilkens, "and can offer comprehensive services including storage, logistics, HR and IT and maintenance." Investment on the site has been running at €20-30m/year since it was opened up for third-party investment in 2001.

Dow Wolff Cellulosics is the largest operator on the 130ha site, located in open countryside. The other major operator is Wipak, a Finnish company that bought Wolff Walsrode's packaging and technical films operations based on polyethylene, polypropylene, polyamide and rigid polyester in 2001.

COMPETITIVE TENDERING

However, there are over 20 other companies on the site, including Bayer's Epurex polyurethane films business and a number of service providers such as Atos Origin for IT, OHE for rail logistics and AF Personalpartner for HR services.

"As site operator, we have developed a system of competitive tendering for service provision at the site", explains Wilkens, so that investors here can be guaranteed market conditions for their services. Requests for supply are fed to IndustriePark Walsrode office, which ensures contracts are awarded to specialists with well defined service level agreements, covering defined periods, usually over five or six years.

Industriepark Walsrode not only features production facilities but is also a place of intensive research. Today more than 120

r business

Closeness to market

Wipak Walsrode's managing director Matti Rovamaa stresses that IndustriePark Walsrode's location in the heart of Germany is a key factor for the Wipak business. The company produces both blown and cast films and prints them on site using flexographic and rotogravure techniques. It thus needs to be as close to its customers as possible to remain flexible and competitive.

"We have a strong and versatile technology platform here", he says, "and we are highly focused on and driven by our customers. Wipak operates no less than 12 manufacturing units in Europe (and a similar number in North America), ensuring supply chains are kept short.

of Dow Wolff Cellulosics' 1,500-strong workforce at this site develop new products, applications and production processes. And lately, barely six month after investing in IndustriePark Walsrode, Dow has decided to concentrate the worldwide R&D activities of Dow Wolff Cellulosics at IndustriePark Walsrode. The scientists and engineers are engaged in the development of products based on the renewable resource cellulose and carry out field-oriented research on new applications that exploit the properties of cellulose derivatives.

PILOT FACILITY

The company's multipurpose pilot facility enables innovations to be developed beyond the laboratory scale into marketable volumes, while tried-and-tested collaboration schemes with universities such as the Technical University of Braunschweig (Brunswick), the University of Jena and the Ecole des Mines de Paris have contributed to the success of projects.

Dow Stade



Synergies on offer

Dow is gradually stepping up its search for new investors at its Stade complex in northern Germany, where it offers a range of integration possibilities based on chlorine, hydrogen and cellulosics

The Dow Chemical Company is gradually stepping up its search for new investors at its Stade complex in northern Germany, reports Klaus Miksche, the site integration manager. "We are not yet an industrial park," he says, "but we are making our way and offer a good set of synergies."

Dow has been building its presence at the 550ha Stade site since the early 1970s, and now operates no less than 19 plants here. But it still has plenty of land spare, although merely selling land is not what Dow is looking for. "We want to attract investors that fit into our value chain, based mainly around ethylene, propylene, caustic soda, chlorine and hydrogen," Miksche explains.

Dow Stade has developed an industrial park concept similar to the ValuePark offering of Dow's Schkopau site in central Germany. It offers a variety of opportunities based around raw material integration, energy availability, logistics, rail links, and its deep-sea harbour facilities on the river Elbe which runs right next to the complex.

UNDERGROUND STORAGE

This gives ready access to the North Sea and, via Kiel Canal, the Baltic Sea, thus providing a sea route to the countries of eastern Europe and Russia. Nearby salt mining operations also give the potential for underground storage of natural gas and chemical feedstock.

Although the site is currently occupied mostly by Dow operations, there are several investors already on-site, notably Air Liquide which runs a carbon monoxide and technical gases facility,

as well as water treatment company Evides. Air Products is also present, taking excess hydrogen from Dow and distributing it for the regional market.

Miksche says Dow would welcome a range of potential investors at Stade. Based on the objective of mutual benefits from realised synergies, these might include converters of products produced by Dow at the Stade site, producers of specialty chemicals, suppliers of raw materials, utilities or logistic services, or producers needing special infrastructure for waste treatment. Dow has both waste water treatment and thermal incineration capabilities on site.

INTEGRATION DRAW

Miksche reports a growing number of enquiries from potential investors and says Dow Stade is learning from each new request. "Integration is the key to efficient production," he explains, "and the Dow site is highly integrated". This integration is one of the key draws for investment at Dow ValuePark.



Cellulosics find many uses in construction products

Brunsbüttel



Germany's north coast region is seeing investment in ports, transportation and power generation, laying a sound base for chemical investment

Room to expand in the north

Increasing trade between eastern and western Europe and changing energy supply and usage patterns are stimulating investment in infrastructure and logistics along Germany's northern coast, notably in port facilities, waterways and trunk roads, and power generation. The benefits for the chemical industry in the region are clear to see, making production and investment here more attractive.

Major producers active in the region include Dow Chemical at Stade and Walsrode, INEOS at Wilhelmshaven, Bayer MaterialScience and Sasol at Brunsbüttel and Honeywell at Seelze.

One of the major industrial centres on the northern coast is the port and chemical complex of Brunsbüttel, located at the mouth of the river Elbe. It is also at the entrance to the busy Kiel Canal, which enables shipping to move from the North Sea to the Baltic. The port has thus become an important hub between east and west and is set to become even more so as the canal's lock capacity is increased to accommodate growing traffic.

SUBSTANTIAL INVESTMENT

The port at Brunsbüttel is seeing substantial investment. Norbert Feis, managing director of port operator Hafengesellschaft Brunsbüttel (HGB), says that a number of expansions are planned to handle increased volumes of coal that will feed up to three power stations planned in the coastal region as two nuclear facilities are shut down. Sudweststrom (SWS) and Electrabel are expected to confirm investments this year, according to the ministry of economy of Schleswig Holstein.

As the private operator of the port since 1999, HGB has developed a strategy not only to run the port but offer services in logistics and even consulting. It will, for example, take responsibility for unloading, breaking of bulk and onward logistics of materials, all under its own control. There are three harbours, handling oil, chemicals and general goods.

For instance, HGB has just invested €38m in a copper ore transshipment facility that supplies 1.5m tonnes/year of blended



Port facilities in Brunsbüttel have plenty of room for expansion

feedstocks to the Norddeutsche Affinerie copper smelter in Hamburg. It provides a full logistical service, from unloading of concentrates and storage to the mixing of 23 grades, delivery of these from storage by barge and all track and trace operations. It is

“HGB has developed a strategy not only to run the port but offer services in logistics and even consulting”

Norbert Feis, managing director of port operator Hafengesellschaft Brunsbüttel (HGB)

hoping to do the same for coal supply to the planned power stations.

Today, says Feis, “the Elbehafen is an all-purpose port with extended customer orientation and logistical competence.” There are connections to water, rail and road and a combined traffic terminal “plays a highly important role in the lower Elbe region.”

Chemical investment, too, is a priority for the region. There are no less than 2,500ha of land available and qualified for chemical investment, with 900ha of this at Brunsbüttel and plenty more at Wilhelmshaven and Industriepark Walsrode and Seelze. The region is strong in polyurethane production and processing, chlorine, cellulose and electronic chemicals, all of which existing producers are keen to build upon.

POLYURETHANE VISION

The potential for a strong polyurethanes cluster is already there, with two raw materials producers in Dow and Bayer MaterialScience, major formulators, such as Huntsman, Büsing & Fasch and Elastogran, and many systems houses and component makers. Companies are keen to establish links with leading local universities and regional car and aerospace makers to create a centre of PU excellence here.

But, the real selling point for northern Germany is the huge and highly developed logistics infrastructure with expandable modern ports and vast open spaces for new investments.

Deepwater advantage

The deep sea port at Wilhelmshaven is being expanded to handle larger ships and greater volumes, and local chemical companies are looking for investors to join them



NWO-FOTO KLAUS SCHREIBER

Large tankers can find berths at Wilhelmshaven

The decision by INEOS not to proceed with its major ethylene cracker and chlor-alkali investments at Wilhelmshaven on the north German coast was undoubtedly a blow for the site and the region, stymieing plans for olefins pipelines across Germany and into the Netherlands.

But the complex of the port and industrial area in the city are still looking for investments and there is plenty of land and infrastructure to entice companies to set up here. Over 1000ha have been designated as available for industrial development.

Total ongoing and planned investment in Wilhelmshaven is put at over €5bn.

POWER AND PORT EXPANSION

Besides being the only deep sea port on the German coast, Wilhelmshaven is also home to four major industrial companies which have come together to create CoastSite Wilhelmshaven (www.coastsite.info), under the wider umbrella of the ChemCoast initiative (www.chemcoast.de).

These companies are Northwest Oil Pipeline (NWO), which handles import, storage and transfer of crude oil; INEOS

ChlorVinyls, producer of chlorine, ethylene dichloride, vinyl chloride monomer (VCM) and polyvinyl chloride (PVC); Wilhelmshaven Refinery WRG, owned by ConocoPhillips, and electricity producer E.On, which runs a coal-fired 740 MW power station.

E.On will shortly be joined by Electrabel, which late last year announced it will build an 800MW coal-fired power station at Wilhelmshaven, at a cost of €1bn. Construction of the plant will begin this year, with start up scheduled for 2012.

The port itself is also being expanded, through the development of JadeWeserPort, a deep sea container terminal with 18m of water depth. This will be able to handle the next generations of ships, capable of carrying over 10,000 TEUs, irrespective of the state of the tide. Capacity of the first stage is put at 2.7m TEUs/year when the facility comes on stream in 2010.

The terminal will measure 1,725m in length by 650m deep, giving a container handling area of around 120ha. This will be backed by a 170ha logistics area on the landward side. Just behind this there is a further industrial area ready for development,

with road and rail links.

Chemical production in Wilhelmshaven focuses on chlorine, caustic soda, ethylene dichloride, sodium hypochlorite, VCM and PVC, sodium hydroxide, hydrochloric acid, crude oil products, flue ash, gypsum, paraffin, propane, butane, sulphur.

PAN-EUROPEAN GATEWAY

That, says the investment body Wilhelmshaven Economic Development Agency (WFG), means a number of possible links for chemical and other downstream industries.

WFG is also confident the region surrounding the JadeWeserPort will become "the most advanced commercial and industrial area, as well as one of Europe's most prominent logistics, industry and trade hubs within the next decade."

For this purpose, four regional municipalities have pooled their forces to form the Jade Bay Region. The modern container terminal and the professionally managed Jade Bay Region will together constitute a new blend: the Pan-European Gateway, says WFG.

