Bluetech Award

4th Bluetech Technology Manual

December 2018

Organizer

Bluetech Clean Air Alliance

Co-Organizers

Innovation Center for Clean-air Solutions

Council of Industry and Technology Alliances in Z-park

Zhongguancun International Environment Protection Industry Promotion Center

Supporting Organizations

Administrative Committee of Zhongguancun Haidian Science Park

Chinese Research Academy of Environmental Sciences

Research Institute of Environmental Science and Engineering, Tsinghua University

Beihang University

Beijing Institute of Collaborative Innovation

Tsinghua X-Lab

China Energy Conservation Association Energy Saving Technology Promotion Specialized Committee

China Bio-Derived Gaseous Fuel Alliance

Z-Park Green Strategic Alliance of Industrial Technology Innovation for Environment Governance

World Bank

Japan International Cooperation Agency China Office

AECOM

Faurecia China

Asia Society (USA)

Japan Science and Technology Agency

Vanke Foundation

C Team

Beijing Green Innovation Foundation

Contents

Bluetech Award Introduction **4**

Process 4

Approach 5

Assessment 5

Highlights of Bluetech Award 6

4th Bluetech Award Categories **14**

Category 1: Diesel engine emission reduction technologies & clean energy substitutes 14

Category 2: Coal combustion emission control & clean energy substitutes 15

Category 3: VOCs substitution and pollution prevention 15

Category 4: Indoor air pollution control 16

Category 5: Advanced pollution source and air quality monitoring 16

Bluetech Future Unicorn 17

Bluetech Future Star 17

Bluetech Winners **19**

$PM_{2.5}$ Sensor Grids for Urban Air Quality Monitoring 20

TT24-7xr 22

Simple VOC Detection Technology using IER Method: Handy VOC Sensor 24

Onboard Air Quality Monitoring System 26

High Spatio-Temporal Resolution of Mobile Realtime VOCs Monitoring System 28

XPO® Ultra Low NO_X Gas Burner 30

Large-scale Dairy Farm Sewage Classification and Treatment Technology 32

Bluetech Future Unicorn Award **34**

Electric Airplane 34

Bluetech Future Star Award **35**

Bi-Modal Real-Time Air Quality Solution 36

Modular Unit of Indoor Air Purification (MUIAP) 38

Waterless Printing Technology to Enable Elimination of VOCs 40

Supercritical Carbon Dioxide Coating Apparatus 42

Cogeneration of Power and Heat 44

Wearable Air Purifier 46

4th Bluetech Award Finalists **48**

Previous Winners **49**

Bluetech Award Introduction

The Bluetech Award is launched in 2015 to seek and promote high-quality international clean air technologies. Technologies that submitted will undergo a standardized evaluation process that verifies practical results, where the selection committee will examine environmental benefits, technical performances and financial advantage. The winners will receive ample support from the Bluetech Clean Air Alliance (BCAA) and its partners to expand their ability to create a blue sky for everyone.

Bluetech Award

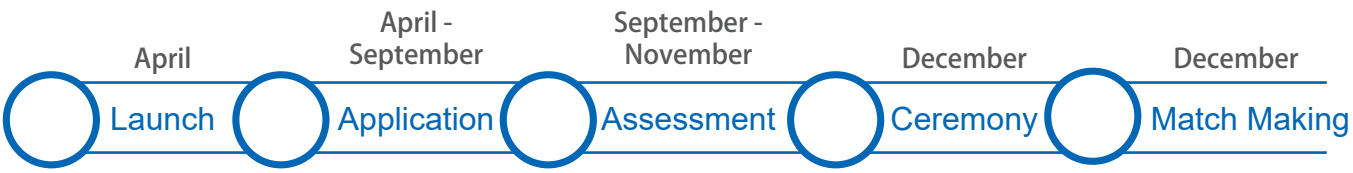
◎ International: We seek technologies from leading countries around the world, work with international experts in our selection process, and leverage international media coverage.

◎ Objective and Scientific Process: We use a uniform, systematic assessment methodology to examine all technologies for practical, real-life results. Our methodology includes document review, expert analysis, on-site examinations and lab tests.

◎ Result-oriented: Our procedure focuses on real-world results.

◎ Systematic Dissemination: Participants get featured dissemination at the Bluetech Forum, and through our official website, custom local matchmaking sessions, video releases, WeChat platforms, and media partners.

Process



Approach

Gathering clean air technologies from China and overseas, the Bluetech Award provides a platform for technologies to validate and demonstrate core competencies. The Award uses the Clean Air Technology Assessment Methodology to examine real-world results, analyzing environmental benefits, technological performances and financial viabilities to find breakthrough potentials.

Assessment

1. **Form Bluetech Assessment Expert Panel**
   Includes international clean air technology experts, industrial and testing experts.
2. **Preliminary Assessment Plan**
   Design preliminary assessment plan for each category to carry out essential technology screening for advanced assessment.
3. **Preliminary Assessment**
   Using preliminary assessment plan to conduct quick evaluation based on technology or product performance data as provided by the applicant.
4. **Advanced Assessment Plan**
   Design specific assessment plan for every technology to assess its breakthrough potential in environmental, technical, and financial fields.
5. **Advanced Assessment**
   Using advanced assessment plan to assess technology which includes document review, on-site investigation and laboratory testing.
6. **Assessment Conclusion and Reports**
   A full assessment report and simplified assessment report are issued for each assessed technology.
7. **Publicize Assessment Result**
   The assessed technology will be recorded into Bluetech Platform.

Highlights of Bluetech Award

Award Categories Match the Need to Support Local Implementation

The Bluetech Award aims to promote best available clean air technologies to help tackle China's air pollution problems. Air pollution is a very complex issue. Different cities face very different sources of pollution due to varied economic development levels, energy structures, and urban modes. How to help cities to develop their own clean air action plans with reference of the most advanced technology is key to accelerate the pace of restoring blue skies. CAAC was launched 10 local clean air pilots since 2014. This year's bluetech categories are closely linked to the technology needs from these pilots.

Beijing-Tianjin-Hebei: Air pollution in Beijing, Tianjin and Hebei (Jing-Jin-Ji) Region and its surrounding areas has attracted significant attentions all over the world. It is estimated that if the coal burning pollution in rural areas during winter can be eliminated, the $PM_{2.5}$ concentration can be reduced by 20% in Jing-Jin-Ji, and 40% for Beijing alone, which is more than the emission transportation sector and power plants combined. Hence, the coal pollution prevention and control for non-power sector is also selected as a technology category for 2016 Bluetech. Winners in this category will have opportunities to support the development of the Technological Guidance of Jing-Jin-Ji Household Coal Pollution Control, and participate in the local technology demonstration projects.

Shenzhen: Shenzhen is China' s leader in clean air efforts, who has already achieved the national $PM_{2.5}$ standards and committed to achieve EU level $PM_{2.5}$ standard by 2020. As the 3rd largest container terminal in the world, one of the biggest challenges for Shenzhen is the emission control for port, which contributes to 13% of Shenzhen's total $PM_{2.5}$ emission. 2016 Bluetech Award Campaign has selected diesel engine emission reduction & clean energy substitutes to call for advanced technology in the related field to help Shenzhen tackle this problem.

Changzhou: VOCs and its secondary products are toxic and cancerous, harming public health. The 13th Five Year Plan listed VOCs as important contaminants, pushing some major cities and provinces to create their own VOCs control plans. For Changzhou, one of China's most important chemical manufacturing bases, VOCs is one of its major contaminants. The emission amount of VOCs in Changzhou is about 51,540 ton per year. Bluetech Award Committee selected VOCs substation, monitoring and pollution prevention as one of the technology categories in Bluetech Award this year to control VOCs emission and ultimately

protect public health.

Shanxi, etc.: Many provinces and cities including Shanxi and Inner Mongolia are gradually enhancing delicacy management in improving the environment and air quality while abating the pollution caused by coal use. In 2017, Shanxi issued the action plan for air pollution prevention and treatment for the province. The plan proposes actions that allow to meet comprehensive governance requirements for VOCs in key sectors while continuing to strictly control the coal pollution. The VOCs alternation and pollution treatment technologies gathered by Bluetech platform are capable to assist Shanxi in the treatment of VOCs. Futhermore, the plan also requires strengthening coping with heavy pollution regulations and improving the capacity of provincial and municipal air quality monitoring, early warning systems and response teams, all these requirements increase the need to investon technology for monitoring air quality and pollution sources. The monitoring technology provided by the Bluetech platform is able to help Shanxi to enhance the monitoring of air quality and at the same time to improve its management capacity.

Global Award

Three Bluetech Award assessed nearly 300 technologies. Those applicants came from 20 countries including China, USA, France, Germany, United Kingdom, Japan, New Zealand, Australia, Malaysia, Switzerland, Denmark, Holland, Sweden, Isrel, Italy, India, Finland, Poland, Norway and Canada.

We have received strong support from many cooperative agencies in the past four years. Those agencies are listed below.

