

ACHEMA

WORLDWIDE

News

BIOMASS-TO-LIQUIDS



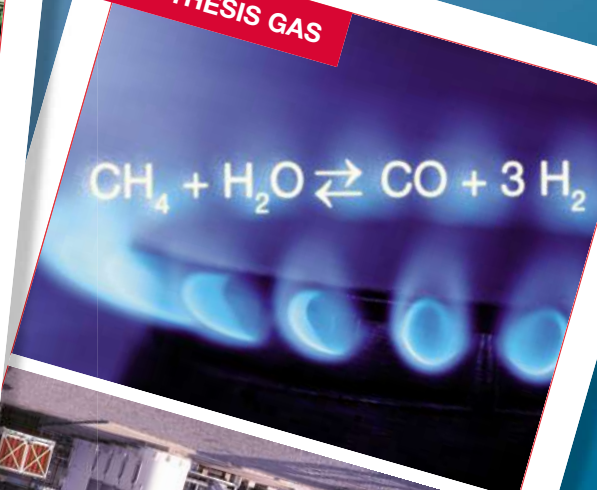
CATALYSIS



BIOMASS-TO-LIQUIDS



SYNTHESIS GAS



SYNTHESIS GAS



CATALYSIS



Progress
in Process
Technologies

A special edition from

PRO·CESS

Are your in-laws *thrilled by pumps?*

D"Did we make it on the news?" – "Have you seen the article in the paper?" Whenever big events take place, one recurring issue is media and public visibility. ACHEMA makes no exception. But, honestly, why do we even care? The postman is probably not really interested in the latest in refinery processes, to the in-laws packaging machinery means nothing, and the elderly lady next door will never buy an industrial pump. Wouldn't it suffice to publish in our own expert papers and journals and stay within our community where knowledge, interest and investment budgets are?

Of course, in preparing and organizing ACHEMA, a large part of our media activities is targeted at the B2B and scientific media. Partnerships with many international quality publications for experts and industry, in-depth reports on technological and scientific trends, online and on-site services are designed to accompany the physical meeting in Frankfurt by high-quality information and discussion within the community. In addition to press releases, interviews, editorials and other "conventional" channels, we are expanding our Web 2.0 activities in order to communicate even faster and more directly. We are using all the tools that any exhibitor and visitor can expect from a global industry summit.

Yet, I believe there are strong rationales for addressing the public media as well: First, we are missing out on chances if we restrict ourselves to the target groups we already know. Many new technologies have been developed by combining knowledge from different industries and scientific communities. ACHEMA's portfolio

is large, and we need to raise awareness in other industries for the offerings of our exhibitors. Secondly, our disciplines are orientated towards the future, they are innovative. But there is a certain reluctance in societies to accept new technologies and change in general, in some countries more so than in others. We need to be heard by the general public in order to explain what we are doing, why and how, and to generate the acceptance that is the foundation for a positive political and societal environment. Thirdly, especially in the Western countries we are worrying about a foreseeable shortage of scientific and technological talent. If we want young people to follow a career in natural science or the industry, we have to be inspiring – we have to show them the fascination and the relevance of our work. Some of them come and visit ACHEMA, but we need to reach them all, and their parents, peers and teachers as well, to create an environment where studying "something with technology" is as obvious as studying "something with media".

There is one last rationale that may even outweigh all the others and that is, in fact, an „irrationale“: We are proud of what we are doing! We want people to know about the contribution our industries make to economic progress and environmental protection, we want to tell them how we ensure energy and resource supply for the future, and we want them to appreciate the sophisticated and, yes, sometimes beautiful technology we are employing.

We want to show all this to the world – and to the postman, the in-laws and the lady next door.



Dr. Kathrin Rübberdt
Head of Public
Relations of
DECHEMA e.V.



Editor's Page 3

Are your in-laws thrilled by pumps?

ACHEMA Congress 2012 6

Hot topics and networking at its best

ACHEMA – Virtually Anytime, Anywhere 8

ACHEMA online, the multifunctional platform for the process industry



Challenges in Chemistry 10

The chemical industry is going full steam ahead in the search for alternatives to crude oil

Biotechnology in Japan 12

A brief insight into the Japanese pharmaceutical and biotechnology markets

Microbial Cellular Plants and Metabolic Engineering 15

Metabolic engineering offers many opportunities for using biotechnological processes

Engineers and Biotechnologists for Tomorrow 16

DECHEMA's student activities

The Chengdu Summit 18

On the way to become a major meeting point for decision makers from the process industries in China



ECCE 8 and ECAB 1 20

8th European Congress of Chemical Engineering and 1st European Congress of Applied Biotechnology Germany – the place to be for engineers and biotechnologists

Catalysing Renewable Energy 21

The second Indo-German Catalysis Conference

BRAIN and DECHEMA Cooperate in the Biotechnological Production of Perillic Acid 22

German Academia & Industry Network Bio-GAIN 22

International Conferences Organized by DECHEMA 23

Imprint 23

Hot topics and networking at its best

ACHEMA Congress 2012

— DR. THOMAS SCHEURING —

WWith a programme featuring regularly over 900 lectures and attracting some 27,000 attendees, the congress is the second cornerstone of ACHEMA, alongside the exhibition. This is where experts and scientists meet decision makers, and vice versa. The ACHEMA congress is also the platform for our industry where interdisciplinarity comes to life like nowhere else. In addition to the regular conference sessions numerous special and guest events, panel discussions, expert

The author is Head of Exhibitions, DECHEMA e.V.



round tables and plenary lectures provide an extensive survey of topical trends and the rich diversity of process technology.

The ACHEMA Congress programme reflects the diversity of topics of the exhibition and covers the complete spectrum of process engineering, supplementing the classical aspects with special lecture series on up-to-the-minute hot topics (see box).

