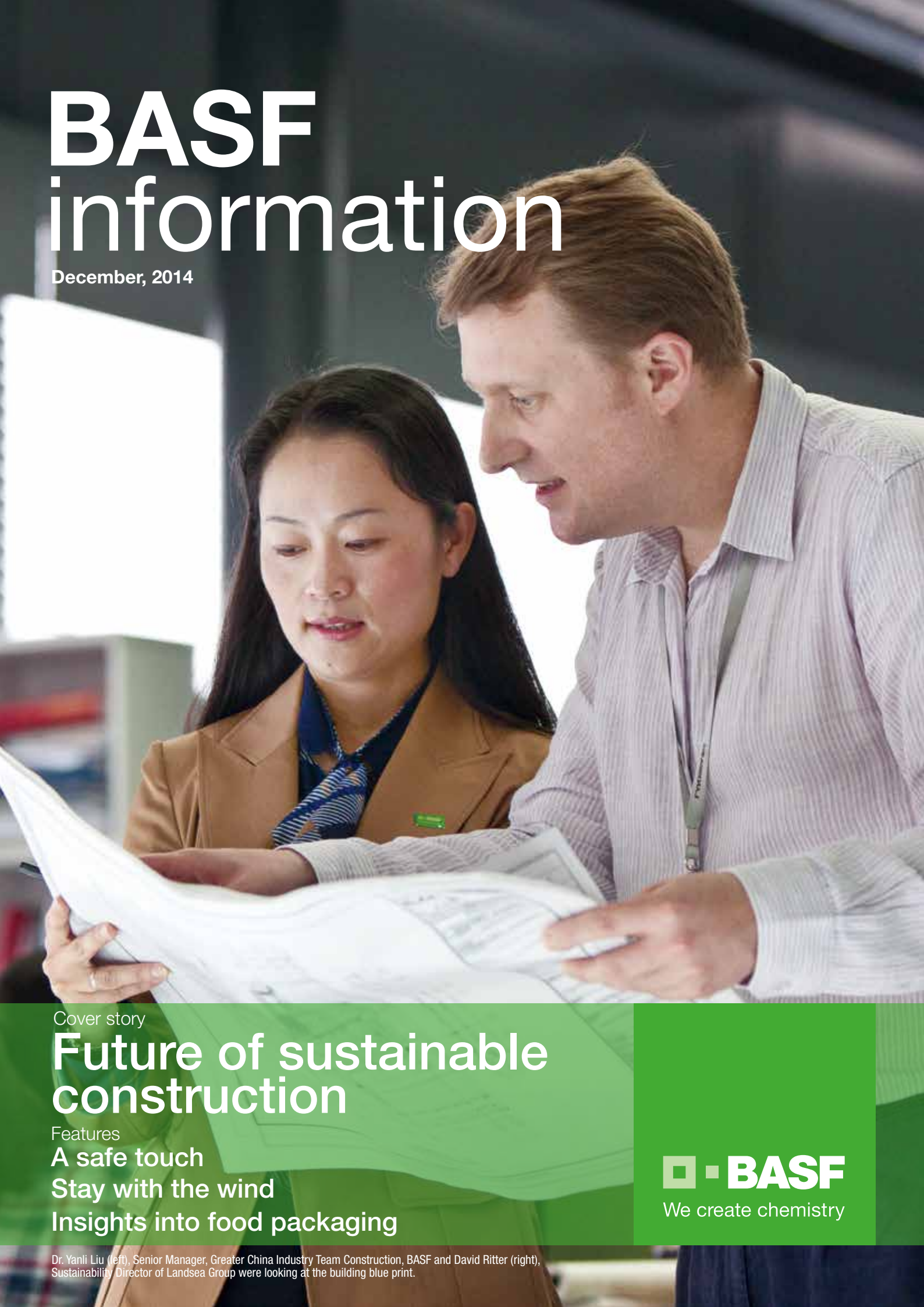
BASF information

December, 2014



Cover story

Future of sustainable construction

Features

A safe touch

Stay with the wind

Insights into food packaging

BASF
We create chemistry

Dr. Yanli Liu (left), Senior Manager, Greater China Industry Team Construction, BASF and David Ritter (right), Sustainability Director of Landsea Group were looking at the building blue print.

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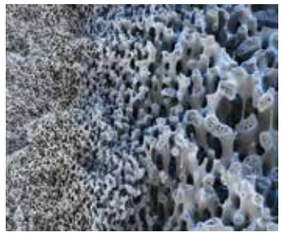
22 Safety of plasticizer, an important adjuvant of plastic products, is drawing the public attention.



36 Ultrafiltration is a central element of modern drinking water treatment.

18 Whether it’s a comfortable sofa or clean drinking water, many things that make living more healthy and congenial contain BASF products.

Foreword

We are soon to celebrate BASF’s 150th anniversary in 2015 – an important occasion when we will bring together people and ideas in a process of co-creation to address the global challenges.

Connectedness between BASF and all our stakeholders is what makes the company successful today. With chemistry as an enabler, we have been working together with customers and other partners to develop innovative solutions to tackle with the challenges in environment, resources, food and living quality. In this publication, we are highlighting some of the best examples.

It is estimated that 75% of us will be urban dwellers by 2050. This is uncharted territory for mankind, and it comes with a unique set of challenges. How to improve the energy efficiency of constructions – which currently accounts for one-third of energy consumption in metropolitans – is a common question. In the cover story **Future of sustainable construction**, you will discover what we can achieve through close collaboration with Chinese real-estate developers, for environmentally-friendly and long-lasting buildings.

A healthy and safe living environment is equally important to people. **A safe touch** showcases how we work with customers and a third party accreditation institution under the Hexamoll® DINCH® Trusted Partners program, to improve the safety of flooring and toys, among all the plastics products with close human contact, through the use of the trusted plasticizer.

Then let’s take a look at the infrastructures around us – more than 80,000 utility poles collapsed in the formidable typhoon Rammasun in Guangdong this summer, while a group of PU composite utility poles stayed unaffected. You may discover this secrete of “not falling” empowered by BASF’s local innovation with a customer, in **Stay with the wind**.

Behind the above and many more examples of our latest collaboration stories, there are countless solutions we have co-created with partners during the past 150 years. I look forward to continuing this journey of co-creation with you in the anniversary year and beyond.

Albert Heuser
President, Functions Asia Pacific, BASF
President and Chairman Greater China, BASF

World in figures

75%

By 2050 it is estimated that 75% of us will be urban dwellers. Cities currently consume over two-thirds of the world's energy, while constructions accounts for one-third of total energy consumption in metropolitans.

See **Future of sustainable construction** on page 8

Resources, environment and climate

90%

Compared with the traditional buildings, passive constructions can save up to 90% of energy consumption.

71%

About 71% of the Earth's surface is covered with water – and most of this is salt water.

See **Ultrafiltration for clearer water** on page 36

Quality of life

17,000

17,000 desalination plants are currently installed in 120 countries.

8 million tons

The global consumption of plasticizer reaches 8 million tons each year, in which China accounts for around 50%.

See **A safe touch** on page 22

Quality of life

€7 million

In total €7 million have been spent on toxicological testing, making Hexamoll® DINCH® the best researched plasticizer on the market.

1.3 billion tons

1.3 billion tons of food production – around one-third of the total – are lost or wasted every year worldwide, which is sufficient to feed 1 billion refugees. In the future, smart and active packaging will reduce food waste.

See **Food packaging insights** on page 28

Food and nutrition

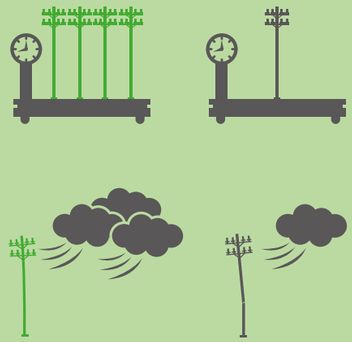
$500 billion

Sales of global packaging industry amount to $500 billion. Food packaging is a big part.

Quality of life

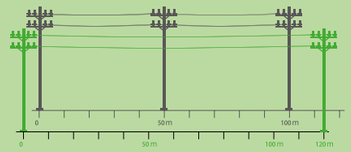
2.5 folds

Compared with the common utility poles, new polyurethane (PU) composite utility poles made of BASF's Elastolit, can improve its wind resistance by 2.5 folds with only one-fourth weight.



120 meters

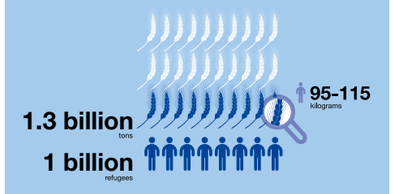
In terms of installation spacing, this kind of lightweight PU composite utility pole can extend the installation spacing to 120 meters, whereas that of common utility poles is 50 meters at most.



Food and nutrition

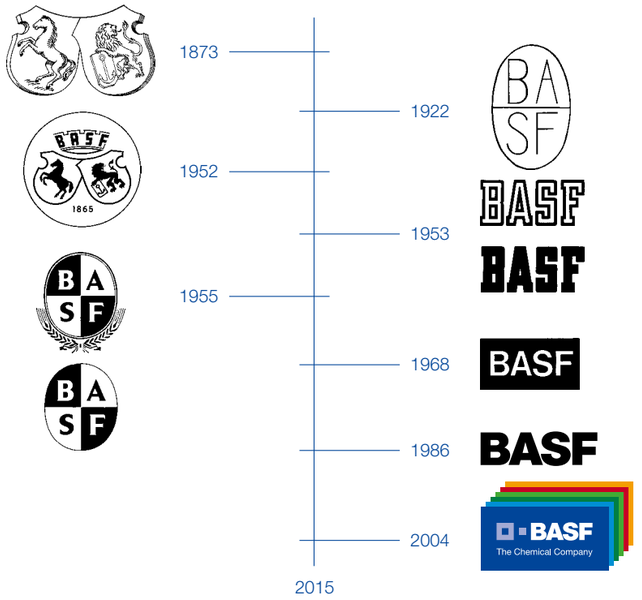
1 billion

95-115 kilograms of edible food per person are lost or wasted each year in industrialized countries. 1.3 billion tons of food production – around one-third of the total – are lost or wasted every year worldwide, which is sufficient to feed 1 billion refugees.



The BASF logo

Historical development



BASF prepares for its 150th anniversary in 2015

BASF is introducing a new claim “We create chemistry” in its logo. This change to the company’s brand identity underlines how BASF collaborates and innovates with customers and partners to contribute to a sustainable future. As of January 1, 2015, it will be applied broadly throughout BASF.

In accordance with its company purpose “We create chemistry for a sustainable future”, BASF’s goal is to bring together people and ideas in a process of co-creation. BASF is inviting people to collaborate on developing solutions to global challenges related to urban living, smart energy and food throughout the anniversary year. To spark the discussion, the company has launched an interactive platform called Creator Space™ online at www.creator-space.basf.com. Here, customers, scientists, the public and BASF experts are invited to exchange thoughts and ideas.

BASF Crop Protection inaugurates its first plant in Jiangsu

Reinforcing its strong commitment to support the development of agriculture in Asia-Pacific, BASF Crop Protection opened its first formulation and packaging plant in Yangkou Chemical Industrial Park, Rudong, Jiangsu Province, in August 2014. With an annual production capacity of 10,000 metric tons, the new facility will produce fungicides, insecticides and herbicides solutions for Chinese farmers.

Over the past years, BASF Crop Protection has experienced excellent business growth with a substantial sales increase in China. In the upcoming five years, BASF Crop Protection plans to increase investment in property, plant and equipment globally, and further participate in the productive and sustainable development of Chinese agriculture.

Inaugurating expanded mobile emissions catalysts manufacturing operation

BASF inaugurated its expanded mobile emissions catalysts manufacturing operation in Shanghai in October 2014, further strengthening the company’s regional presence and its position as a leading supplier to the automotive industry. The inauguration doubles the company’s production capacity for mobile emissions catalysts in China, adding new light duty emissions catalysts production lines, a new heavy duty diesel catalysts plant and a state-of-the-art automated warehousing facility.

This expansion project positions BASF to meet growing demand in China by providing a full line of innovative emissions catalysts solutions that allow our customers to address increasingly stringent emissions requirements.

Expanding Innovation Campus Asia Pacific in Shanghai

BASF broke ground on the second phase of its Innovation Campus Asia Pacific at its Pudong site in Shanghai in July 2014. The €90 million expansion consists of an additional regional research and development (R&D) building and auxiliary facilities and it will be completed by the end of 2015.

By 2020, around 25% of BASF’s R&D employees will be located in Asia Pacific. The Innovation Campus is BASF’s most important R&D center in the region and is expected to become one of its largest R&D sites outside of Germany. With the expansion, BASF’s regional research capabilities will be further strengthened, focusing primarily on advanced materials and systems as well as adding new areas such as formulations and chemical process and engineering serving growth industries such as automotive, construction, health and nutrition, and home and personal care.

Strengthening performance materials production in China

BASF has undertaken three key capacity expansion projects for performance materials at its Pudong site in Shanghai: the completed expansion of Ultramid®, Ultradur®, Elastollan® thermoplastics polyurethane elastomers, and the undergoing expansion of Technical Center and capacity expansion of Cellasto®.