◎ China Association of Environmental Protection Industry – Committee of Vehicle Emission Control

◎ China Association of Environmental Protection Industry – Committee of VOCs Pollution Control

◎ Chinese Society of Environmental Sciences – Professional Committee for Pollution Prevention and Control of Volatile Organic Compounds

◎ Xiamen Environment Protection Vehicle Emission Control Technology Center

◎ The Chemical Industry and Engineering Society of China- Water Borne Coatings Committee

◎ China Electric Vehicle Charging Technology and Industry Alliance

◎ China Highway And Transportation Society

◎ 3iPET International Platform for Environmental Technology

◎ TEDA Low-carbon Economic Promotion Center

◎ China Machinery & Environmental Industry Development Center

◎ ESCO Committee of China Energy Conservation Association

◎ IE Expo

◎ Japan International Cooperation Agency

◎ Japan External Trade Organization

◎ IVL Swedish Environmental Research Institute Beijing Representative Office

◎ Air & Waste Management Association (US)

◎ US-China Clean Tech Center

◎ UK Trade & Investment

◎ Clean Air Alliance UK

◎ VERT Association (Swiss)

◎ Swiss clean technology association

◎ World Future Council (Germany)

◎ France Chamber of Commerce and Industry

◎ Clean Cluster Denmark

◎ China Culture Desk (Austria)

◎ Italian Chamber of Commerce

◎ International Laboratory for Air Quality and Health (Australia)

◎ Commonwealth Scientific and Industrial Research Organization (Australia)

◎ New Zealand Trade & Enterprise

◎ International Council for Local Environmental Initiatives (Korea)

◎ China-Britain Business Council

◎ US-China Energy Cooperation Program

◎ Water Borne Platform

◎ National Big Data Alliance of New Energy Vehicle

◎ World Bank

◎ Cteam

◎ Zhongguancun International Environment Protection Industry Promotion Center

◎ Centre of Excellence for Research on Clean Air

◎ Sino Italian Cooperation Program for Environmental Protection

◎ Iranian Embassy

◎ Swisscleantech

◎ Japan Science and Technology Agency

◎ Los Angeles Cleantech Incubator

◎ Energy Foundation China

◎ China Council for Industrial Environmental Protection (CIEP)

◎ Canada-China Business Association

◎ European Union Chamber of Commerce in China

◎ China Association of Private Equity

◎ Beijing Global Village Environmental Education Center

◎ State of Green(Denmark)

◎ China-Britain Business Council

◎ Sino-Sweden innovation& Entrepreneurship center

◎ International Fund for China's Environment

◎ Chambre de Commerce et d'Industrie Française en Chine

◎ Plug and Play

◎ Young Green Tech. Entrepreneurs Forum

◎ Bay Area Council

◎ Prospect Silicon Valley

◎ World Alliance for Efficient Solutions

◎ Aquilaris

◎ danish embassy

◎ Smogathon

◎ Council of Industry and Technology Alliances in Z-park

◎ Beijing Institute of Collaborative Innovation

◎ US-China Energy Cooperation Program

◎ China Association of Environmental Protection Industry – Committee of Vehicle Emission Control

◎ Green Finance Committee of China Society for Finance and Banking

◎ bio.china-nengyuan.com

◎ China Energy Net

◎ IE Expo

◎ Swiss Chinese Chamber of Commerce

◎ International Fund for China's Environment

◎ Chambre de Commerce et d'Industrie Française en Chine

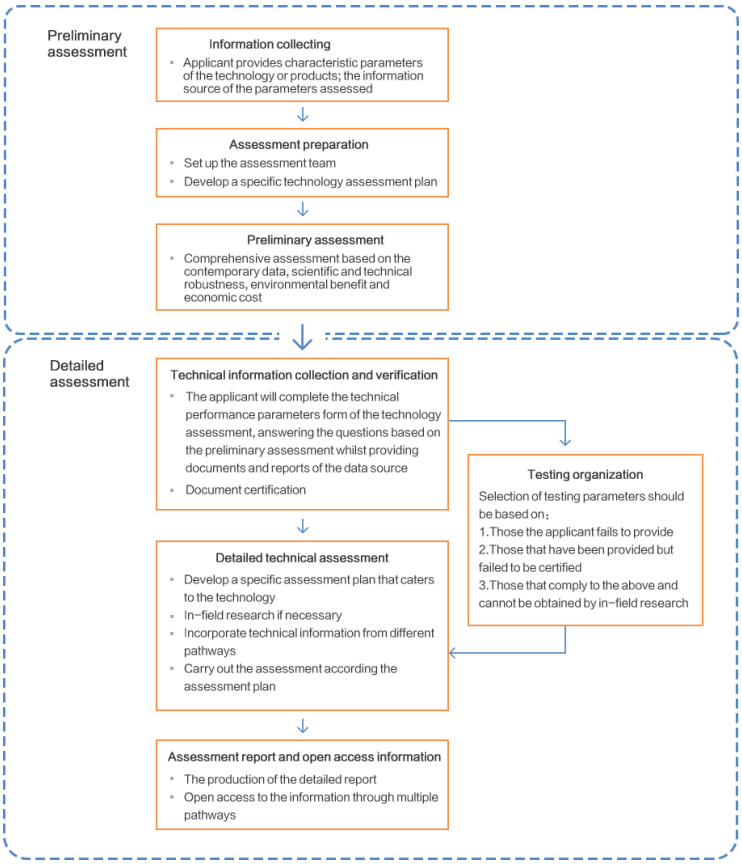
◎ Korea Association of Energy, Climate Change and Environment

Professional Assessment

Bluetech technology assessment is a tool that supports the relevant performance of the clean air technology with systematic assessment. It uses real-world application results as the core basis of evaluation, adopts and combines methods such as document review, technical analysis, expert review, on-site surveillance, and laboratory testing, and eventually tackles the environmental benefit, technical performance and economic feasibility of these technologies.

To guarantee the objectivity and professionalism of the assessment, Innovation Center for Clean-air Solutions has organized experts to edit the following documents:

- *The Outline of Bluetech Clean Air Technology Assessment*
- *Bluetech Clean Air Technology Assessment: Methods and Procedure*
- *Bluetech Clean Air Technology Assessment: Technical Performance*
- *Bluetech Clean Air Technology Assessment: Environmental BenefitBluetech Clean Air Technology Assessment: Economic Cost*



Comprehensive Promotion

Technologies participating in the assessment of the Bluetech Award will have the opportunity to technology exhibition, technology demonstration, project cooperation and all-around promotion, to grow more rapidly on the *Bluetech* platform.

Technology exhibition

The technologies winning Bluetech Award winners will be exhibited at the “Bluetech” Conference. The Bluetech Conference will hold a presence of about 300 to 400 participants every year, including more than 100 representatives from local environmental protection departments, over 100 representatives of technology companies, and over 50 media representatives. Representatives of the winning technologies will be able to directly communicate with experts from China and overseas, obtain promotion support of domestic and overseas media agencies that allow to increase the popularity and influence of their technologies across the globe.

Technology demonstration

Technology companies will be able to demonstrate their technologies in cooperation with the organizers of Bluetech Award, including:

- ◎ Contacting with enterprises and government departments, that have relevant demands of products, to establish pilots for application demonstration of the technologies.
- ◎ Participate in the technology demonstration, verification and promotion projects led by provincial and municipal government departments.
- ◎ The demonstration projects that pass the evaluation phase, will also be selected by the online demonstration platform of Bluetech for exhibition.

Project and Resource Cooperation

The Alliance organizes and coordinates 15 to 20 seminars every year and local conferences for cooperation, technology investigation, among other activities, to facilitate that Bluetech technologies will be better participating in the environmental governance of both the central government and local regions, and cooperating with industrial resources more effectively.

- ◎ Industrial seminar: based on the specific needs of the state, provinces and cities in improving air quality, relevant departments, experts and representatives of industrial organizations and technology companies are invited to convene industrial seminars on topics such as VOCs prevention and control and clean development of motor vehicles.

◎ Conference for cooperation of meeting local demands: technology companies are organized to carry out exchange and cooperation along with the environmental protection department and enterprises that have relevant demands, based on the environmental protection demand of each province and city.

◎ Investor salon: helping enterprises with access to capitals and resources, to pick up the speed of their development based on the characteristics of technologies, enterprises and industries.

Promotion

Technologies participating in the assessment of Bluetech Award will have the opportunity of gaining systematic promotions:

◎ We-media platform: The award winners can enjoy systematic demonstration, promotion and spreading on we-media platforms such as Bluetech's website, public WeChat accounts and email promotion via the Alliance.

◎ Bluetech media seminar: The *Bluetech* clean air media seminars refer to a series of activities launched by the Center for Environmental Education and Communications under the Ministry of Environmental Protection and the Innovation Centre for Clean-air Solutions (ICCS), which aims to deal with important issues such as air pollution prevention and control and carry out idea sharing and in-depth exchanges. The technologies winning the award, will be able to take part in the Bluetech media seminars, and also could be demonstrated during the seminars.

◎ Bluetech's Remark: Bluetech's Remark is a promotion brand introduced by ICCS, which releases researches in the field ofclean air through interviews and by partnering with the media, providing excellent technologies with the opportunity of perform a systematic demonstration.

◎ Promotion through cooperative media: Bluetech has established an in-depth cooperation with renowned media agencies both in China and overseas, to jointly promote the advanced technologies.

◎ International promotion: Bluetech has established cooperation with 60 institutions in 20 countries, allowing the award winning technologies to be promoted across the globe under the support of our partners. Futhermore, the Alliance is building the California-China Acceleration Partnership with the partner in California, with an aim to promote these technologies and enlarge their global influence via the clout of Silicon Valley.

