



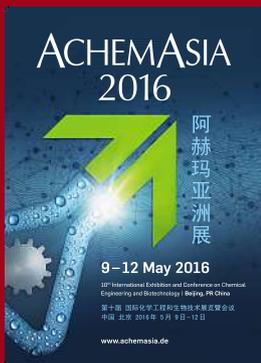
# ACHEMA

## Worldwide News

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# INDUSTRY 4.0 — AND WHAT EXACTLY IS NEW?

Not long ago I met four children (one girl and three boys) aged 6–7 that showed great interest in technology. After exchanging a few words we also touched the subject what “Industry 4.0” actually is.

I quickly explained the topics around digitization, networking, new interaction with machines (man-machine interface), the possibility of worldwide 24/7 remote access for better business deals and also new business models — at this point I was interrupted by the four children that had listened carefully up till then.

Astonished I was asked what I thought was so “mega new” with this Industry 4.0?

With great commitment I was told that networking was a common practice amongst the four, their friends and also worldwide acquaintances, via Facebook, WhatsApp, Twitter, Virtual Game Worlds, Second Life etc.! Yes, and business over the internet, “the new business models”, adds 6 year old Kevin, through shopping platforms or service providers is being practiced for years together with their parents. And, everything can be done worldwide — worldwide friendships are made and maintained through the internet and networking, and: the operation rarely occurs with a keyboard, as user interfaces of tablets and smartphones are well-known.

So, they digged deeper, what exactly is new with Industry 4.0? As member of the advisory board of the platform Industry 4.0 I had a hard time with the argumentation which techniques are actually new, or if they simply had to be transferred to industrial production. One of the boys then explained that he can check the video camera at the door of his apartment and programme the TV at home — all from his smartphone.

And now what!? — Are we really in the midst of a revolution or evolution with Industry 4.0 or are we, as the children concluded, just in a catch-up or transfer process of well-known modules? For this new generation it seems to be self-evident. This is why it is all the more important that the industry takes

## ■ DR. EBERHARD VEIT

Chairman of Festo (till 2016) and Managing Partner of 4.0-Veit; Head of Advisory Board “Plattform Industrie 4.0 der Bundesrepublik Deutschland” ■

*“Are we really in the midst of a revolution or evolution with Industry 4.0 or are we just in a catch-up or transfer process of well-known modules?”*



Picture: 4.0-Veit

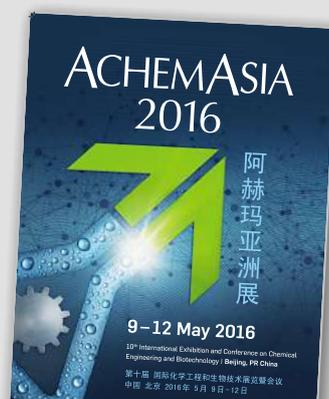
up this topic even more dynamically and implements it intensely, or, to say it in the words of the four children: transfers it.

Furthermore, please feel free to think of statistics whatever you want, but — if €12,8 billion were spent on research and development of technology for Industry 4.0 in 2015 by the Federal Republic of Germany, and only €1,4 billion for education and training to Industry 4.0, then this causes me to worry.

Are we not running the risk that technology rushes ahead, leaving people with their knowledge, their insecurities and anxieties about the future and especially with their motivation behind? That's why companies are in demand to intensify their efforts in education and training, together with the state, with universities and associations.

Encouraged, however, I look back at AICHEMA 2015: the euphoric mood, the wealth of innovations, the high commitment — actually everything! If it wasn't just a modern exhibition hype and companies indeed dedicate themselves to these topics according to the Swabian saying “don't just talk, act”, then were the statements of the four children mere kids chatter — and maybe answers to these questions then will pass my lips easier in two years' time!

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## INDUSTRY 4.0 IS MORE ...



Picture: © Coloures-pic - Fotolia

**“... much more, it is THE chance for Germany! If we do it right!” says Dr. Eberhard Veit, Chairman of Festo (till 2016) and Managing Partner of 4.0-Veit in his statement.**

“Today, Industry 4.0 is primarily discussed with focus on requirements of networked and integrated production. Besides these aspects, requirements related to interaction between man and machine as well as regarding education and qualification will change significantly in the industry. A company’s innovation capacity will in the future be a main success factor to ensure a sustainable competitiveness in Germany and other high-wage countries and to increase the attractiveness as employer. But, the ground has to be prepared for innovation capacity. Lots of companies, as for example Festo, the innovation leader from Esslingen, manage this by implementing appropriate innovation processes that also control corporate innovation networks. A strong innovation culture is a must in a company, considering that innovations come from people. It starts at the top, with the owner, the board and leads on to every single employee. Festo defines three main areas in the industrial application: Innovative technology takes into account the markets demand for higher flexible production facilities. This is not

solely subject of manufacturing automation. The process automation has meanwhile also got very good approaches to enhance flexibility through modular design, so that customer-specific requirements, e.g. regarding production capacities, can be covered easier and faster through standard modules. Very encouraging is the high customer interest in this respect which was already recognizable during the last ACHEMA.

The second focus is man-machine-interaction. In the future, facilities will be operated smartly and intuitively with machine and man working hand in hand, co-workers in a wider sense. Festo implements concepts in its own production facilities, e.g. the first cooperation of man and robot in the future factory in Scharnhausen, and starts single projects with customers. Further pre-studies go as far as the operating of machines through brainwaves or force intensification.

The third pillar is the qualification of employees. The classic personnel development process from the training needs analysis to qualification will not be adaptable in the future due to ever-shorter innovation cycles. Festo takes account of these requirements with learning factories that enable necessary qualifications in a university environment, but that are also used for qualifications for concrete tasks within the production.”