General Topics

- Advanced Reaction Technology
- Mixing and Separation Technology
- Plant Components: Apparatus, Piping, Reactors
- Plant Controlling: Systems, Field Devices and Concepts
- Processes and Apparatus for Pharmaceutical Production
- Laboratory and Analysis Techniques
- Safety
- Industrial Security/Risk Management
- Materials and Materials Testing
- E-Learning
- Chemical Leasing/Forward Integration

Special Sessions

Focus: BioEconomy

- New Products through Biotechnology: Fuels, Polymers, Biopharmaceuticals
- Raw Materials for Biotechnology: Synthesis Gas, Lignocellulosics
- Bio-Refineries and Processing of Renewables
- Development and Application of Novel Biocatalysts: Enzymes, Cells, Organisms
- High-Tech Equipment for Biotechnology: Sequencers, Synthesizers, Chips
- Bioprocesses: Reactors, Monitoring, Modelling, Downstream Processing
- Food Biotechnology

Focus: Process Technology

- Potable and Ultrapure Water Generation
- Energy Efficiency by Integrated Processes

- Reaction Modelling for Layout and Control
- Solids Process Engineering
- Recycling and Urban Mining
- Single-use Reactors
- CO₂ Separation and Utilisation

Focus: Materials Technology

- Energy Storage, Transport and Use
- Plastics vs. Metal: Options for Plant Engineering and Design
- Chemical Nanotechnology
- Advanced Fluids in Process Engineering

Call for Papers

Call for papers is open now! Please submit congress registrations in the form of a one-page abstract (max. 200 kB) via <http://www.achema.de/congress>. Lecture time is 20 minutes; the congress language is English. Deadline for submitting contributions is August 31, 2011.

Further information can be obtained through e-mail at lecture@achema.de or telephone on +49 (0) 69/75 64-2 54.



Special Show: Energy-efficient Storage and Transportation

This year's focal topic and Special Show on the theme of "Innovative Energy Carriers and Storage" promises to trigger an unprecedented innovation drive. Concepts for efficient storage and transportation of energy – not forgetting the buzzword 'e-mobility' – are challenges of the future, and what sector is better qualified to meet them than the chemical process industry? The Special Show is aiming to trigger plenty of discussions on fresh ideas and new concepts that chemists and engineers now increasingly have to face up to the numerous technical challenges posed by thermal and electrical energy storage technologies. In view of rising demand and intensified funding programmes, an innovation surge is literally in the air... In fact it's a certainty, especially in the fields of battery technology, solar-chemical processes, photovoltaics, supercapacitors, fuel cell technology and the hydrogen economy.

A small selection of issues calling for solutions in the short to medium term:

■ How can we optimize the efficiency of water electrolysis for the generation of hydrogen as a chemical storage medium, particularly under variable loads?

■ How can we develop stationary batteries with dimensions exceeding those currently used for mobile applications by several orders of magnitude?

■ Which materials are best suited for a thermal storage device, an important component of adiabatic gas pressure storage systems?

Whatever energy storage requirements and transportation demands you face, there is no doubt that the Special Show will be one of the best ways of examining the multi-faceted energy storage challenges that we all face. The Special Show will help you quickly gain a global perspective of how best to resolve these fast-moving issues. ■

ACHEMA 2012
online



ACHEMA – Virtually *Anytime, Anywhere*

Every three years, ACHEMA is the place to be for anyone involved in the process industries. But what do you do in between if you need information or are looking for the right contact?

You visit ACHEMA – ACHEMA online, the multifunctional platform for the process industry. More than 5,000 producers and research institutions from 60 different countries are listed with their products and offerings. Whether you are searching for new products and processes, suppliers of equipment, components or complete plants or for cooperation partners, joint venture partners or buyers, ACHEMA online is the place to go. Extensive and continuously improved search functionalities allow for quick and focused results. As ACHEMA is drawing closer, ACHEMA online becomes the key to a successful visit to the event. It allows visitors to identify the exhibitors that match their interests, get information on their offerings and plan their way around the exhibition and the congress. Visitors can compose their individual tour over the exhibition grounds and their tailored congress programme from the more than 900 lectures. Exhibitors can use ACHEMA online as a virtual showcase, supplying information on their innovations both to visitors and the press.

An online press center with exhibitors' press displays bundles information for the media and gives journalists a chance for pre-coverage. All media events are listed as well as the ACHEMA trend reports, and the right contact persons can also be found in the exhibitors' profiles. Pictures are available for download ahead of the event, and during ACHEMA they will be updated daily. Starting early



New ACHEMA Representative for the Czech Republic and Slovakia

DECHEMA is glad to announce that ACHEMA worldwide events are now being directly represented in the Czech Republic and Slovakia. Based in Prague, Ms Lucie Havlova will be the contact person for ACHEMA worldwide inquiries from both countries. Ms Havlova has an excellent background in materials technology and a long-term affiliation with the exhibition industry. Contracting a capable ACHEMA delegate has been on DECHEMA's agenda for a while as the Czech Republic and Slovakia both have shown significant growth rates in the process industry sector recently.

Contact:

Ms Lucie Havlova
Happy Materials
Ricanova 19, 169 00 Prague 6, Czech Republic
Tel.: +420 233 355 246, Fax: +420 220 518 448
e-mail: lucie.havlova@happymaterials.com

in 2012, social media releases and short podcasts will be available in addition to the traditional press conferences. Of course, journalists may also simply sign up for the conventional press releases.

A comfortable way to stay up-to-date on the latest ACHEMA news is to use the RSS-feeds offered in different sections of ACHEMA online. Highlights will also be announced on Twitter – outstanding speakers as well as new statistics, important additions to the programme and everything you want to know about the global summit of the process industries. Followers of ACHEMA on @ACHEMA_2012 receive timely news before and throughout the event.

ACHEMA's online services are continuously revised and improved. DECHEMA's philosophy is to offer everybody the best information possible on the channel they prefer. ACHEMA as a global on-site summit can not be replaced by electronic media, but they can complement it – and with ACHEMA online, an access to ACHEMA is now available anytime and anywhere. ■



The chemical industry is going full steam ahead in the search for alternatives to crude oil. Biomass-to-liquids technologies, research into catalysts, and the production of synthetic gas are among the latest such challenges for chemists and process engineers. AICHEM worldwide News interviewed leading experts in the relevant fields.

Challenges in Chemistry

When utilizing biomass catalysis is an important issue. Which challenges has the catalysis research to take on when such a heterogenic mixture of substances is used for the production of fuel or basic chemicals?

Dr. Marvin Estenfelder, Head of Research of the Catalyst Technology Business Unit at Süd-Chemie



“Renewable resources indeed make particularly high demands on catalysts. In detail, it depends on which processing route is chosen.

In the case of biomass gasification and subsequent catalytic conversion of synthesis gas into base chemicals or fuels, it is vital to integrate, in the best way possible, the necessary gas purification steps into the processing scheme. In general, catalysts which are highly resistant to so called catalyst poisons play an important role in that process. Catalyst poisons such as sulfur or acidic compounds are particularly abundant in biomass.