Bluetech Acceleration

In order to facilitate a rapid application and development of excellent clean air technologies, the Alliance has partnered with several parties to set up the *Bluetech Acceleration Platform* which promotes the application of advanced clean air technologies and improves of air quality.

The modules of Bluetech Acceleration Platform include:

◎ Business acceleration strategy: according to the characteristics of technologies and enterprises, roadmaps customized for enterprises are created to boost their development both in the Chinese and international markets, and also to facilitate them in setting development goals and implementing accelerated development strategies.

◎ Pilot demonstration: helping technology companies obtain the opportunities of present pilot demonstration of technologies by use of Bluetech's platform resources.

◎ Policy promotion: carrying out relevant policy research to analyze the policy bottlenecks and opportunities faced by the technologies; and organizing media conference, we-media promotion and cooperative media communications, among other activities, for the research achievements.

◎ Intellectual property strategy: helping innovation-driven enterprises to develop intellectual property strategies that cater their specific needs; helping the management of enterprises to correctly understand the strategy of intellectual property rights; guiding intellectual property strategy departments of enterprises to flexibly use appropriate tactics in practice; and helping to supervise the quality of the accomplishments of intellectual property agencies.

◎ Investment cooperation: helping enterprises to cooperate with appropriate capitals and resources to achieve rapid development.

◎ Promoting influence: promoting the spreading of advanced technologies and their application cases via media platform.

4th Bluetech Award Categories

Category 1: Diesel engine emission reduction technologies & clean energy substitutes

Over the past few years, China is driving at an increasingly faster pace: in fact, the country is ranked first globally in terms of vehicle amount increase rate over the past five years. China is also driving longer distance: the average mileage of passenger vehicles in Beijing today is approximately 44 km per day, twice as much as that in the EU. Additionally, most cars are driven in developed areas, which subsequently concentrate air pollution in urban regions. In China's megacities like Beijing, Shanghai and Shenzhen, vehicle emissions have become the top local polluter of $PM_{2.5}$, contributing to nearly 30% of all local $PM_{2.5}$ emissions.

Diesel vehicles are believed as the most significant problem, as they are responsible for up to 70% of all vehicle NO_X emissions, and up to 90% of all vehicle particulate matter emissions. Furthermore, diesel powered non-road vehicles, such as ships, port machinery, agricultural machinery and general engineering machinery and so on, their emissions are also believed as significant problems due to lack of control. Some advanced cities like Shanghai and Shenzhen have already begun to employ new energy (e.g. LNG) and emission control retrofit (e.g. DPF) technologies in their policy making to control non-road vehicle emissions.

We are looking for the following types of diesel engine emission control technologies:

- ◎ Fuel treatment technologies, such as diesel fuel treatment, clean energy (e.g. LNG) etc.
- ◎ Engine combustion optimization technologies, such as Exhaust Gas Recirculation, fuel injection optimization techniques, etc.
- ◎ Engine emission control technology, such as Diesel Oxidant Catalyst, Particulate Oxidation, Catalyst, Selective Catalytic Reaction, Diesel Particulate Filter, etc.

Category 2: Coal combustion emission control & clean energy substitutes (non-power sector)

Coal is the major energy source in China. It contributes approx. 60% of the primary energy and has become one of the main pollution sources. Thanks governmental policy support, emission control for coal fired power plants have been conducted in many places. However, emissions from non-electrical coal combustion should not be underestimated. The $PM_{2.5}$ source apportionment analysis for Jing-Jin-Ji region shows that coal-fire emission has contributed about 25% of local $PM_{2.5}$ emissions. In order to meet the national goal for air pollution improvement, the Municipal Research Institute of Environmental Protection along with Innovation Center for Clean-air Solutions have conducted a project to collect emission control technology for non-electrical coal combustion and list the advanced technologies into *Clean Coal Combustion Technical Guidebook.*

We are looking for the following type of Emission Control Technology for Non-electrical Coal Combustion:

- ◎ Alternative clean energy & renewable energy technologies.
- ◎ Advanced heating technology, such as waste heat recovery technology, etc.
- ◎ Other related technology.

Category 3: VOCs substitution and pollution prevention

VOCs is one of the main primary pollutants in various regions throughout China and is one of the major precursors for secondary $PM_{2.5}$ and ozone. VOCs and its secondary products are toxic and cancerous, harming public health. As the China launches the official war on pollution, the 13th Five Year Plan listed VOCs as an important contaminant, pushing some major cities and provinces to create their own VOCs control targets

We are looking for the following type of Emission Control Technology for VOCs monitoring and control technologies:

- ◎ Leak Detection and Repair (LDAR) related technologies, such as leak detection technology, leak repair technology, etc.

◎ VOCs end of pipe control technologies, such as VOCs recycling technology, VOCs destruct system, etc.

◎ Low VOCs substitutes, such as low VOCs paint, low VOCs solvents, etc.

◎ Other technologies that address VOCs pollution.

Category 4: Indoor air pollution control

People spend, on average, 70% of their time in indoor environment and therefore are potentially more exposed to indoor air pollutants. In addition to outdoor pollution infiltration, there are also many pollution sources in indoor environments, which causes high indoor air pollution that are often more severe than the outdoor air. As people are becoming more aware of air quality and health, concerns on the indoor air quality have also been raised.

We are looking for the following types of indoor air purification technologies:

◎ Indoor air quality monitoring and control technologies.

◎ Central HVAC system purification technologies.

◎ Decentralized purification technologies, such as indoor air purifiers, vehicle air purifiers, etc.

Category 5: Advanced pollution source and air quality monitoring

In order to effectively conduct air pollution prevention work, it is essential to know the specific air pollution characteristics of the area and its major pollution sources. Advanced monitoring technologies are able to provide real time, accurate and comprehensive air quality data, which can support air quality management, policymaking and strategic planning. Hence, the Bluetech Award has selected the advanced pollution source and air quality monitoring as one of the technology categories.

We are looking for the following types of advanced monitoring technologies:

◎ Ambient and indoor air quality monitoring technologies.

◎ Pollution source monitoring technologies, such as online monitoring devices, portable devices.

★ Bluetech Future Unicorn

This year, a special section of the Bluetech Award, namely Bluetech Future Unicorn, has been established to encourage more start-ups and teams to shape a cleaner future. The power of business is strong and we believe it is necessary to offer more support for potential future unicorn companies in clean air technologies to accelerate the change.

★ Bluetech Future Star

As the effort of making our skies blue again continues, a growing number of start-up tech companies have joined the alliance making their contribution to fight the air pollution. This year's award added Bluetech Future Star Award, hoping to leverage Bluetech platform resources to help and accelerate outstanding high-tech clean air start-ups.

4th Bluetech Winner & Award Finalists Introduction

The 4th Bluetech Award officially began in April 2018, and gathered 66 technologies until September. The applicants come from China, USA, France, Germany, Italy, United Kingdom, Poland, Finland, Isrel, India, and Malaysia. The Bluetech Award looks for breakthrough potential from these technologies in terms of environmental benefits, technical performance and economic feasibility. This year, we are excited to announce that 15 technologies get Bluetech Award finalists, 7 Winners , 1 Unicorn and 6 Future Stars that take the lead in developing high-quality, innovative technologies to tackle China's air pollution!

Disclaimer

Innovation Center for Clean-air Solutions (ICCS) undertook the mandate to organize the *Bluetech Award* Clean Air Technology Schemes. ICCS organizes this event in accordance with relevant laws and regulations and also based on the principles of objectivity, fairness, and justice. In order to ensure the seriousness and scientificity of the award, we have clearly required all participating entities that:

1. The intellectual property of the technologies that participate in the event of *Bluetech Award* (*Participating Technology*) shall belong to the participating entity, or the participating entity shall be legally granted a license to use the Participating Technology and shall have the right to submit the Participating Technology to the event of "Bluetech Award".

2. The participating entities shall truly disclose the information related to the Particiapting Technologies, include but not limited to inventors, applicant, technical parameters, legal status, etc.

ICCS hereby acknowledges that the award of *Bluetech Award* shall be based on the information, data and documents provided by the participating entities and we have only conducted onsite verification for a few technologies which had applied for the technology assessment. Hence, we are not able to guarantee the authenticity and accuracy of all information, data and documents. ICCS does not take responsibilities for any un-authorized use of relevant technology information in any form of distribution in the internet. ICCS reserves the right of final interpretation to the above statement.

Bluetech Winners

In the 2018 Bluetech clean air technology campaign, 7 technologies from 4 countries win the Bluetech Award. The winners include 5 Advanced pollution source and air quality monitoring category.and 2 technologies from Coal combustion emission control & clean energy substitutes (non-power sector) category The technologies and applicants are listed below.