# HOLD THE LINE!

AchemAsia is just around the corner – for the tenth time! In an interview, Dr. Thomas Scheuring, CEO of DECHEMA Ausstellungs-GmbH, dips into the past, at the beginnings of AchemAsia, explains, why to visit AchemAsia 2016, and has a look at the future. His credo: China’s process industry has a challenging yet bright future.

• **Dr. Scheuring, thinking about AchemAsia 2016, what is the prevailing sentiment – joy, worry, mixed feelings?**

**SCHEURING:** As with every edition before, we are looking forward to AchemAsia 2016. This is my tenth AchemAsia, and I have always been excited about the next one to come.

• **Looking at China’s current economic situation, we receive less than positive news every day. What are the implications for AchemAsia?**

**SCHEURING:** The euphoria about China is indeed somewhat subdued at the moment – a situation we have experienced every now and then in the past, by the way. The reasons are well known. We do not see the two digit growth rates at the moment that we have got accustomed to over the past decade. On the other hand, these growth rates have resulted in a much higher economic base line than what we saw years or decades ago. Meaning that even with a lower percentage, economic growth in absolute numbers is still significant.

• **AchemAsia 2016 is the tenth edition. Let’s look back at the beginnings: What was your first impression as you entered**



**the hall at the very first AchemAsia in 1989?**

**SCHEURING:** It was a different world. I was really impressed by the courage of my predecessors at DECHEMA back then to become actively engaged in China in the late 1980s – at a time when the development over the past two decades could not be foreseen. The visual impression then is nowhere near comparable to AchemAsia today. You may say that we came to China as ambassadors of Western technology, introducing the Chinese to technology they had never seen before. Even then, there were some Chinese exhibitors, but they lagged behind in

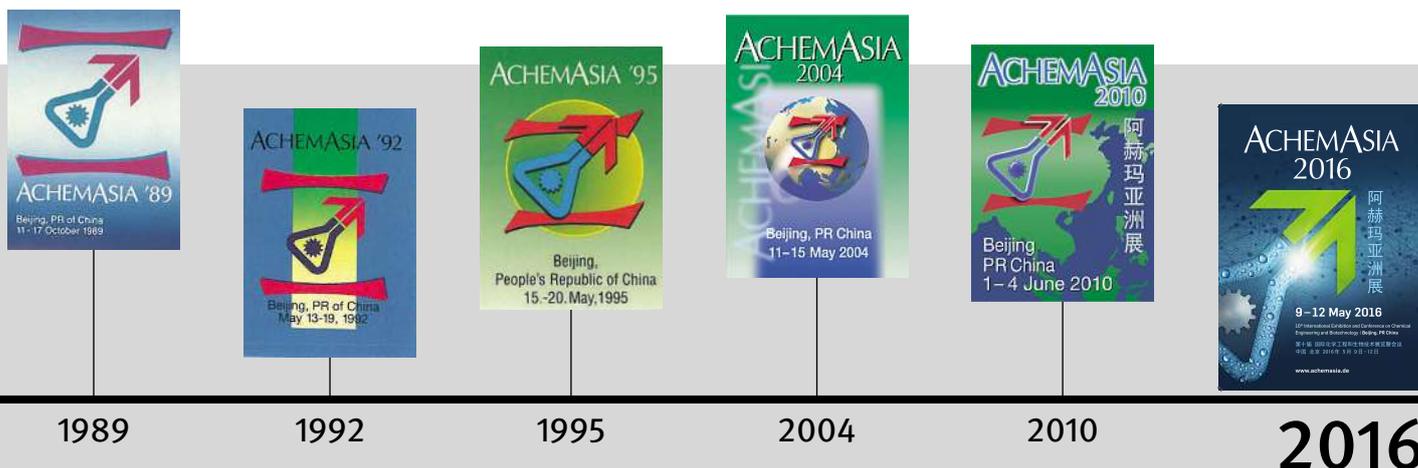
terms of technology. That has changed completely.

• **So if someone had participated in the first AchemAsia in 1989 and came back in 2016 – would they even recognize the event?**

**SCHEURING:** They would probably be flabbergasted. The tremendous development that China has undergone is visible in AchemAsia: We have so many Chinese exhibitors offering high tech equipment and state-of-the-art equipment technology. The exhibits are impressive, the stands are attractive – and not least the current location offers the setting and all the amenities you expect from a modern exhibition center.

• **If the current economic situation in China is the “new normal” and if the transformation of the Chinese economy towards more innovation, high tech and modern production is achieved: In your opinion, what are the implications for German and international companies?**

**SCHEURING:** Trade with China was never easy. And indeed, there will be a shift in the range of products and services that are traded between Germany and China.



## ❖ AchemAsia Mobile App

Be always up-to-date with the **AchemAsia 2016 App!** Get access to all exhibitors from A-Z with a short profile of their business fields or products, searchable by name, target group, product category and country. An overview plan of the exhibition grounds and detailed hall plan make it easy to find the stands of interest. The AchemAsia App will be available from mid April 2016!  
All about AchemAsia: [www.achemasia.de](http://www.achemasia.de)



Already for a while now Sino-German trade is no one way street where Germany exports technology and imports cheap mass consumer products—it is a bilateral exchange, and it becomes more balanced over time.

### • Why should international exhibitors go to AchemAsia at a time like this?

**SCHEURING:** The Chinese market is already a very important one, and its relevance will increase. AchemAsia's slogan is "Meet the future of China's process industries. Now."—and that's for a reason: China's process industries have a bright future. Anybody who ignores China now makes a severe mistake—similar to 15 years ago when some deemed activities in China too early. On the contrary: It is essential to hold the line at a time of dampened enthusiasm. The Chinese are very observant who stays with them and who steps back at the slightest obstacle.