In an alternative route, the cellulosic biomass structure is enzymatically broken down and converted, for example into sugar monomers, which subsequently can be further converted, either by fermentation or heterogeneous catalysis, into chemical building blocks. The challenge for both the processing technology and the catalysts used is to react flexibly and function properly with biogenic feedstock, which naturally varies in its detailed composition. In addition to the resistance to catalyst poisons, heterogeneous catalysts need to have certain stability for the use in aqueous media.”

New raw materials such as biomass now appear to herald a renaissance of synthetic gas production. What role can biomass play as a raw material in the future, and is an energy-intensive system such as this with its origins in coal chemistry actually timely, given the context of the debate on renewable raw materials? Synthetic gas plants are only profitable if they are a certain size. What kind of biomass-based concepts are cost-effective?



Prof. Dr. Dinjus, Head of the Institute of Catalysis Research and Technology (IKFT) at Karlsruhe Institute of Technology (KIT)

"Time is running out for the development of highly efficient and marketable systems for the use of raw materials in an industrial scale; not only are such developments timely, they may even be ahead of their time. The development of gasification systems for the production of synthetic gas is certainly gathering pace; one

reason for this is the changing situation with regard to raw materials, particularly the inclusion of renewable, i.e. sustainable, feedstock. Biomass is the only carbon-containing energy source whose use is CO₂-neutral. Its huge potential has been underused to date because there has been so little development of efficient technologies and, to some extent, biomass is simply seen as a waste product.

It is true that synthetic gas plants in the upper range of megawatts or gigawatts are cost-effective; pre-treatment systems are necessary when using biomass in this range in order to significantly increase energy density and thus minimize transport costs, and to carry out gasification under high pressure. It is therefore essential to produce synthetic gas under pressure so as to avoid compression work. We also need more process-intensive measures in order to reduce the size."

Mr. Radtke, using biomass for the production of fuel or basic chemicals has great potential. However, currently there is still a lack of commercially techniques. How does Uhde evaluate this market for the future and which technical solutions does Uhde develop in order to make the extensive use of biomass possible?

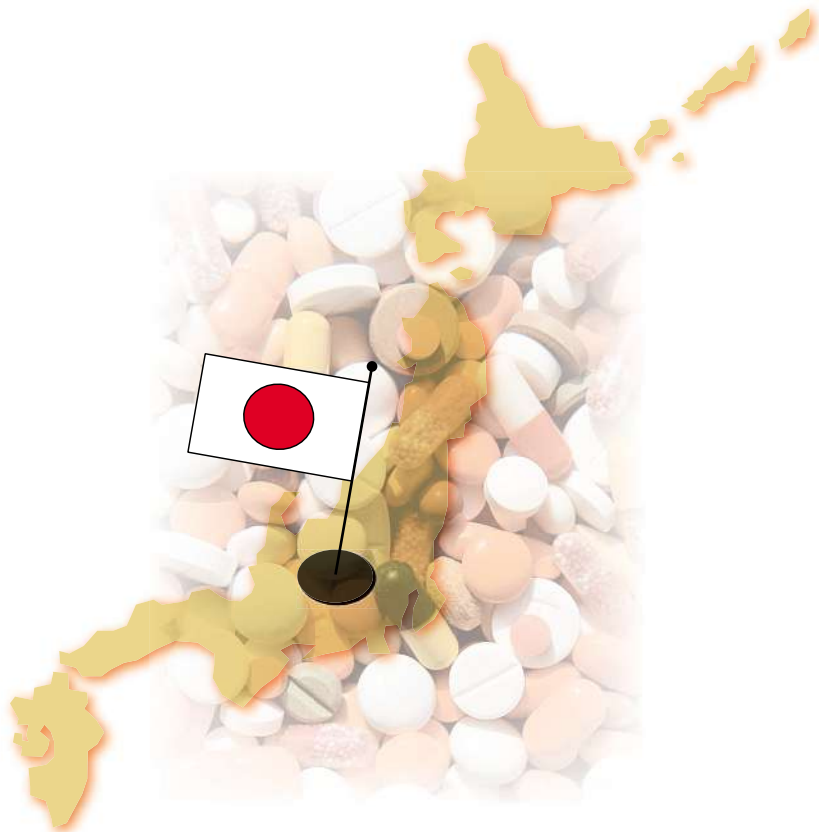
Karsten Radtke, Head of Gas technologies Division, Uhde, Dortmund/Germany



"2020, the EU demands a minimum of ten percent renewable-derived fuels in the transportation sector, which can only be achieved to this extent by adding Biomass-to-Liquids (BTL) fuels, especially BTL technologies of the so called second generation, to the fuel mix. Uhde has 70 years of experience in the field of gasification, and is currently involved in a number of projects to convert biomass or biomass/coal mixtures by means of gasification technologies, such as Uhde's proprietary PRENFLO or HTW gasification processes, into clean syngas, which can be converted into clean biofuels. Uhde follows two different approaches:

- The generation of diesel and kerosene by means of a Fischer-Tropsch synthesis, which is commercially proven for decades.
- The generation of gasoline by means of methanol-to-gasoline (MTG), a technology for which Uhde built world's first pilot plant in Germany in the 1980's, and which we offer under license by ExxonMobil. MTG is commercially proven in New Zealand and China.

On this basis, we can offer the suitable gasification process depending on the feedstock, as well as the right down-stream technology, depending on the customer's needs."



In recent years a steady stream of bad news of deflation, structural crises and a shrinking population have increasingly dampened public interest in Japan as the second biggest economy in the world. In many cases the incredible economic growth of its huge neighbor, China, has also meant that current developments in Japan are being overlooked. This feature provides a brief insight into the Japanese pharmaceutical and biotechnology markets.

Biotechnology in Japan

WWith sales of ¥8 trillion (€61.54 billion) in 2007, the Japanese pharmaceutical market is the second biggest in the world behind the USA and well ahead of Germany. Even in 2005, the market volume was some US\$ 66 billion and therefore equivalent in size to the German, French, British and Australian markets combined. The biggest products groups in Japan by sales in 2007 were heart and circulation drugs with a market share of 21.5%, metabolism drugs (9.6%), drugs for diseases of the central nervous system (9.1%) and gastrointestinal drugs (8.9%). The markets for anti-diabetes drugs and psychotropic and neuroactive drugs in particular have posted high growth rates in recent years.