Technology/Product	Applicant
Advanced pollution source and air quality monitoring	
$PM_{2.5}$ Sensor Grids for Urban Air Quality Monitoring	Beijing Municipal Environmental Monitoring Center
TT24-7xr	Markes International
Simple VOC Detection Technology using Interference Enhanced Reflection (IER) Method: Handy VOC Sensor	O.S.P Inc.(Japan)
Onboard Air Quality Monitoring System	Nova Fitness Co.Ltd.
High Spatio-Temporal Resolution of Mobile Real-Time VOCs Monitoring System	Guangzhou Hexin Instrument Co.,Ltd.
VOCs substitution and pollution prevention	
XPO® Ultra Low NO_X Gas Burner	Honeywell
Large-scale Dairy Farm Sewage Classification and Treatment Technology	Huameng Kechuang

$PM_{2.5}$ Sensor Grids for Urban Air Quality Monitoring

Category:

Advanced pollution source and air quality monitoring (Management Innovation)

Applicant:

Beijing Municipal Environmental Monitoring Center

Country:

China

Technology Overview:

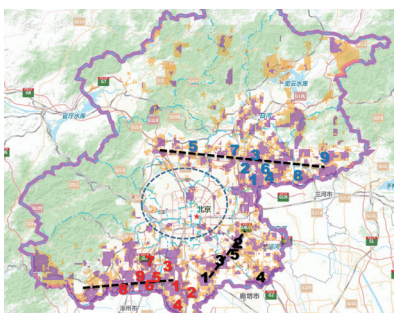
◎ The monitoring unit contains $PM_{2.5}$ sensor array, the sensor uses laser scattering mothod to monitor $PM_{2.5}$ The sampling interval is less than 5 minutes while the online rate is greater than 95 % in outdoor environment.

◎ The city's monitor distribution network construction covers all villages and towns while taking into account key pollution sources and key areas.

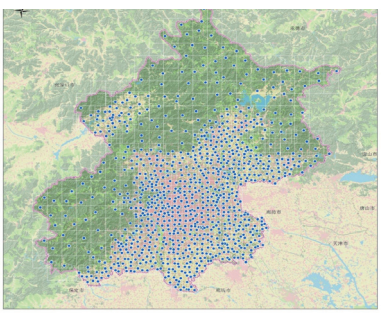
◎ The data quality control system based on artificial intelligence ensures the parallelism among monitoring equipment and the accuracy of monitoring data.

◎ The operation and maintenance platform can identify equipment abnormalities automatically and track the on-site inspection and maintenance operations which realizes equipment management for full lifetime.

◎ The data comprehensive application and management platform integrates multiple data such as monitoring data, meteorology, remote sensing and law enforcement supervision to realize high-precision pollution distribution monitoring, street and town air quality evaluation, intelligent identification of local pollution sources and law enforcement support for environmental monitoring.



House heating hotspot identifation in 2017



Location of $PM_{2.5}$ monitor in Beijing

◎ The technology supported Beijing Municipal Bureau of Ecology and Environment to carry out air quality assessment of streets and villages, promote the implementation of pollution control responsibilities and related work in the territory and help Beijing to achieve the goals of the Clean Air Action Plan 2013 - 2017.

◎ Pushing the grid alarm information to the two stages of environmental protection supervision departments in Beijing city, and greatly improving the accuracy of on-site law enforcement.

Financial Features:

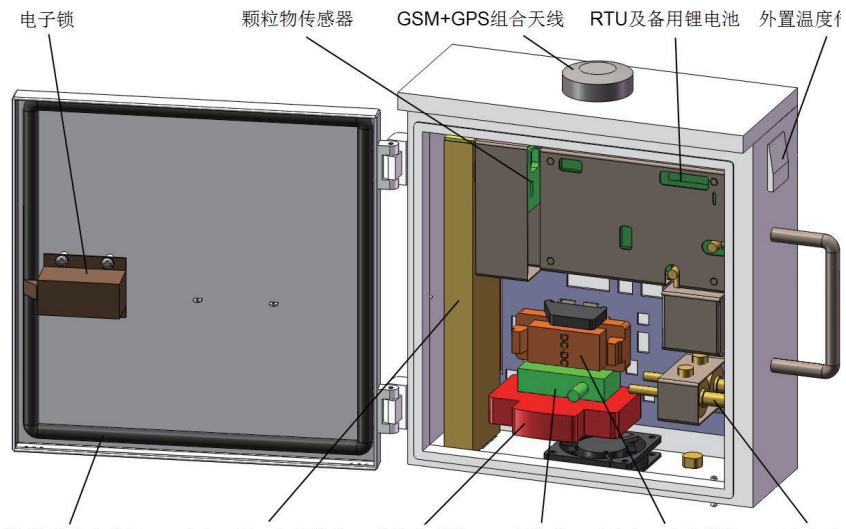
◎ Compared with the standard $PM_{2.5}$ monitoring method, the cost of monitoring equipment, installation and layout, operation and maintenance has been greatly reduced.

Implementation Status:

◎ In 2016, high-density $PM_{2.5}$ monitoring network of was completed and put into trial operation in Beijing.

◎ From 2017 to 2018, the Ministry of Ecology and Environment carried out $PM_{2.5}$ grid monitoring and supervision in " 2 + 26 cities".

◎ From 2017 to 2018, a grid monitoring network has been successfully set in Shunyi District, Pinggu District, Chaoyang District, Huangcun Town, etc. in Beijing. In 2018, Beijing environmental monitoring team will apply grid monitoring technology to mobile law enforcement.



System Diagram

TT24-7xr

Category:

Advanced pollution source and air quality monitoring

Applicant

Markes International

Country:

United Kingdom

Technology Overview:

◎ TT24-7xr instrument is an advanced thermal desorption system for almost real-time monitoring of volatile Organic Compounds (VOCs) and semi-volatile organic compounds (SVOCs). It is designed with dual cold trap for alternating sampling which can ensure a continuous near-real-time sampling analysis without sampling blind spots. No refrigerant operation (electrical refrigeration) makes TT24-7xr an ideal option for continuous unattended observation in fixed laboratories or on-board laboratories.

◎ Main process: firstly, the gas sample was collected to the cold trap A at a certain flow rate (up to 250 mL/min). After reaching the acquisition time, the sampling gas path will switch to cold trap B, while cold trap A will perform the heating analysis. These two traps will repeat sampling and analyze alternatively until the end of the online sampling program.

◎ The high time resolution and low operating period with 3-5 minutes facilitate monitoring the rapid real-time changes of the target and perform a near real-time air monitoring.

◎ Wide sampling range (up to 250 mL/min) with high sensitivity suits well for bulk concentration of low concentration samples.

◎ For humid air: a new water vapor management device available. Additionally, TT24-7xr has a small size and can realize remote control, electronic cooling which is suitable for long-term unattended operation and mobile monitoring in the field. Adsorption tube can also achieve quantitative recovery and recollection of online samples, it is helpful for the repeated analysis and method verification.

Financial Features:

◎ TT24-7xr has different cost in different applications.

◎ In China, the cost is about 600,000~650,000 RMB (including water removal components, no customs clearance and other related costs and no GC/GCMS components for back-end configuration).

◎ In the United States, TT24-7xr are widely used in the analysis of explosives and testing of VOCs in national defense monitoring, the cost is about 450,000 to 500,000 RMB (excluding the Kori part of water removal, customs clearance and other related costs, no GC/GCMS components for back-end configuration).

◎ The normal service life of the instrument is about 10 years, and it can be operated for 15 years or more if it is maintained well. The annual cost of routine operation and maintenance is about 100,000 RMB per year, of which the human capital is 20,000 - 30,000 RMB and the rest is consumables.

Implementation Status:

◎ TT24-7xr is mainly used in the analysis and testing of VOCs from atmospheric environment and pollution sources and the analysis of explosives and testing of VOCs in national defense monitoring.

Product Figure

Working Principle Diagram

Simple VOC Detection Technology using Interference Enhanced Reflection (IER) Method: Handy VOC Sensor

Category:

Advanced pollution source and air quality monitoring

Applicant

O.S.P Inc.

Country:

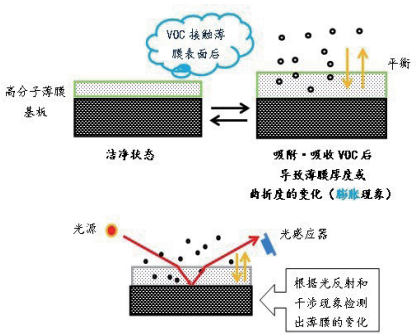
Japan

Technology Overview:

◎ The IER method of the O.S.P Inc.(Japan) (Interference Enhanced Reflection Method) can detect the total volatile organic compounds (VOCs) concentration at a ppm level. The VOC sensors of IER is a portable. It is easy and convenient for site staff to use in autonomous management and daily management.

◎ Principle: The polymer film contacts with VOC and absorb it, then, swelling phenomena occurred according to its concentration. The polymer film is injected by laser at a certain angle into the silicon substrate (Si)and multiple reflections occur at two interfaces. Due to absorb VOCs, the film has swelled, result the thickness and the diopter of the film has changed. The superposition of waves lead to the enhancement or attenuation of the peak waves. The concentration of TVOC can be measured by detecting the increase or decrease of the intensity of reflected light IER curve.

◎ Non-destructive inspection technology: The polymer film of the sensor will absorb all VOCs until reach the equilibrium bentonite state. The film will immediately release the VOCs and restore to the initial thickness after cleaning with clean air. The operation is reversible and the film can be reused for many times as a non-destructive inspection.