As the leading producer of these performance materials, and preferred business partner for our customers, BASF continuously strengthens its position in key markets. With technical and engineering competence, BASF helps customers differentiate in their markets and gain a competitive advantage.

New Zetag® ULTRA for water treatment

In February 2014, BASF globally launched a new ultra-high molecular weight cationic powder flocculant range with Zetag® ULTRA for solid/liquid separation in industrial and municipal waste water treatment.

Because of its effective bridging capabilities, Zetag ULTRA shows advanced dewatering performance. It offers strong floc integrity to withstand high shear forces which makes it especially effective for the use in centrifuge applications as well as for dissolved air flotation.

No electric car without plastic

For several innovative components in the BMW i3, the electric vehicle from the BMW Group, the chemical company BASF supplies versatile plastics and supported part development with extensive construction know-how. These include the backrests of the front seats, key reinforcement parts in the carbon fiber body, and the rear seat shell.

BASF's Coatings operating division contributes to the extraordinary design of the BMW i3. It supplies the new production line for the BMW i3 at the Leipzig factory with basecoats in four colors which meet the requirements of the coating of add-on components and of the painting processes involved.

System solution for coffee capsules

BASF launched coffee capsules made with BASF's biodegradable and certified compostable polymer ecovio®. In the injection molded coffee capsules, ecovio replaces aluminum and fulfills demanding requirements for protecting and brewing coffee under high pressure. BASF also offers the sealing layer of the coffee packaging made out of ecovio. Additionally, Ultrason® polyarylsulfone, one of BASF's high performance thermoplastics, will also be featured as part of the high pressure mechanism needed for coffee brewing.

High performance plastic for eyeglass frames

Compared to other plastic materials, the adoption of Ultrason® in eyeglass frames provides higher stiffness while at the same time offering more flexibility, better transparency, and greater design and coloring freedom. The material's excellent flexural strength and light weight also make the frames durable and comfortable to wear. Ultrason resins are especially suitable for highly stressed parts that must show substantial dimensional stability and good mechanical properties, and can substitute thermosets, metals and ceramics.

Co-branded between BASF and STC, a leading manufacturer of eyeglass frames in Korea, the frames made of Ultrason are also expected to be exported overseas to China and other international markets.

BASF TPU is now used directly in bare yarn knitting process

BASF launched an innovative grade of Elastollan® thermoplastic polyurethanes elastomers (TPU) for the production of melt-spun elastic fibers. It can be directly used in the bare yarn knitting process without first needing to be covered with polyethylene terephthalate or polyamide yarn; as a result it improves productivity of the textile production process. Moreover, as the new generation elastic fiber made from Elastollan possesses improved thermal resistance, fabric made from it can be processed under the higher heat setting and dyeing condition as normal melt-spun elastic fibers.

Melt-spun elastic fiber made from Elastollan TPU provides outstanding comfort. In the textile sector, melt-spun elastic fiber is mostly used in garments that require a high degree of comfort and compatibility such as sportswear, stockings, and underwear.

First use of UV-stable TPU on the vehicle exterior

Apart from its application in textile industry, Elastollan® TPU can be applied extensively and unpainted on the vehicle exterior through optimization. The automotive manufacturer PSA Peugeot Citroën uses the new TPU grade Elastollan AC 55D10 HPM (High Performance Material) for cladding the Citroën C4 Cactus with so-called Airbumps®.

These are large air-filled cushion bumpers in contrasting colors: They are fitted on the sides as well as on the front and rear of the vehicle, protect the car exterior from impact and scratches and give the vehicle its distinctive look. This world first is the result of many years of development work between the French automotive manufacturer, the supplier Rehau, Switzerland and BASF. Rehau manufactures the side Airbumps, while the company Faurecia, France produces the bumpers at the front and back.

Future of sustainable construction

Against the challenges of the growing population and resource scarcity, what is the ideal living environment for urban dwellers? What are the development opportunities of sustainable constructions and eco-cities in China?

The photo was taken at Lujiazui Financial and Trade Zone in Shanghai.

Located 17 kilometers from the capital Abu Dhabi, Masdar City has a couple of nicknames such as Middle East Sun City, Zero Carbon Ark, Utopia in Desert, etc. Why the six-square-kilometer city still under construction is given so many beautiful titles?

That is because it's regarded as a model of future cities.

Established in the desert with an average temperature of 40 to 50 centi-degrees and with 100 billion barrels of oil hidden underground, Masdar City will not consume a drop of oil, with an ultimate goal of realizing "zero carbon, zero emissions". Through ingenious design, the average temperature of Masdar City can be 20 centi-degrees lower than outside; the energy used in the buildings completed thus far comes entirely from renewable sources; and solar energy will account for 80% of the city's energy supply. Currently, the power supply of this city still under construction is generated by a 10 megawatt solar power plant in the desert.

In order to live up to its pioneering role, Masdar has partnered with leading companies, including BASF. It is aimed to be built as a role model of eco city that provides the world with inspirations and best practices in respect of sustainable constructions and smart transportation solutions, etc.

Buildings play a principal role in cities and are energy guzzlers. They account for one-third of energy consumption in metropolises globally.

No CO2, no waste, no cars. A carbon neutral city to be completed by 2016 is being built in Abu Dhabi's desert. A model of the climate-friendly city was on display at the World Future Energy Summit.

Urbanization and sustainable constructions

Along with the irreversible urbanization trend, many challenges are increasingly inescapable. The current global population living in cities is already larger than that living in rural areas. By 2050 it is estimated that 75% of us will be urban dwellers. How do we curb the urban sprawl that has afflicted some of the world's megacities? And how can power consumption be reduced in cities, which currently consume over two-thirds of the world's energy?

Buildings play a principal role in cities and are energy guzzlers. They account for one-third of energy consumption in metropolises globally. Under the energy challenge, sustainability will undoubtedly become the biggest trend of future constructions. The philosophy of sustainable constructions is to reduce environmental impact, to harmoniously co-exist with the surroundings, and to benefit people's health. That's why the buildings are designed to reduce energy consumption, conserve water, reduce pollution and protect health. Passive house is a typical example of sustainable constructions, of which the ultimate goal is "zero carbon, zero emissions" and comfortable living demonstrated by Masdar City.

Governments have already introduced policies to support sustainable constructions. According to the latest Europe Union (EU) regulations, after 2020, any new housing that fails to meet the standard of passive house will not be granted with a construction permit. That means ever since 2020, all new buildings in EU countries will be passive constructions. European countries have also introduced more specific measures. For example, the German government requires all new buildings to achieve "zero emissions" by 2020. Sweden also requires that its new constructions should completely get away from reliance on fossil fuels.

Sustainable architecture will not only save energy, but also provide a comfortable environment for people. Skyscrapers are a sign of modern city. Although they have been lauded and criticized in equal measure, it's undeniable that this leap in scale is necessary to prevent urban sprawl and help cut emissions. Skyscrapers help enlarge the capacity of cities by several times, while shortening people's transportation distance. In addition, the centralized design of skyscrapers can help a city in energy saving.

Functionally, skyscrapers are transforming from the previous business premises into more diversified comprehensive function body. Shard London is a "vertical village" of residences, restaurants, offices and hotels; Shanghai Tower, the tallest building in China to be completed also integrates restaurants, cafes, shops, gardens and other open public spaces. These building facilities are built for people to work, rest, have fun and socialize in. The old habits of walking out of the office to have a cup of coffee or eat something on street will gradually be replaced by the simple moves of walking into elevator, selecting a floor upstairs or downstairs to the nearest cafe or gym.

China: challenges and changes

During the three decades after reform and opening up, China has witnessed the fastest urbanization process in the world. China's urban population has increased from 170 million to 710 million in 2012, with the urbanization rate growing from 17.9% in 1978 to 52.6% in 2012. By 2020, China will become one of the high-income countries. According to the growth trend, China's urbanization rate will continue to grow in the next one or two decades towards 75% or 80%.

"On the one hand, China's urbanization process brings opportunities to the construction industry; on the other hand, we must trade quality for speed to make the new buildings more sustainable."

Dr. Qu Cuisong, Associate Professor of College of Architecture and Urban Planning, Tongji University

"On the one hand, China's urbanization process brings opportunities to the construction industry; on the other hand, we must trade quality for speed to make the new buildings more sustainable, " said Dr. Qu Cuisong, Associate Professor of College of Architecture and Urban Planning, Tongji University. According to the official data, China boasts the largest new construction volume every year in the world. However, the average life expectancy of real estate is only about 30 years.

Cities in China have more pressing needs for sustainable buildings. According to a research by Chinese Department of Construction Science and Technology Division, energy consumption of the buildings in China increased year by year in total energy consumption, currently accounting for about one-third of the latter. In recent years, China is at the peak of its building wave, with the annual floor space built being 1.6 to 2 billion square meters, exceeding the sum of annual completed construction area in all developed countries. Among them, more than 97% are high-energy-consumption buildings.

According to Qu, China faces three challenges in developing sustainable buildings: firstly, buyers' moderate concern about housing quality leads to a low weight of housing quality among price factors. Secondly, environmental awareness of user groups holding high-end properties is to be enhanced, as currently they are still the groups consuming the highest amount of resources and energy in China. Thirdly, there have been inadequate supporting policies, which lead to a lack of motivation for developers.

Sustainable buildings will play an influential role in reducing urban energy consumption. Taking today's passive house in Germany for example, its energy consumption per square meter is only one-fourth of ordinary buildings. The Chinese government is also actively promoting the development of energy-efficient buildings, proposing that by 2020 the energy consumption for new buildings should be 75% lower.

In fact, China has no lack of real estate developers who are conscious of sustainability and have made outstanding achievements in this field. Landsea Group Co., Ltd. (Landsea) is an example of that. Through continuous investment in research and development for sustainable buildings, Landsea has become a unique existence in real estate industry. "Our planet will benefit greatly from a sustainable China," said Xie Yuanjian, vice president of Landsea. "We have built many sustainable buildings that can provide occupants with comfortable living environment of perennial constant temperature and humidity. Moreover, through using thermal insulation solutions and ground source heat pump technologies, they are more energy efficient and environmentally friendly than ordinary constructions." In over a decade, Landsea was able to achieve the balance of economic and ecological benefits and more than 30% of its buyers are returned customers.

There won't be sustainable buildings without high quality building materials, while BASF is an active advocator of sustainable constructions and a leading global provider of energy-saving construction materials and solutions. "Building materials of excellent quality can offer many benefits, for example increasing housing durability, reducing maintenance effort, improving energy efficiency, as well as shortening construction period and saving labor costs," said Dr. Zheng Daqing, Senior Vice President, BASF.

"Our planet will benefit greatly from a sustainable China."

Xie Yuanjian, Vice President of Landsea Group Co., Ltd.

"We are working hand in hand with real estate developers to realize our vision for sustainable constructions in China."

Dr. Daqing Zheng, Senior Vice President, Business and Market Development, Greater China, BASF

"BASF has formed into great partnership with Chinese real estate developers in China. We've also witnessed the perception change of Chinese developers and users," said Zheng. "More and more developers and builders started to choose high-quality materials and the public's awareness of construction quality is increasing. We are working hand in hand with real estate developers to realize our vision for sustainable constructions in China."

Perception change is the beginning of all transitions. China has a huge potential consumer market for sustainable building and is the largest manufacturer and consumer of solar, wind and other alternative energy equipment. More and more building materials manufacturers are moving towards sustainability. These are all the facts that lay the foundation of a future ecological city. More importantly, Chinese cities are changing the previous GDP-oriented growth mode, and "sustainable building" will become the most important city signature. ■

“Cool” buildings around the world

Facing the energy challenges, sustainability has become undoubtedly the biggest trend of the future buildings. At present, buildings reducing energy consumption and minimizing pollution have emerged all around the world, which also provide people with a healthy and comfortable living environment.

Orjin office building

The all-black facade of the building is no doubt impressive, but with a fatal flaw - it will absorb more than 95% of solar radiation and make the interior really hot in summer. BASF’s pigments guarantee a cool look of the black building, while creating a really cool indoor environment.

Center for Sustainable Building Housing

Center for Sustainable Building Housing operates out of a specially refurbished building designed to test and showcase new sustainable technologies, for which BASF provides energy-efficient thermal management solutions.

Musée des Confluences

Musée des Confluences has become a new landmark in Lyons, France. The so-called “crystal” building consists of modern glass and steel structure, where BASF provides the protective coating to the facade to ensure its everlasting color.

Ginger & Fred

Ginger & Fred building is also known as The Dancing House. BASF’s architectural solution is used throughout the renovating process of this old building, providing it with thermal insulation system solutions.

Burj Khalifa

Burj Kalifa is almost 820 meters high. For the construction of the tower, BASF developed a concrete mix that can be pumped to a height of 600 meters without segregating. Thanks to its admixture Glenium Sky 504, the concrete can be worked for more than three hours and then hardens quickly. This means a shorter construction time and gives the building a longer useful life, in this way making it more sustainable.

CasaE

By using BASF’s sustainable products and construction techniques, the 400-squre-meter CasaE is warm in winter and cool in summer. It is the first energy-efficient building in Brazil.

National Aquatics Center

Also called Water Cube, the National Aquatics Center is one of the landmark buildings for the Beijing Olympics 2008. BASF offered it sound-protection foam solutions.

Architect: Peter Ruge Architekten

Landsea Passive House “Bruck”

It is first to be designed and built by Chinese developer for hot summer/cold winter climate of Yangtze River Delta region.