Heavily Fragmented

There are more than 1,100 pharmaceutical companies in the market in Japan, the majority of which are very small companies that only manufacture traditional herbal medicines. Only 457 companies manufacture drugs that qualify as refundable by health insurance companies. As a result of this high number of manufacturers, the Japanese market is heavily fragmented. The market concentration of the 25 biggest pharmaceutical companies in Japan is 64%, as it is in Germany – relatively modest by international standards when compared to the USA (85%) and France (78%), for example.

Until the 1990s, the Japanese market provided the perfect environment for the local pharmaceutical industry;

however, competition has become tougher in recent years as a result of market liberalization in the 1990s and a wave of takeovers of Japanese pharmaceutical companies by international competitors at the start of the millennium. In 2001 Mitsui Pharmaceuticals was taken over by Schering and SS Pharmaceutical by Boehringer Ingelheim, while in 2002 and 2004 Roche became the majority shareholder at Chugai and Merck likewise at Banyu. Although the market share of Japanese pharmaceutical companies still came to 85% in 1990 and only one foreign company featured among the 20 biggest manufacturers, by 2005 the market share of Japanese companies had fallen to 64%.

At present, four foreign companies – Pfizer, Roche, Novartis and Merck – are in the top 10 of the Japanese pharmaceutical industry. Pfizer is in first place with a market share of approx. 6%, ahead of even the biggest Japanese pharmaceutical company, Takeda (5.3%).

At a Glance: The Japanese Pharmaceutical Industry

- At ¥8 trillion (€61.54 billion), the second biggest pharmaceuticals market in the world
- Demographic change is expected to result in above-average growth
- Large number of medium-sized pharmaceutical companies
- Numerous mergers and takeovers are resulting in a highly dynamic market
- The fixing of drug prices by the state has an impact on players

This article is taken from "Biotechnology in Japan", a study published in 2010 by the VBU (or Association of German Biotechnology Companies) and DECHEMA. Contact: info@dechema.de

Top Ten of Japanese pharmaceutical companies (excluding foreign companies)

		Sales in FY 08 ¥ billions	R&D expenses ¥ billions (% of sales)	Employees	Place of business
1	Takeda	1,538.3	453.0 (29.4)	19,362	Osaka
2	Astellas	965.9	159.1 (16.5)	14,261	Tokyo
3	Daiichi-Sankyo	842.1	184.5 (21.9)	16,273	Tokyo
4	Eisai	781.7	155.3 (19.9)	10,686	Tokyo
5	Otsuka	440.4	85.5 (19.5)	5,592	Tokyo
6	Mitsubishi-Tanabe Pharma	414.7	73.1 (17.6)	10,030	Osaka
7	Dainippon-Sumitomo	264.0	47.3 (17.9)	4,464	Osaka
8	Taishi Pharmaceutical	256.2	24.7 (9.9)	5,409	Tokyo
9	Shionogi & CO	214.2	40.3 (18.8)	6,010	Osaka
10	Ono Pharmaceuticals	145.8	38.6 (26.5)	2,415	Osaka

Business portfolio of Japanese
biotechnology start-ups

	Number
Pharmaceuticals	208
Contract research	178
Consulting services	87
Cosmetics	86
Laboratory requisites/Consumables	83
Green biotechnology	63
Bioinformatics	58
Laboratory apparatus	49
Other medical biotechnology	48
Regenerative medicine	46
Industrial biotechnology	41

Spectacular Mergers

A number of spectacular mergers have taken place in recent years within the Japanese corporate landscape with the aim of achieving a critical mass for international competition. New industry giants were created in 2005 with the mergers of Yamanouchi and Fujisawa – at that point the numbers 3 and 5 in the top Japanese pharmaceutical companies – with Astellas and with the merger between Daiichi and Sankyo to create Daiichi-Sankyo. In October 2007, the merger between Mitsubishi Pharmaceuticals and Tanabe Pharmaceuticals resulted in Mitsubishi Tanabe Pharma, the new number 6 among Japanese producers.

Taken together, Japanese pharmaceutical companies have a global market share of 11%, of which the Japanese market constitutes more or less half. In 1989, the global market share stood at 15.7%.

Although the proportion of expenditure on research and development has increased in recent years, the question remains: Are the available resources sufficient to remain in-

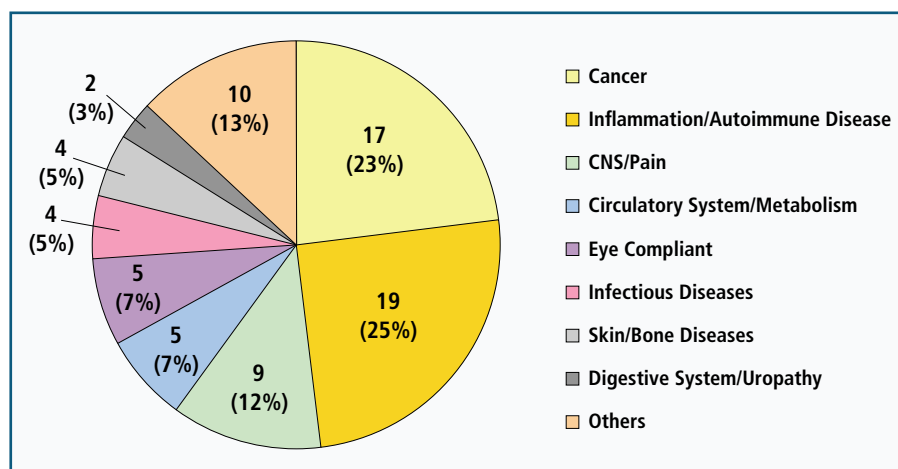
ternationally competitive in view of the increasing cost of research and development, or is further consolidation of the market unavoidable?

The internationalization of the Japanese pharmaceutical industry has advanced rapidly in recent years. In Japan also, the large pharmaceutical companies are endeavoring to extend their product pipelines through acquisitions or alliances with biotechnology companies. The focus here is on foreign biotechnology companies in particular. On the other hand, very few cooperation agreements have been struck so far between the big pharmaceutical manufacturers and Japanese biotechnology companies – to the regret of the Japanese biotechnology industry.