• There has been a continually growing Chinese participation over the past years—AchemAsia has become "more Chinese". What does AchemAsia mean to Chinese exhibitors?

**SCHEURING:** The message to the Chinese exhibitors is: AchemAsia is THE place where you can initiate and intensify your international network. It's both a display and a window to the world—and that's invaluable especially in a time of economic transformation.

• Let's have a look at the congress. You changed the concept for AchemAsia 2013, having several symposia organized together with Chinese partners instead of one integrated congress. Has this proved successful?

**SCHEURING:** Yes, definitely. The conditions have changed—we are not "technology missionaries" any more, but we need a platform where Chinese and West-

ern partners can meet and discuss. With the symposia, our Chinese partners can put the spotlight on topics relevant to their communities. At AchemAsia we will have several independent symposia; CIESC for instance as our main domestic cooperation partner contributes sessions on smog prevention and process intensification as they consider both topics as highly relevant for their target groups.

### • Looking ahead—what are your expectations for AchemAsia 2019?

**SCHEURING:** Predictions are difficult. But I notice today a certain lack of recognition that a country that has had two digit growth rates for decades will not be able to continue this percentage increase on a much larger economic basis. I expect that this will be common sense in three years time and that China's economy will still be growing at a solid pace—meaning that Western industries will have realized by then that the "new normal" is indeed the "normal" to be expected—and by all means still a very attractive business environment.

### • What is your vision—or your wish—for AchemAsia 20 years from now?

**SCHEURING:** Our goal was to crack the mark of 1,000 exhibitors on the long run. I think chances are high that this will happen over the next 20 years. The share of domestic exhibitors will probably level off at about 50 %—similar to what we see at ACHEMA. Personally I feel that it has been a privilege to witness the development in China as a whole and of our industry in particular over the last 25 years and even have a—if only small—role in it, and I am looking forward to see what the coming decades will bring.

• Dr. Scheuring, thank you very much for your time.

*"We are not 'technology missionaries' any more, but we need a platform where Chinese and Western partners can meet and discuss."*

❖ Dr. Thomas Scheuring, CEO DECHEMA Ausstellungs-GmbH

# CHINA'S ECONOMY IN TRANSFORMATION

As China's economy is slowing down and the stock markets are undergoing turbulences, trade journalists, economists and industry experts alike wonder whether this is just a temporary slump or the beginning of a "new normal" for the Chinese economy.

DR. KATHRIN RÜBBERDT\*

A growth rate of 6.9% in 2015 — in many countries around the world this would be considered a tremendous success. But in China with its history of double digit growth, the significant slowdown causes some wrinkled brows. To be sure — the economy is still growing, and still growing much faster than in most other regions of the world. And in absolute figures, the annual increase of China's BIP still surpasses the total BIP of countries such as Switzerland or the Netherlands.

Nevertheless, it has become obvious not only to economists that China is facing challenges that run deeper than just changes in trade statistics. Air pollution levels this winter have reached unprecedented heights, causing the government to raise alerts and restrict traffic and industrial production. The explosions in Tianjin in August 2015 stimulated questions about safety precautions in logistics and production. And in the "Guardian", columnist Will Hutton describes China's economy as one big Ponzi scheme "that is waiting to implode".

Better stay away from China then? Quite the contrary, according to leading stakeholders. For example, Sanjeev Gandhi, Head of BASF's operations in Greater China and Asia Pacific, explained in a recent interview with China Daily that the segment of innovation would open up new opportunities for global companies and expressed that BASF was "very, very confident about the China market".

The focus on innovation and on technologies that go beyond mass production is in line with several actions that China's



The Chinese growth engine is spluttering, but by no means it isn't stalled. According to experts, business opportunities are still good. There are some set screws to wind up the movement again.

government has set in motion even before the recent economic turmoil.

One is the transformation from China as the "workbench" of the world towards a center of innovation, as expressed in the "Made in China 2025" strategy. This ten-year action plan that was issued by the State Council in May 2015 aims to transform China in a leading manufacturing power by the year 2019. The focus is clearly on innovation and the combination of manufacturing and services. A great emphasis is placed on digitalization, mirroring Germany's "Industrie 4.0" initiative. "Countries, both developed and developing, are reshaping their competitiveness as new technologies, including 3D printing, mobile Internet, cloud computing and new energy, emerge and

China needs to urgently improve its ability to innovate and grasp these cutting-edge technologies, the plan states", according to the official news published on the State Council's website.

For international companies, this strategy is a double-edged sword. On the one hand, it poses a severe challenge to the established global players who now have to anticipate serious competition from future Chinese high-tech companies. On the other hand, many technologies that are required to implement the plan are not available in China today, opening up huge business opportunities for suppliers from all over the world, especially in the fields of plant equipment, systems integration and automation. M&A activities such as the takeover of German plas-

\* K. Rübberdt is Head of Biotechnology, DECEMA e.V.

tics machinery producer KraussMaffei by ChemChina for €925 million in January 2016 are part of the Chinese initiative to incorporate the necessary know-how into its industry. Companies who want to take part in the Chinese economic transformation need to manage their activities wisely and have to stay one innovation step ahead in order to succeed.