Working Principle DiagramSchematic diagram of VOC composition leading to expansion of polymer film

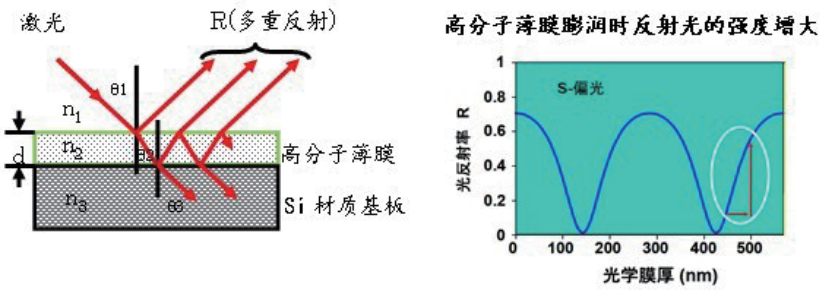
◎ Valves automatic measurement: valve is accessory of the charcoal tube and solenoid valve in the head of the sensor. The automatically zero calibration save time of dismounting and washing the charcoal tube and improve the working efficiency.

Financial Features:

◎ The initial cost of the portable VOCs sensor is 30,000 to 40,000 yuan. Additionally, the cost of sensor inspections and the consumables should also be considered which vary according to actual usage requirement.

Implementation Status:

◎ About 400 units have been sold to Local government environmental bureau, public inspection center, research institute, university institutions and various folk factories in Japan.



IER Method Diagram

Monitor Device

Onboard Air Quality Monitoring System

Category:

Advanced pollution source and air quality monitoring

Applicant

Nova Fitness Co.Ltd.

Country:

China

Technology Overview:

◎ The onboard air quality monitoring system uses taxis, buses and other public vehicles as carriers, loading with particulate matter and nitrogen oxides monitoring equipment and uploading the location of operating vehicles and pollution concentration of particulate matter in real time. It is a low cost and high density monitoring system.

◎ The main process of monitoring: vehicle monitoring system upload data every 3 seconds including timestamp, spatial GPS coordinate information and concentration of $PM_{2.5}$ and PM_{10}. 12,000 sets of data collected per day. The system is equipped with GPS and analysis through car relay and intelligent algorithm to figure the dust cloud map of urban roads. Moreover, the system is able to trace pollution resource through the road network.

◎ Cloud platform: Data receiving, database storage, pushing data to intelligent environmental protection platform, data analysis and statistics, and online calibration.

◎ Remoate video monitoring: video device can be installed to capture pictures for future inspection when the particle concentration alarm occurs.

◎ Dynamic Calibration: when the vehicles installed the atmospheric monitoring equipment pass the official station, a dynamic calibration based on the official station data can be achieved.

Schematic Diagram of Onboard Air Quality Monitoring System

◎ Remote fault diagnosis and alarm: The internal sensor of the vehicle monitoring device apply the Nobel quad-core system.Each core can operate individually or corporately. When one of the monitoring core unit malfunctions, the cloud platform auto detection algorithm will detect it and alarm. At the meanwhile, staff will confirm the alarm information and repair the faulty equipment to ensure the accuracy and the reliability of data.

◎ Environmental adaptability: The on-board system is able to withstand high temperature, vibration, windproof and other difficulties. The temperature and humidity monitoring module can automatically achieve dehumidification and dedusting. Temperature and humidity monitoring and humidity calibration which can reduce the impact of humidity on measurement accuracy and adapt to the special needs of on-board system and improve the stability of the system.

Financial Features:

◎ Investment and cost varies from different projects.

Implementation Status:

◎ There are applications in many domestic environmental protection institutions, some of which are listed as follows.

Project	Content
Shandong Taxi Project	First stage: 100 onboard air quality monitoring system were installed to taxi in Jinan City
Beijing Taxi Project	Part of taxies in Tongzhou, Beijing were installed onboard air quality monitoring systems
Taiyuan Taxi Project	Part of taxies in Taiyuan were installed onboard air quality monitoring systems
Shanghai Taxi Project	Part of taxies in Shanghai were installed onboard air quality monitoring systems

Monitoring Result of Jinan, China

High Spatio-Temporal Resolution of Mobile Real-Time VOCs Monitoring System

Category:

Advanced pollution source and air quality monitoring

Applicant

Guangzhou Hexin Instrument Co.,Ltd.

Country:

China

Technology Overview:

◎ TOF is the core component of the VOCs online pollution source identification mass spectrometry system. The wide dynamic tedious mass analyzer is used to increase the dynamic range of flight time quality analysis from 3 orders of magnitude to more than 4 orders of magnitude, and the resolution is improved from 1000 to 10,000. It is equipped with an atmospheric pressure interface and a radio frequency quadrupole molecular ion reaction device to increase the transmission efficiency of ions from atmospheric pressure to vacuum and raise the sensitivity by 1000 times.

◎ Key features: a silicone film injection system is used to seperate interference particles. Different compositions are distinguished by the time of arrival of ions at different mass to charge ratios. The composition data then can be processed and analyzed.

◎ Mobile monitoring: the VOCs monitoring terminal instrument on the mobile platform is a real-time, online, orthotropic visual mobile system which can achieve automatic warning, intelligent path planning, heavy pollution area division, etc. Moreover, it can establish a pollutant intelligent monitoring network and database system and an online VOCs pollution source identification mass spectrometry system.

Mobil Realtime VOCs Monitoring System

◎ Thep system is able to calibrate the mass spectrometry data, combined with the monitoring position and meteorological parameter information to filter independent variable Parameters, and then able to trace the pollution source and do contribution analysis.

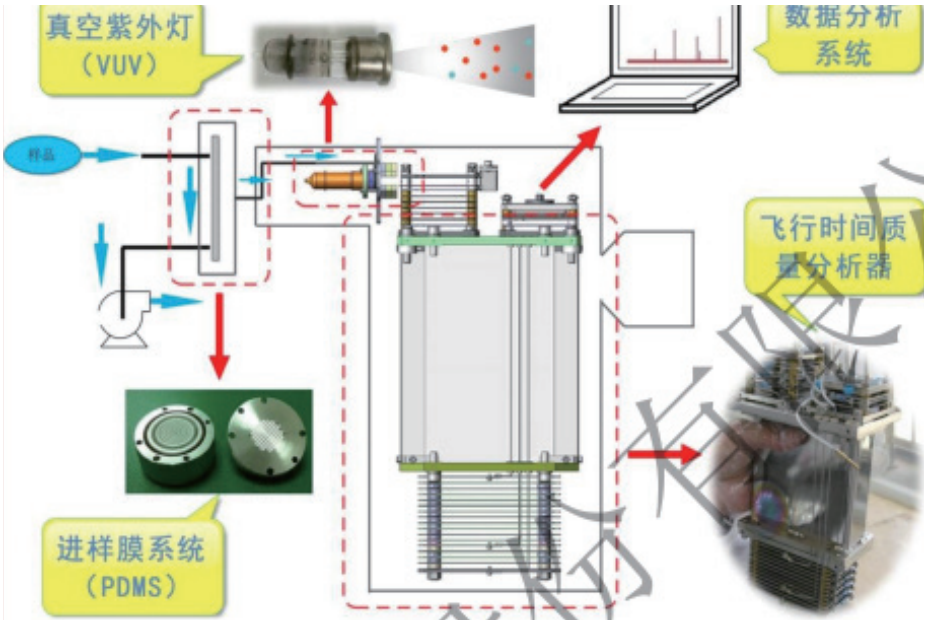
◎ The system is able to build local VOCs pollution source characteristic fingerprint. Through the rapid comparison and analysis of online data and the data from fingerprint database, the source tracing of VOCs pollution can be realized online, and be applied to the emergency monitoring and investigation of pollution accident in chemical industrial park.

Financial Features:

◎ Investment is depen on actual project situation.

Implementation Status:

◎ The technology has been applied in many domestic environmental protection departments and industrial parks.



Working Principle Diagram

XPO® Ultra Low NOx Gas Burner

Category:

Coal combustion emission control & clean energy substitutes

Applicant

Honeywell

Country:

United States of America

Technology Overview:

- ◎ XPO® ultra-low nitrogen gas burner is a new type of burner, which integrates various control devices and regulating devices. The burner is equipped with the world's first integrated combustion safety control and PLC functions and SIL3 certified combustion control management system which can achieve real-time interconnection.
- ◎ XPO® burner can be used to most types of heating demand, mainly includes: hot water boiler, steam boiler, direct contact hot water heater, liquid heater and melting furnace.
- ◎ This technique is suitable for various shapes of furnaces and standard WNS, module furnaces, direct-fired furnaces and other types of furnaces.
- ◎ XPO® burner has a simple and compact mounting structure. It is easy to manufacture and install. Additionally, the burner can fully mix the combustion gas and oxidizer before combustion.
- ◎ The burner meets the requirements of ultra-low NO_X emissions all over China which is conductive to the upgrading of existing equipment.

XPO ® Burner

◎ Staged combustion technology is applied in XPO® burner, and the burner does not need external FGR.
◎ There is also split design in addition to the integrated system which is suitable for the reconstruction site.

Environmental Features:

◎ Full power discharge: NO_X< 30mg/m^3 (3.5% oxygen).
◎ Combustion efficiency:100%.
◎ Excess air coefficient: 1.15~1.3.

Financial Features:

◎ The average fuel saving is 2-3% or more.
◎ The output power of the boiler can reach 100% of the design power.

Implementation Status:

◎ Domestic: Retrofit of 2 tons steam boiler for Wanchunyuan.
◎ Foreign:There have been successful cases in the United States.