Clinical Research in the Ascendancy

While at the start of the 1990s Japanese pharmaceutical companies were still using their overseas laboratories primarily to conduct basic research, the capacity for clinical research has expanded significantly in recent years. Now already over 50% of all clinical trials are conducted overseas. Results from overseas clinical trials have been recognized in Japan since 1998, although further conditions are imposed by the Japanese supervisory authorities. In all cases, phase I clinical trials and parts of phase II trials are required in order to assess the pharmacokinetics in respect of the on-average smaller body size.

Although it has been possible to speed up the registration process in recent years with the availability of



Fields of application of active ingredients of Japanese biotechnology companies, which are in clinical trial.

more and better trained personnel at the regulatory authorities, the average time taken in Japan of 20.1 months is still significantly longer than in the USA (10 months) and the EU (13 months). Japanese experts believe that greater individual liability of employees in the approval process is responsible for more careful and more accurate testing.

The Japanese Biotechnology Industry

According to a study by the Japan Bio Industry Association (JBA: 2008), there were 714 biotechnology companies in Japan in 2007. In addition, many large companies in the chemical, consumer goods, cosmetic and food industries in particular have their own biotechnology departments. 577 companies were listed by the JBA as biotech start-up companies. According to the JBA's definition, these companies are no more than 20 years old and conform to the legal definitions of small and medium-sized enterprises (SMEs) in Japan.

Business Sectors

A survey of Japanese biotechnology start-up companies by business sector found that the largest proportion is engaged in the pharmaceutical sector and biomedical research and development. In Japan, these sectors are a particular focus of public interest and are covered by most publications on biotechnology in Japan.

As well as the relatively high proportion of companies engaged in green biotechnology, companies in the industrial biotechnology sector are conspicuous by their low numbers. It should be noted, however, that the majority of industrial biotechnology companies are not

recorded by the JBA as biotechnology start-up companies due to their size or their age.

lition (€4.45 billion) from ¥876 trillion (€6.73 billion) in 2008. By contrast, all other biotechnological product groups and services showed positive growth in 2008. The greatest growth was posted in the human vaccines sector in 2009. Here, the market grew by 61% from ¥85 billion (€654 million) to approx. ¥137 billion (€1.05 billion). A large percentage growth was also posted by the markets for therapeutic antibodies (44%) and DNA sequencers (28%).

Product Pipeline

A survey of Japanese biotechnology companies on products in clinical trials phases found that 75 products from 39 companies were at least in the first clinical phase at the start of 2009. At the time of the previous survey, covering the period between April and June 2007, there were only 56 products from 30 biotechnology companies. This represents an increase of more than 30% in around 18 months. Because of the difficult financial situation of Japanese biotechnology companies, more and more products are being developed together with domestic or foreign partners. While in 2007 just 17 products were developed through collaboration, this had already reached 30 at the start of 2009.

With regard to the active ingredients to be found in the product pipelines of Japanese biotechnology companies, active ingredients that combat inflammation/autoimmune diseases (19) and cancer (17) together make up almost half of all active ingredients. This mostly involves the results of basic research that were developed further through a spin-off from a university or public research institute with a biotechnology company. ■

At a Glance: The Japanese Biotechnology Industry

- More than 700 biotechnology companies in Japan
- Long tradition of industrial (white) biotechnology
- Since 2000, numerous new businesses have set up in the red biotechnology sector in particular
- Market volume of ¥2.41 trillion (approx. €18.56 billion) in 2009
- Numerous well-known research facilities are based directly in the clusters

Microbial Cellular Plants and Metabolic Engineering

Biotechnologists and chemical engineers work closely together in many fields. One of them is industrial (“white”) biotechnology. Metabolic engineering offers many opportunities for using biotechnological processes.

Whoever has ever dealt with organic synthesis probably experienced that special moment between total frustration and unbelieving awe when encountering biochemistry for the first time: An enzyme with an enigmatic abbreviation is introduced, and functionalizations are performed in exactly the right places with exactly the desired stereochemistry in one step where a conventional synthesis with 17 steps was otherwise required. No wonder microorganisms have taken root as little helpers in industrial processes. But nature with its microbes and enzymes does not always exactly meet the chemist’s or pharmacist’s wishes.

What is there to do? So far, organisms have been variegated based on haphazard mutations and optimized using trial-and-error-processes until a bacterium had been found that was able to grow and be cultivated and produced the desired substance with acceptable yield. This development can take decades, is expensive, and the result is not necessarily a real optimum.

That’s where metabolic engineering enters the stage. The basic idea: If the metabolism of a microbe is understood well enough, an organism can be designed that does exactly what it is supposed to do. Design wins over mutation.

Unfortunately, adjusting only one screw – meaning one gene – usually does not work. Metabolic processes interact in a very complex way, and optimizing an organism requires to take the whole metabolism into account. In order to achieve this, a couple of methods are available: It is now possible, for example, to isolate a single cell and study its metabolism instead of working with the mean of a large population. Mathematical and statistical simulation models also contribute in identifying the places where genetic manipulation can work. In addition, there exist several approaches to reduce the complexity of the cellular system.

Of course you cannot build walls inside a cell or isolate parts from each other as you would do in a mechanical plant and still have a living cell. A variety of methods can be used to achieve orthogonalization, or the



Sustainable biotechnological production of bioactive products

Picture: Kristian Barther/BRAIN

decoupling of metabolic processes. One strategy consists of the development of bacteria with minimal equipment; Craig Venter’s “artificial cell” that drew attention a couple of months ago represents this line of thinking. Another interesting approach is to use cell-free *in vitro* systems. They combine the advantages of *in vivo* and *in vitro* systems. First, a cell with the wanted enzyme system is developed. This cell is then broken down and homogenized before unwanted enzymes are removed. This can be done by introducing cutting sites into the enzymes while the cell grows. These cutting sites are designed for specific protein-cutting enzymes, so-called proteases, that cannot access the other wanted enzymes. The protease is then added to the processed *in vitro* system. The unwanted enzymes are split, while the desired enzymes remain.

Some processes based on “designer-cells” are already competitive, but overall, metabolic engineering makes its way only slowly into large industrial production processes. This is due to the large and time-consuming testing and to the often incomplete knowledge of the detailed metabolism of the organisms used.

But scientists from industry and research institutions are working hard to identify interesting chemical building blocks and train microorganisms to produce them. Thus, this kind of “talent shortage” could soon be history. ■

Engineers and Biotechnologists for Tomorrow

“Chemistry needs a future, and chemistry has a future”, said the German Chancellor Angela Merkel in her speech on the occasion of the opening ceremony of the International Year of Chemistry 2011 (IYC) in Berlin. DECHEMA certainly does a lot to substantiate this statement.