Read more on page 14

Waterford

Victorian Terrace
High energy efficiency and low carbon emission

Wales

Lyons

Milan

Prague

Giax Tower
Apartment building with the highest energy-efficiency standards

Istanbul

Yekaterinburg
A new district of energy efficient apartments

Ordos

Dongsheng District Sports Park
Stadium with excellent acoustic effect

Beijing

Zhejiang

Dubai

Zambia
System construction as employee dormitory

Sao Paulo

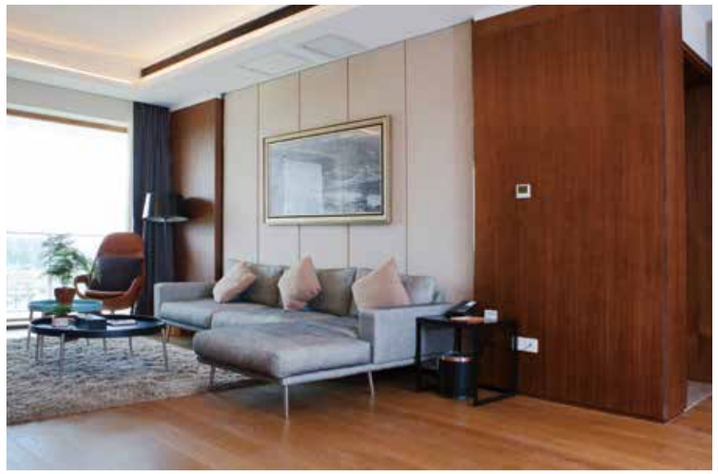
Towards the “passive” era

Passive House Bruck is the first to be designed and built by Chinese developer for hot summer/cold winter climate of Yangtze River Delta region. (Architect: Peter Ruge Architekten)

Passive house, as a model of energy-efficient buildings, has been introduced to China. Will it lead the Chinese construction industry towards a new era?

“Passive houses allow for space heating and cooling related energy savings of up to 90% compared with traditional building blocks and over 75% compared to average new buildings – substantially less than common ‘low-energy’ buildings.”

Dr. Wolfgang Feist, Director of Passive House Institute



Judging from the interior decoration and design, Bruck is just like an ordinary boutique hotel. (Architect: Peter Ruge Architekten)

Passive House Bruck was built by Taihu Lake that suits the typical climate condition in the Yangtze River Delta region.

Changxing County by the Taihu Lake in Zhejiang Province turns all scorching and humid in August. When the outdoor temperature reaches 35 centi-degrees, the vapor in the air would make one feel as if in sauna. However, if you walk into the Bruck Green Boutique Hotel completed just recently, the heat and humid and everything that irritates your body will be just gone and replaced by fresh, dry air and a suitable temperature of over 20 centi-degrees.

Surprisingly, this unique German style hotel does not use any air-conditioning method – the comfort was simply achieved by ventilation system with low energy consumption.

The hotel with an area of 2,500 square meters has 48 standard rooms and 4 suites. Judging from the interior decoration and design, it is just like an ordinary boutique hotel. However, it is the first large passive house designed and built by Chinese developer for hot summer and cold winter climate of Yangtze River Delta region, a house certified by Passive House Institute (PHI) in Germany, as well as the first project in China fulfilling requirements of three standards - China Three Stars Green Building Evaluation Standard[1], DGNB (German Sustainable Building Certificate) [2] and LEED[3].

“Passive houses allow for space heating and cooling related energy savings of up to 90% compared with traditional building blocks and over 75% compared to average new buildings – substantially less than common ‘low-energy’ buildings,” said Dr. Wolfgang Feist, Director of PHI.

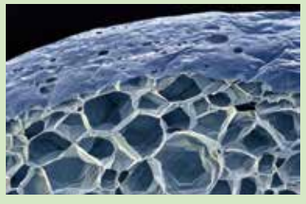
As Feist introduced, passive houses make efficient use of the sun, internal heat sources and heat recovery, rendering conventional heating systems unnecessary throughout even the coldest of winters. During warmer months, passive houses make use of passive cooling techniques such as strategic shading to keep comfortably cool. Special windows and a building envelope consisting

[1] China Three Stars Green Building Evaluation Standard is the highest level of certification among all green building assessment standards in China.
[2] DGNB (German Sustainable Building Certificate) is a system describing and evaluating building sustainability developed jointly by Transportation, Architecture and Urban Construction Department, The German Federal Agency
[3] Leadership in Energy and Environmental Design (LEED) is established and implemented by The United States Green Building Council

The secret of thermal insulation

Even to laypersons that do not have knowledge of building physics, the BASF computer program "Construction Assistant" provides an overview over energy-saving and cost-effective insulation in their own house. The infrared photo shows a house whose left wall is well-insulated (blue area) while the front wall is barely insulated so that the heat can escape to the outside (red area).

BASF provided a range of high performance products and solutions for Bruck, including Elastospray® CH spray polyurethane foam for the roof, and Neopor® innovative foam insulation solution for exterior walls. Elastospray CH is an integrated solution for insulation and waterproofing. Neopor foam enhances insulation performance by 20% with 20% less in thickness, compared with conventional EPS panels, with the help of graphite particles. With the help of Neopor, the use of raw material can also be reduced by 50%, reducing cost and carbon emissions even further.



Neopor is made of blowing agent-containing and thus expandable polystyrene granules. The photo shows the bead-shaped particles after processing into foam blocks. Using an innovative technique, BASF has succeeded in integrating infrared absorbers and reflectors into the foam. They prevent the conduction of heat even at low material densities.

of a highly insulated roof and floor slab as well as highly insulated exterior walls keep the desired warmth in the house – or undesirable heat out. A ventilation system imperceptibly supplies constant fresh air, making for superior air quality without unpleasant draughts.

“The advantage of passive house is not only in energy saving, but also in enhancing the comfort of living to a great extent. That is our greatest motivation to build a passive house in China,” said Tian Ming, Chairman of Landsea Group Co., Ltd. (Landsea).

Adapted to local conditions

In 2011, Tian visited Feist who is known as the “Father of Passive House” in Austria. After a long conversation, he captured the core elements to build a passive house: adapted to climate and local conditions, as well as low technology. “Every place has different climatic conditions, which should be a major consideration. Passive house is not an integration of high technologies, but leverages natural conditions to achieve lower energy consumption and better comfort,” explained Tian.

Germany is the country with most densely located passive houses in the world. It now has thousands of passive houses. According to German government, by 2020, all new buildings must achieve the “zero emissions” standard. For this reason, passive house construction in Germany has received more and more attention.

However, if we copy the model of German passive houses entirely here in China, we are destined to fail. Germany is mainly in the cold temperate zone, while China has a vast territory spanning multiple climatic zones, each with different features. “The main climate feature of China’s Yangtze River region is hot in summer and cold in winter, which creates entirely different conditions to the construction of the passive house than in Germany where only heat insulation in winter is considered. In China, we not only need to keep the indoor temperature warm in winter, but also to achieve coolness and removal of moisture in summer, which is very challenging, ” said Xie Yuanjian, Vice President and Technical Director of Landsea.

After returning from Austria, Tian decided to build the first passive house in the Yangtze River Delta region. Landsea was facing many challenges at that time, for example, how to find an innovative way to adapt the passive

“We are proactively developing the business related to passive houses in China, contributing to the future of sustainable construction.”

Dr. Liu Yanli, Senior Manager, Industry Team Construction Greater China, BASF.

house to local conditions, how to achieve high air tightness and how to handle cold and thermal bridge during construction. Besides, there were few supporting suppliers for passive house construction, which leads to difficulties in project management and cost control. To conquer the challenges, Landsea invited PHI for evaluation and consultancy throughout the construction period, and cooperated with partners who were experienced in passive house construction, like BASF.

After designing and planning stage for over a year, Passive House Bruck began construction in April 2013 and was completed a year later. “It’s proven that Bruck met or even surpassed the indicators for German passive houses,” disclosed Tian with pride. “With this successful case, we are planning to introduce passive houses to our real estate projects in China.”

Multiple benefits

As a representation of energy-efficient buildings, passive house has multiple advantages. “In thermal insulation properties, for example, boiling dumplings in a passive house in winter for once could increase the indoor temperature for two centi-degrees which lasted two days,” said Zhang Xiaoling, Head of Project Cooperation Division, China’s Ministry of Housing and Urban-Rural Development (MOHURD), taking her personal experience in a passive house project in North China for example.

She also summarized other advantages of passive house, including energy saving, independence on fossil fuels, no worry of

BASF worked with Chinese real estate developers to develop innovative building materials and system solutions for passive houses.

the heat island effect, longer service life and health benefits for occupants, etc. “Energy used for heating every year in North China equals roughly to 200 million tons of standard coal. However, when these buildings become passive houses, energy consumption can be reduced to 14 million tons,” said Zhang. She disclosed that currently MOHURD is formulating a standard for passive house construction in Hebei Province, in which BASF is also an active contributor who provides professional suggestions on some indices.

Passive houses have so many advantages that people are wondering about their economic return on investment, to which Feist responded with his experience in Germany. “In fact, the investment of passive houses is only about 5% higher than ordinary buildings,” said Feist. “In the long run, with the energy cost savings, the initial extra investment of passive houses can be recovered quickly in a certain period.”

However, due to comparatively lower building standards in China, the initial investment costs for passive house in China are much higher than the percentage in Germany. “It’s expected to be 20% to 50% higher,” said Xie. “This could be a substantial income in the highly competitive real estate market.” For this reason, Xie believes that different levels of standards should be implemented to meet the market needs.

Feist expressed his optimism towards the positive prospects of the passive house market in China. According to him, the main obstacle in passive house development is not the cost, but the whole process of mastering passive house development technology and process to adjust to the local conditions. “Passive house is an open system and is not patented. What it requires to build a passive house is a long and committed learning process,” said Feist.

Supplier could be another factor influencing the development of passive house. “At the moment the number of suppliers able to provide materials or components of passive house is very small, which also leads to the high cost. However, as time goes by, the cost will be reduced sooner or later,” he explained. Currently he still resides in the world’s first passive house he built by himself in 1991. “It is still in a good state after over 20 years.”

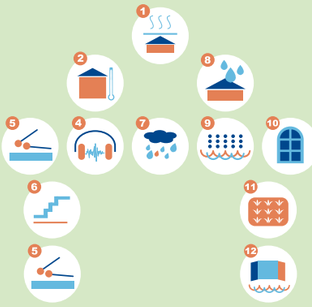
BASF is very experienced in global passive house renovation and construction. As early as in 1996, LUWOGE, an architectural design firm under BASF began to rebuild the Brunck residential quarter, an old building block first built in 1930s, into a more energy-saving and comfortable one in Ludwigshafen, the location of BASF headquarters. By virtue of its passive house concept, BASF made continuous breakthrough in reducing energy consumption per unit area, creating the “7-liter house”, “5-liter house” and “3-liter house” and is now making efforts towards “zero-heating cost house”. In Europe, North America and Asia, LUWOGE designed and participated in the construction of many sustainable building projects. During the World Expo 2010, BASF provided insulation solutions to the Hamburg House, China’s first certified passive house.

"We are actively developing the business related to passive houses in China, contributing to the future of sustainable construction," said Dr. Liu Yanli, Senior Manager, Industry Team Construction Greater China, BASF. "In addition to thermal insulation materials for roof and external wall, BASF also provide a series of solutions including flooring and window for passive houses." ■