Energy and salt attract

The Baltic coast area around Lubmin is set to play a leading role in Germany's energy infrastructure, as the landing place for a new pipeline bringing Siberian gas to Europe

SynergiePark at Lubmin on the German Baltic Sea coast is unique among German industrial parks, and not just because it borders wide sandy beaches and a bird refuge. As its developer, Energiewerke Nord (EWN) points out, the name is not just a catchy one developed for promotion purposes. The synergies – between energy and chemicals – are real and could have tangible benefits for both sides.

What is a bane for power companies could be a blessing for chemical producers, says Herbert Hollmann, head of the legal and quality management department at EWN. Power producers face levies on waste heat if uses are not found for it, so having companies with heat-intensive processes locate on the site would be ideal.

Another thing sets Lubmin aside from parks in the west and the south. Instead of energy infrastructure being added as needed to power chemical plants, the site has always been energy-driven. It was home to an East German nuclear power complex called Greifswald, after the nearby university town.

This is now being dismantled, but energy will continue to be the focus at Lubmin as it will be the landing point of the 1,400km Nord Stream gas pipeline. This will be operated by a consortium of Russia's Gazprom, German energy producers Wintershall and E.ON, and Gasunie of the Netherlands, and will link northern Germany to Russia's vast gas fields.

Park developers believe this will make the region, now somewhat off the beaten path, "well connected".

ENERGY SWITCH ON

SynergiePark currently has a permit to use 120ha and is seeking planning permission for up to 75ha more. Energy investments worth around €5bn are already planned. To support industrial production and deliver energy to surrounding towns, two gas-and-steam power plants – each with a capacity of



Lubmin will be a gateway for Russian gas, stimulating chemical investment

1,200MW – will be erected by energy utility companies. The construction of the first is due to start at the end of 2008.

A permit to build a 1,600MW coal-fired power complex at Lubmin, coupled with a pilot plant for CO₂ emissions reduction, is also in progress, and biofuels producers are also expected to locate at the site in the state of Mecklenburg-Western Pomerania.

Complementing the exemplary power infrastructure, abundantly available salt could be another attraction for chemical companies. Vast amounts of salt are being excavated to make room for the subterranean dome needed to store natural gas. This means that low-cost brine can be made available to chemical producers for the next 20 years, as an alternative to pumping it into the sea.

Low-temperature fresh water and cooling water flow into the Lubmin site from the

nearby Peene river, and chemical producers also can take advantage of the dredged deep-water channel and a 7m-deep harbour, wide enough for two ships to pass. SynergiePark also has a private link to the German rail network, and the A20 coastal motorway is 25km away.

SKILLED WORKERS

Hollmann notes also that skilled workers familiar with sensitive and hazardous processes of the nuclear energy sector could provide a ready-made employment pool for future chemical investors.

Another of the park's drawing cards is its location in a structurally underdeveloped region that qualifies for German federal and state project aid. Small- and medium-sized companies can receive funds totalling as much of 50% of investment costs, while larger companies can qualify for up to 30%.

Pipeline restores confidence

A new ethylene pipeline is certain to attract future chemical investment to the southern German state of Bavaria

More than 25 chemical-related companies, including such diverse players as Air Products, BASF, Borealis, Chemtura, Clariant, Dyneon, Evonik, Klöckner Pentaplast, Linde, LyondellBasell Industries, OMV Deutschland, Vinnolit and Wacker have production facilities in the southeast of

"rejuvenate the region". While petrochemicals are not the only focus of companies in the area, he says "a secure ethylene supply is essential for many. Not being connected to the grid was clouding our future."

BASF, Borealis, Clariant, LyondellBasell, OMV, Vinnolit and Wacker Chemie are

new 330,000 tonne/year polypropylene plant that will make Burghausen Europe's third largest PP site. Both projects are slated for completion in 2010.

At the Industrial Park Werk Gendorf, Vinnolit is converting chlorine electrolysis capacity to the membrane process and will ramp up PVC capacity by 2011. LyondellBasell is upgrading the cracker at Münchsmünster it acquired from Ruhr Oel in early 2007.

Up and down the route, site operators expect the pipeline to be a catalyst for new investment. The energy infrastructure is exemplary, they say, and there are still prime production spaces left to be filled.

CHLORINE FOCUS

The largest single-owner site in Bavaria is Wacker's at Burghausen, which sprawls over 2km² and employs 10,000 people manufacturing products ranging from PVC to solar silicon. Industrial Park Werk Gendorf is the second largest employer, with 4,000 people working at 20 companies with annual sales of around €1.5bn.

InfraServ Gendorf, which itself employs more than 900 and derives about half of its €240m sales from energy supply, is an economic powerhouse on its own. Investment in energy and environmental protection at the 195ha site over the period 2007-2011 is projected to be well over €50m. Altogether, 30ha are available for development

A special site focus is chlorine and ethylene oxide, but surfactants, polyalcohols, PVC, fluorine based high performance polymers and rigid films also are in the manufacturing portfolio.

While most chemical park operators justifiably praise their prowess in quickly obtaining planning and building permits for customers, InfraServ Gendorf has a somewhat unique approach. It holds an open house for local authorities once a year and also invites them to participate in one- or two-week internships in the industrial park, to get an inside look.



Chemicals and beauty mix in scenic Bavaria

Bavaria, the so-called Bavarian Chemical Triangle. They have annual sales of around €8bn and provide employment directly or indirectly for more than 25,000 people.

Thanks especially to the 360km Ethylene Pipeline Süd (EPS), now under construction, the outlook for chemical producers in the chemical triangle is bright indeed, says Bernhard Langhammer, CEO of InfraServ Gendorf, which operates the Industrial Park Werk Gendorf in Burghausen.

REJUVENATION

The €150m connector, part financed by the state of Bavaria, will cross three states of Germany and connect crackers at Münchsmünster and Burghausen to the ARG network at Ludwigshafen from early 2009. It will have a throughput of 40,000 tonnes/year.

As Langhammer sees it, this will

partners in the project, and Infracor – the company that runs the ChemSite chemical parks along the Ruhr – is technical operator.

"[This will] rejuvenate the region ... A secure ethylene supply is essential."

Bernhard Langhammer,
CEO, InfraServ Gendorf

New chemical investment of €2.4bn has been announced along the pipeline's path since the green light was given in late 2006. OMV is spending €640m to expand olefins and polyolefins capacity at Burghausen. The additional output will supply Borealis's

Rebranding for leadership

CHEMPARK and CURRENTA are two new names for a well-known chemical site and its associated industrial services provider

From the beginning of this year, Bayer Chemical Park, with sites at Leverkusen, Dormagen and Krefeld-Uerdingen, has been renamed CHEMPARK. At the same time Bayer Industry Services has also been renamed, as CURRENTA.

"Our new company name symbolises our

"Being a prime industrial location covering 13.3km², our chemical park is already among the largest in Europe. We now aim to make it one of the most attractive on the continent and become the cost leader in this field. By providing cost-effective services, CURRENTA is helping to safeguard the

prices. All three sites are connected to the European pipeline system for naphtha, natural gas, ethylene and other products.

Offices, laboratories and warehouses can be leased. Besides managing and offering site security and occupational safety services, CURRENTA is also competent in dealing with local authorities to obtain the necessary permits, thus representing a valuable benefit for companies locating to the parks.

The technical maintenance department with 1,400 employees was hived off into a wholly owned subsidiary, Tectrion. The logistics company Chemion Logistik, remains as another part of CURRENTA.

TRAINING SURPLUS

CURRENTA is also willing to operate plants for customers within CHEMPARK. Additionally, customers can tap the company's resources to train their employees. As CURRENTA each year trains more young people than Bayer and Lanxess can employ, a pool of well trained is always available. With the help of job@ctive, Bayer's HR agency, CURRENTA can also provide temporary staff.

As examples of the type of investors CURRENTA is seeking to attract, Schäfer lists "industrial firms that can plug into the product chain of our chemical park partners; companies that will help us with our utilities", along with other enterprises "that are self sufficient and sell externally".

Start-ups are also welcome. Some 15 already are in residence, and park management hopes these will be a magnet to attract others. The "CURRENTA Start UP Initiative" will help them develop efficient business concepts, find flexible financing, provide laboratory and office space and just generally "open doors", Schäfer promises.

"However, maintaining cost leadership is an ongoing task," says Schäfer. "This means that we have to work every day to ensure we provide optimal value for money."



Leverkusen – the main complex within CHEMPARK's trio of sites

goal of becoming Europe's leading chemical park manager and operator," explains Klaus Schäfer, chairman of the executive board. "In concrete terms this means that we aim to offer our existing customers optimal value for money and provide an attractive environment for investors looking for a location in northwest Europe."

TRANSFORMATION

The company's new identity also underscores its transformation from a corporate site administration division to a modern service provider with a strong customer focus. CURRENTA is a joint venture between Bayer and Lanxess, which still hold 60% and 40% of the renamed company respectively.

"CHEMPARK offers our more than 60 chemical park partners a platform on which to present their own brands," says Schäfer.

future of the sites."

Companies located at the three CHEMPARK sites employ some 50,000 people and produce around one-third of North Rhine-Westphalia's chemical industry output.

"CHEMPARK – Europe's chemical park" is a signal that the company aims to become one of the most attractive addresses on the continent. "Above all, the new name is universally comprehensible and emphasises the strength of our location as a base for the chemical industry," explains Schäfer. "CHEMPARK also stands for safety, reliability and good neighbourhood relations. These are guiding principles for all the companies based there."

CHEMPARK offers its tenants benefits such as ship, rail and road logistics, raw materials and pipeline connections, waste treatment facilities and competitive energy

The break-up of Hoechst, once one of Germany's chemical majors, created a huge multi-occupancy site, now under the management of InfraServ

Focus turns to biotech

Among German chemical parks, Höchst, on the western fringe of Frankfurt, is the "top address", says site management company InfraServ Höchst.

As one of the country's first such parks, created 10 years ago in the "cell division" of the Hoechst group, it has served as a model for others that have sprung up in the meantime, as Europe's premier league of chemical producers sells, swaps or outsources businesses.

The Frankfurt site "has shown consistently dynamic growth" since its establishment, says InfraServ CEO Jürgen Vormann. Currently, it is home to more than 90 companies employing 22,000 people.

Vormann says investors will find "optimal conditions" at the 4.6km² site, where the presence of many diverse companies and production networks assures that newcomers can easily be integrated.

Production facilities of such big industry names as Sanofi-Aventis (pharmaceuticals) Celanese (chemicals) and Clariant (specialty chemicals) and LyondellBasell Industries (polyolefins) exist alongside those of other well-known companies such as Merck (liquid crystals), Kuraray (polyvinyl alcohol and polyvinyl butyral), DyStar (textile dyes) and Solvay (fluorine products), and many smaller specialised firms.

A newcomer to Höchst is Celanese engineering plastics subsidiary Ticona, which is relocating a 140,000 tonne/year polyacetals plant from nearby Kelsterbach (see page 33).