— MELANIE ENDERS —

For more than ten years, DECHEMA has been organizing the nationwide DECHEMAX students' competition to arouse the interest of students in natural sciences. It aims to reach not only the elite but every teenager aged 12 to 16. The response is overwhelming: To date, more than 60,000 pupils have participated in the competition.

In the first round, the teams of pupils, which consist of three to five students, have to answer eight questions around engineering, chemistry and biotechnology via

The author is an employee of the Public Relations Department at DECHEMA e.V.

internet. Every year changing topics are highlighted. Themes in the past years were for example “Green Chemistry”, “Searching for Clues with Chemistry” or “Chemical Tour Round the World”.

On the next level, the teams have to carry out experiments. In this round they reach the goal by careful research, exact observation and good documentation of their experimental results. All experiments are designed so that they can be performed “at the kitchen table”. No laboratory equipment is required.

The best three teams are invited to a DECHEMA conference, where each member of the winner teams gets a prize money of € 250, a certificate and the DECHEMAX trophy. In addition, about 40 teams are rewarded every year with non-cash prizes like books or subscriptions of natural science magazines; several publishing houses like Wiley and Konradin act as sponsors.

By sticking to a moderate degree of difficulty, this competition proves to “normal” students that science is fun and that they can master scientific problems without too much effort. Beside the competitions, the DECHEMAX students' club informs interested pupils via internet and email-newsletter about the world of science, education, studies and career. Interesting reports, experiments for the kitchen and free tickets for the ACHEMA try to enthuse the teenagers for science.

Science Days – Dedicated to the Youth

At the end of their school life, DECHEMAX club members can get a one year membership at DECHEMA for free. Every autumn, several days at the DECHEMA house are dedicated to the youth. At the “Science Days”, scientists show the fascinating and beautiful sides of chemistry, physics and biotechnology. In ex-

The latest highlight in DECHEMA's student activities was the “Formel Elms” competition. Three winning teams received their prizes from the hands of the German Chancellor Angela Merkel.



Picture: DECHEMA

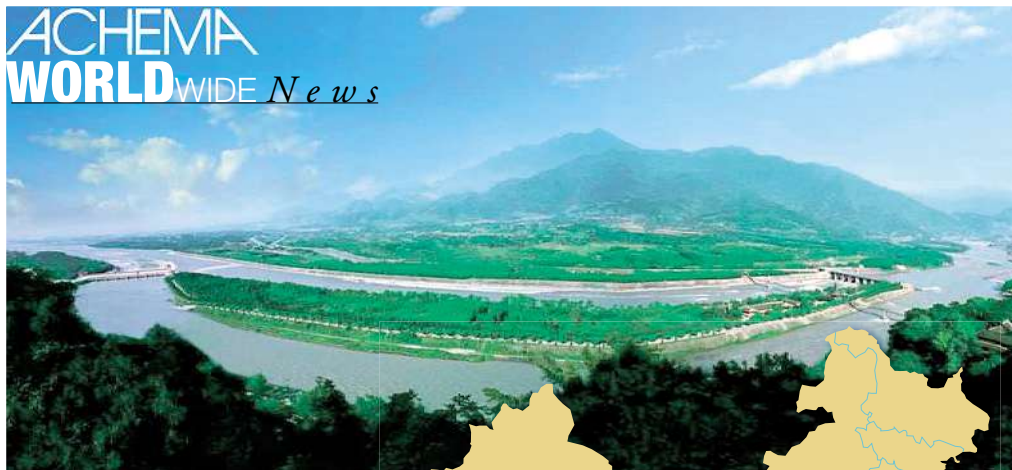
perimental lectures, the speakers show for example liquid fire, burning metal or luminescent cucumbers. In this way, the pupils, their teachers and interested persons get an impression of what is possible in science.

Students' Programme at ACHEMA

DECHEMAX addresses students from grades 6 to 11. For older students who are thinking about following a scientific or engineering career, the DECHEMA offers a students' programme at ACHEMA: Groups of students in the upper forms of grammar and secondary schools can visit the ACHEMA free of charge. Apart from a visit to the exhibition, career information events are offered where young chemists and engineers answer pupils' questions on starting out on a career in the process industry, describe a typical working day and give an overview of information sources on study and training courses. For university students, similar events take place every year at the annual meetings of ProcessNet and DECHEMA's biotechnology community.

The latest highlight in DECHEMA's student activities was the "Formel Elms" competition: In 2010, DECHEMA together with eight other chemistry organizations in the German "Forum Chemie" launched a special students' competition on the occasion of the national year of energy and the IYC. Students' teams had to construct a vehicle which could transport a raw egg over a distance of 20 meters. The energy for the vehicle had to be generated on-site preferably by a chemical reaction. More than 30 teams mastered this difficult challenge and

submitted their car concepts, and six of them were invited to the official opening ceremony of the IYC in Berlin where the final round took place. Three winning teams received their prizes from the hands of the German Chancellor Angela Merkel. With the help of all those activities, the DECHEMA hopes to interest pupils for science. Whether these students follow a career in chemistry and engineering or not, we expect to raise the public awareness for the importance of science and technology for society. And of course we hope to meet one or the other of these young scientists at ACHEMA one day as a professional. ■



*4th International
Advanced Materials Forum
(August 25–26, 2011,
Chengdu New Convention &
Exhibition Center/PR China)*

The Chengdu Summit

— DR. THOMAS SCHEURING —

After three successful and increasingly well attended events in a row the Chengdu Summit is on the way to become a major meeting point for decision makers from the process industries in China. Goal of this summit meeting is creating a platform for the exchange of ideas and experiences between key persons from Chinese

and Western enterprises, combined with an initiative to promote the development of advanced materials and new technologies for China's process industry.

What kind of technology will be most suitable to cope with the vast challenges mankind is facing in the future? Which opportunities will be given to the advanced materials industry sector through China's

The author is Head of Exhibitions, DECHEMA e.V.