### Strong Focus on Environmental Technologies

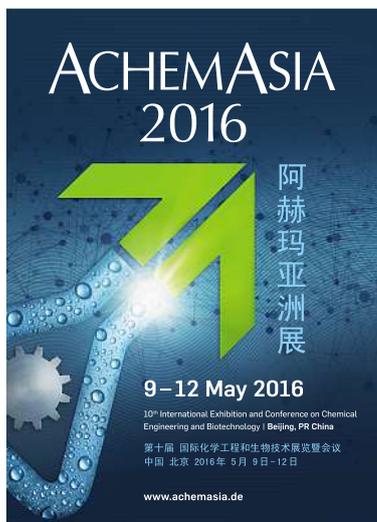
Another growth sector is environmental technologies. The alarming levels of pollution have turned the spotlight towards the need for cleaner production and the remediation of air, water and soil. The 13th Five Year Plan for 2016–2020 that will be published in March will have a strong focus on these areas; they were already high on the agenda in the 12th Five Year Plan. According to Chinese officials, the targets laid out for the reduction of four major pollutants — sulfur dioxide and chemical oxygen demand, ammonia nitrogen and nitrogen oxide— have been fully met. Nonetheless, according to Environment Minister Chen Jining, some major pollutants must be cut by another 30 to 50 percent for remarkable improvement of environment. More ambitious regulations have already taken effect, seeking to reduce pollution at the root especially in the most polluted region that includes Beijing, Tianjin and Hebei. For the European industry that has performed the shift from end-of-pipe technologies to integrated environmental protection already some time ago, the modernization of the Chinese industry creates an attractive market—even more so as concepts for resource management (e.g. in the

field of industrial water management) have to be designed individually according to specific regional and industrial requirements, meaning they cannot be bought “off the shelf”.

The development in China is not only closely monitored by industry, but also by politics. In 2015, the German government turned a new page by developing the first-ever strategy paper for bilateral cooperation in research and development. The “China strategy” emphasizes the opportunities for a joint development of knowledge and technologies, but it also

stresses the necessity to create a level playing field regarding IP rights, market access and mutual benefits.

With the “new normal”, the cooperation and economic relations between China and its global partners will undergo a transformation. But companies managing the changes wisely, providing innovation and taking the specific requirements for technologies and services into account will find an attractive new market instead of an extended workbench—and this might make a deal whose long-term potential can only be estimated today. ■



# PRELIMINARY EXHIBITOR LIST ACHEMASIA 2016



Picture: DECHEMA

Company	Stand
<b>A</b> Actreg (Shanghai) Actuator Co., Ltd.	H14
A.D. TUBI INOSSIDABILI S.P.A.	F35
AISENBERG GmbH	P30
Allied Supreme (Jiaxing) Corp.	L28
Andritz (China) Ltd.	L19
API Heat Transfer (Suzhou) Co., Ltd.	O40
AP2E SAS	G17
ARCA Regler GmbH	O8
Asahi Organic Chemicals Trading (Shanghai) Ltd.	G18
ASSOMA Inc.	F19
ASung Clean Flow-Tech Co., Ltd.	L35
ATR Asahi Process Systems (P) Ltd.	N25
AUMA Actuators (China) Co., Ltd.	G27
AZ Armaturen (Taicang) Co., Ltd.	M17
<b>B</b> Baoding Shenchen Precision Pump Co., Ltd.	F20
BASF SE	L44
Beijing Chuangshifurui Sealing Technology Co., Ltd.	R25
Beijing Kehua Bomex Glass Co., Ltd.	L34
Beijing Palmary Technology Ltd.	Q2
Beijing Plastics Research Institute	H4
Beijing University of Chemical Technology	S23
Beijing Zhongxing ShiQiang Ceramic Bearing Co., Ltd.	R27
Bertrams Chemical Plants (China) Co., Ltd.	N7
Bhastrik Mechanical Labs Pvt. Ltd.	F28
Biar Sampling Systems SA	M21
Bioengineering AG	M34
BOKELA Ingenieurgesellschaft f. Mechan. Verfahrenstechnik	O29
Bolian Filter Co., Ltd.	H17
Braunschweiger Flammenfilter GmbH	N8
Bronkhorst (Shanghai) Instrumentation Trading	F12
BSK Fluid Technology LLC	P18
Burgmann Sealing Material Co., Ltd., Cixi	R23
Busch Vacuum (Shanghai) Co.Ltd.	K36
<b>C</b> Cathay Packing & Sealing Co., Ltd.	P34
Chair Man Hi-Tech Co., Ltd.	Q3
Changsha Boneng Technology Co., Ltd.	L40

Company	Stand
Changzhou Fanqun Drying Equipment Co., Ltd.	M18
Changzhou Jianda Dry Equipment Co., Ltd.	J27
Changzhou Yibu Drying Equipment Co., Ltd.	Q26
Chematur Engineering AB	M12
China Petrochemical Technology Company, Ltd.	R24
Corning China (Shanghai)	H51
Corrosion Materials (Shanghai) Co., Ltd.	H36
<b>D</b> Dalian Hermetic Pump Co., Ltd.	N21
Dalian SATAKE Chemical Equipment Co., Ltd.	R22
Dalian Teikoku Canned Motor Pump Co., Ltd.	H12
De Dietrich Process Systems (Wuxi) Co., Ltd.	K19
DECHEMA Ausstellungs-GmbH	R39
DeChem-Tech. GmbH	N40
Dedert (Shanghai) Drying and Evaporating Tech. Co., Ltd.	H1
Dinggin Hardware (Dalian) Co., Ltd.	M3
DOCKWEILER AG	N18
Dongguan Huahui Precision Machinery Co., Ltd.	H7
Dongguan Walle Sealing Technology Development	R36
Dongtai Shengshi International Advertising Co., Ltd.	R35
Dongying Giayoung Precision Metal Co., Ltd.	O26
DrM Shanghai Co., Ltd.	H30
Dwyer Instruments HK, Ltd.	G2
<b>E</b> Eclipse Combustion Equipment (Suzhou) Co., Ltd.	J13
Edwards Technologies Trading (Shanghai) Co., Ltd	L33
Eletta (Beijing) Instruments Co., Ltd.	L26
EtringKlinger Engineered Plastics (Qingdao)	O28
Eltex Elektrostatik GmbH	Q1
EXA S.r.l.	M24
<b>F</b> FELUWA Pumpen GmbH	O8
FineTek Co., Ltd.	J39
Flottweg SE	O35
FLUX-GERÄTE GmbH	N12
Födisch Umweltmesstechnik AG	O23
Foshan Kar Ming Industrial Equipment Co., Ltd.	Q1
Fraunhofer Institut IKTS	O27
Frenzelt Werke GmbH	N24