WELL CONNECTED

The large production complex has strong ties to the Rhine-Main region, one of Germany and Europe's major commercial centres. The proximity to Frankfurt's international airport, one of the continent's busiest hubs, is a "definite advantage", Vormann says.

Höchst also is well connected to Germany's dense motorway and rail networks. From the park's "trimodal" (road,

rail and water) port directly on the river Main, goods can be shipped directly to principal North Sea harbours.

Already Germany's largest pharmaceutical site, Höchst is also an ideal location for chemical producers as well as biotechnology companies, InfraServ believes. "These are

The state-of-the-art sewage facilities also are specially equipped to treat pharmaceutical waste water.

As would be expected of an operation of this calibre, Höchst offers the professional security checks important to companies working with sensitive substances and is

Investment in Höchst at record level



Companies at the Höchst site invested €2.7bn on-site between 2000 and 2006. The largest-ever project is the new €300m power plant fuelled by industrial and household wastes that InfraServ will bring on stream in 2009. This will produce 250 tonnes/hr of steam, generating 70MW of electricity to be piped into the park's grid. A €44m fully automated logistics centre is also under construction. Ticona's new polyacetals plant will ensure that capital spending remains at record level for some years to come.

the sectors we have clearly identified as our focus", says its managing director Roland Mohr. "By orienting our infrastructure towards a well-defined group of customers, we are in a better position to meet their special needs", he remarks.

InfraServ says the infrastructure at Höchst stacks up very favourably against other chemical parks, especially as regards efficiency, energy supply and cost structure, reliability and quality of services. Despite the vast size of the complex, "we are quite flexible and in a good position to offer individual solutions to our site companies", Mohr stresses.

Höchst's power plant generates around 900 tonnes/hr of steam and provides enough electricity for a city of 1.4m inhabitants. The site also produces its own ultra-pure pharmaceutical water and has the world's largest plant for pharmaceutical-grade water.

well prepared for emergencies of any type. Round-the-clock fire-fighting readiness, environmental monitoring and IT assistance are self-explanatory. Of course, InfraServ can obtain all the necessary building and operating permits, says Mohr.

STANDALONE SERVICES

Logistics, personnel training or contracting have been carved out into standalone companies to improve efficiency. InfraServ Logistics has specialised know-how in transport of hazardous goods. Provadis offers vocational and continuing education to 1,400 young people who will work for international companies on-site.

InfraServ's technical maintenance arm, Technion, can scale up production processes from laboratory to commercial scale and can operate pilot plants for customers when required.

Overview



Partners for success

The many chemical sites and parks in Germany offer a wide range of flexible business models and incentives to attract investors to their location

The German chemical industry is nothing if not flexible, and this is shown as much in its chemicals parks as within individual companies. Across the major complexes, and indeed some of the smaller ones, there is a huge variety of business models that potential investors can explore.

If they so choose, the investor can merely buy or lease land from the site owner and establish its own production unit. At the other extreme, the business model might consist of a site operator investing in and operating a new plant for the investor, on a custom or toll manufacturing basis.

In between, of course, lies the more conventional approach, and the one that most sites market most keenly. Here the investor brings his production and expertise to the site and integrates the new plant with the various raw material streams, utilities and services that the chemical park or lead

site producer has to offer.

This brings major benefits to both the site operator/owner and the investor. Site overheads are shared and thus become more cost-effective. These can include electricity, steam, security and fire services, maintenance, warehousing, logistics, and so on.

In some cases, the contract will specify use of the site services as a prerequisite for the investment; in others the investor may be allowed to buy in services, on a competitive basis. In a third model, the site operator may offer to tender for services on a competitive basis with a short list of suppliers, on behalf of the investor.

One of the important offerings in the business model is the integration of raw materials and waste streams, whereby one producer can balance its own supply, production and demand requirements with a third-party offtaker, or can monetise a

byproduct stream that would otherwise have to be used as fuel on the site or shipped off-site.

Hydrogen is a classic example. Where a site has excess supply, the hydrogen is often fed to the power plant. If there is sufficient, an industrial gases investor might be enticed to the site to take the gas and package it for local use. Or, if quantities are substantial, the site might be integrated by pipeline into the gas company's grid system, and sold further afield.

The ultimate goal, of course, is to create added value at the site, for all parties concerned. Call it synergy, alchemy or just good chemistry, successful cooperation among chemical companies in Germany is providing a business model for industrial development around the world. Indeed, it has created a word to describe the integration: Verbund.

Infracor, the company that manages the Marl chemical site, is proving its expertise can bring it business outside its core location

Flexible approach pays off

When the ARG pipeline consortium chose Marl-based Infracor as its partner to operate the Ethylene Pipeline South (EPS), now under construction in Bavaria, it praised the company's near 70 years' experience in operating pipelines and complex chemical infrastructure.

As a standalone firm, Infracor dates back to 1998, when the Marl chemical complex was opened to outside investors. In the 10 years since, the footprint of the site management company, now wholly owned by Evonik and with 2,700 employees and an annual turnover of about €700m, has grown steadily.

"Since our founding", says managing director Hartmut Müller, "we have systematically aligned our organisation and business processes". For historical reasons, the company and the site's petrochemicals competency – in particular C2, C3 and C4 chemistry and chlorine chemistry – looms large. However, the chemical park is now also home to a number of highly specialised companies whose individual needs must be met.

TAILORED PACKAGES

Alongside technical competence, one of Infracor's core concepts is flexibility, the managing director says. It goes without saying that the site company can provide all the services one would expect in an integrated chemical park – good logistics, highly trained and experienced personnel, contacts to local planning and permit authorities. Its speciality, however, comes in the form of innovative packages specially tailored to individual customers' needs.

A number of business models are available to investors. During the negotiating phase with a potential investor, Müller says, "we explore the possibilities and let them decide how they would like responsibilities divided". Some of the plants are run by Infracor on behalf of third



Marl offers investors waterborne logistics through its own port facilities

parties, and it will even provide personnel. There are also mixed models.

While Müller stresses that "we won't run all

onsite air separation plant built by Linde in the early 1990s, while the gases producer handles maintenance and upgrades technology, when needed.

COMPREHENSIVE OFFER

This cooperation in gases, which Müller notes is not common at other chemical sites, has advantages for all sides, he says. It provides companies in the park with a captive supply of process gases at an attractive price and enhances infrastructural links at a site where large amounts of liquefied gas are consumed.

These comprehensive and tailor-made services available from Infracor - from a single service to running a plant on behalf of a customer - are a major advantage for investors. But even more, investors have the chance to tap into one of the most tightly structured and integrated production sites.



"We explore the possibilities and let them decide"

Hartmut Müller, managing director, Infracor

types of plants" – the technology should be in house or in the public domain – he underscores that due to the site's multi-faceted history, Infracor's engineers are "familiar with a large number of production processes".

One successful business model is the more than 15-year partnership between Infracor and leading German industrial gases producer Linde, recently extended for another 15 years. Infracor operates the

SPES



A business model that involves process development and plant fabrication has paid off at Industrie Center Obernberg



Site entrepreneur wins out

In view of the fierce competition to attract new investment to Germany's established chemical sites, simply having a good concept, qualified personnel and plenty of space available is sometimes not enough. Having all of these is, of course, an important prerequisite.

However, determination, persistence and a high degree of inventiveness are needed to stand out in a crowd, as Bernhard Krautwurst has learned. In 2005, the manager of engineering at Mainsite Services, which runs the 1.7km² chemical park Industrie Center Obernberg (ICO), had an idea for improving a production process for a global membrane producer.

To turn a well-worn phrase, indeed apt in this case, he and his staff were able to translate the idea into a win-win situation – for the park's private equity owner, the infrastructure company and the membrane producer, as well as its customers.

The membrane producer was using polyether sulphone (PES) to manufacture hydrophilic membranes used in various filtration processes as well as fuel cells. At the company's request, Krautwurst developed a process to improve membrane performance by adding sulphonate to the PES to make SPES (sulphonated polyethersulphone). This also reduced production costs significantly.

LOOKING FOR FINANCE

At the same time, Mainsite Services proposed designing and manufacturing new production machinery, and the customer inked a five-year take or pay agreement for the end product. Site management agreed to procure or manufacture all raw materials needed, including PES, as well as scaling up the process.

CVC Capital Partners, the private equity

group and owner of the Industrie Centre Obernberg, was reluctant to back the project financially. But the infrastructure company did not give up easily. After Krautwurst and site manager Alfred Franz won outside financing and agreed to take shares in the new company they called SPES Produktions, CVC turned thumbs up.

Within a short time schedule Mainsite Services engineered and manufactured the equipment and erected the plant. After a short start-up Mainsite Analytics confirmed that the very first batch hit the tough specification and quality targets. The new SPES company started up in 2005 and currently produces SPES. It can also offer 5-10kg batch production as well as run trial operations for sulphonating processes that can be used with other polymers.

Thanks to site management's ingenuity, the riverside chemical park has a new entrepreneurial concept and a business model it can leverage to benefit site companies and attract fresh investment.

Since ICO was opened to outside investment in 2003, the number of companies has doubled from 15 to 30. The SPES company is one of them, and Mainsite hopes there will be more of this

type. Krautwurst sees the location on the river Main – which is in the industry-friendly state of Bavaria but very close to Frankfurt international airport, as well as direct rail and motorway connections – as ideal for medium-sized companies. Negotiations currently are in progress with two companies that have larger investment plans. They are interested in locating at Obernberg because of the availability of business models enabling them to focus their core activities, says Krautwurst.

OUTSOURCING SERVICES

Several firms already there have outsourced personnel recruitment, personnel management or logistics to Mainsite. Office space as well as IT support, of course, also can be provided. All investors can take advantage the good connections to state authorities so crucial in winning operating permits.

Start-ups with specialised ideas and/or new products are especially welcome at Mainsite, says Krautwurst, adding that "what I find especially exciting is participating in the growth of a company." In expectation of further companies settling on this site, a neighbouring 35ha area offers opportunities for further expansions.



Infraserv Knapsack prides itself on the flexibility of its business offerings to companies that have or want to locate on the site near Cologne



All you want, and more

Ask InfraServ Knapsack's managing director Helmut Weiher what his chemical park can offer its customers, and he will answer: "Everything they need."

Finding innovative solutions for investors or those wanting to build or buy on the 160ha of prime industrial real estate near Cologne is the site management company's speciality, he explains.

While many industrial parks also sell or lease property, rent office and laboratory space or offer logistics, Knapsack has developed a number of business models and turnkey solutions that take a step farther, the manager adds.

Some of these have been fine-tuned and adapted from the specialised plant services that were key functions when Knapsack was part of Hoechst. However, InfraServ has also developed marketable business models of its own.

The management company prides itself especially on its flexibility in responding to investors' demands, some of which require thinking outside the chemical grid. Most of the services open to Knapsack investors, including planning, engineering, construction and maintenance, are of a more sobering technical nature, although financing is almost always an integral part of the plan.