Application Site and Emission Test Result

Large-scale Dairy Farm Sewage Classification and Treatment Technology

Category:

Coal combustion emission control & clean energy substitutes

Applicant:

Huameng Kechuang

Country:

China

Technology Overview:

◎ The large-scale diary farm sewage classifaction and treatment technology system consists of cowshed dung collecting and recycling module, circulating flushing module for waiting area of milking hal. The technology combined excrement and urine classification, rinse water circulation, warm temperature anaerobic fermentation, wastewater treatment technology, and achieved biogas production, cow bedding material, organic fertilizer production from cow excrement and urine with sewage discharge within standard.

◎ The anaerobic fermentation system include Pretreatment unit, Anaerobic fermentation Unit, Biogas storage Units, Biogas slurry treatment unit.

◎ The classification and treatment technology separate CIP rinse water from domestic sewage, reduce the amount of recycled water in the anaerobic fermentation system, and reduce the discharge amount of biogas slurry returning to the field.

◎ PLC automatic control system is adopted in the whole process, and the demand for equipment maintenance and operators is low.

Demonstration Project Site

◎ High-efficiency anaerobic fermentation strains is added into the middle-temperature anaerobic section. The system volume gas production rate to be stable at 1.2 - 1.6m^3 / m^3 d combing with the adjustment of inlet feed.

Environmental Features:

◎ It can handle 2000 t of cow excrement and urine per day and produce 15.8 million m^3 of methane per year.

◎ It can handle 350t milking parlour waste water and domestic sewage per day.

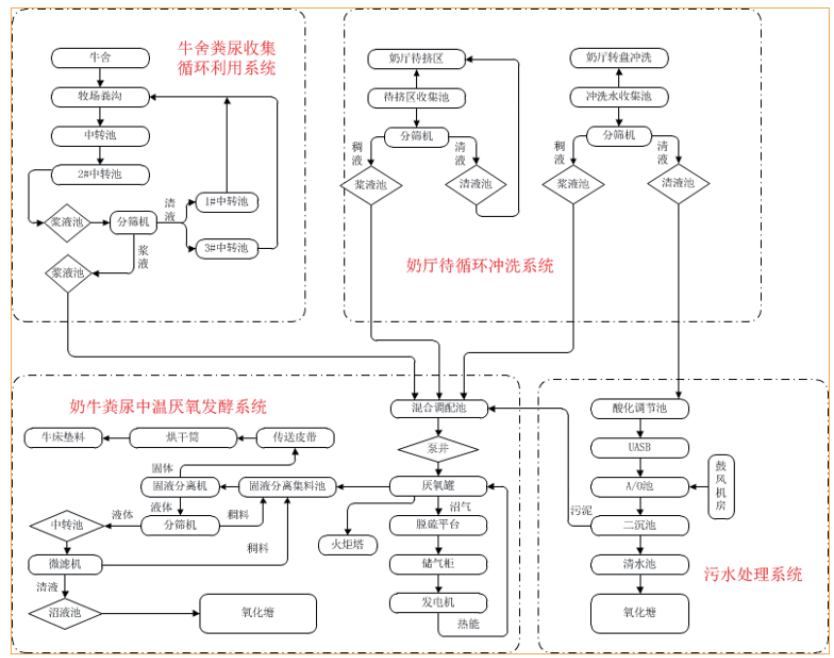
Financial Features:

◎ Lifespan of equipment in Hebei Wuqiang project is about 20 years.

◎ After the stable operation of the project in Hebei Wuqiang, the monthly net profit will be maintained at about 580,000, with an estimated annual net profit for 696 million yuan, the annual net rate of return is 15.8 %.

Implementation Status:

◎ A demonstration project in Wuqiang county, Hebei province is in operation.



Flow Chart

Bluetech Future Unicorn

Bluetech Future Unicorn has been established to encourage more start-ups and teams to shape a cleaner future. This year, the winner of Bluetech Future Unicorn is Electric Airplane technology from Ampaire Inc.

Electric Airplane

Applicant

Ampaire Inc.

Country:

United States of America

Technology Overview:

- ◎ The electric airplane applies existing aircraft technology and a new electric motor to carry passengers. A single electric motor plane can carry 5-9 people and a two motor plane can carry 19 people, which is suitable for short-distance trip.
- ◎ The main components of the power supply system: power pack, battery pack, command / control unit and cooling system.
- ◎ The system is equipped with electronic and manual emergency shutdown systems and backup software and electrical control units to meet the safety and performance requirements of the aircraft.
- ◎ Modular design: achieving a high level of safety and meeting the power, weight and volume requirements of various aircraft.
- ◎ Modular battery pack: higher battery pack voltage can be achieved by changing the module arrangement, and the battery pack is suitable for optimized motors with different input voltages.
- ◎ System fault response management: half of the components of the operating battery pack can be closed while the other half will keep working to make sure the flight arrive at the destination and land safely. In the case of complete failure of the electrical system, the aircraft has high longitudinal wings and high gliding ratio and can fly a long distance and land without power.

Environmental Features:

- ◎ Carbon dioxide Emissions: 1136.53 lbs/MWh.

Financial Features:

- ◎ The total cost is $ 17.6 per hour and the service life is over 20 years.

Implementation Status:

- ◎ Not yet applied.

Bluetech Future Star

Six technologies from 5 countries won the prize of 2018 Bluetech Future Star Award. Bluetech Future Star Award hopes to boost the development of clean air technologies that have great potential but are not yet commercialized or in the early stages of commercialization. This award covers all areas of clean air technology. The technologies and applicants are listed below.

Technology/Product	Applicant
Bi-Modal Real-Time Air Quality Solution	Clarity Movement Co.& Ramboll Group A/S
Modular Unit of Indoor Air Purification (MUIAP)	Air Liquide Group
Waterless Printing Technology to Enable Elimination of VOCs	Toray International (China) Co., Ltd.
Supercritical Carbon Dioxide Coating Apparatus	Kami Electronic Industry Co., Ltd.& Nagase Co., Ltd.
Cogeneration of Power and Heat	SunOyster Systems GmbH
Wearable Air Purifier	ATMOBLUE

Bi-Modal Real-Time Air Quality Solution

Applicant

Clarity Movement Co.& Ramboll Group A/S

Country:

United States of America

Technology Overview:

◎ Bi-Modal Real-Time Air Quality Solution (BRAQS) is an air quality solution which can achieve a real-time and high efficiency data analysis.

◎ Monitor unit is equiped with $PM_{2.5}$, PM_{10}, NO_2, O_3 , temperature and humidity sensor which is driven by solar energy with waterproof shell and a strong ability to reduce the effect of humidity and other factors. Real time data can be transferred to the Clarity Cloud platform by cellular data.

◎ Clarity Cloud: Clarity Cloud can calibrate the data through different algorithms of patented intelligent calibration technology which adapt to different regions' situation, and can also extend equipment life. Data visualization, storage, download and other functions and datas can be imported to other analysis tools through API interface at the same time.

◎ A 10m*10m real-time pollution concentration map is able to be established the data. Other variables can also be accounted in the system to improve data accuracy. These data can track pollution hotspots, predict future air quality and evaluate the emission reduction efficiency under the heavy pollution weather.

◎ BRAQS is easy to install. With a lower operation and maintenance cost, which is suitable for large-scale deployment.

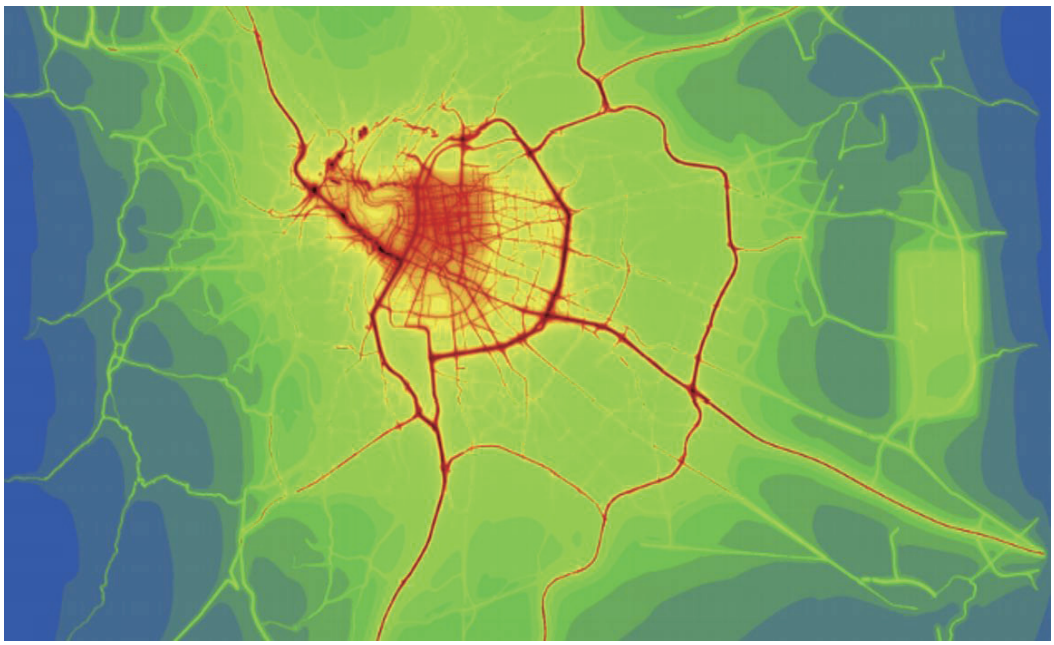
Sensor Module

Financial Features:

◎ Cost varies from different project.