Company	Stand
<b>G</b> Gasmet Technologies (Asia) Ltd.	Q30
Gaungdong Chungchak Heavy Industry Co., Ltd. (CCHI)	S20
GEA Process Engineering China Ltd.	J12
GEFA Procestechnik (Shenzhen) Co., Ltd.	H18
Gemeinschaftsstand Verlage	R35
gempex GmbH	P13
GERB (Qingdao) Vibration Control Co., Ltd.	P33
German Pavilion	N2
GKD (Beijing) Ind. Technologies Co., Ltd.	Q35
Global Business Reports Pte.Ltd.	R35
Good Morning International (Shanghai) Ltd.	G33
Gore Industrial Products Trading (Shanghai) Co., Ltd.	J20
GSKET SRL	J45
Guanghan N&D Carbide Co. Ltd.	M1
<b>H</b> Haiyan New Century Petrochemical Device Co., Ltd.	M25
Halifax Fan China	J51
HAMMELMANN GmbH	O18
Hanbon Science & Technology Co., Ltd.	F25
Hangzhou Hengyi Filter Co., Ltd.	Q25
Hanrui Puzer Bulk Handling Technology (Shanghai) Co., Ltd.	J35
Haoxin SS Sanitary Vessel Co., Ltd.	O20
HAYER & BOECKER Maschinenfabrik	O11
Hebei Sinter Filter Technic Co., Ltd.	L21
Hefei Xinhu Canned Motor Pump Co., Ltd.	M7
HEINKEL Process Technology GmbH	M36
Hempel Special Metals (Asia) Ltd.	P25
HEROSE GmbH	O14
Hohhot Monva Valve Co., Ltd.	H34
Hongtuo Mechanical Casting Co., Ltd.	G7
Hot Water DHS (Beijing) Co., Ltd.	F18
Huading Separator Yixing Huading Food Machine Co., Ltd.	G23
Hunan Neptune Pump Co., Ltd.	Q28
<b>I</b> IKEUCHI (Shanghai) Co., Ltd.	P27
Insheng Engineering Co., Ltd.	M33
Institute of Process Engineering	R34
IWAKI Pumps Co., Ltd.	H46
<b>J</b> JAKIFLOW Valve Corporation	J19
JC Manufacturing Group (Shanghai) Co., Ltd.	L20
Jiangsu Ousa Industry Seal Co., Ltd.	J25
Jiangsu Sunkaier Industrial Technology Co., Ltd.	F29
Jiangyin Kebo Machinery Co., Ltd.	P29
Jingjiang DKD Filter System Co., Ltd.	F1
Jingjin Environmental Protection Inc.	P12
JJULI Hi-Tech Metals Co., Ltd.	Q24
JIXUN Media Co., Ltd.	H26
Josef Rettenmaier & Söhne GmbH & Co. KG	J3
<b>K</b> KBR Ecoplaning Oy Chematur Ecoplaning Oy	N19
KEM Flow Technology (Beijing) Co., Ltd.	G39
Kempchen Dichtungstechnik GmbH	N35
Klinger Fluid Control GmbH	N35
KLINGER-SCHÖNEBERG GmbH	N35
Klinkau GmbH & Co. KG	O7
Körting Hannover AG	P17
KSB Aktiengesellschaft	L1
Kunshan Elite Instruments Co., Ltd.	J2
<b>L</b> Lanzhou Highland Pumps, Co., Ltd.	Q20
Lechler GmbH	N34w
LEWA Pumps (Dalian) Co., Ltd.	O30
Liaoyang Youxin Pharmaceutical Machinery	G35
Lödige Maschinenbau GmbH	P1
Lubrizol Management (Shanghai) Co., Ltd.	K20
Lung Yun Casting Co., Ltd.	P19
<b>M</b> M Pumps Asia Pacific Pte. Ltd.	M2
Mankenberg GmbH	O19
MAVEG GmbH	O17
Mdexx Magnetronic Tianjin Ltd.	L8
Mersen Xianda Shanghai Co., Ltd.	L2
Modentic Valve Corp. (Nanjing)	H28
MTG Innovative Hose Solutions Asia Pacific Ltd.	K35
MUNSCH Chemie-Pumpen GmbH	N28
<b>N</b> Nanjing Baotai Special Materials Co., Ltd.	S37
Nanjing Tech University Membrane Science and Technology	S28
NERAK GmbH Fördertechnik	O12
Netzsch (Lanzhou) Pumps Co., Ltd.	P20
Newson Gale Ltd.	N11
Ningbo IDT Sinyuan Sealing Technology Co., Ltd.	P21