Chemical producers setting up in the park need not even purchase their own machinery and equipment. InfraServ will lease it for a fixed monthly fee.

Knapsack's machine pool counts 14,000 pieces of equipment, including most of the spare parts a producer usually needs. Even if it is a special part that may not be in stock, "we can get it", Weiher says.

He calculates that a company leasing its machinery and equipment from InfraServ can achieve considerable savings. For

Energy is no problem

The Knapsack location is particularly attractive for businesses with high energy needs due to its well-developed infrastructure.

For new investment projects the site can supply energy cost-effectively. In addition to RWE's existing lignite coal-fired power plant, in October 2007 Norwegian company Statkraft started operating a newly built 800MW gas and steam power station.

A further project on the site is the construction of a power station using refuse-derived fuel. This power plant project - a cooperation between Sotec and InfraServ - is planned to go into operation in mid-2008 and will provide the site with electricity and steam.

But even less energy-intensive businesses can profit from chemical park operator InfraServ Knapsack's comprehensive services and infrastructure.

accounting purposes, the equipment - which can represent 15-20% of a process plant's total investment budget - is not accrued as operating cost until the facility is up and running.

ENGINEERING ON TAP

A particular advantage for SMEs or start-ups is that InfraServ keeps the investment on its books until the plant is on stream.

Regular maintenance is another option investors can book. Weiher says this especially benefits foreign companies not wanting to employ a large permanent staff.

One of Infraserv Knapsack's "special strengths" is plant contracting, says Dieter Hofmann, who heads engineering and contracting services. Using various price models, the infrastructure company builds, expands or upgrades plants for investors on-site. In some cases it leases the facility to the customer, in others, InfraServ operates it.

Clariant, an InfraServ shareholder as well as a Knapsack investor, had InfraServ engineers build its flame retardant plant, and has contracted to rent it for 33 years.

InfraServ also expanded Clariant's phosphorus intermediates plant at a fixed price.

Such site services are "especially useful for us" says Wolfgang Schick, Clariant's Knapsack operations manager. As the Swiss group produces at several European locations, "it would be prohibitively expensive for us to make large investments into the infrastructure everywhere".

For PVC producer Vinnolit, InfraServ built and will operate a sodium hydroxide tank farm for ten years.

Pumps and motors needed for the ongoing €60m expansion of a Bayer CropScience plant for the agrochemical intermediate methane phosphonous acid n-butyl ester are being purchased and financed by Knapsack site management and integrated into its machine pool.

InfraServ's investment in each of the four projects ranged from €1m to €5m. "Our taking care of planning and construction enabled the companies to decide on the investment more quickly, and this led to improved cost efficiency", Hofmann asserts.



Let's work together

Germany has made great and rapid strides through its innovation clusters and the use of public-private partnerships between government, companies and academia

One of the great successes of the German industrial model is its creation of clusters of excellence for a whole range of purposes. This might be to put suppliers and customers together with processors in, say, a polymer cluster, or producers and academia together in innovation clusters.

In many cases, there is an effective mix of public and private funding, with municipal, state, regional and federal money supplementing funding from industry and the big research institutes, such as the Fraunhofer Institute and Max Planck Institute, to name but two.

Often these clusters are built up by industry to support and speed innovation in existing sectors, but increasingly they are being established by government to stimulate German expertise in emerging areas such as biotechnology, nanotechnology, solar technology and the hydrogen economy.

Whichever is the case, in general the infrastructure investment is often provided by the state, and running costs and project costs funded by the cluster members.

And these clusters and networks are not just talking shops! They are independently managed and have significant budgets for collaborative research. In this publication, we look at several examples, based around polymers, silicon chemistry, carbon fibre reinforced composites and biotechnology. These are spread across Germany, and many have been built up rapidly in recent years.

German government policy stands four-square behind these innovation clusters. It wants to drive the country towards a high-tech future and realises that this requires a high level of private and public investment. For 2009, the federal government will commit €6bn of additional investment to ensure the state and the private sector are jointly

investing at least 3% of GDP in research and development, as set out in the EU's Lisbon agenda.

The result for potential investors in the German chemicals sector is attractive. They can tap into these networks and clusters as soon as they invest in production or research in the country, giving access to first class facilities, specific scientific and industrial projects and greater contact with suppliers and customers.

The German chemical industry is already a leading investor in innovation. It already spends 3.8% of sales on R&D, amounting to over €8bn a year, or just over 11% of the global industry total. This innovative strength is reflected in the rising number of patents issued to German chemical producers.

The growing presence of innovation clusters and networks will undoubtedly accelerate innovation even further.

Making innovation happen

Private and public monies have funded investment in a state-of-the-art pilot scale facility for studying polymerisation and processing

In the middle of the Dow ValuePark at Schkopau stands €20m worth of gleaming new pilot plant facilities for polymer synthesis and processing. The state-of-the-art investment is a tangible result of Germany's system of cofunding research by government, industry and academia, and for creating clusters of excellence for innovation.

The pilot plant has been built and is operated jointly by the Applied Polymer Research (IAP) and Mechanics of Materials (IWM) institutes of the Fraunhofer Society, one of Germany's largest research institutes, focused on applied research. Fraunhofer receives funding from government, industry and public sources in roughly equal measure.

The facility, known as the Fraunhofer Pilot Plant Center (PAZ) for Polymers, plays an integral part in two local networks, one known as the Future Cluster Chemistry/Plastics Central Germany, formed in 2003 (see box on next page); the other known as the Fraunhofer Innovation Cluster for Polymer Technology, formed just last year (see below). Both are designed to stimulate development of the chemical and plastics industry in the central German chemical region around Halle/Schkopau/Leipzig.

CONTRACT RESEARCH

Michael Bartke, head of the pilot facility and also a professor at the nearby Halle University, explains that "the design has focused on producing a flexible multiproduct, multipurpose pilot plant" for contract research. Start up of the PAZ was finalised in 2006, but already commercial campaigns have been performed.

The pilot plant has polymerisation lines for solution, emulsion, suspension and bulk polymerisation as well as polycondensation reactions and can be used to make butadiene-based elastomers, polystyrene (PS), polyvinyl chloride (PVC), polyesters and polyamides. A hydrogenation reactor

also allows post-reactor modifications of polymers, such as PS. The main reactors are sized between 500 and 800 litres.

Adjoining the polymerisation pilot plant is the processing centre, with pilot scale injection moulding units and compounders. Much of the focus here, explains Bartke, is on fibre-reinforced thermoplastics. In all there are 17 people working in the centre, enabling 24 hour running of the pilot plants, if required.

Bartke believes the centre is attractive to polymer producers, polymer converters, catalyst and additive suppliers and engineering companies, that require large scale development facilities for their ideas and products. "We are already seeing international interest", he notes.

"Often polymer synthesis and material science are too separated in the scientific world, as lab scale polymerisation doesn't deliver enough material for polymer processing and materials evaluation. This is the opportunity for the Fraunhofer PAZ, as it offers an integrated approach."

Much of the work in the pilot plant will be for industrial clients, usually he anticipates, on a single client basis. But Bartke also envisages the facility carrying out some innovative research under public financing, potentially arising through the newly created Fraunhofer Innovation Cluster for Polymer Technology.

This was launched late last year to stimulate collaborative innovation in the Halle/Leipzig area between industry and academia, with tripartite funding from Fraunhofer, the state and industry sources. The project has a budget of €6m over the next four years.

Industrial members include The Dow Chemical Company and BASF and a range of downstream processors including Orbita Film and Kometra. On the scientific side, there is participation from the Martin-



The pilot plant makes possible the production of hundreds of tonnes of polymer for trials

Luther-University at Halle-Wittenberg, the University of Applied Sciences at Merseburg and the Institute for Polymeric Materials at Merseburg.

FOCUS ON NANOPARTICLES

Projects are focusing on three main areas: polymer/nanoparticle blends, new synthetic rubber grades and biopolymers and natural fibre composites. The first project is looking at nano-reinforced polyamide components for use in the automotive industry – offering smoother surfaces and better mechanical properties.

"The aim is to foster long-term cooperation between industry, universities and research institutes", says Bartke. The innovation cluster, he stresses, is not just another networking club, but seeks to drive real innovation and build up polymer industry capability in the region.

Clustering for the future

Chemical and polymer production are established competencies in the central region of Germany and have shown strong growth over the last decade. A number of local and regional networks have been established to support this development, such as the plastics and processing networks Polykum, KuBra, PolymerMat, AMZK and CeChemNet, the Central European Chemical Network.

However, in 2003, the business community in the region realised that further support was needed to develop the industry, based around the now-restructured East German production centres of Leuna, Böhlen, Schkopau, Zeitz, Bitterfeld Wolfen, Schwarzeiche, and the like. Thus, after some political persuasion, the Future Cluster Chemistry/Plastics Central Germany was created, involving chemical producers and federations, research institutions, as well as politicians and administrations.

As cluster spokesman Dr Christoph Mühlhaus of Dow Olefinverbund, based in Schkopau, explains: "After the restructuring of production in the region, we had two main concerns: value-chain integration and too little innovation, despite the presence of good academic institutions". Thus, the aim of the new cluster is "to promote the formation of value-added chains, from applied research, via feedstocks to final products."

VALUE CHAIN

The cluster covers four of the former East German states – Saxony, Saxony-Anhalt, Thuringia and Brandenburg, all of which have strong chemical sectors, and is managed by the ISW economic institute, based in Halle. And quite uniquely, adds Mühlhaus, it covers chemicals and polymers and polymer converters, so as to capture the entire value chain

The aim, he adds, "is to make central Germany a competence centre for polymer synthesis and polymer processing, which neatly brings us back to the Fraunhofer PAZ – one of the early concrete successes of the Chemistry/Plastics cluster. Others are the new plastics competency centre (KKZ) at Halle-Merseburg and the Fraunhofer Innovation Cluster for Polymer Technology. Not bad progress in just a couple of years!

Kunststoffland NRW

Platform for progress

The concentration of polymer producers, plastic converters and customers in NRW has led to the development of a powerful plastics cluster

North Rhine-Westphalia (NRW) has emerged as the leading plastics region in Germany and, indeed, in Europe. The entire value-added chain is represented here, from polymer producers and research and development, to processors and consumers.

The plastics sector in North Rhine-Westphalia boasts some 3,000 companies and organisations and around 100,000 employees. In 2006, it generated a turnover of €25bn, with over 80% of production being exported.

The businesses are closely networked with key buyer industries, such as automotive, aerospace, electronics, engineering and medicine. The proximity of individual companies to each other is a contributing factor to the success and growth of these cooperation relationships.

The sector continues to expand dramatically. It is expected that more than 3,000 new specialists in the plastics industry will be required in North Rhine-Westphalia by 2011.