Conference Topics

- New development trends in the global petrochemical industry
- Advanced materials industry innovations brought by China's twelfth Five-Year Plan
- Motivation to chemical industry by seven strategic emerging industries
- Industry-oriented investment and financing of advanced materials in China
- New energy materials to enhance the social development
- Environment-friendly materials to make life better
- Information technology materials for the future

Materials' Focus

- Composite materials: synthetic resin, high-performance fibers
- Environment-friendly materials: eco-materials, renewable materials, water treatment materials
- New energy materials: lithium ion battery, silicone materials, fluorine materials
- IT materials: electronic materials, processing materials, storage materials, transmission materials, display materials

"Twelfth Five-Year Plan"? How does the Chinese government's emphasis on the importance of "the seven strategic new industries" influence the chemical process industries? And how is the advanced materials sector going to progress through technological innovation, industrial restructuring, or enterprise reformation, under the new economic development policies? Or, what will be the final economic result of the industry-oriented, yet authoritative guiding from the government?

This is just a small selection of topics the 4th International Advanced Materials Summit will be addressing when being held in Chengdu next August.

Chengdu, a historical city of 2300 years, is the capital of "Heavenly State" (Tian Fu Zhi Guo), habitat of giant pandas and city of cotton-rose hibiscus. It is designated as a national role model city of environmental awareness where inhabitants are living under healthier conditions. While the industrial sectors playing a significant

Contact

International conference
 secretariat in Germany
 Ms Sinian Huang, DECHEMA e.V.
 e-Mail: huang@dechema.de
 Tel.: +49 69 7564-276
 Fax: +49 69 7564-180

Conference Venue

Chengdu New Convention &
 Exhibition Center
 Chengdu, Sichuan Province, P.R. China

Online registering via

<http://iams.chemevent.com.cn/en>

role in Chengdu range from chemicals over aerospace and automobile to information technology, Chengdu is one of the very few cities worldwide with a designated advanced materials industry zone, located in a distinct part within the metropolitan area. This unique feature has been an additional point for the decision to hold the summit in Chengdu.

The Chengdu Summit is an innovative event format bringing together decision makers from the chemical process industries in China with

their international counterparts. Aiming at a more constant presence in China besides the three-annual exhibition-congress AchemAsia, Dechema is co-organizing this symposium together with the semi-public holding ChemChina, in order to complement their event portfolio in China.

We look forward to welcoming you in Chengdu to the 4th International Advanced Materials Summit in August 2011! ■

From September 25–29, 2011, the 8th European Congress of Chemical Engineering and the 1st European Congress of Applied Biotechnology take place in Berlin, Germany – the place to be for engineers and biotechnologists.

ECCE 8 and ECAB 1

What is necessary for running a successful biotechnological process? Well, obviously it requires some kind of biotechnological “ingredient” like a free enzyme, a bacteria or another microorganism, a fermenter, and a procedure for isolating the product from the fermentation mixture. If one tries to visualize this, the answer to what kind of experts are needed becomes almost instantly obvious: Biotechnologists know how to find or develop the appropriate biological system, they know what kind of environment it needs and how it has to be treated so that the products are released at the highest possible concentration. Engineers know how to build the necessary apparatus, how to regulate the feed streams and the temperature, and what operations are available for product isolation. Thus, it seems quite natural that the two should be working closely together.

Yet, in practice, the two disciplines today often lack a common language. Biotechnologists and engineers use the same expressions but mean different things. To overcome these challenges, they need a common platform to define precisely the challenges they are addressing and create a base for cooperation. In Germany, this platform has been existing for almost a decade: Since 2001, DECHEMA's Biotechnology Annual Meeting has been held together with the Annual Meeting of ProcessNet, the platform for chemical and process engineers.

This successful model will be rolled out to the European level in 2011: From September 25–29, 2011, the 8th European Congress of Chemical Engineering and the 1st European Congress of Applied Biotechnology take place in Berlin. These are not just two events running in parallel, they are closely connected: Several of the 19 parallel lecture sessions combine biotechnological and engineering expertise, especially in areas such as renewable energy, biomass refining and processing, process efficiency, and safety. Of course, there are also sessions addressing new insights in the classical foundations: unit operations and transfer processes. Both have changed with the computational skills and the new methods that have become available over the last



decade and will change even more with the focus on nano scale, on biological or on interface dominated systems.

Almost 2,000 abstract submissions from 63 countries give proof of the overwhelming interest this concept has raised in the international community. Plenary speakers at this outstanding event are Dr. Konstantin B. Konstantinov, Genzyme Cooperation, Dr. Andreas Kreimeyer, BASF SE, Prof. Dr. Philippe A. Tanguy, Total S.A., and Prof. Dr. Rolf G. Werner, Boehringer Ingelheim GmbH.

The accompanying exhibition is an opportunity to discuss practical solutions on-site with experts from the industry. It is also featured in the students' programme where young scientists can get first-hand information in workshops and lectures on career opportunities.

An attractive social program offers the chance to make useful connections outside the lecture rooms. One highlight will certainly be the sixth ChemCar competition: Students from all over Europe are called to design a vehicle only driven by (bio)chemical reactions. While ChemCar has a slight focus on engineering, the 2nd International Brewing Contest focuses more on biotechnological fermentation. ■

Catalysing *Renewable* **Energy**

The second Indo-German Catalysis Conference will be held in Rostock, Germany from June 19–22, 2011. The event will feature eminent guest speakers, who will discuss the role of catalysis in renewable power generation.

Catalysis is the key-interdisciplinary technology in the chemical industry, particularly for the development of energy supply and for the application of new renewable raw materials and for more environmental benign chemical processes. The second Indo-German Catalysis Conference – organised by DECHEMA (Society for Chemical Engineering and Biotechnology) – will be hosted in Rostock, Germany, in June 2011. The event aims to build on the tremendous response to the first conference, which was held in Hyderabad, India in 2003, and will highlight the role of catalysis (an interdisciplinary technology) in the development of renewable raw materials for power generation.

The conference will also offer a common platform to industry experts from India and Germany, who will share insights on the latest developments in the application of renewable raw material catalysts for energy supply (photocatalysis, electrocatalysis and fuel-cell catalysis) and new energy and material-saving processes. Keynote speakers at the event will include MS Hedge/Indian Institute of Science, Bangalore, India; JA Lercher/TU Munich, Germany; F Schüth /Max-Planck-Institut für Kohlenforschung, Mülheim, Germany; D Wolf/Evonik Degussa GmbH, Hanau, Germany; and GD Yadav-Institute of Chemical Technology, Mumbai, India. ■



The second Indo-German Catalysis Conference will focus on the latest developments in the application of renewable raw material catalysts for energy generation.