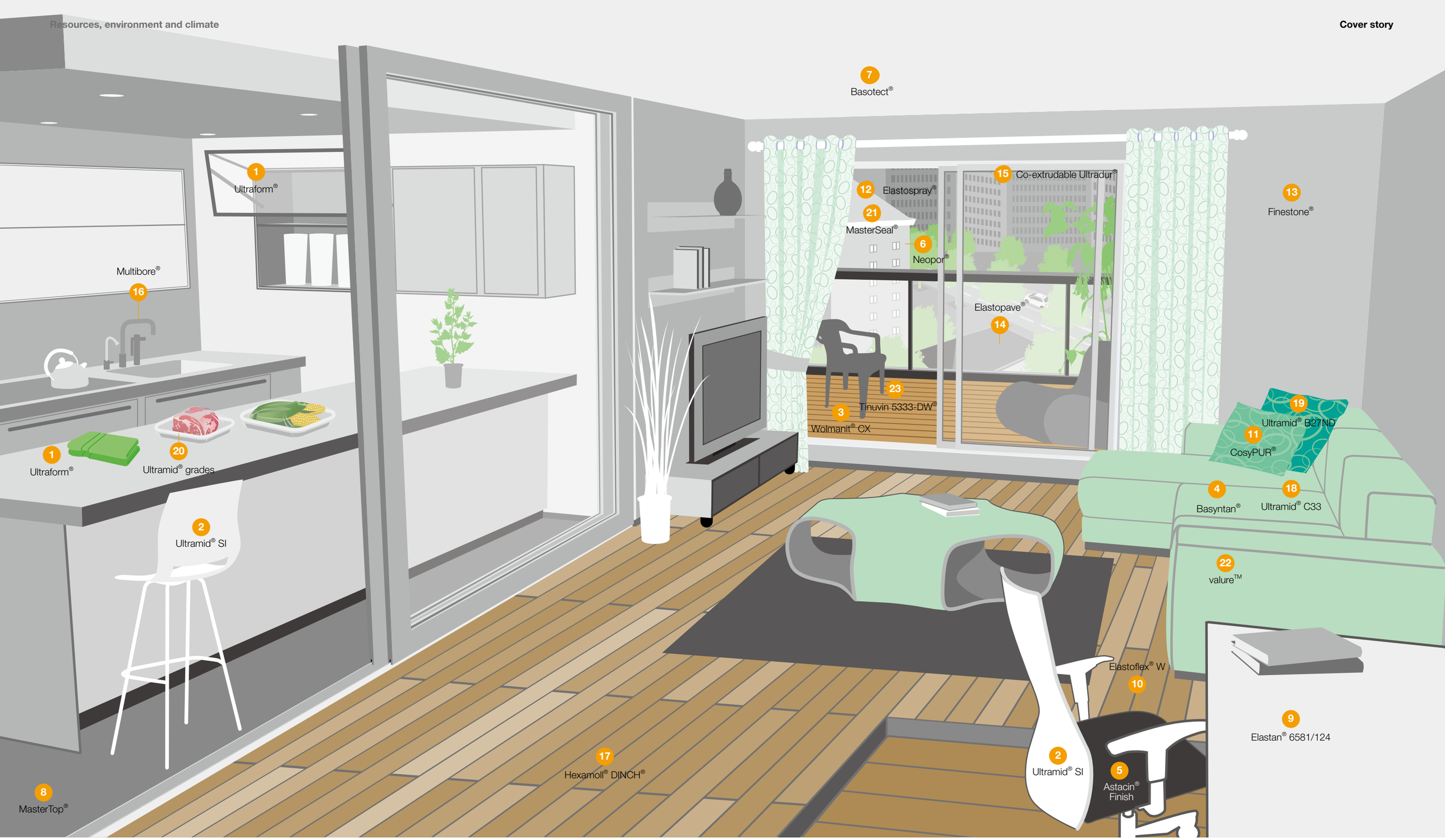
Major advantages of the passive house

- Energy-saving and independent on chemical energy sources
- No worry of the heat island effect and helps solve challenges in urbanization
- Longer service life. Its main structure hides under a protective layer, thus reducing resource consumption in rebuilding
- Easy to renovate
- Ensures healthier environment, reducing chance of heart or skin diseases
- Reduced labor for housekeeping owing to fewer dust
- Less infrastructure investment

BASF is everywhere in the passive house



1. Roof insulation
2. Exterior wall insulation and finish system
3. Interior paint
4. Acoustic absorption
5. Flooring sound insulation
6. Basement/flooring insulation
7. Permeable pavement material
8. Roof waterproofing
9. Multi-bore ultrafiltration technology for water treatment
10. Energy-efficient window
11. Flooring system
12. Indoor damp area waterproofing



The drawing was localized upon a feature story in "Euroscope" in 2013, which is a BASF publication for European employees.

Healthy Living with BASF

Whether it's a comfortable sofa or clean drinking water, many things that make living more healthy and congenial contain BASF products. Let's find them out!

Healthy Living with BASF

1 Ultraform®
This engineering plastic is characterized by high strength and good resilience properties in hinges and drawer slides.

2 Ultramid® SI
These plastics combine the technical properties that are typical of polyamides with a refined appearance.

3 Wolmanit® CX
This wood preservation product effectively protects against destruction by fungi and insects.

4 Basyntan®
This synthetic tanning agent makes leather softer and tighter-grained and lends it more opulence.

5 Astacin® Finish
In the leather-treating process, this finish improves the appearance of the surface and prevents wear.

6 Neopor®
This expandable polystyrene granulate contains graphite and is used in various insulating materials.

7 Basotect®
This melamine resin foam improves room acoustics with its excellent sound absorption properties.

8 MasterTop®
This seamless polyurethane floor unites hygiene, walking comfort and aesthetics.

9 Elastan® 6581/124
This product adheres various components in the production of lightweight building boards.

10 Elastoflex® W
Thanks to its high elasticity, this mould flexible foam guarantees relaxing sitting and reclining comfort for upholstered furniture.

11 CosyPUR®
In hardness grades from super-soft to viscoelastic, this mould flexible foam enables both comfort and attractive design.

12 Elastospray®
This integrated solution for insulation and waterproofing not only offers an energy-efficient and comfortable indoor environment, but also improves weather resistance of the buildings.

13 Finestone®
This zero VOC, formaldehyde-free interior water-based coating is mildew-proofing and scrub resistant, offering a healthier indoor living environment.

14 Elastopave®
With this novel solution which creates an open-pore and high-strength surface, paths and roads stay dry, firm and clean.

15 Co-extrudable Ultradur®
This new solution is a high strength but lightweight reinforcement for thermally insulated PVC window profiles that reduces heat transfer through the window profile.

16 inge® Multibore®
The small pores of the membranes can filter out viruses, bacteria and other materials from water, providing complete disinfected water, without using any chemicals.
Find more information on page 36

17 Hexamoll® DINCH®
This non-phthalate plasticizer is especially developed for applications with close human contact because of its excellent toxicological profiles.
Find more information on page 22

18 Ultramid® C33
This polymer for textile application offers fabric with super-soft touch, down-proof effect and realizes a stretch fabric made from 100% nylon.

19 Ultramid® B27ND
This high amino end group polyamide brings textiles with deep dye shade and outstanding color fastness.

20 Ultramid® grades
It provides gas and aroma barrier properties for applications like coextruded films, offering a combination of barrier and mechanical properties for the packaging and food industry.

21 MasterSeal®
The system provides waterproof and protective sealing membranes for roof gardens, contributing to a longer service life and less maintenance needs for a building.

22 valure™
This solution enables the creation of innovative textures on a range of substrates without impairing the air permeability of the material, helping to achieve soft and attractive surfaces.

23 Tinuvin® 5333-DW
This light-stabilizing additive filters UV light and protects against discoloration and loss of sheen on the coating and the wood substrate in outdoor environments.

Reinforcement of energy efficient window profiles

Heading to the low-carbon era, China is continuously promoting energy efficient constructions. The optimization of energy utilization in buildings is a key topic, which is also contributed by the insulating windows.

Jointly with Dalian Shide Group, BASF introduced the new co-extrudable Ultradur® for the reinforcement of thermally insulated PVC window profiles in April. It is also the first Engineering Plastics innovation developed at BASF's Innovation Campus in Shanghai.

Window profiles made with durable, lightweight and highly thermal insulating Ultradur® enables energy efficient construction and contributes to a reduction in energy required for heating and cooling of buildings. As such, it meets with increasingly stringent insulation requirements. Additionally, energy efficient construction directly translates to energy cost savings for consumers. This accordingly increases the value of buildings using such window profiles.

"The energy saving window profile co-developed with Shide is an important milestone of innovation developed in close cooperation with the local customers in China."

Dr. Daqing Zheng, Senior Vice President, Business and Market Development, Greater China, BASF

BASF solutions for industrial constructions

Ucrete®
Ucrete® hygienic floors provide ideal floor finishes for applications in the food, beverage, chemical and pharmaceutical industries. It gives floors exceptional resistance to aggressive chemicals, extreme mechanical and thermal shock, providing a long-term, durable flooring solution, and is renowned as the world's toughest industrial flooring.

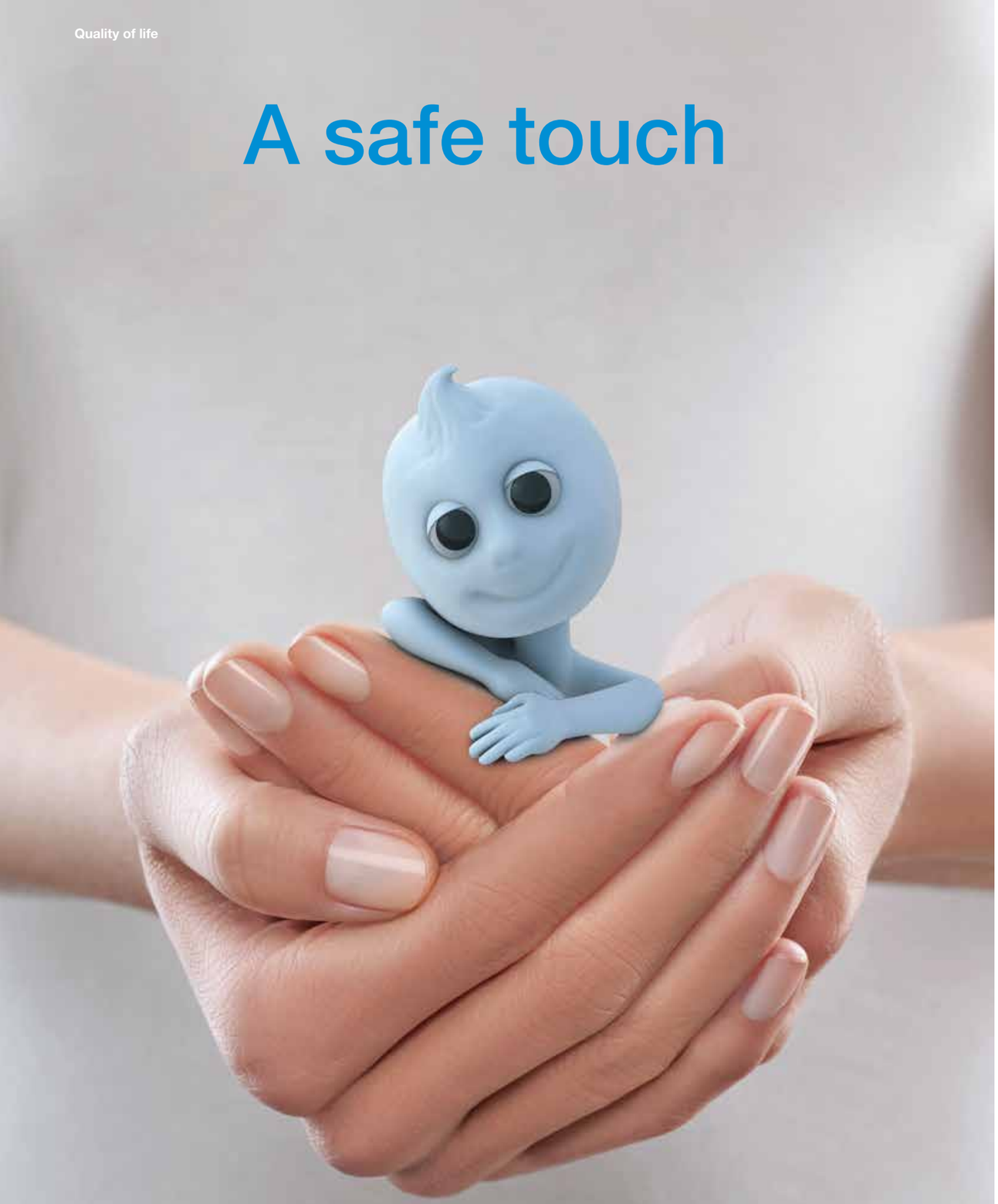
MasterFlow®
BASF's range of cementitious and resin-based precision grouts addresses the most demanding grouting requirements, which include high-flow, high-strength natural and metallic aggregate precision products for high load and complex structures.

Elastopir®
It is a new generation of polyurethanes rigid foam systems for composite panels with improved fire-protection properties, enabling the construction of safe and energy-efficient industrial buildings.

MasterPolyheed®
This polycarboxylate superplasticizer ensures the workability of concrete while at the same time increases the final strength and durability after hardening.

MasterEmaco®
BASF provides the products and services to maintenance and repairing concrete manufacturers, as well as to road and bridge constructors to improve the durability of concrete.

A safe touch



Safety of plasticizer, an important adjuvant of plastic products, is drawing the public attention. In order to push forward the application of its trusted non-phthalate plasticizer – Hexamoll® DINCH®, BASF has established the Hexamoll DINCH Trusted Partners program in Asia Pacific with a third party accreditation.

Two years ago, William Kang, General Manager of Vinyl Tech Enterprise Co., Ltd., a Taiwan-based manufacturer of luxury vinyl flooring, discovered that his baby was most fascinated by playing games on the floor. This prompted Kang to pay attention to the safety of vinyl flooring. “Children’s exploration of the world starts with touch, and young children spend most of their time playing right at the floor,” said Kang.

The key ingredient of vinyl flooring, apart from polyvinyl chloride (PVC), is plasticizer. “Plasticizer only accounts for 10% of vinyl flooring, but is one of the important factors that determine the safety performance,” explains Kirin Cheng, Supervisor Sales, Petrochemicals, Asia Pacific, BASF, and in charge of Vinyl Tech. In Taiwan, the food contamination scandals in recent years where phthalate plasticizer was found in food and beverages triggered people’s common fear even at the mention of plasticizer.

Vinyl Tech was founded by Kang’s father in the 1980s. In its early days of setup, it provided foundry services as an original equipment manufacturer to well-known vinyl flooring brands. Although the demand of global flooring industry experienced a decline in the past several years, vinyl floor, a product with relatively high efficiency of resource utilization, grew 20% annually.