Company	Stand
Ningbo Taifno PTFE Plastic Products Co., Ltd.	F30
<b>O</b> Orientec Industrial Development Corporation Ltd.	L44
Osaka Stainless Co., Ltd.	O34
<b>P</b> Peiyang Chemical Equipment, Co., Ltd.	H40
Plinke GmbH	N26
Pride International (Shanghai) Co., Ltd.	Q21
<b>R</b> RENOLIT Beijing Medical	M32
Rhodium Safety and Environmental Solutions	M19
Richter Chemie-Technik GmbH	O39
Rivertrace Engineering Ltd.	J1
<b>S</b> Saideli Pharmaceutical Machinery Co., Ltd.	G12
Samoa Industrial S.A.	J36
Sandvik International Trading (Shanghai) Company Ltd.	O22
Schaaf GmbH & Co. KG	G1
Schrader Verfahrenstechnik GmbH	N36
Sealtex Co., Ltd.	L18
Sefar Filtration Solution (Suzhou) Co., Ltd.	M22
SGT Glass-lined Equipment Co., Ltd.	K34
Shaanxi Lasting Titanium Industry Co., Ltd.	J7
Shanghai Bailun Bio-Technology Co., Ltd.	P35
Shanghai Bi-Yun Filter Equipment Co., Ltd.	H52
Shanghai BS & B Safety Systems Ltd.	F37
Shanghai Champion Controls Ltd .	F24
Shanghai Fier Mechanical Co., Ltd.	Q29
Shanghai Gateway Trade Co., Ltd.	S35
Shanghai HIE Technology Co., Ltd.	R19
Shanghai Jianglang Fluid Machine Manufacturing Co., Ltd.	S36
Shanghai Jofee Pump Co., Ltd.	H20
Shanghai Sunrise Industrial Equipment Co., Ltd.	J21
Shenyang Shiboda Instrument Co., Ltd.	M29
Shenzhen Kelida Industrial Co., Ltd.	Q27
Shield Sealing Co., Ltd.	J29
Shijiazhuang Beot Inorganic Membrane Separation	K1
SK- Elektronik GmbH	O23
SMC Asia Gas Systems Co., Ltd.	Q6
Solvay Specialty Polymers	G8
SPX (Shanghai) Flow Technology Co., Ltd.	J34
Stahlhandel Gröditz GmbH	P3
STAUFF Hydraulic Components & Services (Shanghai) Co., Ltd.	Q19
Suzhou Donit Sealing Materials Import and Export Co., Ltd.	L22
Suzhou Kung Hai Trade Co., Ltd.	P28
Swenson Technology Inc.	P24
Swissfluid (China) Co., Ltd.	H3
Systec GmbH Labor-Systemtechnik	N22
<b>T</b> Tecreal Fluid Control System Co., Ltd.	H2
TEMA Siebtechnik Process Equipment (Tianjin) Co., Ltd.	L12
Tianjin Junge Molecular Distillation Equipment	S34
Tianjin University	S24
TLT Turbo GmbH	O33
Tsinghua University Department of Chemical Engineering	R28
Tycon Alloy Industries	G19
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UWT International Trading (Shanghai) Co., Ltd.	O38
<b>V</b> VDM Metals GmbH	O36
VIBRA Maschinenfabrik Schultheis GmbH & Co.	N20
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Zhejiang NAMAG Equipment Manufacturing Co., Ltd.	P24
Zhengzhou Greatwall Scientific	P8
Zhuzhou Hongda Polymer Materials Co., Ltd.	G25
Zibo Chemet Equipment Co., Ltd.	G3

# A LOOK AT FUTURE PRODUCTION CONCEPTS

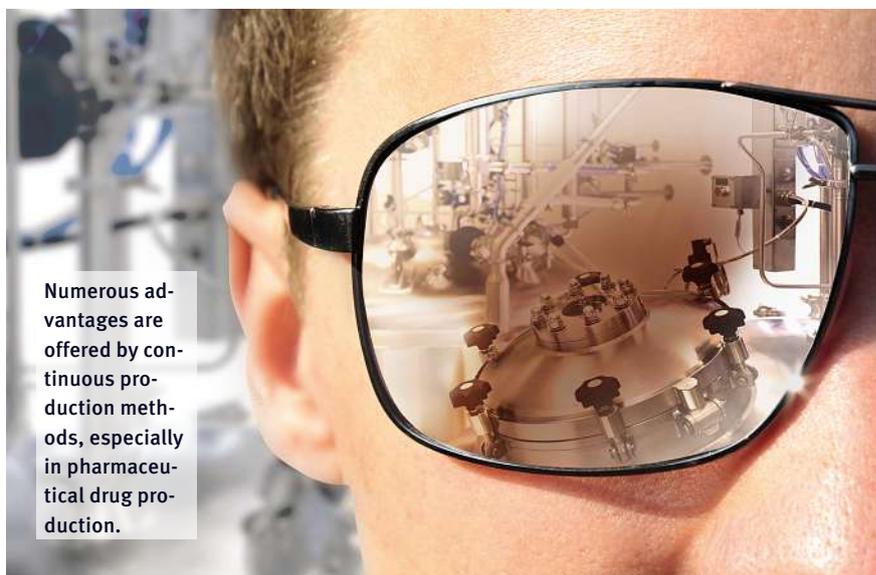
Over the last years, chemical and pharmaceutical industry companies have been working on two major production concepts to further improve their production of chemicals, drugs, materials or biotechnology products: continuous flow and modularized production. The general goal is to produce faster, with a higher quality and less waste.