Implementation Status:

◎ The applications plan has been applied and approved in more than 30 cities in 22 countries today.



NO_X Monitor Result in Lyons, France

Modular Unit of Indoor Air Purification (MUIAP)

Applicant

Air Liquide Group

Country:

France

Technology Overview:

- ◎ As a pilot solution for indoor air purification, our Modular Unit of Indoor Air Purification (MUIAP) system comprehensively addresses ventilated air within a building in order to reduce the concentration of CO_2 and pollutants in the indoor environment.
- ◎ Our solution uses CO_2, VOCs and formaldehyde adsorption filtration technology. It is based on temperature swing adsorption: an air treatment technology that Air Liquide has been using for a long time for industrial gases production. This process allows, via a solid material, to selectively capture gas molecules (volatile organic compounds, formaldehyde) while releasing clean air.
- ◎ Our solution is designed for use in commercial real estate and industrial buildings. The solution minimizes the supply of polluted outdoor air by replacing it with purified recycled air, thus reducing the energy consumption of the building.
- ◎ MUIAP is a modular adsorption system specifically designed to be easily integrated to any new or existing Heating, Ventilation and Air Conditioning (HVAC) system in a commercial building. It insures centralized treatment of an indoor air in the entire building. The solution can cover up to 2,000 m2 indoor area per module and reduce up to 40% HVAC energy consumption, depending on the climate and building architecture.
- ◎ The adsorption technology has an additional benefit: it allows capturing pollutants without cracking them. Unlike other technologies, no potentially harmful by-products are released. Another advantage of this technology relies in regeneration: the adsorbents are able to self-clean onsite at a very low energy cost, ensuring maximal efficiency all year round.
- ◎ Our solution contains numerous indoor air quality sensors that are connected to a "cloud" type interface. It allows a remote monitoring of the indoor air quality and the energy consumption of the equipped building.

Environmental Features:

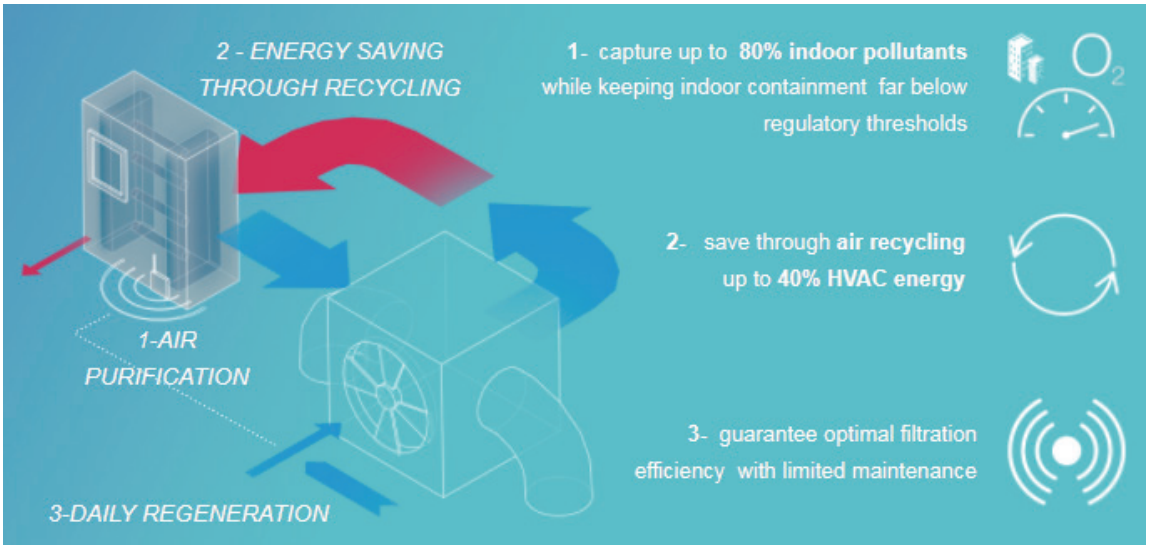
- ◎ Pollutant reduction: adsorption of up to 80% of CO_2, VOCs and formaldehyde.
- ◎ Up to 75 % Reduction of outside air intake with effects on energy, PMs and NO_X ingress.

Financial Features:

- ◎ Length of service: over 20 years.
- ◎ Maintenance: Manual check of fans and yearly replacement of sorbent cartridges.

Implementation Status::

- ◎ This pilot solution has been successfully tested in Air Liquide offices building in Lyon, France.
- ◎ Availability:Year 2020 at the earliest.



Modular Unit of Indoor Air Purification basic diagram

Waterless Printing Technology to Enable Elimination of VOCs

Applicant:

Toray International (China) Co., Ltd.

Country:

Japan

Technology Overview:

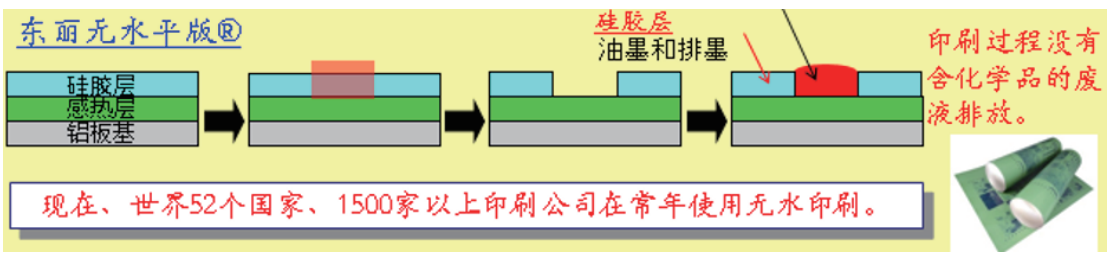
◎ The waterless printing technology without VOCs emissions replaces the solution contain high volatile organic compound (VOCs) in the traditional offset printing. Which can reduce VOCs emissions, waste water disposal and improve the environmental quality. Combine the waterless plate technology with anhydrous water-soluble ink and water system cleaning agent can achieve “zero” VOCs emissions throughout the printing process.

◎ No dampening solution: No dampening solution make the print density more stable, no water bar on print but have a good network reduction, improve the printing registration accuracy, shorten the preparation time, improve the paint color matches of the sample and reduce the printing quality complaints caused by dampening solution.

◎ The printing process will not generate waste liquid, as the result, the treatment costs can be saved.

◎ There is no VOCs emission, so do not require to install the end-of-pipe control and save cost and resource.

◎ Low energy consumption of waterless plate: Saving energy from water supply, waste water disposal, VOCs end-of-pipe control , etc.



Waterless Printing Principle Schematic

Environmental Features:

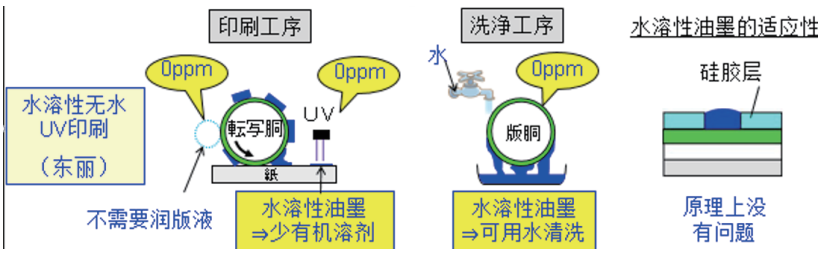
◎ The printing process does not require solution and zero VOCs emission from it.
◎ Water-soluble inks contain no solvent, no VOCs emission.
◎ Water-based cleaning solution, no VOCs emission.

Financial Features:

◎ Ink, printing plate and the plate-making machine should be used together. The plate-making machine cost 600,000 yuan, can work for 10 years.
◎ The price of Toray's consumables is 50-60% higher than ordinary consumables, and the ink cost 10-15% higher than ordinary consumables.

Implementation Status:

◎ Japanese printing companies including publishing books and printing companies, cosmetics and daily necessities packaging and printing companies, label printing companies, and web offset printing flexible packaging companies have applied the technology.



Waterless Printing Schematic

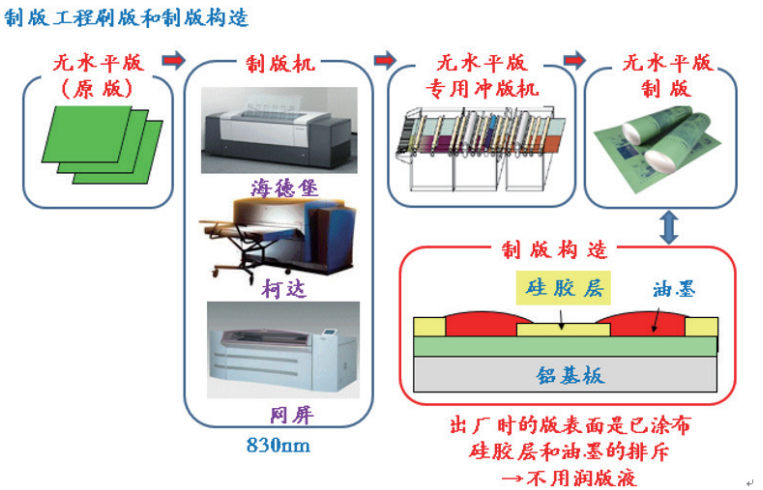


Plate Making

Supercritical Carbon Dioxide Coating Apparatus

Applicant:

Kami Electronic Industry Co., Ltd.& Nagase Co., Ltd.