Over a decade ago, Vinyl Tech started to develop its own brand. In a highly competitive market of the flooring business, Kang strived to find “blue ocean” opportunities by providing unique products. The safety challenges of plasticizer inspired him with an opportunity for product differentiation – finding a safe plasticizer for the vinyl flooring. It was then when he learned about Hexamoll DINCH, the trusted non-phthalate plasticizer by BASF, and since started their business cooperation.

In 2012, Vinyl Tech introduced flooring solutions containing Hexamoll DINCH to the market. “We are one of the first companies to introduce non-phthalate vinyl flooring in Europe, which is also the world’s biggest vinyl flooring market. Now, our European brand ‘ProjectFloors’ ranks among the top three bands there,” Kang revealed.

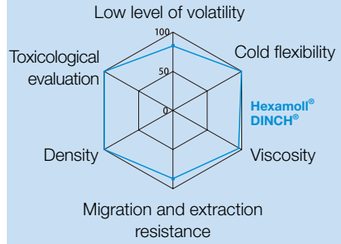
Safe products

Plasticizer is extensively used in daily life, particularly in products made from the versatile plastic PVC. Without plasticizer, PVC is brittle and snaps like a dry noodle. Like the boiling water that softens the pasta, plasticizers act like a lubricant between the molecule chains of the polymer and make the plastic as soft and flexible as is required for the intended application.

Plasticizers go into a wide area of applications, ranging from electrical underground cables to medical devices. Hence, the requirements of plasticizers are as diverse as the possible applications and there are specific plasticizers to fulfill them. “BASF offers the right plasticizers for the different requirements,” explains Mathias Haase, Senior Manager, Marketing Plasticizers and Alcohols, Asia Pacific, BASF.

There has been growing concern over a specific group of plasticizers called phthalate plasticizers for their potential health risks. As a result, the demand for specialty plasticizers in sensitive applications, such as toys, medical devices, food contacts applications along with indoor applications like flooring and wall covering has increased. To meet this growing demand, BASF launched the alternative non-phthalate plasticizer, Hexamoll DINCH in 2002 for applications with close human contact. It is probably one of the most thoroughly tested plasticizer in today’s market, and on account of its excellent toxicological performance, Hexamoll DINCH has been approved and certified by many authorities and institutions worldwide. “BASF has invested more than €7 million in toxicological research for Hexamoll DINCH,” states Haase. “This helps customers meet the demanding requirements for plasticizers in food contact applications, toys, medical and drinking water applications in Europe, US, as well as in Asia.”

Hexamoll® DINCH® has many superior features, compatible with PVC over a broad concentration range, and can be applied in extensive applications.



0 = low value, 100 = high value

Wide application of Hexamoll DINCH

- Sport and leisure products
- Medical devices
- Flooring
- Food contact applications
- Wall covering
- Toys

Children’s exploration of the world starts with touch, and they spend most of their time playing right at the floor.

When young children discover something new, one of the first things they do is – put it in their mouth. Safety of these PVC toys is of great importance.

In October 2013, CFDA has approved the use of Hexamoll® DINCH® in extracorporeal circulation pipelines.

“We are very confident about the market prospect for alternative plasticizers, especially in sensitive applications. We are ready to support and grow together with our customers by remaining a reliable and trusted partner,”

Mathias Haase, Senior Manager, Marketing Plasticizer and Alcohols, Asia Pacific, BASF

Safe demand

Safety is of top priority, especially for applications with close human contact. For example, when young children discover something new, one of the first things they do is – put it in their mouth. It is so common to see children chewing around on animal figures and suck away at rubber ducks. As far as their parents are concerned, the safety of these PVC toys is of great importance. Hence, many of the established toy manufacturers have been using BASF’s trusted non-phthalate plasticizer.

Another field with vast demand for high-safety plasticizer that Haase finds very promising is medical care. “China Food & Drug Administration (CFDA) has just approved the application of Hexamoll DINCH in extra corporeal tubing, mainly used for artificial heart and lung machines, which is a good beginning for the use of alternative plasticizers in medical products,” said Haase. Furthermore, some brands promoting healthy lifestyles also are starting to switch to these alternative plasticizers, for instance, yoga mats, gloves and food packaging products.

Safe trust

Asia, in particular China, being the growth engine is no doubt also applicable to the plasticizer industry. The global consumption of plasticizer is around 8 million tons annually, in which about half is by the China market. Higher awareness among the general public of phthalates used in sensitive applications, as well as stricter standards set by legislative entities have made the Asian manufacturers switching their production to alternative plasticizers, like Hexamoll DINCH. “To acknowledge companies in Asia Pacific who share the same uncompromising commitment to product safety, we launched the exclusive Hexamoll DINCH Trusted Partners program,” states Wayne Musselmann, Senior Manager Plasticizers, Asia Pacific, BASF and responsible for the program. “Since we launched the program in 2012, we have welcomed a growing number of companies in the region who put product safety as their highest priority.” The program is for compounders, producers, retailers and brand owners with a presence and business establishments in Asia Pacific who use Hexamoll DINCH in soft PVC applications.

To join the program, applicant companies have to complete a qualification process, conducted by an independent certification body, TÜV Rheinland, the well-established accreditation institution from Germany. “We will accredit the applicants in areas of human rights, occupational safety, production process etc., and will spot-check products in the factories in order to confirm that the raw material used by the manufacturer conforms to BASF safety requirements,” said Chen Weijun, Project Lead in TÜV Shanghai Inspection Center. “In the past, we usually provide service to customers’ suppliers, but this time we provide service to our customer’s customers— —this is a new service model, which fully reflects BASF’s emphasis on social responsibility.”

After passing TÜV accreditation, Vinyl Tech joined Hexamoll DINCH Trusted Partners program. Once a company becomes a Hexamoll DINCH Trusted Partner, they can take advantage of various benefits that BASF offers: technical and marketing advice, exclusive market and product information, industry networking opportunities, and among them joint promotional opportunities. Over the past several years, their cooperation with BASF has played a significant role in improving Vinyl Tech’s brand image and sales. Kang is now constructing new plants and he wants to apply Hexamoll DINCH into all of their products. “Giving top priority to product safety is the cornerstone of our effective cooperation with BASF,” said Kang. He expects the sales income for Vinyl Tech to increase by around 50% in 2015.

The steadily growing market demand has made BASF double the annual production capacity of Hexamoll DINCH to 200,000 tons in Ludwigshafen, Germany in 2014. “We are very confident about the market prospect for alternative plasticizers, especially in sensitive applications. We are ready to support and grow together with our customers by remaining a reliable and trusted partner,” said Haase. ■

Stay with the wind

Why can plastic utility poles stand firm and erect in strong typhoon? Besides plastic utility poles, where else can polyurethane composites be applied to?

"Our innovation is driven by the market needs. Closer collaboration with our customers enables us to creative more valuable solutions."

Dr. Karl Rudolf Kurtz, Senior Vice President and Asia Pacific Research Representative, BASF

"This is an innovation born in the R&D labs in Shanghai."

Dr. Han Wei, Senior Manager of Performance Material Asia Pacific, BASF.

"There are a number of ways to compound glass fiber and PU. In the case of utility pole, we adopted filament winding process."

Dr. Qian Zhenyu, Manager of Technology R&D Center, BASF.

This July, the formidable 14-force typhoon Rammasun ravaged Guangdong. More than 80,000 concrete and metal utility poles collapsed in the powerful typhoon, which not only resulted in heavy property loss, but also brought power failure to large tracts of areas. Nevertheless, what's surprising is that throughout the typhoon attack, a group of plastic utility poles stood firm, and merely "sway with the wind" amid the gusts of typhoon.

Of course, the plastic utility poles resistant to typhoon do not use common plastics. Instead, it uses a kind of high-strength and high-flexibility polyurethane (PU) composite material developed by BASF. Compared with the common utility poles, this kind of new utility pole made of Elastolit®, a BASF PU composite material, can improve its wind resistance by 2.5 folds.

What's more, because the new plastic utility pole is a hollow cylinder, its weight is only less than a quarter of the same type concrete utility pole – the weight of a common concrete utility pole is generally 1,100 kilograms, whereas that of a plastic utility pole is only 250 kilograms, making it possible to be carried and installed by manpower. In terms of installation spacing, this kind of lightweight PU composite utility pole can extend the installation spacing to 120 meters, whereas that of common utility poles is 50 meters at most.

Secret of "no falling"

The secret of "no falling" of the utility poles lies in the innovation of the new material. Traditional utility pole mainly relies on its own weight to take root in the ground, so as to gain support. However, when encountering ultra-large typhoons, such pure "rigidity" will lose resistance. On the contrary, only utility pole with both "rigidity" and "flexibility" can stand firm in the more powerful typhoon. Combining both qualities, the new plastic utility poles are exactly a compound of glass fiber and PU through filament winding technique.

"BASF's inspiration for re-innovate utility pole came from the local market needs. This is an innovation born in the R&D labs in Shanghai," said Dr. Han Wei, Senior Manager of Performance Material Asia Pacific, BASF. "Another important factor is that our global R&D departments have accumulated rich experience in the compounding of glass fiber and PU material."

PU is a kind of versatile polymer material. It's lightweight and with wide range of adjustment – meaning it can be either made very hard or very soft. Two objects with seemingly drastically different surface features are very likely the same PU product in essence. Glass fiber features high level of strength, but if there's no resin-type adhesive to bond them together, it will be like a brittle nylon string and fail to bring out its strength.

After compounding glass fiber and PU, the resulting material can integrate the innate features of both substances thus perfectly combine strength and flexibility. "In fact, the new material is not only strong and flexible, its impact resistance, corrosion resistance and UV resistance are also very good," said Han. At BASF, glass fiber PU composite has been used in extensive applications. For instance, it replaces metal as the lightweight alternative for exterior decorative parts of automotive.

BASF's PU composite utility pole is easier to be installed and thus more suitable in mountainous terrain.

"There are a number of ways to compound glass fiber and PU. In the case of utility pole, we adopted filament winding process which enables glass fiber to compound with PU as continuous fiber, so as to reach higher strength, but the technological challenge is also daunting," said Dr. Qian Zhenyu, Manager of Technology R&D Center, BASF.

The biggest technological challenge lies in controlling the reaction time between PU and glass fiber. PU is a kind of material with fast reaction and thus allows short reaction time which is only less than 20 minutes. During such short period of time, it's challenging for both substances to fully immerse along the winding process. "The R&D team in Shanghai has been working to prolong the operating time of PU, while strengthening its hydrophobic property – it generates bubbles if affected by the humidity of air during long exposure, which will greatly impact the product strength and appearance," Qian explained.

Commercial value of PU utility pole

In terms of unit cost, glass fiber and PU composite utility pole is indeed more expensive than the traditional concrete utility pole. "Nevertheless, we should not only appraise the value by the individual product. Instead, the entire lifecycle shall be considered," said Dr. Karl Rudolf Kurtz, Senior Vice President and Asia Pacific Research Representative, BASF, who is very excited about this innovation created in China.

If taking into account the reduced transportation logistics cost, less installation and maintenance costs, the reduction in quantity brought by extension of installation spacing, as well as prevention of losses resulted from collapses and rebuilding, PU utility pole is not expensive at all. "PU composite utility pole has very high economic value for regions with unique geographical surroundings and meteorological environment, for instance, mountainous regions and sea islands with inconvenient transport access, as well as regions with frequent typhoon attacks," Kurtz emphasized.

In China's coastal regions, up till now this lightweight and convenient PU utility pole has been put into market trial. Customers of Southeast Asian regions where there are frequent typhoon attacks also showed intense interest in this plastic utility pole.

More applications and open innovation

Aside from plastic utility poles, PU composite also has many other application fields yet to be developed. Overall speaking, lightweight is a big trend of industrial products. For instance, for Liquefied Natural Gas (LNG) steel bottle, if a layer of PU composite is coated on the exterior of steel inner container, it can both improve the strength and greatly reduce the weight of steel bottle previously made of pure metal. In another instance, plastic window frame made of glass fiber and PU composite can both reduce weight and obtain far better insulation and energy saving effects than window frame made of metal.

"We are also researching and developing how to apply PU and other composite materials in wind energy, for example the application in wind turbine blade. Blades made of PU composite can extend the service life of existing materials," Kurtz disclosed. He considers that in shipbuilding and automobile sectors, the potential of composite materials have not been fully tapped. "Each kind of material has its own features. It's not fair to simply say which is better, yet we must apply their special features to the most suitable applications. The compounding method can also help us create new material features by maximizing the favorable factors and minimizing the unfavorable ones."

It is exactly for this reason that Dr. Kurtz considers open innovation combining local market insights and BASF know-how is extremely important. "You cannot take hair care products in the European market directly to the Asian market to sell, because Europeans and Asians differ in hair property. Similarly, in Germany the market for plastic utility poles may be weaker than that in China, for there is no typhoon at all in Germany," said Kurtz.

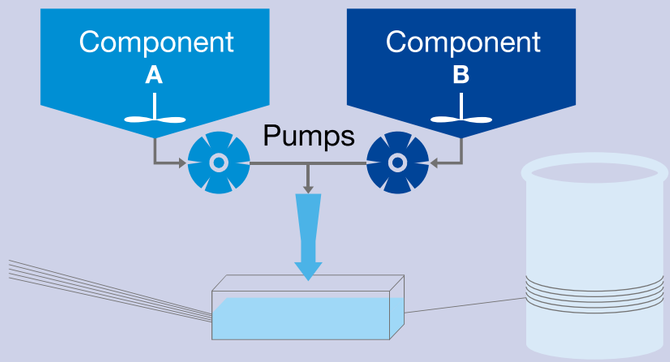
As an innovator of advanced materials, BASF is joining hands with local partners for more open innovations. "Our innovation is driven by the market needs. Closer collaboration with our customers enables us to creative more valuable solutions," said Kurtz. ■

This machine will be used to test the PU filament winding process.