DR. BJÖRN MATHES\*

**D**ue to globalized and volatile markets, reduction of time-to-market is as essential as safe, resource-efficient and flexible production. The chemical industry is facing an increasing demand from fast growing and vibrant markets such as China, India or Brazil (maybe not as strong as expected, but still reasonable) and a trend to customized specialty and fine chemicals. This leads to high product varieties which are produced from small amounts to over hundred tons per year.

But what are the advantages and disadvantages of continuous production processes and modularized production systems? Are these production concepts really helpful for the whole industry, or are they only fit to the production of bulk chemicals?

Let's have a look at traditional batch processing: Scaling up a batch process is a long-term run and requires a lot of chemical engineering know-how and calculations as well as experimental results from lab-scale and pilot plant prototyping. Step by step the production volume is increased until the final production plant is build. Every step is difficult, ac-



Numerous advantages are offered by continuous production methods, especially in pharmaceutical drug production.

Picture: © lassedesigner; © werbefoto-burger.ch - Fotolia

counts for a high investment and increases time-to-market. Not forgetting that market foresight has potentially a high deviation rate as time-to-market is too long.

So, the continuous-flow and modularized process approaches to overcome the disadvantages of the batch process and reduce the development time of a chemical or biotechnological production process from initial idea to market operation with simultaneous energy and resource efficiency are a new paradigm in chemical and pharmaceutical industry. It could also be an example for the agrochemical industry.

Numerous advantages are offered by continuous production methods: first of all they have a smaller ecological footprint, the required equipment is much smaller and more easy to handle, process cycle times are lower as well as operating costs, maximized quality control and a higher level of automation coupled with less human interaction allows for smarter

and digitized process control from upcoming trends like the Internet of Things. You also have to keep in mind that depending on the produced chemical or biotechnological product the usage of single-use equipment could be profitable, and overall the need for inventory and storage is much lower.

For processes which are susceptible to contamination, like in pharmaceutical drug production, continuous processes together with real-time monitoring and regular sampling can easily detect such contaminations and allow for discarding only a small amount of the product instead of the entire batch.

Another key point of continuous-flow production is the fact that the process is fully integrated, meaning the products of one reaction flow into the next through small-volume pipes. So scientists and engineers in specialty and fine chemical companies can now use certain kinds of chemical reactions that are not feasible in batch processes, such as very fast reactions, highly exothermic reactions, safety-relevant conversions like nitrations or those which require specific light- or UV-impulse or high temperatures. This could open a completely new field of chemicals and drugs.

## Continue the Discussion

... with industry experts at the DECHEMA PRAXISforum: "Future Production Concepts in Chemical Industry" (April 27–28, 2016, Frankfurt/Main) [www.dechema.de/praxisforum](http://www.dechema.de/praxisforum)

\* B. Mathes, Head of PRAXISforums, DECHEMA e.V.

According to fine chemical and pharmaceutical companies, it seems that it is only a question of time until for example all major pharmaceutical drug producers have commercial-scale continuous-manufacturing facilities.

For higher outputs which may be needed in specialty chemical industry, a single micro- or milli-structured reaction system sometimes doesn't fit. But modularized plant systems, working with continuous manufacturing methods as key enablers, allow a quick reaction to increasing or decreasing market demands and are very suitable for the chemical process industry. The target behind modular plant systems is to use standard modules for continuous manufacturing. Therefore, modules and components must be integrated and multi-scalable to really accelerate modeling and process design. By using continuous manufacturing laboratory equipment very similar to the final process equipment, the detailed engineering of the final production facility can be already realized with the chosen labora-

tory plant structure. The production facility is then assembled from pre-configured modules. The wise combination of these components into modules and the associated integrated information modeling from the process design to the initial operation are essential cross-cutting activities. They reduce on the one hand throughput times and on the other hand optimize the energy efficiency of the process.

To realize an efficient modular plant system, the mentioned integrated and multi-scalable reaction, separation and other hardware modules are needed. Only with these modules and components the transfer of laboratory reactions directly into mass production would be possible, circumventing pilot projects and time-consuming adjustments of the chemical recipe. The development of scalable components supports the concurrent development of appropriate planning and hardware modules for recurring process steps and frequently used components (such as pumps, columns, reac-

tors, infrastructure, etc.). These modules must be integrated into a planning tool that supports the entire design process from early process development in the laboratory up to the 3-D plant model.

The modularization of key components such as columns and pumps as well as the data integration and data management through various phases in the plant design cycle contributes significantly to an increased efficiency and reduced time-to-market as well as allows for industry-wide use.

Furthermore, models of automotive industry supply chains can be adapted, which offer great potential for synergies and competitive advantages for specialty and fine chemicals companies. So, the continuous-manufacturing and modularized plant system approach could lead to produce cost-effectively over the long term and this right from day one, just by offering the optimal balance between investments and operating costs as well as future updates – the future standard in chemical process industry? ■

# BIOECONOMY? IT'S YOUR BUSINESS INDEED!

BiobasedWorld was a focal topic at ACHEMA 2015, featuring technologies that contribute to the shift of the process industries from petrol to renewable resources. With the bioeconomy ever growing in significance, BiobasedWorld will become a stand-alone trade show, debuting on February 15–16, 2017 in Cologne, Germany.

DR. MARLENE ETSCHMANN\*

**B**ioeconomy, biobased chemicals, renewable energy—just in case you think “this is esoteric fuss and none of my business”, think again. Wherever on the planet you read this magazine, chances are that the fuel in your car contains a percentage of alcohol. It can be as low as 5% in Germany or as high as 27% in Brazil. Worldwide, about 100 billion liters of ethanol are distilled every year, most of it for fuel use. This number makes ethanol the most important product of the bioeconomy and you contribute to the business directly with every trip to the pump.