Key Facts

Event: Second Indo-German Catalysis Conference

Dates: June 19–22, 2011

Venue: Schwaansche Str. 6, 18055, Rostock, Germany

Highlights: Keynote addresses from industry experts on the latest technologies and developments in catalysts for renewable power generation; opportunity to publish abstracts in the official booklet

Speakers: MS Hedge – Indian Institute of Science, Bangalore, India; JA Lercher – TU München, Germany; F Schüth – Max-Planck-Institut für Kohlenforschung, Mülheim, Germany; D Wolf – Evonik Degussa GmbH, Hanau, Germany; and GD Yadav – Institute of Chemical Technology, Mumbai, India

Registration fee: € 535 for industry participants and € 340 for participants from academia

Industry segments represented: Renewable energy, power generation

BRAIN and DECHEMA Cooperate in the Biotechnological Production of Perillic Acid

The biotechnology company BRAIN and DECHEMA have announced a collaboration in the biotechnological production of perillic acid. This patented natural monoterpene is owned by BRAIN and will be used in a wide range of applications as



Picture: DECHEMA

Development of integrated bio-processes in multi-fermentation systems

a bioactive compound in cosmetic products. The cooperation is aimed at advancing further development of an integrated bio-process for efficient microbial (+)-perillic acid synthesis from the cheap precursor (+)-limonene, developed by PD Dr. Jens Schrader and his team at DECHEMA. The compound (+)-limonene is extracted in large quantities from orange peel. By combining the competencies in strain and process optimisation as well as scale-up at the Karl-Winnacker-Institute of the DECHEMA, with the micro-biological and molecular biological methods of BRAIN, this project is aimed at developing an integrated bio-process for effective technical production. The research project is partially sponsored within the BRAIN research program "MikroPro" by the the German Federal Ministry of Education and Research (BMBF).

German Academia & Industry Network Bio-GAIN

The German Academia & Industry Network is a cooperation platform that provides access to thousands of German life sciences companies, universities and research institutions. This free information and communication service was developed by the Association of German Biotechnology Companies and DECHEMA e.V. to encourage cooperation, joint research and technology transfer among German life sciences organisations and to stimulate international cooperation. Joining the German Academia & Industry Network will enable you to get access to one of the world's largest life sciences markets and will boost your internationalisation activities.

Further information: www.bio-gain.eu

International Conferences Organized by DECHEMA

May, 19–20, 2011: Trends in Metabolomics – Analytics and Applications, Frankfurt am Main/Germany

June, 5–8, 2011: 9th International Symposium on the Characterisation of Porous Solids – COPS 9, Dresden/Germany

June, 5–8, 2011: AIChE-DECHEMA Global Conference on Energy Sustainability in Process Industries, Hong Kong SAR/China

June, 16–19, 2011: Affinity 2011, Tavira/Portugal

June, 19–22, 2011: 2nd Indo-German Catalysis Conference, Rostock/Germany

June, 20–22, 2011: Second International Conference on Energy Process Engineering, Frankfurt am Main/Germany

August, 25–27, 2011: The 4th International Advanced Materials (Chengdu) Summit, Chengdu New Century Jiaozi International Conference Center/P.R. China

September, 4–8, 2011: EUROCORR 2011, Stockholm/Sweden

September, 25–29, 2011: 8th European Congress of Chemical Engineering, together with ProcessNet-Annual Meeting EFCE Event No. 693, Berlin/Germany

September, 25–29, 2011: 1st European Congress of Applied Biotechnology, together with DECHEMA's Biotechnology Annual Meeting, Berlin/Germany

November, 15–16, 2011: Workshop: The new Paradigm – IgM from bench to clinic, Frankfurt am Main/Germany

Further Information:

DECHEMA e.V., Congress Office

Theodor-Heuss-Allee 25, 60486 Frankfurt am Main/Germany

Tel. +49 (0)69 7564-129/-333/-249; Fax +49 (0)69 7564-176

E-mail tagungen@dechema.de Internet www.dechema.de

Imprint

Editorial Staff

Editor-in-Chief: Gerd Kielburger ☎ +49 (0)9 31/4 18 - 25 36, gerd.kielburger@vogel.de

Editor: Dr. Jörg Kempf ☎ +49 (0)9 31/4 18 - 21 73, joerg.kempf@vogel.de

Editorial Assistant: Gabriele Ilg ☎ +49 (0)9 31/4 18 - 21 07, gabriele.ilg@vogel.de

Editorial Office: Vogel Business Media GmbH & Co. KG, Max-Planck-Str. 7/9, 97082 Wuerzburg, Germany, Telefax +49 (0)9 31/4 18 - 27 50, redaktion@process.de www.process.de, www.process-worldwide.com

Layout: Dieter Kansog

Production: Werner Wolz, ☎ +49 (0)9 31/4 18 - 24 79

Publisher

Publisher's Address: Vogel Business Media GmbH & Co. KG, Max-Planck-Str. 7/9, 97082 Wuerzburg, Germany, ☎ +49 (0)9 31/4 18 - 0, Fax +49 (0)9 31/4 18 - 27 50, A Company of Vogel Business Media

General Manager: Stefan Rühling

Advertising Manager: Reiner Öttinger ☎ +49 (0)9 31/4 18 - 26 13, (responsible for the advertising section) reiner.oettinger@vogel.de

Copyright: Vogel Business Media GmbH & Co KG. All rights reserved. Reprints, digital processing of all kinds and reproduction only by written permission of the publisher.



VOGEL Business Media

ADVERTISERS INDEX

A asecos GmbH www.asecos.com	18	I ILUDEST Destillationsanlagen GmbH www.iludest.com	10
C C. Otto Gehrckens GmbH & Co. KG www.cog.de	19	K KSB Aktiengesellschaft www.ksb.de	5
Carl Padberg Zentrifugenbau GmbH www.cepa-zentrifugen.com	23	O OHL Gutermuth Industrial Valves GmbH www.ohl-gutermuth.de	22
D Düker GmbH & Co. KGaA www.dueker.de	13	S SCHMITT-Kreiselpumpen GmbH & Co. KG www.schmitt-pumpen.de	19
Düperthal Sicherheitstechnik GmbH & Co. KG www.dueperthal.com	7	W Weidmüller GmbH & Co. KG www.weidmueller.de	21
E EFFEBI S.p.A. www.effebi.it	9	W WIKA Alexander Wiegand SE & Co. KG www.wika.de	17
I i-fischer-Engineering GmbH www.iludest.com	11		