Dr. Qian Zhenyu was checking the sample of PU utility pole.

Standard filament winding process

There are a number of ways to compound glass fiber and PU. In the case of utility pole, BASF adopts filament winding process. This method can enable glass fiber to compound with PU as continuous fiber, so as to reach higher strength, but the technological challenge is also daunting.



Food packaging insights

Fast urbanization of the world has promoted the rapid development of food packaging industry. So what are the future trends for food packaging?

Food packaging has become an increasingly indispensable basic component of our daily life, which is closely related to the global urbanization trend. The reason for that is simple: when half of the world's population lives in cities, while the cities are unable to provide the land and environment required for agricultural development, we'll have to process and package our food and put them on supermarket shelves for people to purchase. That's an increasingly convenient choice for people living a busy life in cities.

Good packaging can enhance the cleanness and freshness of food, while offering branding opportunities for food manufacturers. In addition, good food packaging can prevent food spoilage and extend shelf life, thereby reducing waste of food. According to statistics, up to 1.3 billion tons of food is wasted every year on a global scale, which can feed 1 billion people lacking in food.

According to information provided by World Packaging Organization (WPO), the turnover of global packaging industry is more than $500 billion, in which food packaging is a pillar area. However, food packaging is influenced by local food preferences in different countries and regions. Japanese consumers have a strong dislike towards incomplete packaging – even some insignificant crease on packaging could result in the unwanted destiny of supermarket food. Fish and seafood are an important part of the Japanese diet and must be kept fresh and prevented from spoilage. Normally a small bag of silica gel or starch polymer is put inside a food packaging to absorb moisture. However, European consumers share a different opinion – they are skeptical of moisture absorption agent and putting that in a packaging might just trigger their suspicion of the food itself.

Despite that regional preferences could result in different food packaging in different countries, we are still able to gain insight into several development trends in the food packaging industry.

It must be fresh

The demands made of packaging are high. Guaranteeing freshness and hygiene is a particular challenge, as foods must often cover great distances when travelling from their place of origin to supermarket shelves. Further time passes before they find their way into a shopping basket, and then again before they ultimately end up on the dining room table. Highly developed technology ensures packaging can keep products impeccably fresh and hygienic. The differing characteristics of the composite materials are combined to ensure the packaging is ideally suited to the food. The base of the packaging, for example, can be produced to have different characteristics than the lid or wrapping film.

Hard-wearing composites made of various materials are also well suited for use in what is known as Modified Atmosphere Packaging or MAP. With this technology, the air surrounding an edible product is replaced with a protective atmosphere specially tailored to the food. One example is a mixture of nitrogen and carbon dioxide. These slow-reacting gases replace oxygen, and slow the growth of germs, all without using any preservatives. To ensure the solution works properly, the packaging material must form an effective gas barrier. Otherwise, the valuable protective atmosphere would quickly be lost.

Safety first

Potentially dangerous substances are not limited to the food, however – they can also be found at times in the packaging material itself. In 2010, researchers at the Zurich Food Safety Authority in Switzerland found that mineral oil residue contained in cardboard packaging was being transferred to foods. The main source of the problem was deemed to be ink used in newspaper printing, which found its way into the packaging via recycled paper. The residue traces detected also occasionally came from inks used to print the food packaging. These oil residues evaporate at room temperature, and can then be transferred to dry foods, such as pasta, semolina, rice, or cornflakes. This is even possible merely when the transportation packaging of the food contains recycled paper. Certain components of mineral oil are suspected of being carcinogens, according to the World Health Organization's Joint Expert Committee on Food Additives, and the FAO.

BASF has already developed various barrier solutions that are applied to the internal surface of the cardboard box. These extremely thin coatings are made from polymers, in other words macromolecules made up of many repeating smaller molecules. Barrier coatings that are only 10 to 15 micrometers thick (one-tenth of the diameter of hair); however, they can effectively filter toxic mineral oil molecules of a larger size, while allowing smaller water molecules to pass through.

In China, the issue of food packaging printing ink pollution is just beginning to arouse people's concern. As most of China's food packaging is not printed with safe, edible ink, food safety experts remind consumers to notice whether barrier material is contained in food packaging when choosing the food.

China's food manufacturers are showing more and more concern for the safety of food packaging, on the basis of meeting the needs of a fast-paced urban life. Recently, BASF worked with Zhuhai Fucheng Science and Technology Co., Ltd, one of the major producers of retort pouch and food packaging in China to develop a food cooking bag supporting efficient production. The bag can withstand high temperatures of disinfection, with excellent steam blocking performance. As no solvent is required in production process, it can realize zero solvent emissions as well as no solvent residue in the packing.

Environmental efforts

Alongside freshness, increasing numbers of consumers want packaging that can be recycled. According to a survey of 6,000 consumers in ten different countries, carried out by Swedish carton manufacturer Tetra Pak, recyclable packaging is one of the public's key priorities, as it is seen as kinder to the environment.

Purchasing packaged food in the supermarket is an increasingly convenient choice for people living a busy life in cities.

Consumers and legislative regulators are becoming increasingly concerned with packaging. The aim here is primarily to encourage the efficient use of resources. This trend is particularly noticeable in Europe. In the Netherlands, for example, a tax is applied to packaging manufacturers according to the average CO2 emissions of the materials used – 36 to 57 euro cents per kilogram for aluminum packaging, 6 euro cents for cardboard.

Demand for biodegradable renewable materials is also on the increase. For example, drink box and food container can be produced with biodegradable plastic, which contains a certain percentage of renewable raw materials. After use, the product can be disposed and used for compost together with food residue.

In China, as people's awareness of environmental protection continues to grow, recyclable food in paper packaging is becoming more and more popular. According to statistics, paper packaging now accounts for about 40% of the packaging materials in China and the figure is likely to grow.

Intelligent packaging

Some high and new technologies have been introduced to the food packaging industry. The development of the Internet of things allows sensors, chips and electronic label printing to integrate into the traditional packaging industry. In years to come, 'intelligent' or 'active' packaging could help reduce food waste. This is a response to experts' efforts around the world to come up with new ways to inform consumers about the perishability of food and to protect against spoiling. The new systems could display the state of a product and at the same time increase its lifespan with oxygen absorbers or special acids. As an example, American firm Sonoco is currently developing packaging with integrated microchips that collect information about the condition of a product, such as moisture and temperature. It raises the alarm when preprogrammed thresholds are exceeded or fall below target.

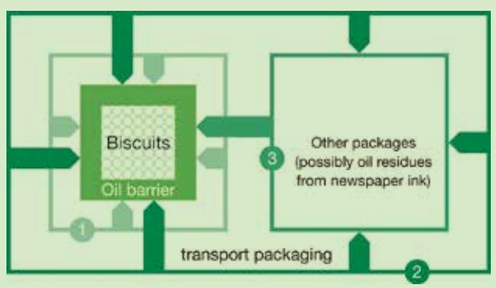
Of course, for business, cost is the first consideration in smart technology introduction. For some food with high added value such as premium health care products or highly demanding fresh food, it can be a sensible attempt to introduce intelligent packaging in order to further improve product added value and availability. ■

The mineral oil barrier protects food

Food packaging is often made of recycled paper fibers. This recycled paper packaging can contain newspaper ink, which researchers have identified as the main source of potentially harmful mineral oil residues in cartons. These oil residues evaporate at room temperature and can thus be transferred to dry foods that contain fats, such as biscuits.

Mineral oil residues can migrate from:

1. the inner side of contaminated primary packaging
2. contaminated outer packaging, for example, corrugated board packaging used to hold products during transportation
3. contaminated packages in close proximity, for example, on the supermarket shelf or in delivery trucks



Roots - Laboratory, laying a solid foundation

“The ongoing expansion of our R&D facilities in Shanghai is bringing many opportunities to local students.”

Dr. Piyada Charoensirisomboon, Vice President, Innovation Campus Asia Pacific (Shanghai), BASF.

Cindy Deng starts her work at 8:30 a.m. at the Performance Polymers Lab. Most times, she conducts compounding and injection experiments according to the formulations designed by her lab leader, and analyzes their outcomes. Seemingly repeated and countless experiments actually will bring big value when they are turned into novel PBT-based solutions which are crucial to China’s auto industry. That, naturally, also ignites Cindy’s passion for work.

However, her daily routine as a chemist will soon be challenged by some “green hands” at the lab. As one of the five selected “training champions” for “Roots – Laboratory” program at Innovation Campus Asia Pacific (Shanghai), Cindy will have to spend half of her working time to coach new apprentices who are fresh college graduates.

New comers

The “Roots – Laboratory” is a new R&D apprentice program to be kicked off in July 2015, aims to recruit qualified college graduates with chemistry background, and train them into reliable lab technicians through a 12-month program covering basic and specialization training. Cindy and her peers will guide the first 30 apprentices throughout the process from “green hands” to professionals.

“The ongoing expansion of our R&D facilities in Shanghai is bringing many opportunities to local students, and at the same time, challenges for us to recruit the best talents,” said Dr. Piyada Charoensirisomboon, Vice President, Innovation Campus Asia Pacific (Shanghai), BASF. “This means, we have to make more proactive efforts in attracting and developing the right people.”

While BASF is actively recruiting R&D scientists through new channels like Virtual Job Fair and NAO open innovation platform, “Roots – Laboratory” is one of the new approaches to build up a sustainable talent pipeline for ready and reliable employees for technical functions in labs.

Since the recruitment kick-off in June, the pilot program has aroused great interest among the target group. According to Eric Kang who works on recruitment for Innovation Campus, it has attracted more than 500 applicants from three colleges in Yangtze Delta area, while eventually close to 40 of them will be recruited as pre-apprentice interns.

Develop self and others

“Every plant needs strong roots to absorb nutrition and to grow. We name the new program as ‘Roots - Laboratory’ because we do hope this program enables young talent to develop strong roots for a successful career in our labs and to become an essential part of our growing R&D activities in China,” said Dr. Lars Reichmann, Vice President, Human Resources Greater China, BASF. “We want to recruit candidates with first ‘roots’ of basic chemistry knowledge, and enable them to learn more through further trainings within the company.”

Lisa Drahmann, project lead and training correspondent for Roots Laboratory, introduced that the 40 candidates will firstly go through six-month internship at BASF. Qualified ones will be officially recruited as apprentices who will continue to receive six-month general education in East China University of Science and Technology, and then spend another six months at different labs for specialization trainings.

“‘Roots – Laboratory’ shares the same philosophy as the well-renowned Apprentice Programs in the Ludwigshafen Headquarters – all candidates deliver comparably qualified jobs after theoretical and practical trainings,” said Reichmann. “We have made use of the long-term experience in training young lab technicians from our colleagues in Ludwigshafen as well as from our China experience to develop the new program.”

The program design considers the different educational system in China. It is tailored for the Chinese apprentices who have received most theoretical education at colleges or vocational school, offering one year additional training, while the German version covers also the basics in an overall three and half years training.

The training courses and assessment criteria of “Roots – Laboratory” are to be developed by the five training champions under guidance with experienced lab leaders and trainers both in Ludwigshafen and Shanghai. As part of the pre-training program, Cindy and her peers will spend two months in Germany in the central training department as well as in research units, during when they observe and practice how to teach apprentices, and take some deep dives in their specialized research areas. Meanwhile, training champions will work as a group on localized training plan for their own apprentices.

“Every plant needs strong roots to absorb nutrition and to grow.”

Dr. Lars Reichmann, Vice President, Human Resources Greater China, BASF.

“I know it is very challenging, yet also makes a meaningful process of learning, sharing and contributing,” said Zeming Gao, one of training champions from dispersions lab. He joined BASF in 2013 after working as research assistant at Beijing Institute of Technology where he used to guide university students to conduct experiments. “I am very happy to be able to accompanying these apprentices and share what I have learnt contributing to their growth.”

“Training champions is one of the key success factors for this pilot program,” said Charoensirisomboon. “All the five trainers we have selected are very good lab technicians who are open and curious with potential intellectual capabilities. They will have the opportunity to development themselves and the others through teaching and mentoring.”

Like the other training champions, Lily Zhang also feels excited about her new role. She is one of the first lab technicians at Innovation Campus. “I have been accumulating my technical experiences during the past two years under the guidance of my lab leader and now I have this great opportunity to develop other skills which I believe is also important to my career.”

“We have a diversified team at Innovation Campus – our colleagues are from different cultural and educational backgrounds. It brings unique opportunities for mutual learning and development,” said Charoensirisomboon. “Roots – Laboratory program has further enriched our diversity, and contributed a new development module.” ■

Conducting experiments is a major test for applicants.

What makes a good lab technician?

Training champions participated in some on-site interviews to screen the qualified candidates for Roots – Laboratory. What qualifications and characteristics do they value most?