To bring the various plastic industry companies together, Kunststoffland NRW was formed over a year ago. It serves as a platform for over 40 companies, research centres and institutions and provides a network for its players, offering an information, communication and contact platform. It also promotes close collaboration between the areas of research, development and production and campaigns for better political conditions and structures.

North Rhine-Westphalia offers ideal conditions as a location for the plastics industry:

- It has a central location within Europe, with strong sales markets and an excellent infrastructure
- Economically, it is the most important

federal state in Germany

- It has close proximity to other excellent sectors
- It offers a high level of qualification amongst its workforce.

One key aspect is the density of research and higher education institutions. More than 20 of the total of 59 North Rhine-Westphalian universities and universities of applied sciences offer training and research in the areas of polymer sciences, plastics technology and other plastics-related subject areas. In addition to this, there are many non-university related research centres, such as the Max-Planck Institute and the Fraunhofer Institute.

Kunststoffland NRW provides a network to connect these research and science centres with each other and initiates the cooperation between science and industry. The association also supports the training and education of qualified staff for the sector by offering qualification programmes and activities.

The close proximity of manufacturers, processors and consumers to research and education institutions is a requirement for a strong sector that creates solutions for a large number of application cases with innovative developments. The key partners of Kunststoffland NRW, including large and mainly strong medium-sized internationally active companies, provide the necessary willingness to cooperate as well as a notable problem-solving competence.

Kunststoffland NRW helps new players and companies in their efforts to establish themselves in the existing network, are offers access to its communication and information platform. Companies can also be introduced to and assisted in forming cooperation relationships with other companies.



Large-scale prototypes of carbon-fibre reinforced components can be made for clients

Fibre composites take off

The boom in demand for advanced composites has stimulated a collaborative innovation cluster and university campus at Stade, around the huge Airbus factory there

Around the enormous Airbus production facility in Stade in northern Germany, a unique cluster of excellence devoted to carbon-fibre-reinforced plastics (CFRP) has literally sprung up over the last few years. Dubbed CFK-Valley Stade, the initiative is designed to promote networking to speed up CFRP innovation.

With the initial impetus from industry,

including Airbus, and funding to the tune of €8m coming from Stade and regional authorities, CFK-Valley Stade now boasts a service centre, where companies can set up offices and hold meetings; a composite technology centre, where large scale automated equipment and processes can be developed; and the CFK-Valley Stade Campus, where the first 110 students have

now started their degree-level training in composite technology.

Andreas Baar, managing director of the CFK-Valley Stade main office, explains that the initiative focuses on emerging construction methods and automated manufacturing processes in the CFRP market. The interdisciplinary competencies represented by the members cover the entire value chain, »

CFK-Valley Stade



Airbus' A350 XWB family of medium-capacity aircraft will use the latest materials and technology

from design of CFRP structures, to their production and even eventual recycling.

CFK-Valley Stade hopes to open a recycling centre in Stade at the end of 2009, recovering the long carbon fibres from the component by pyrolysis of the resin matrix. The fibres, which retain 90% of their original mechanical strength, can be re-used in short-fibre-reinforced mouldings.

There are now more than 70 members in CFK-Valley Stade, representing a mix of large companies and SMEs, research institutes and universities. Many of the companies are international players well known in the chemical and fibres sectors, such as Hexcel, Toho Tenax, Röhm and Dow Chemical. Others include car makers (Volkswagen and Karmann), truck makers (Kögel) and machinery suppliers, testers and composite fabricators.

STRONG GROWTH

The drive for CFRP innovation is strong, says Professor Axel Herrmann, chairman of steering board, and demand for composites is taking off, literally in the case of the aerospace industry. A step change in demand growth was seen around 2003 and growth rates are now put at 15%/year, meaning CFRP output needs to double every five years.

Airbus and US rival Boeing are increasingly using and developing new uses for CFRP components in their aircraft. The Stade facility, for instance, uses CFRP to

make the huge vertical tailplanes for the Airbus aircraft.

But other areas are also developing rapidly. Offshore wind turbines, which have much larger blades than land-based ones, use CFRP supports in the centre of the blades. Truck builders are beginning to develop CFRP chassis, instead of using steel, which can shave several tonnes from a truck's unladen weight, making it possible to carry a greater payload and still stay within prescribed gross weight limits.

And car makers are also looking at CFRP use to save weight. Already there is uptake in small series vehicles – sports cars and the like – where CFRP is being used in body panels, floor pans and roofs, and bumpers.

The main issue, explains Baar, especially for the automotive market, is the need to speed up production of CFRP parts, reduce the labour intensity and thus cost of production, and increase unit outputs. And this is where the CFK-Valley Stade networking comes into its own.

Developing CFRP automation requires innovation in the resin and fibre materials used, the lay up processes and the way parts are designed and assembled. By bringing together experts from across this value chain, issues and projects can be discussed and collaborative work undertaken.

The networking initiative has developed ideas for some 45 projects worth close to €100m, which it has set out in a white paper

on research and development strategy until the year 2016. Ten of these projects are already underway, with funding of €34m committed, with money coming from the private and public sector. The network activities, itself, however, are fully funded by the member companies.

If 2016 seems a fair way off, it is not, notes Herrmann. For instance, "if the automotive sector wants to use CFRP components in a scale of 200,000/year in a new vehicle, it needs to have a technical solution by 2013, which gives use five to seven years to develop and get the machinery technology in place and the individual parts through the approval process. Which means we need to start today."

Wilm Unckenbold, professor for fibre composites at the Private University of Applied Science Gottingen in Stade, says one of the main issues is simply the lack of experienced and trained personnel in the CFRP sector, which is why CFK-Valley Stade moved very quickly after its formation in 2004 to set up the university campus. Against this background, the university has developed two completely novel courses in close cooperation with CFK-Valley Stade and relevant industries. These are just at the stage of accreditation.

CONCRETE RESULTS

Unckenbold does not foresee any problems with the graduates getting jobs in the industry after they have finished their training. In some cases, the students are funded by companies for which they are already working. "This is the first such facility in Europe and was just an idea three years ago. Today it is up and running and the first courses started in October 2006."

The physical results of the initiative are thus clear to see: several brand new buildings either side of the Airbus-strasse leading up to the Airbus factory. But there are other successes, not least 500 new jobs in the town, four companies settled in Stade, and no less than €18.6m worth of investments, split half and half between industry and local and state government funding.

The real results, however, are still in the future, as the competence network begins to deliver innovative CFRP products and processes to the manufacturing industries.

Leuna quest

Industrial gases producer Linde has made Leuna the centrepiece of its hydrogen cluster, where its future as a clean fuel can be developed

Linde was the first company to invest in Leuna after German re-unification, beginning with technical gases production that came on stream in 1992. This was followed by further facilities like a steam reformer, a gas cylinder filling unit, a specialty gases plant, acetylene production, an air separation plant and a CO₂ unit.

With investments totalling about €460m to date, Leuna has become Linde's largest production site for industrial gases. "For the



Linde Group of companies, Leuna is a site with a proud past, a vibrant present and a promising future" says Aldo Belloni, board member of the executive board of Linde.

In September 2007 a new hydrogen liquefaction plant with a nameplate capacity of 5 tonnes/day of LH₂ (liquid hydrogen at -253°C) was commissioned. It is fed from a nearby plant generating the gaseous raw material from natural gas. The benefit of LH₂ is its higher energy density, making for lower logistics and distribution costs.

As a supporter of hydrogen technology, Linde took the initiative to build a full-scale LH₂ plant not only for the benefit of today's customers, but also envisaging the future of hydrogen as an environmentally friendly fuel for mobility in the 21st century. Thereby it also laid the cornerstone for a "hydrogen community" in the region, where substantial R&D synergies are facilitated.

This is an ideal environment to develop

and commercialise hydrogen-based applications. The site at Leuna was chosen because it not only offers production of 70,000m³/hr of conventional gaseous hydrogen but also infrastructural advantages. It is well located to supply Berlin, Hamburg and the logistics hub developing around nearby Leipzig, all of which are developing a strong demand for hydrogen.

Already today hydrogen is making a strong contribution to improving the environment as almost half of the produced volumes are employed to desulphurise fossil fuels. However, its full potential will only be developed once it can be produced sustainably from renewable resources. "For years Linde has been committed to establishing hydrogen as a sustainable fuel. We are convinced that hydrogen technology is the way forward as we approach the end of the fossil fuel era" says Belloni.

With new investments close to realisation, sustainable hydrogen is starting to play its part in a completely emission-free energy value chain. In fact, all hydrogen-powered test buses and passenger vehicles can shortly be supplied with such "green hydrogen".

The Linde Group invites companies that are actively developing and commercialising hydrogen technology to join it in its quest to realise this vision of a clean and renewable energy carrier.

Leuna keeps on growing

Some €500m are currently being invested in the Leuna chemical park. The money is being used to build new facilities and upgrade older ones. Investors include Quinn Chemicals, Total Raffinerie Mitteldeutschland, Leuna-Harze and Kataleuna. InfraLeuna is the owner and operator of the infrastructural entities in Leuna.

Making the most of hydrogen

HyCologne is paving the way for use of hydrogen as a fuel in power plants and buses

The chemical and petrochemical industry around Cologne produces significant quantities of hydrogen as a byproduct of its reactions. An industrial-scale infrastructure for collection and transport of the gas has been in operation for some 70 years.

As hydrogen seems to be one of the important energy carriers for the future, a regional technology cluster, called HyCologne, has been founded to support the development of hydrogen as a fuel. It is a public-private partnership with about 20 participating companies and is one of Germany's most advanced hydrogen initiatives.

CLEAN TECHNOLOGY

The Rhineland energy cluster was set up to facilitate development of the clean technology in the region and to offer potential investors, from other parts of Germany as well as abroad, a well-developed hydrogen infrastructure. One of the main objectives is to enhance the research and development focus by cooperating with universities, with particular emphasis on demonstration projects. Another is to create a new outlet for the 50 tonnes/day of byproduct hydrogen produced by the regional chemical industry, as well as expanding the existing hydrogen pipeline network.

HyCologne aims to demonstrate that hydrogen is economically interesting. Therefore, several different projects have been initiated. On the industrial side, construction of a €3m pilot power plant with a capacity of 1MW will begin at the chemical park in Knapsack in the first quarter of 2008. This will be powered by hydrogen co-product from an onsite chlorine production unit. Catalyst membrane technology is being



Hydrogen clusters



Zero-emission, hydrogen-powered buses took to the streets of Cologne last year

supplied by two German companies and one US one. Overall energy efficiency is estimated at 92%. Capacity is planned to be scaled up to 20MW by 2010.

A separate company, Innovation Group for Hydrogen, has been founded by HyCologne to commercialise the power generation technology. Its management expects that 30% of the 250MW total potential for generating power from by-product hydrogen streams in Germany should be realised by 2015. Global potential for this technology is around 1GW, in the innovation group's estimate.