## Prospects Are Optimistic

“The shift to a European bioeconomy is now irreversible and this transition will now accelerate after the COP21,” said John Bell recently. As Director of Bioeconomy Directorate of the European Commission, his focus is naturally on Europe, but his statement probably carries far beyond. More and more countries worldwide are issuing national bioeconomy strategies and many of them already translate into impressive growth rates.

These growth rates also apply to the number of biobased products and processes on the market. However, if you are looking for an event where you would find all of the technological aspects of bio-refining in one place, you would be having a hard time. High time to launch BiobasedWorld, the first trade show dedicated to the bioeconomy. Whether you are engineering fermentation plants or



Fuel ethanol — biggest player in the bioeconomy

offering pumps suitable for solvent transfer, if your filter units are compatible with the harsh conditions of biodiesel, if your extruder can handle bioplastics, you should consider exhibiting in Cologne next year.

## Show Your Expertise in Bioeconomy

BiobasedWorld is calling companies and researchers who are active in the production of bio-based products and bioenergy from renewable resources. BiobasedWorld aims at showing the potential of the bioeconomy as a whole, therefore there is no focal topic. Topics include: industrial biotechnology; algae; biomass; biorefineries; biopolymers; bioenergy; biofuels; biobased chemicals, lubricants, surfactants; biobased materials, including building materials.

BiobasedWorld covers the whole value chain extending to raw material producers; technology providers; equipment manufacturers; project developers; service providers; venture capitalists; regulators.

## Why not Frankfurt?

Frankfurt on the Main traditionally is home of ACHEMA and will be so in the future. Cologne, however, is located at the hub of the major European bioeconomy countries—The Netherlands, Belgium, Northern France, UK and Germany. BiobasedWorld therefore conveniently takes place right in front of your customer's doorstep. Cologne-Bonn airport can be reached with a one hour flight from many European cities and there are high-speed train connections to Frankfurt, Amsterdam and Brussels. ■

\* M. Etschmann is Project Leader BiobasedWorld, DECHEMA Ausstellungs-GmbH.

## ONLINE MINI-ENCYCLOPAEDIA ON SINGLE USE TECHNOLOGIES

Development and commercial production of pharmaceuticals is today unimaginable without single use technologies or “disposables”. This is especially true for upstream processing where a large variety of apparatus is available from a range of suppliers. But also for downstream processing, filling and formulation, there is a broad selection of production platforms. Conventional systems are increasingly replaced by their single use antagonists in continuous, hybrid production plants. Market projections predict an increasing share of complete single use production lines for mammal cell antibodies and biosimilars. The new mini encyclopedia “Single Use Technologies A-Z” explains important and often used technical terms in single use technology with a focus on the current main applications. It is available in German and English. About 300 keywords and explanations are linked internally and with literature, pointing out relations between different terms. The

A-Z is an invaluable tool for master students of biotechnology and related disciplines (pharmaceutical technology, medicinal biotechnology, biotechnological processing etc.) as well as for industry newcomers. The encyclopaedia was compiled by Britta Badertscher, Regine Eibl und Dieter Eibl (Zürcher Hochschule für Angewandte Wissenschaften) and is a publication of the DECHEMA working group “Single Use Technology in pharmaceutical production” supported by biotech Switzerland and the Nationale Themennetzwerk (NTN) Swiss Biotech.

### ❖ Save the Date

Want to learn more about Single-Use Technologies in Pharmaceutical Production? Then join the symposium at AchemAsia: May 11, 2016, Beijing. More at [www.achemasia.de](http://www.achemasia.de)

❖ Available free of charge, at [a-z-singleuse.org](http://a-z-singleuse.org)

### ❖ International Events Organized by DECHEMA

- **June 2–3, 2016:** Single Cell Technologies 2016 – Frankfurt/Germany
- **June 5–8, 2016:** 15th International Symposium on Loss Prevention and Safety Promotion in the Process Industries – Freiburg/Germany
- **September 19–21, 2016:** CORRUS 2016 – Moscow/Russia
- **October 16–19, 2016:** Green Solvents Conference – Kiel/Germany
- **November 8–9, 2016:** PRAXISforum Enzymes for Industrial Applications – Frankfurt/Germany
- **November 8–10, 2016:** TeQ Chemical Technology – Rio de Janeiro/Brazil



### ❖ Further Information:

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## ZERO LIQUID DISCHARGE: A MATTER OF CIRCUMSTANCE



Picture: © Andrei Merkulov, jag.cz, -fotolia

What's the role of Zero Liquid Discharge (ZLD) in industrial water management? In a paper published by ProcessNet, the experts of the working group “Production Integrated Water and Waste Water Technology” caution against exaggerated expectations regarding ZLD. Globally, an increasing number of production plants are required to introduce Zero Liquid Discharge. The motives for this differ and may range from scarce water supplies to regulatory frameworks and independence of local water resources to “green labeling”. A globally accepted definition of ZLD is still lacking. Strictly speaking, ZLD

means that no liquid water leaves the system (although it may exit as steam). Less restrictive conditions allow also for the emission of sludge, brine or aerosols. The experts agree that ZLD, which usually requires significant energy, should be employed if a plant has to be run independently of local resources, for example in areas with an insufficient infrastructure. The decision for or against ZLD should be based on a detailed evaluation taking into account both business and economic requirements of flow management as well as ecological aspects; these may be contradictory. As ZLD is costly and energy-intensive, a thorough systems analysis should be performed before making a final decision.

❖ **The paper, which is a supplement to a more comprehensive publication on industrial water management published in 2014 is available (in German language only) at [www.dechema.de/studien](http://www.dechema.de/studien)**

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