“Safety awareness and habit”
Ray Ye
Polyurethanes Lab

“Ernst and cautious”
Xu Lu
Care Chemicals Lab

“Proper use of experiment tools”
Cindy Deng
Performance Polymers Lab

“Certain level of flexibility”
Lily Zhang
Construction Coatings Lab

“Ask the right questions”
Zeming Gao
Dispersions Lab

Make development happen

BASF information: What is the development path for a lab technician? Is it separated with that of a scientist?
Dr. Piyada Charoensirisomboon: There are opportunities for everyone to develop themselves in the R&D community. For example, a previous lab technician at the research team, Innovation Campus, now works at a business unit on intellectual property topics; a scientist used to work on Engineering Plastics now works at Performance Materials, Product Development. There is no big differentiation between the path of technician and scientist. It depends pretty much on each individual’s personal will and their intellectual and learning capabilities.

Within the research team at Innovation Campus, we provide monthly ‘mini-lectures’ to lab technicians, on which occasion our scientists give lectures on materials science to help them develop in that direction. Another fact is that BASF provides financial supports to some qualified employees who want to get further education. Network for Advanced Materials Open Research is also an academic platform for them.

In the development of R&D staff, how can senior management contribute?
Dr. Lars Reichmann: Senior management can contribute in many different ways. For the new employees including fresh graduates, we shall ensure that practical training is helping them understand the way we work at BASF, and we can make ourselves available to answer their questions especially during onboarding months; for employees with longer working experience, we shall focus more on individual coaching to help them develop in specialized areas.

Later on we also have to support their development not only within our own departments. R&D staff as well as any other staff can learn a lot from new challenges on the job, Supporting changes in the job scope and into new jobs after some year in the same position is also part of our job as senior management to support employee’s development and at the same time strengthen the talent pipeline for BASF as a whole.

Grow responsibly with the suppliers

Business is ever changing. The traditional buyer/seller relationship that used to be the predominant rule in the past is increasingly becoming a more collaborative one. This also applies to BASF's relationship with the suppliers – improving sustainability of the sourcing practices together with suppliers has become a way to minimize risks and to achieve a win-win future.

Several days before attending the first Shanghai conference of Together for Sustainability (TfS) which is a global initiative aiming at improving sustainability sourcing practices in the chemical supply chain, Johnny Kwan, Senior Vice President, Country Platform and Functions BASF Greater China, received an exciting e-mail from a supplier who just passed the TfS audit.

This means they have been assessed as a qualified supplier who fulfilled a list of ecological and social requirements endorsed by several multi-national chemical companies including BASF.

"The supplier could not be happier about this result, so am I," said Kwan. "If it was ten years ago, we'd never expect a small-medium-enterprise in China to care so much about their performances in environment, social and governance (ESG) – speed and cost were the keywords then."

As Kwan put it, the behaviors of the entire supply chain in the chemical industry in China are changing towards a more socially responsible direction. "The whole industry is putting great efforts on it, while BASF has been one of the pioneers in China to drive sustainability along the value chain for more than a decade."

From the first Sustainability Symposium which was held in Beijing in 2002, the debut of the unique "1+3" corporate social responsibility (CSR) project in 2006, to the supplier sustainability training curriculum just kicked off in September 2014, the approaches for BASF to engage the value chain for sustainable development is evolving, so is its relationship with the suppliers.

For a win-win future

Professor Yan Haifeng, Associate Dean of School of Business in East China University of Science and Technology (ECUST), recently launched a brand new course in his college – yet not open to any university students. It is a training curriculum co-designed by BASF and ECUST, targeting executive from around 2,000 BASF's suppliers. Under invitation, these "senior students" will spend one day at the university campus, to go through an integrated course combining the topics of corporate governance and management, labor and human rights, and environment, health and safety.

"This marks a new milestone, which underscores our dedication to foster deeper relationships with our suppliers," said Kwan. "Covering almost all of our procurement partners in China, we are committed to helping them upgrade their overall ESG performances through this course over the next five years. When they improve, we also benefit from a stable and prosperous value chain in the long run."

The one-day course is designed to offer the audience a combination of aspiration and empowerment – making them firstly be motivated and committed to sustainability and then providing practical know-how to help them improve. In the first class of the program with over 100 representatives from 40 suppliers, typical issues like labor and working conditions were specially emphasized.

Caption: At the end of the training, all suppliers signed a manifesto to improve their ESG performance. Starting from Sep.19, 2014, the training was rolled out at full scale.

"If it was ten years ago, we'd never expect a small-medium-enterprise in China to care so much about their performances in environment, social and governance."

Johnny Kwan, Senior Vice President, Country Platform and Functions Greater China, BASF

"A systematic way to manage labor working hour is somehow missing in many local suppliers, which usually leads to compliance problems and affects their overall productivity," said Kwan. "In today's well-connected world, suppliers' productivity is also ours. This is an example that demonstrates responsibility brings forward productivity, and that motivates us to achieve mutual sustainable growth hand in hand."

Along the learning curve

Like the TfS audits that aim to initiate continuous improvements in sustainability, BASF's various supplier programs provided the starting points of a learning curve for many participants. "Taking an audit or a course is a good beginning – they since make a commitment to conduct positive changes in the long term," said Kwan.

Over the last decade, BASF had significantly grown its operation in China with many new investments starting up. BASF was also a front runner in developing its engagements in environmental protection and social contribution; amongst them, BASF worked to

In 2006, BASF initiated the "1+3" CSR project under the platform of the China Business Council for Sustainable Development. In the past three rounds of the project, all participants went through various steps such as self-assessments, evaluations by a special task force, and "Eyes for Safety" inspections by BASF Responsible Care specialists at partners' sites, which helped to identify potential areas of improvement for each individual participating company.

improve the Industry's responsibility along the value chain together with business partners.

In 2006, BASF initiated the "1+3" CSR project under the platform of the China Business Council for Sustainable Development. In the eco-system of "1+3" project, one company like BASF teams up with three types of partners along the value chain – customer, supplier and logistics service provider – by sharing best practices on CSR and sustainability management as well as on environment, health and safety (EHS). These partners in turn introduce the same concept to their respective partners along their own value chains.

"If the '1+3' project partners want to do a better job, there are always people willing to help," Kwan pointed out the advantage of such a network. BASF so far has engaged 27 partner companies in the "1+3" project, who have since made remarkable improvements. For example, one "1+3" partner has upgraded its off-gas treatment tower to reduce gas emissions and currently plans to install bag-type dust collectors. Another partner has established a Safety Steering Committee and introduced a holistic EHS management system to enhance occupational safety and environmental protection. Some investments added up to around CNY 10 million. Many project partners have started to publish their own CSR reports as well as gaining public recognitions in their respective industry sectors.

"BASF China Suppliers Sustainability Training" course shares the same philosophy of continuous improvement. On the back of the learning certificates, each participant, who are mostly top management and EHS managers of the suppliers, are encouraged to sign a manifesto as a commitment to reflect their learning in the daily work, which serves as a reminder of a mutual journey they have embarked.

This is a long journey between BASF and 2000 suppliers including raw material, technical and equipment suppliers and service providers. More than a step of scaling up, Kwan believes that the influence to individual participant of the training course will last. "Otherwise, I could not have received that happy e-mail from the supplier who passed the TfS audit, just one month after they signed the manifesto." ■

About Together for Sustainability

Together for Sustainability (TfS) aims at developing and implementing a global supplier engagement program that assesses and improves sustainability sourcing practices within the supply chains of the chemical industry, including ecological and social aspects. Technically, suppliers now only have to complete one form instead of multiple questionnaires. Additionally, buyers can access the information through a shared platform.

The initiative was originally founded by six multinational chemical companies: BASF, Bayer, Evonik Industries, Henkel, LANXESS and Solvay. Further members are Akzo Nobel, Arkema and Clariant. Designated members are Merck, DSM and Brenntag.

An interview with Johnny Kwan

BASF information: How do you describe BASF's relationship with its suppliers? How is it different from before?
Johnny Kwan: Our relationship with the suppliers has increasingly become a more collaborative one, which means we are going beyond the traditional buyer/seller contract and working together on more topics that are critical to mutual sustainable development.

The world is changing and we have to take actions to address the global challenges, especially concerning environment protection and resource scarcity. According to data from WWF this year, August 19 marked the date for humanity to use up nature's entire budget for the whole year and go into ecological overshoot. It is both an ecological and an economic problem. We should not continue the current way of production and consumption, or we won't have a sustainable future.

So much needs to be done and we must do it with partners. This is the motivation behind our numerous supplier engagement initiatives these years, and shapes our collaborative relationship.

TfS aims to build the industry's standard for sustainable supply chains. BASF is also a member in this organization. What is our role and how it will help us, especially in China?
BASF and other five multinational chemical companies founded this global initiative together in 2011. As the leading chemical company, BASF takes responsibility in the sphere of our influence for our supply chains to support adherence to existing regulations and to respond to the needs and expectations of consumers and society.

We have defined audit criteria, auditor pool and initiated comprehensive supplier assessment tools and audits. All supplier sustainability assessment and audit data are shared among the member companies, which helps to simplify the inspection of suppliers.

We are now driving the initiative at full strength in China, as we believe the increased transparency on sustainability standards provides a sound basis for making decisions. Besides, it is a resource efficient way.

Health matters

A historical document indicates that on December 3, 1866 – only one year after the founding of the company – Dr. Carl Knaps was hired as the first industrial physician at BASF. This date also marks the birth of the first occupational medical service in the chemical industry in Germany – long before legal obligations were introduced.

Nearly 150 years ago, Dr. Knaps' mission was to assure the best protection of life and health possible for BASF employees. Until today, this plays a central and primary role in BASF's corporate policy, as it has in the past.

"In China, BASF is at all efforts to care about employees' occupational health conditions – some measures we take, for example, can influence the purchase of the office supplies or even drive the adjustment of the production lines," said Janice Chen, Country Coordinating Occupational Health Physician, Responsible Care Greater China, BASF. Having worked for 12 years in the medical service system in the chemical industry, Chen deeply understands the importance of occupational safety and health for a chemical company.

"Chemicals are a special kind of harmful substances. They are of high risks and may invade our body through various means to cause short-term or long-term impacts on health. How to timely discover and handle employees' health problems and how to protect them from the hazards are of top priority for BASF," said Chen. She also disclosed that during the company's three decades of operation in China, no case of chronic occupational disease has been reported.

It mainly owes to BASF's well-established Occupational Medicine and Health Protection system, which focuses on all aspects beneficial to employees' occupational health through versatile measures from disease prevention, medical examination, diagnosis and treatment, first aid to health promotion campaigns. Besides strict compliance with laws, regulations and standards set by local governments and the industry, the company continually assesses and improves the environments and processes at all production sites around the world in accordance with BASF Health Performance Index (HPI).

"Regular medical examination and assessment are the most direct and effective ways to understand the health conditions of our employees," said Chen. According to her, BASF provides customized examination programs to employees at different job positions, followed with timely treatment when discovering any problems or potential risks, to maintain or improve their health conditions and productivity. In 2013, almost all the operational staff participated in the occupational medical examination, while participation rate of health examination for office staff increased to 85%.

Apart from providing the traditional medical services, Chen and her team also play an active role in other areas related to occupational health. At a BASF site, a packaging assembly line has been effectively improved within a short period, as a Responsible Care assessment participated by Chen found the unbalanced working time of workers in two production lines. After discussions, the site increased the investment in small packaging production line to meet the market demand, while reasonably reducing the labor intensity of some operators.

"Environmental and process planning, monitoring and improving are the focuses of industrial hygiene. We participate in the early planning stage of new production sites and regularly check the safety conditions of the sites and labor working time," said Chen. "Such Level One prevention efforts also apply to employees working in the office."

In 2012, BASF Greater China's new Headquarters building was completed at the Pudong site, Shanghai. Before that, Chen and her team participated in the design of the office area. "Working environment has a direct impact on employees' productivity and health conditions. Friendly environment and suitable furniture help effectively prevent cervical spondylosis, vision loss and other health problems," explained Chen. She also introduced that workspaces, furniture heights and comfort-of-use were specially considered. This set of office space design standards is also applicable to the other new office buildings in Greater China.

60% employees at BASF Greater China are between 26 to 39 years old, mostly the backbone of their families. Their health, both physical and mental, is extremely important for their families. In 2013, BASF launched the Employee Assistance Program (EAP) in China to provide mental health counseling for employees and their family members. Through the 24/7 toll-free hotline, they can seek for counseling on emotional and psychological problems anonymously from professionals.

"We need to respect and support the occupational health needs of every employee to ensure their productivity and creativity," said Felix Hu, Head of Responsible Care Greater China, BASF. "Therefore, Occupational Medicine and Health Protection is an important part of BASF's Responsible Care Management System. Besides caring for our employees, we are also concerned about the occupational safety of our suppliers and contractors, so as to maintain productivity with our value chain partners." ■

Protection within reach

At BASF, Occupational Medicine and Health Protection measures are not just executed by Janice Chen and other medical personnel, but also by hundreds of well-trained first-aiders within the company. They are everywhere at BASF's sites in Greater China who can implement professional first aid measures in real time at emergencies.

The company also provides global travel medical and emergency consultation to employees on business trip, while providing information about the destination country and possible health hazards, medical examination and travel medical kit and other medicine

Are you balanced in work and life?

By: Wang Zhiyan, EAP consultant

Employees were doing physical exercises during lunch break at BASF Pudong site.