Participating companies will have access to hydrogen from pipelines, optimal infrastructure, expert know-how, office facilities and undeveloped land, as well as a "top-class" R&D network, says HyCologne.

German aerospace centre DLR, the Jülich research centre, the Cologne university of applied sciences and three Max Planck institutes are located in the region. Car manufacturers Ford, Daimler and Toyota, which have production as well as R&D facilities nearby, are members of the initiative. All of these aim to provide hydrogen-based fuel cells for automotive applications by 2016.

Boris Jenner, project manager, says there is "great scope" for using hydrogen in a number of stationary and transport projects in the area. Construction of a multi-megawatt fuel cell-driven combined heat and power plant (CHP) is planned, to supply electricity to nearby industrial facilities.

A fleet of 15 "zero emission" buses fuelled by waste hydrogen from the Knapsack park took to the streets of Cologne briefly last autumn for a trial run. Regular service is to begin in the not-too-distant future.

Silicon cluster

Silicon valley wins global recognition

Favourable subsidies have catapulted Germany into the lead of the world's photovoltaic industry, with much development centred around Halle

It is hard to pick up a newspaper these days without spotting a story on German investment in solar energy. A *New York Times* columnist recently described the country's "red hot" solar technology market as "brilliant".

With current growth rates averaging 20-30%/year and 30% growth expected annually, photovoltaics is indeed taking off, helped along by government schemes to promote renewable energy. Attractive incentives are offered to home owners who put solar modules on their roofs.

Germany is now the world's second largest producer of solar cells, with around 20% of the market. Its leading manufacturer, Q-Cells, is the largest global player, with an estimated 10% worldwide share. The company's CEO Anton Milner has played a leading role in promoting solar energy internationally.

Photovoltaics is also adding a chapter to Germany's traditional export strength. Over the past three years, exports by the industry, which employs well over 50,000 people and adds 5,000 jobs a year, have surged from €190m to €1bn, according to the solar industry association BSW.

Most of the companies are home grown. Alongside Q-Cells, other recognised names include Ersol, PV Crystalox Solar, Wacker Schott Solar, SolarWorld and EverQ, a joint venture of Q-Cells with US-based Evergreen Solar and Norway's "Renewable Energy Corporation" (REC). According to the foreign ministry, at least 10 North American investors are building solar plants in Germany.

Although hot spots of investment are also found in southern Germany - where Freiburg was a solar pioneer and Wacker-Chemie at Burghausen is a silicon "powerhouse" - the real centre of the photovoltaics world is the

area around Halle. An estimated 18% of world solar production is concentrated here, and the sector employed 3,000 people in 2007.

One important reason for this is good chemistry, says Ralf Wehrspohn, director of the Fraunhofer Institute for Mechanics of Materials (IWM) in Halle. Without the chemical industry's input, solar silicon cannot be manufactured, he points out. The value chain starts with chlorine-based chemicals, and "this traditionally has been a strength of the region's chemicals sector".

SOLAR GOES EAST

Ironically, says Wehrspohn, who also wears the title of professor, there was no photovoltaics infrastructure in the old East German chemical belt when the federal government began to promote solar energy in the 1990s. Practically all of the research has been done in the west so far.

Even so, the industrial infrastructure went east, and R&D followed. Not only was land cheaper and investment conditions favourable, investors also found intellectual talent and a labour pool familiar with chemical processes. Project funding was available from German federal and state authorities as well as the EU, with schemes supporting economically depressed regions and innovation.

Solar Valley's photovoltaics manufacturing facilities are encircled by a cluster of firms in the silicon raw materials chain. Akzo Nobel Base Chemicals (ANBC), which operates a (membrane) chlor-alkali electrolysis plant and synthesis for hydrogen chloride in the Bitterfeld chemical park, is the starting point.

This "truly integrated" silicon network is a "beautiful example of how producers can profit from cooperation", says ANBC site



FRANK MAYEPALCORBS

manager Konrad Syska. "A no-waste closed loop was the idea", and this, he says, "has been realised".

Hydrogen chloride from Akzo Nobel's plant is piped to nearby Evonik (formerly Degussa) for chlorosilanes production. Evonik supplies tetrachlorosilane to Heraeus Tenevo for production of quartz glass (a raw material for fibre optic cables). Evonik will also supply tetrachlorosilane to PV Silicon's solar-grade polysilicon scheduled to start up in 2009. All acid waste streams are quenched with caustic soda from chlorine electrolysis and recycled back for electrolysis. Linde purifies the hydrogen from the electrolysis that is used

Bitterfeld attractive because of the availability of chlorosilane raw materials over the fence from Evonik, as well as the chance to draw employees from a pool of former employees previously working in the chemical industry nearby, he says.

NEW CHAPTER

PV's initial investment at Bitterfeld will be around €90m. The first plant will start up in early 2009 producing 900 tonnes/year, and nameplate capacity will rise to 1800 tonnes by 2011. "Bitterfeld will open up a new chapter in the silicon market's history", Aulich predicts.

The first plant definitely "won't be the end of the line", says technical director, Hilmar Tiefel. If demand continues to grow at this pace, output could be increased to 5,000-6,000 tonnes annually. "As soon as the new plant is on stream we will decide on expanding it", he says. The company has an option to buy more land at Bitterfeld.

Paradoxically, rapid growth is casting the first shadows on the sunny photovoltaics sector, as silicon supply is unable to keep up with booming demand, and research institutes such as Fraunhofer, with the support of the German ministry of the environment and the PV industry, are working creatively to secure its future.

An estimated 95% of all solar cells manufactured worldwide are made of silicon, and due to the market's tightness, prices have been rising according, rather than falling. German law stipulates that this alternative energy must eventually be competitive with fossil fuels by 2020 to receive further preference. Some experts, such as Q-Cells management, see the break-even point as early as 2012 or 2013 in certain regions of the

world, while others are not that sure.

In any case, the silicon supply bottleneck could ease when a string of new plants comes on stream in 2008-2009, Wehrspohn believes. Long- to medium-term, silicon producers will continue to receive financial and political encouragement to build new facilities. Alternatively, some companies and institutes are exploring the possibilities of metallurgical routes to silicon.

One of Fraunhofer's research focuses is on how to produce silicon more cheaply, so that the break-even point can be reached sooner. Another project is to make lighter modules. Those that would place no physical burden on European houses are too heavy for the frame structures common in the US, says the director.

The Center Silicon Photovoltaics (CSP), a joint establishment of Fraunhofer IWM and its sister Institute for Solar Energy Systems in Freiburg (ISE), began applied research in late 2007 in Halle. Over the next several years, pilot plants for producing solar silicon wafers will explore the scale-up of processes all along the polysilicon chain, from cleaning and crystallisation to ingot sawing and wafering and microstructure / material characterisation.

An academic solar think-tank is also being put in place. Halle-Wittenberg's Martin Luther University, where Q-Cells is sponsoring a professorship, now offers a master's degree in photovoltaics and physics. In Thuringia, at the University of Ilmenau, a professorship for physics and photovoltaics will be sponsored by PV Crystalox Solar, Schott Solar and ErSol. The university of applied sciences at Köthen has a bachelor of science programme in solar technologies and its counterpart at Merseburg supports continuing education in photovoltaics in cooperation with industry.

"As soon as the new plant is on stream we will decide on expanding it"

Hilmar Tiefel, technical director, PV Silicon

for HCl production.

Syska says there are opportunities for users of any of the materials in the silicon value chain to dock into the cluster. Building lots for smaller companies are available at the Akzo Nobel site, and larger firms will find 165ha of space to choose from in the chemical park.

UK-German silicon wafers producer PV Crystalox Solar, based near Oxford, UK, and parent company of PV Silicon, plans to make Bitterfeld its centre for solar-grade silicon production. As executive director for Germany Hubert Aulich explains: "We wanted to increase output of wafers and needed more silicon". The company found



Sowing seeds for growth

A burgeoning agrochemical site and an innovation cluster in Piesteritz are proof that there is life in even the more mature area of fertilisers in Germany

"Chemistry for the future" is the pervasive message emanating from SKW Piesteritz, Germany's largest producer of ammonia and urea with an output totalling some 2.5m tonnes/year. Indeed, the words are painted in large letters on numerous plants and storage facilities on the huge complex, located in the largely agricultural region of Saxony-Anhalt in eastern Germany.

It is a message put into practice by SKW Piesteritz, which, as well as running its main production units for ammonia, urea and nitric acid, is seeking to drive innovation in its own products and build up an agrochemical cluster at the site.

To this end it has created the Agrochemical Park Piesteritz and in mid-2005 co-founded the Agrochemical Institute Piesteritz, in partnership with the Martin Luther University of Halle-Wittenberg and with state funding.

INNOVATION IS A PRIORITY

"We are Europe's most innovative producer of fertilisers", claims SKW Piesteritz CEO Rudiger Geserick, "with 30% of our sales coming from new products developed over the past 10 years." The company has its own highly competent 50-strong R&D centre on the site, mainly for market driven research. The agrochemical institute is concerned with broad-based research topics, such as

cultures, soils and nutrition as well as the use and yield of fertilisers.

The institute boasts the involvement of six professors at several of the university's departments and a number of graduate researchers. Geserick would like to expand the institute, and is looking for foreign

"We are Europe's most innovative producer of fertilisers"

Rudiger Geserick, CEO, SKW Piesteritz

investors and technology providers. "We are open to all new investors", he affirms.

Geserick explains that SKW Piesteritz needed to move away from selling basic urea products and develop innovative, higher value added products. As recent successes, he cites a urea/sulphur combination for use on rape and corn, and slow release formulations that deliver nitrogen to the crop over a sustained period. The company has recently invested in two production units for these innovations and is considering a third.

One area of interest is in fertilisers for biomass crops. Here the important factor is for the nutrient to help the plants to add bulk

quickly, rather than improve fruiting.

Turning to the Agrochemistry Park, Geserick explains that he has 30ha of land ready prepared for investment. Investors that can tap into the raw material streams and facilities are being sort. And there have been some notable successes in recent years.

Agrolinz Melamine has invested €130m to build an 80,000 tonne/year melamine plant on the site, and is now planning a liquid melamine resin expansion. The melamine unit is fed with urea from SKW Piesteritz's three urea units, guaranteeing year round supply.

SITE INVESTORS

Just last year Neckermann started up a 200,000 tonne/year biodiesel plant and associated oil mill on the site, after an investment of €85m, and shortly Stadtwerke Leipzig will fire up a 20MW biomass-fuelled power station currently under construction. This will supply electricity to the German grid and steam to the site. The biodiesel plant will supply byproduct to another new investor, Proteinwerk Piesteritz, which will make proteins from rape cake.

Geserick also points to a number of further potential investments, which he hopes will develop around fertilisers and biofuels in terms of production as well as research and development.