Eric (anonym) is in his forties, a mainstay at home and at work. He is zealous about his work, where he can find a sense of accomplishment and satisfaction. He works really busy and travels a lot. He has to leave his 3-year-old son to his wife and his mother. The kid recently went to Kindergarten and the teacher already informed the parents several times of his son's trouble of getting along with other kids. Eric, who could neither blame his wife directly, nor educate the boy in person, had a few arguments with his wife on the phone. Worrying about his family, Eric couldn't concentrate on work and felt rather depressed. He felt physically and mentally exhausted and even worried about sinking into depression. Therefore, he reached the EAP consultant for help.

Did you feel that at some stage of life, you became a slave to time and felt exhausted every day without sense of accomplishment or could merely reach the pass line of life? Or you felt you were walking on a thin wire and might just slip and fall into the abyss without even notice? Obviously, Eric is now in such a predicament.

There is no standard answer to the question "how to reach a work-life balance", as everyone has their unique balance point unshared by others. It depends on one's personal style –which do you find more enjoyable, family life, being alone or work? What is your goal in life? What can bring you satisfaction? It also depends on the environment – are you required to work harder for material rewards? Is there anyone helping you take care of your family? Finally, it also depends on the specific lifecycle you are in - new baby, or parents' illness as such might require you to put more efforts in your family affairs.

Work-life balance is a dynamic balance requiring us to constantly check the change of balance point and make appropriate adjustments. If you have a clear understanding of your balance point, the following suggestions may help you do better.

1. Adjust your expectations

Set a goal matched with your ability, drop the idea of an almighty self, accept that one's energy is limited and everybody needs to rest and relax. Proper relaxation is required to make a balanced life. Reasonable expectations include doing a job well aligned to your ability, developing a household spending plan matching with income and maintaining a friend circle as your time and energy allow, etc.

2. Keep hands off sometimes

Do I need to drop my work and return to family, spending more time with my son? This is what bothers Eric most. To answer this question, we need to figure out the real needs of his family. His son is in an age when he is incapable of self-regulation of mood and actions, so parents need to show their empathy as well as establish some family rules; his wife, who could barely pull herself out from both work and life, surely needs her husband's understanding, recognition, appreciation and care; also, the mother and daughter-in-law relationship is not so easy under one roof. Both of them need Eric's care and consolation in life. Once we get that clear, it's no longer hard for Eric to find a solution and meet the family's demand more efficiently.

The same is true in work. As a person in charge, if Eric spends more time on training and supervising the staff, he would need to spend less time for better performance. Whether in work or life, one needs to delegate duly and meanwhile, don't forget to offer encouragement, support and resources required to solve problems.

3. Live in the moment

If you keep worrying about things out of your capacities, it will greatly reduce your work efficiency. However, whether dealing with work or family, if you are dedicated enough in the process and fully engage your mind and body in the moment, you will achieve better efficiency. Also, by doing that you'll greatly save the time and energy required for accustoming yourself to different tasks, thus earning you more efficient work hours.

Finally, it is worth mentioning that in recent years people began to pay attention to a new concept – work-life integration, which, in simple terms, means to take some work home and a part of your life to workplace. Of course it will require more flexibility of your employer, clearer scope of work and a more independent work style. However, in fact we are already doing that in some way or another, which you might not yet realize. For example, you might read a work-related book after work or communicate with your colleagues about parenting knowledge during lunch time, etc. If we ponder on it, there might not be a clear boundary between work and life. Once you break your mindset, you will create a more flexible state of balance. ■

Ultrafiltration for clearer water

Seas and oceans are the biggest water reservoirs on Earth. Since decades sea water is turned to drinking water by desalination in large scale. In Ghana, West Africa, a modern desalination plant is currently being established to produce up to 60,000 cubic meters of drinking water per day – enough to supply half a million people. In this plant ultrafiltration membranes made by the BASF subsidiary inge® play an important role: They are used to pretreat the salt water in order to optimize the actual desalination and to protect the downstream salt filters from contamination. These salt filters operate according to the reverse osmosis principle – hereby the water diffuses as individual molecules through the sensitive membrane. As high pressure of up to 80 bar is required for this process, the pre-purification by means of ultrafiltration additionally contributes to the limitation of the energy input.

The water taken out of the sea is forced under pressure through the very fine-pore Multibore® membranes and can pass through them, while undesired substances such as sand, clay, algae and even pathogenic germs are intercepted. At first glance, the ultrafiltration membranes look like thin white tubules, but the cross-section reveals their complex inner life: The fiber contains seven capillaries into which the raw water runs. The walls of the capillaries have tiny pores with a iameter of about 20 nanometers – this is 500 times thinner than a filament of a spider's web. All the particles larger are retained here by the membrane. Only the purified water passes through the pores into the plastic fiber and emerges again on the outside of the fiber.

Production of the membranes requires extensive know-how and experience. "The challenge is to create pores during the production process that are small enough and evenly distributed over the membrane surface," explains Dr. Nicole Janssen, Laboratory Team Leader at Performance Materials Research. Together with her team, she is optimizing the conditions and the starting material from which the membrane

Cross-section through the filtration fibers: The honeycomb-like arrangement of the seven capillaries stabilizes the fibers. In this way the membranes are protected from fine cracks through which disease pathogens could penetrate.

fibers are manufactured: the BASF plastic Ultrason® E, a olyethersulfone. "We can now adjust the Ultrason solution and the process so accurately that the membranes offer dependable filter performance."

For the filters to work reliably in practice, however, not only the size and distribution of the pores have to be correct, the fibers also have to be resistant. This is ensured by the honeycomb structure inside the fibers designed by the experts of the BASF subsidiary inge. "The rrangement of the seven capillaries in the supporting structure makes the fiber mechanically stable and thereby resilient," explains Martin Heijnen, Head of Membrane Development at inge , who adds: "This protects the membranes against fine cracks through which otherwise bacteria or viruses could pass."

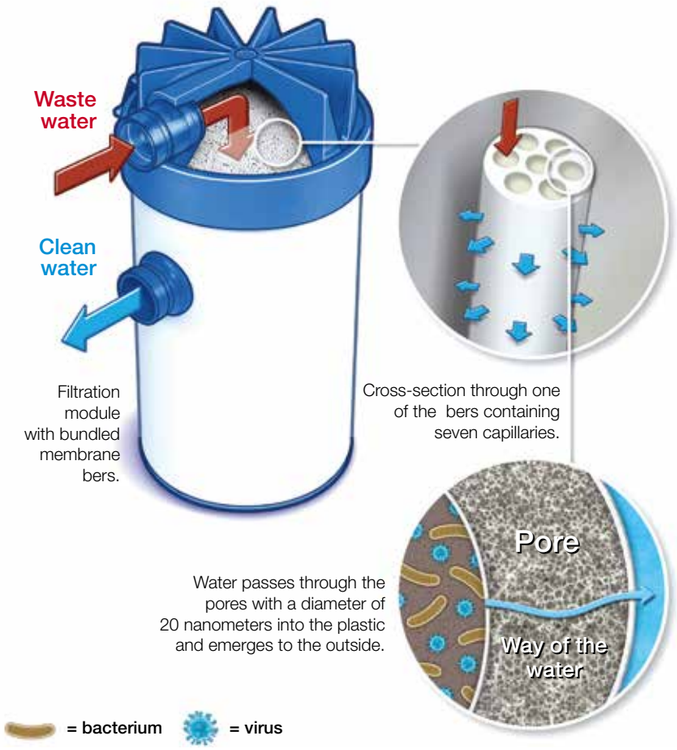
In a filter plant through which, for example, the sea water in Ghana will be pumped, the membrane fibers are bundled together in white plastic cylinders. The ends are stuck to the housing with epoxy resin. During operation, the lower surface is sealed so that the capillaries are only open at the top. Here the raw water is pumped in at a pressure of about 0.5 bar. The only path it can take from here is through the pores in the internal capillary walls of the fibers – and out again as clean water on the outside.

Avoiding contamination

Over time, the residues collect in the capillaries. To ensure that the water can penetrate this o-called filter cake, the water pressure has to be increased. This requires large amounts of energy and causes stress to the membranes. The filter system is therefore cleaned regularly every one to two hours by reversing the water flow: Clean water is briefly forced from outside into the fibers and rinses the filter cake out of the capillaries.

Nevertheless, blockages in the pores or sticky substances like sugar or proteins may still remain behind. These are removed chemically at longer intervals, for example using sodium hydroxide, acid or hypochlorite. In time, however, oxidizing agents can attack the plastic Ultrason E. The material expert Janssen and her colleagues want to improve this situation. For example, they are working on making the filter surface of the capillaries more hydrophilic, in other words more water-loving. In this way, it would be more difficult for the contaminants to be deposited. This would make cleaning easier and chemical cleaning steps would also be reduced. "Membrane service time and lifetime are thereby prolonged," adds Janssen. These improvements would not only be useful for the pre-cleaning of sea water but also for the processing of drinking water or the treatment of waste water. ■

The inner life of a water filter



Ultrafiltration as central element of modern drinking water treatment

One of the most modern waterworks along the river Ruhr in Germany is jointly operated by the two municipal utilities of the towns Menden and Fröndenberg ocated on opposite sides of the river. With a multistage filtration process, the facility can process up to 600 cubic meters of raw water per hour into high-quality drinking water. The river water of the Ruhr has already passed through sand filters and the subsoil before undergoing mechanical pre-filtration. When all coarser constituents have been removed, the water then enters a system of ultrafiltration membranes from BASF subsidiary inge®.

This ultrafiltration is followed by three further steps that assure the high quality of the drinking water from the Ruhr: An activated charcoal filter extensively removes any organic trace materials such as medicinal product residues, the flat bottom degassers then deacidify the water, and irradiation with ultraviolet light provides the final disinfection. Other modern treatment facilities with the innovative Multibore® membranes as their central element are operating, for example, in the historical city of Trier which uses the water from a dam, and in Männedorf in Switzerland, where surface water is also fed into the drinking water supply.

Water Solutions from BASF

Know-how on membrane material is considered to be the key success factor for future innovations in polymer membranes. Since the acquisition by BASF in 2011 inge has access to the know-how of the BASF polymer experts and expands as a growth field the offering of BASF's Water Solutions business worldwide. BASF provides a comprehensive and in its industry unique range of water treatment chemicals used for drinking and waste water treatment, desalination and industrial water treatment. The high performing products are manufactured around the globe in world-scale, state-of-the-art production plants. This makes BASF a reliable partner to serve the needs of the water industry.

Butterfly — fly!

The colors of nature are always inspirational to us. When natural plant pigments encounter chemistry, a remarkable color tour is therefore unfolded. In this year's BASF Kids' Lab, children learnt to use everyday materials rather than a brush to color their paper butterflies, creating a lot of unique and beautiful patterns while exploring the secrets of the acid-base property of of materials.

Paint your walls to bring your home a new look, and apply spray coating on your car to make it look more dynamic. Everyone enjoys the refreshment of colors. If you have a playful spirit, follow Dr. Bubble to create your own colors!

A chemist's kitchen

- Anthocyanin changes color as the pH changes, and thus is a natural acid-base indicator: it assumes red when encountering acid, purple in neutral environment and blue or green when added with base. We can use mallow tea to test what else in our kitchen is acidic or alkaline.
- Besides mallow flower, grapes, blueberries, strawberries, eggplant, purple cabbage, purple sweet potato, hydrangea and morning glory can also change color under the same principle.
- Anthocyanin is a powerful antioxidant that protects human body from damage caused by free radicals or other hazardous substances. What's more, anthocyanin is also able to enhance blood vessel flexibility, improve circulation and skin smoothness, inhibit inflammation and allergies, as well as improve joint flexibility.

Mallow flower is a purple flower native to Europe, which is known as the miracle of flower. It initially assumes a bright blue and then gradually turns purple as it reacts with oxygen in the air. After adding some lemon juice to it, the color will evolve to red purple and eventually to beautiful pink, like the glow of the dawn sky. It contains an amazing pigment called anthocyanin, whose color can change as the environmental pH changes. Dr. Bubble's experiment is designed around this characteristic.

Materials

For coloring — mallow tea, lemon juice, sodium soap, cotton swabs, white watercolor correction pen, paperboard with a butterfly pattern (attached with the publication)
Auxiliary materials — tape, colored iron wire, iron sheets, sponges, scissors

Procedures

Step 1. Use a sponge dipped with mallow tea to color the butterfly on paperboard.
Step 2. Use a cotton swab dipped with lemon juice and sodium soap to paint the butterfly with beautiful patterns. Find the surprising effect with the correction pen.
Step 3. Use scissors to cut off the butterfly along the black line.
Step 4. Use adhesive tape to fix iron sheets inside the black circles at the back of butterfly wings.
Step 5. Add a butterfly body: fix the colored iron wires in the middle of the wings with adhesive tape.
Step 6. Slightly fold down the wings.
Step 7. Let the butterfly fly at your fingertips! ■

Find out more

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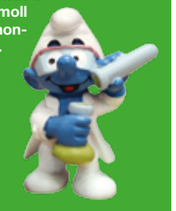

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http://t.cn/8kNPzPW

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By 2050, over 70% of the world's population will probably live in cities. That is why we are celebrating our 150th anniversary by co-creating solutions that will help cities of the future to improve the lives of their citizens, like public transport systems that support modern lifestyles.

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150 years

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