Boost for white biotech

Industrial biotechnology is now benefiting from Germany's clustering concept – in this case companies around Marl have come together to speed innovation



The industrial biotechnology cluster CLIB2021 was founded just last year to promote the business of utilising renewable resources in the producing of novel materials and active ingredients. Cluster members include Bayer Technology Services, Cognis, Evonik, Henkel and Lanxess, as well as about 20 small and mid-sized enterprises and 10 international renowned universities and R&D institutes.

Capital and infrastructure providers offer the means for this dynamic driver of innovation to implement its projects. Manfred Kircher, recently appointed president of CLIB2021, explains that: "We have already raised €40m for R&D partnerships in 2007 – boosted in part with public funding."

The cluster's crucial competitive advantage is academic excellence over the process chain, from feedstock processing and developing the bioprocess, to producing the final bio-product. To this end, four technology platforms have been defined:

- Polyomics - the use of genome science to develop cultures for industrial production
- Biocatalysis - synthesis routes with high selectivity, mild conditions and low energy consumption
- Expression - novel processes are developed for efficient secretion of proteins so far not industrially accessible, and
- Isolation and purification – which can account for over 80% of production costs and are thus crucial for profitable processes.

By focusing on chemicals such as monomers, polymers and functional derivatives of these, CLIB2021 develops

new routes to such different end-markets as packaging, sport and house-hold equipment, cosmetics and personal- and health care products.

Kircher sees his key function as promoting cooperation between industry and academia and organising the technology transfer from academia to SMEs and industry. This networking along commercial and production value chains, from market research to development and commercialisation and simultaneously along the production-

oriented value chain from raw material to intermediate, component and finally to consumer product, results in shorter time to market.

Kircher is convinced that "facilitating this cooperative culture will not only strengthen the participating partners but allow the cluster as a whole to prosper and become a magnet for new members." His goal is to become the No. 1 global industrial biotechnology cluster and he offers an open invitation "to the world-wide best in class" to join CLIB2021.

Science to Business units welcome investors

Partnering along links in the value chain is also the approach of the Science to Business (S2B) centres set up by CLIB founding member Evonik, according to the company's executive board member with responsibility for the chemicals business area, Alfred Oberholz. He says the S2B Biotech centre at Marl Chemical Park is also ready and waiting to welcome companies participating in the state's industrial biotech cluster.

The centre is built in such a way that industrial partners or joint ventures may establish some of their activities in the building. S2B-Bio's vision is planned to be the starting point of a growing science and business network attracting R&D teams from academia, small and medium sized enterprises as well as additional partners and investors. The concept is based on innovative high-performance materials for promising markets and processes based on biorenewables to substitute fossil fuels.

"Many companies and R&D groups working together and integrating market needs into R&D projects from the very beginning have better chances of finding solutions" to the challenges of shortening time to market, stresses the executive, who has spearheaded a large number of innovation drives in Germany and within Europe.

Alongside the biotech centre, the leading speciality chemicals player formerly known as Degussa also operates S2B Nanotronics. Oberholz believes that "this could provide the chance to make Marl an R&D focal point in this field. The chemical prerequisites are all here".

Overview



IMAGESOURCE

German employees lead the pack

Well trained at school, university and on the job, Germany's workforce is one to be reckoned with

Germany's chemical sector is widely admired internationally for the quality of its workforce. As most foreign investors quickly observe, the country does a first-class job of preparing young people for careers in the industry.

Whether it is for management, R&D, engineering or on the factory floor, graduates of colleges and universities as well as technical and vocational schools are well regarded for their highly specialised

knowledge.

Companies setting up in Germany are impressed in particular with the country's so-called dual education system, in which secondary school leavers are employed by businesses for a fixed three-year period while continuing their education in dedicated vocational schools. At the end of the period, most of those successfully completing the programme are offered jobs.

Well over 60% of chemical companies train their own future employees. "Having a qualified and highly motivated workforce is essential to the long-term success of any company", says Eggert Voscherau, managing board member at BASF and current president of the German Federation of Chemical Employers' Associations, BAVC.

The scheme has advantages for both sides. Trainees can put their theoretical

knowledge to use as they gain valuable hands-on experience, while employers seeking skilled personnel to operate complex chemical process machinery can secure for themselves the best-in-class.

Another bonus is that, because of the uniform standards set by the industry, employers can easily hire workers trained by other companies. Some chemical park operators even retain pools of employees who are familiar with a wide variety of production technologies and can work temporarily or permanently for investors at the sites.

COLLECTIVE BARGAINING

An added advantage to investors in the German chemical industry is the pragmatic approach to labour relations taken by both employer and the employee sides. The last industrial conflict dates back 37 years!

In part, this "blessing" reflects the country's collective bargaining system in which teams from the industry's single union and the umbrella organisation representing employers negotiate wages and working conditions on a national level. Purely local matters are dealt with by management and company works councils.

The system, that also sets standards for employees in jobs unrelated to chemical production as well as the non-unionised, may seem unusual to outsiders; however, BAVC says its member companies benefit from it, as they are spared strenuous individual bargaining rounds and are provided with a reliable and transparent basis for calculating salaries.

SOCIAL PARTNERSHIP IS THE WATCHWORD

The chemical union, IG BCE, agrees that cooperation rather than confrontation "improves the industry's competitive position" while at the same time contributing to worker satisfaction. A recent nationwide survey backs this up, as the union points out. Among employees in 30 industries the chemical industry was nationwide "runner-up" in job satisfaction.

While other German industries at least pay lip service to the idea of a "social partnership" between employer and employee, the chemicals sector actually lives it. Besides engaging in dialogue on issues of concern

to the industry itself, the union and employer groupings often issue joint position papers on socio-political issues.

Thanks to its non-ideological stance, IG BCE has helped lead Germany's labour force into a new era in recent years.

As globalisation and a sluggish economy began to strain many traditional businesses, the union agreed to "opt-out" clauses in the national agreement. These allow temporary concessions for companies in dire financial straits, to improve their competitiveness. The pact, updated regularly, allows wages to be lowered by as much as 10% for a limited period in particular hardship cases.

In other cases, local works councils, with

Cooperation rather than confrontation "improves the industry's competitive position" while at the same time contributing to worker satisfaction

Chemical union, IG BCE

union support, have agreed concessions with employers on wages or working time, to safeguard jobs at individual production sites. This has especially helped ease the aches and pains of the industry's decentralisation, making it easier for new spin-offs to find their feet and invest in new production facilities, for example.

Together, the employer and employee organisations have hammered out a number of benefits for the workforce, including a capital-backed industry-wide pension plan funded in part by employee contributions. This, says IG BCE, eases the burden on company plans and is at the same time "an attractive instrument" for recruiting.

Other joint incentives promote continuing education for workers and initiatives to secure equal promotion chances for men and women. The results are encouraging. As a recent study by BAVC shows, the proportion of qualified jobs in the industry has risen, and the majority of women – in this industry traditionally outnumbered by men – are at the higher qualified end of the union pay scale.

Membership in the employers' association benefits investors

Foreign companies investing in Germany will find it useful to belong to one of the 11 regional chemical employers' associations, says Eggert Voscherau, president of the German federation of Chemical Employers' Associations (BAVC), based in Wiesbaden.



BAVC's Voscherau

Along with supporting human resources departments with a wide number of services and advice, BAVC also handles collective bargaining with the union, IG BCE, relieving individual companies of the need to deal with such matters directly, as he points out. For the period covered by the collective agreement – usually one year – all additional negotiations or discussions on wages and working conditions are excluded.

Crucial to BAVC's approach to collective bargaining is ensuring that German chemical employers remain competitive, Voscherau stresses. For many years, he says, the federation's efforts have resulted in "moderate and sustainable" labour contracts, making Germany a favourable place to do business.

The BASF executive underscores that, from the chemical employers' perspective, the concept of social partnership is "the key to the consistently positive industrial relations in the German chemical industry". This, he says, leads to objective and fair relations between capital and labour and fosters a pragmatic approach to problem-solving through compromise.

Voscherau emphasises that the idea of cooperation rather than confrontation is a bonus not only in national collective bargaining. It also helps defuse or eliminate conflicts on a local level as well. Under German law, the works councils "play an important role in guaranteeing that difficult structural problems arising between employer and employee can be solved cooperatively", he notes.

Employee participation benefits chemical companies

Since the late 1940s, German employees have enjoyed the right to participate in the decision-making process at the companies they work for – on the shop floor, in the lab and in the office.

In all chemical companies, the works council has an important voice in matters of concern to employees. At larger, stock market-listed companies, workers – or in some cases their union representatives – enjoy equal representation on corporate supervisory boards.

This system, anchored firmly in German labour law, has had more advantages than disadvantages in ensuring the chemical industry's ability to compete globally, asserts Hubertus Schmoldt, chairman of the union IG BCE, which also represents companies in the energy, mining, glass and ceramics sectors.

The fact that Germany's largest chemical company, BASF, has decided to continue the principle of equal representation on the supervisory board even as a European Company (Societas Europaea), witnesses to this, he says.

Union chairman since 1997, Schmoldt holds positions on the supervisory boards of a number of German chemical companies. In his view, co-determination promotes good relations in the workplace. Carrying on a "constructive dialogue" about concepts and strategies strengthens employees' knowledge of the company's mission and gives them a sense of responsibility in helping management to meet new challenges, he says.

Employee participation also has been an important factor in Germany maintaining its economic resilience over the years, says the union leader. And he adds that the fruitful exchange of views between employer and employee makes an important contribution to innovation in the chemical industry.



IG BCE's Schmoldt

Ticona

Staff play key role in move

Human factors played a major role when Ticona had to decide where it would relocate its German polyacetal production after being forced to quit an existing site

In 2007, US chemical group Celanese made a landmark decision. It agreed to move a polyacetals (POM) production facility out of the path of a planned new runway for Frankfurt airport. The unit, of more than 100,000 tonne/year capacity, belongs to Celanese's engineering plastics subsidiary Ticona.

From 2008 to 2011, production at Kelsterbach, where Ticona was established in 1961 as a joint venture between the original Celanese and Germany's Hoechst, will be gradually wound down. Meanwhile, a new 140,000 tonne/year facility, billed as "the world's largest, state-of-the-art polyacetal plant", is being built on a new 10ha site in the nearby Höchst industrial park.

"Around 95% of the facility will be brand new, although it will incorporate elements of the existing plant", says Ticona managing director Joachim Gersdorf.

Relocating chemical production – without interruption of customer supply and with no alternative sourcing opportunities – represents an enormous challenge, and thus it is not often done. The Celanese/Ticona decision to go ahead with the move was preceded by more than a year of political and legal discussion.

In an extensive screening process, about 50 sites were reviewed, in Germany and points east. It was clear that the plant would be in Europe, because this is its customer base.

Although there might have been greater financial benefits in eastern Europe, in the end, it was the all-round quality of the nearby German location that tipped the scales for the US parent company, says Gersdorf.

In particular because the technology Ticona uses to produce POM at the plant "is rather complex", being able to retain the



Employees fly the flag for Ticona as it relocates plant

qualified staff of the existing unit was an advantage, he says. Recruiting and train new operating personnel elsewhere would have cost time and money.

Logistics were another factor speaking for the German location. Like Kelsterbach, the Höchst park is near Frankfurt airport,

"Around 95% of the facility will be brand new, although it will incorporate elements of the existing plant"

Joachim Gersdorf, managing director, Ticona

convenient enough for shipping, but far enough not to conflict with air traffic.

Ticona's employees enthusiastically greeted management's decision to relocate nearby, agreeing to concessions that included extending weekly working time to 39 from 37.5 hours at no additional pay.



Vocational training pays off

3M has found Germany an attractive location for its Dyneon subsidiary

Ask fluoropolymers specialist Dyneon whether it's American or German and you might elicit the response: We're German-American and proud of it.

A relative youngster, Dyneon was born at Burgkirchen, Bavaria, in 1996, in what is now the Industrial Park Werk Gendorf. Like Ticona, another "dual national", Dyneon grew out of a cooperation between Germany's Hoechst and an American partner – in this case, 3M.

Since its full takeover by 3M at the end of 1999, Dyneon has invested heavily in its facilities in the Industrial Park Werk Gendorf, where it has production and R&D facilities for fluoromonomers and fluoropolymers.

The company has expanded capacity for raw materials used in production of fluor elastomers and polymer processing additives, starting in 2008 with an investment

of around €10m. The processing stages are to be relocated to Burgkirchen from Antwerp, Belgium, creating 16 new high tech jobs at the Bavarian location.

One of the reasons 3M invested in Germany initially, and why it did not move production to the US when it acquired Hoechst's stake in the joint venture, was "the quality of the site's facilities, as well as its personnel," says Dyneon managing director and spokesman Michael Peters.

"It was our German parent that gave us the technological strength needed to complement our American marketing skills", he points out.

Dyneon's firm intention was and is to use Germany as a "foundation for further growing the European business", says Peters. He adds that 3M management has been especially impressed with Germany's world-class vocational training system, which

marries practical chemical education with on-the-job experience.

"This is especially helpful to a company like Dyneon, which operates "highly complex plants using sensitive technology", the executive stresses.

Like many German-based chemical companies, Dyneon trains more young people than it can employ. Due to the skills they have learned in the three-year programme, graduates can also find employment at other production facilities in the Gendorf park.

Supporting the German 3M sponsoring initiative "Unternehmen Schule", the company also cooperates with a local secondary school selected with the support of the ministry of schools, to encourage more young people to pursue higher education in the natural sciences.



The talent and flexibility of the workforce has been a key driver for improvement at SABIC's site in Gelsenkirchen, acquired from DSM in 2002

Labour skills shine through

When the state of North Rhine-Westphalia gave the green light for construction of a new 60km German propylene pipeline from Moers to Gelsenkirchen last October, cheers erupted along the rivers Rhine and Ruhr.

Helping to lead the cheers were executives of SABIC Europe's Gelsenkirchen-Scholven site, who saw their confidence in the location vindicated. A partner in the pipeline's operating consortium, SABIC had been a driving force in pushing for realisation of the €60m infrastructural open access project, which is receiving €20m in state support.

From the terminal in Duisburg harbour, across the river Ruhr, propylene monomer can now be piped to SABIC at Gelsenkirchen, to feed local polypropylene production.

The long awaited pipeline will "further improve our cost position, help compensate for shortage in cracker capacity and make the site generally more attractive," says vice managing director, Karl-Heinz Walter.

SEARCH FOR SKILLS

Even before this, he says, German and Saudi ingenuity had already been pooled to help secure Gelsenkirchen's position at the heart of the Ruhr area petrochemical grid.

When SABIC established a European base with the 2002 takeover of DSM Petrochemicals, it was looking for fully integrated sites, access to stellar technology and good plant design, as well as skilled labour to operate its production facilities besides stimulating its European sales. It found all of these at the Ruhr site, Walter remarks.

The only problem, he says, was that at the time, "our cost position was not the best". Although Gelsenkirchen had a long history of polyolefins production and a connection to the ARG pipeline, many older units were uncompetitive, and even newer ones were not best-in-class. But SABIC, whose management Walter says "encourages innovation," decided to restructure and

"In the majority of our activities, we have cost leadership and for the rest we are aiming to reach it"

Karl-Heinz Walter, vice managing director, SABIC Europe

upgrade, rather than dismantle.

If Gelsenkirchen once trailed in productivity, it now has the lowest production costs in Europe for PE, the manager says. "In the majority of our activities, we have cost leadership and for the rest we are aiming to reach it".

Most of the funding of a multi-stage modernisation scheme went into a social plan – 175 out of 600 jobs were eliminated. In a second phase, aimed at saving €20m in the annual business result, attention was turned to improving logistics, quality control and building new production facilities.

"We had a learning curve to go through, and restructuring gave us a lot of good

ideas," says the manager. Rather than outsourcing logistics, "we further automated it", says Walter.

SHIFT RESPONSIBILITY

Some of the logistical innovations were adapted from other industries, as he points out. An upgraded conveyer belt system used by the coal and cement industries, for example, was converted to transport PE granules to an automated high-rise warehouse. This is less expensive and consumes less energy than a pneumatic transport system, he explains.

In another move, part of the quality control unit for the production facilities was dissolved, and this responsibility handed to shift operators after training, along with an automated control programme.

With human resources and logistics now more efficiently employed, SABIC has moved to the next stage of its plan – upgrading polyolefins production and rebuilding its workforce.

In 2006, it selected Germany's Uhde to build a new 250,000 tonne/year bimodal HDPE plant, scheduled to go on stream in late 2008. The €200m total cost includes a €50m investment in infrastructure.

The new facility will replace an older 100,000 tonne/year unit, but will integrate some of the production hardware, including the proprietary catalyst, adapting it to new SABIC hardware.

In future, Walter says the Saudi group intends to devote more attention to polyolefin specialities.

Reforms lower tax rates

Germany is becoming more attractive to foreign direct investment, but advice is needed to get the best results

One of the first things any company looking abroad for new markets needs to know is how to tap all available financial resources. These ensure it can make the most of its foreign investment.

This is certainly true when establishing a business in Germany. And especially now, as the country's reformed business tax regime and abundance of grants and incentives are contributing to an environment attractive to foreign direct investment.

After the government's reform of the corporate income tax system in 2001, Germany-based corporations (including branches of foreign investors) will benefit from tax cuts. The new legislation reduces the corporate income tax rate from 25% to 15%.

This, says Dr Thomas Borstell, managing board member for tax at international consulting and auditing group Ernst & Young (E&Y), puts the country on a par with the UK. When all factors are included (especially the trade tax burden), the overall tax reduction amounts to around 9% which means an overall tax rate of 30%.

INCREASED COMPETITION

In municipalities with a trade tax multiplier less than 400% the overall tax rate will be reduced to about 23%. As a result, says Borstell, you can expect increased competition between the big cities, with a high trade tax multiplier (eg Munich at 490%), and the affluent areas outside the city boundaries.

Frankfurt am Main has already reduced its multiplier to 460% (overall tax rate 32%) because nearby Eschborn has attracted companies in the finance industry with a multiplier of 280% (overall tax rate 26%).

Another regulation that used to hit foreign investors had also been changed. Even though interest deduction rules have been tightened, many investors may now calculate with a higher deduction of interest expenses than under the old "thin capitalisation" rules.

In Germany, the EU and the German federal and state governments offer a large

variety of grants and incentives programmes. These support the investment activities of private enterprises as well as their research and development activities.

For example, there are investment grants for improvement of Germany's regional economic structure. These are financed with funds from the Joint Task "Improvement of the Regional Economic Structure" (GA) scheme, an instrument of the German government, and are used to improve regional economic structures. Companies investing in economically underdeveloped areas in Germany can apply for financial incentives if they build or expand a permanent establishment, fundamentally rationalise or modernise a permanent establishment that has been shut down or is in danger of being shut down.

From 2004 to 2006, public funds totalling more than €6bn were awarded to German and foreign companies under the GA scheme. However, funding procedures are linked to a number of conditions and obligations, which may turn out as fatal pitfalls, eg, before the start of an investment project the authorities have to confirm that the investment is eligible for funding in principle, otherwise funding for the project will inevitably be blocked.

In view of such "strings", the advice of experts such as Stephan Naumann, a Hamburg-based partner at E&Y, is to "get expert advice" in order to secure and optimise all funding possibilities at hand.

In addition to the GA scheme, Naumann points out, enterprises can apply for tax allowances on the ground of the German Investment Allowance Act 2007. The tax allowance on investment is paid as cash grant and is free of taxes. Eligible areas are the former East German states and some parts of Berlin (funding area).

The acquisition and the production of new depreciable movable assets or immovable assets qualify for funding. Depending on

the region and the size of the investor tax allowance, levels range from 12.5% to 27.5%.

Besides the incentives for investments, a number of support programmes for research and development activities of chemical enterprises exist in Germany. The EU and German federal and state governments offer grants – for example in the thematic areas material sciences, nanotechnologies,



CORBIS

Take advice for the best returns from incentives

biotechnology, pharmaceuticals and solar cells – that may cover up to 50% of the project costs (mainly personnel and material costs).

The EU's main instrument for funding research, development and innovation in member countries is the Seventh Framework Programme (FP7). Started in 2007, it will run until 2013 and, of course, is open to investors in Germany.

Equipped with a budget of more than €50bn, FP7 rewards, among other disciplines, efforts in nanosciences and converging sciences, semiconductors and photonics and sustainable chemical production processes.

About the VCI-Sector Group of Chemical Parks and Sites

The German Sector Group of Chemical Parks and Sites within the German Chemical Industry Association (VCI) represents the interests of around 40 chemical parks and sites in Germany. In addition, it promotes Germany as a location for chemical companies. Chairman of the sector group is Dr Klaus-Dieter Juszak, managing director of Marl Chemical Park.

The VCI represents the economic interests of 1,650 German chemical companies and German subsidiaries of foreign

corporate groups to politicians, authorities, other areas of business, science and the media. The association represents more than 90% of the German chemical industry. It is based in Frankfurt am Main.

For more information please visit www.chemicalparks.com

About Invest in Germany

Invest in Germany is the inward investment promotion agency of the Federal Republic of Germany. We assist and advise potential investors interested in Germany. Foreign enterprises planning to establish their business operations in Germany can obtain information on the business environment, such as the corporate investment framework, tax regulations, and subsidies.

Our range of services includes strategic planning, market

research and competitive analysis.

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