Country:

Japan

Technology Overview:

◎ CO_2 is liquefy at certain temperature and pressure, at 31°C, 7.4 MPa, the increase temperature and CO_2 turns into a supercritical state . Liquid or supercritical Carbon dioxide in has strong dissolving capacity which can be used for coating. It is a supercritical carbon dioxide coating system.

◎ Coating system: according to the hydraulic mechanics optimizing the flow path design and theory of coating formula using solubility parameters. The coating efficiency can increase about 20%.

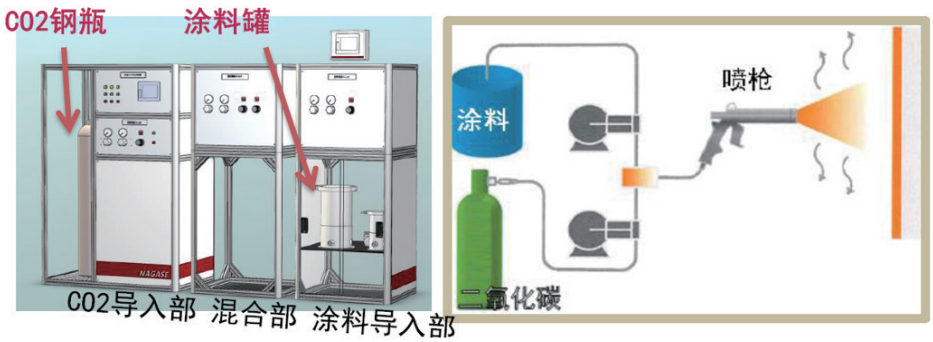
◎ Spray method: at the moment of spraying, the volume of supercritical or liquid carbon dioxide expands 400 times transfer to gaseous state. This expansion energy can promote the coating of the atomization. Using airless paint to promote the micronization and adhere to the surface of the sprayed object softly. Reducing air pressure rebound and improving adhesion rate.

◎ Increasing the coating rate can reduce 25%-35% of material cost and the effect of organic solvents.

◎ Keeping the high quality and good appearance of traditional solvent-based coatings without changing the indoor equipment and control conditions.

◎ Substrate suitability: the system is suitable for iron, stainless steel, aluminum, tin, metal materials, wood, PET, ABS, PP, acrylic and plastic materials.

◎ System applicability: the system is suitable for organic pigments, inorganic pigments and other composite categories.



System Composition Diagram

Environmental Features:

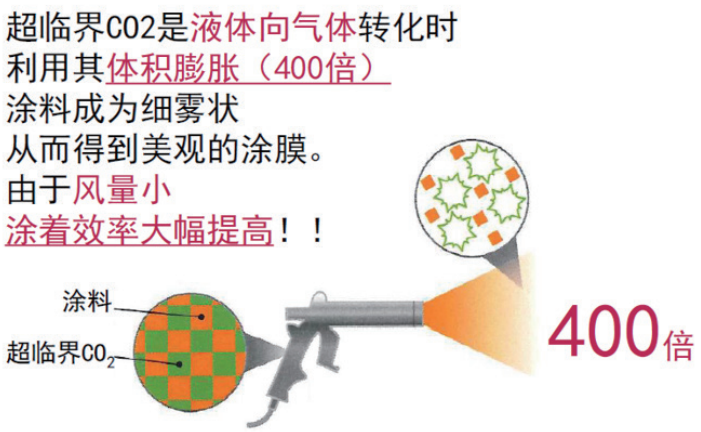
◎ 30-100% VOCs emission reduced during the coating process.
◎ The coating rate is increased to 50~90%, and the coating consumption is reduced by 25~35%.
◎ The highest paint utilization can reach to 90%.

Financial Features:

◎ No process modification is required, depending on the size of the device, cost is approximately 120~150 million.
◎ Estimated payback period less than 1 year.

Implementation Status:

◎ There are applications in the subsidiaries of Kami Electronic Industry Co., Ltd.



Supercritical CO_2 coating characteristics

Cogeneration of Power and Heat

Applicant:

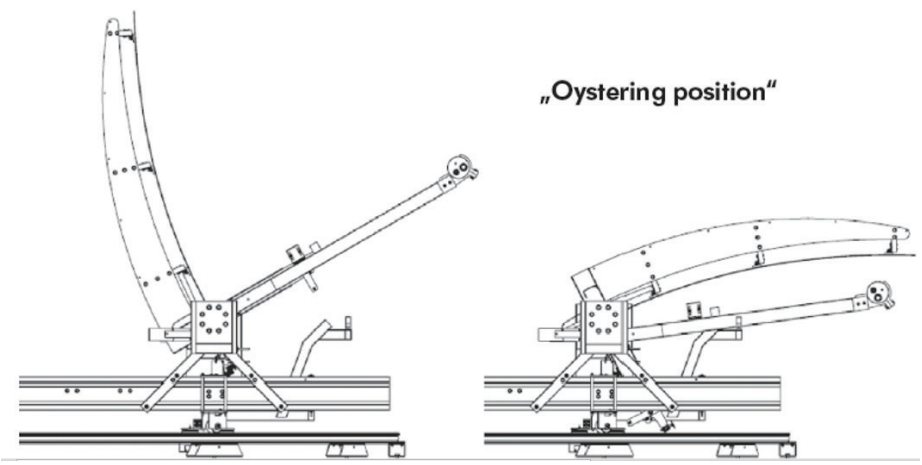
SunOyster Systems GmbH

Country:

Germany

Technology Overview:

- ◎ Congeneration of power and heat system is a concentrated solar collector, which can generate high heat energy and electric energy in one unit at the same time. By tracking the sun with a parabolic mirror of 16 square meters and concentrating the solar energy on the receiving tube, the overall energy utilization rate is 75 %. It is suitable for hot water, heating, swimming pool and other scenes with heat demand.
- ◎ Congeneration of power and heat system‘s core component is a hybrid receiver, which combines concentrating solar power generation (CSP) and concentrating photovoltaic power generation (CPV) to realize efficient collection of solar energy by using dual-axis tracking trough concentrating technology.
- ◎ The receiver is protected by a nitrogen-filled borosilicate glass tube, which is refocused through a special glass lens and is 500 times more powerful than solar energy.
- ◎ Congeneration of power and heat system is light in structure and can meet the load-bearing limit of most roofs. It can be placed on rails and is not limited by the ground conditions of complex reinforced concrete structures. Additionally, it can be opened and closed to adapt to the windy environment in winter.
- ◎ Thermal power: 7.5 kW; The power generation is 4.7 kW, and the photoelectric conversion efficiency can reach 44 %.
- ◎ Every m^2 of ground surface can provide 163 W of electric power and 132 W of heat and the energy density collected per unit area is 295 W / m^2 in total.



Schematic Diagram of the Working and Closing States of the Devicel

Financial Features:

◎ Cost is depended on the actual project.

Implementation Status:

◎ There are applications in Germany and zhangjiakou, China.

Application Site Picture

Wearable Air Purfier

Applicant:

ATMOBLUE

Country:

China

Technology Overview:

◎ Wearable Air Purifier is designed with double fans and double air filters. The user can get enough air flow through the fan and air duct regulation, with the maximum air flow of 88L / min. With two 850 mA large-capacity batteries, the maximum battery life of the product can reach 8 hours. The product PCB is equipped with intelligent algorithms, which rely on gyroscopes to monitor human motion in real time and adjust air volume to achieve comfortable air supply and energy saving.

◎ Intelligent Scene Respiration System iO2 System: the intelligent automatic air supply with APP system, calculates different air supply modes according to the maximum oxygen intake and supports manual adjustment.

◎ Special fan and customized air duct: with double ball bearing fan, the service life can reach 50,000 hr, the gentle air flow in the mask is gentle will be changed 5 times per second.

◎ H13 level HEPA filtert: 99.9 % of filter efficiency. An APP is used for data monitoring and collection to track filter element usage and remind replacement.

◎ Protection performance: the protection efficiency can reach more than 98 %, and the maximum air volume can reach 88 liters / minute.

◎ Comfort and sealing are no longer in opposition: the design of wearing rope and silica gel makes the weight distribution of the product even and ensures the sealing all the time.

◎ Personalized and modular design: the cover, wearing cord and HEPA filter element can be replaced.

Appearance of the Air Purifier

Environmental Features:

◎ Specs of the air purifier

	Filter Standard 滤芯标准	Filtration Rate 过滤效果	Purification Level 防护等级	Protective Performance 防护效果
ATMOBLUE	**H13**	99.95%	A Class	**98%** (MAX speed)
GB2626-2006	KN95/KP95	95%	KN95 Leakage Rate	89% (Leakage Rate ≦ 11%)
GB32610-2016	I Class	99%	A Class	90%

Financial Features:

◎ Retail price at JingDong is 598 yuan per unit.

Implementation Status:

◎ Started retailing in November 2017.

Internal Structure Diagram

4th Bluetech Award Finalists

In the 2018 Bluetech clean air technology campaign, 15 technologies entered finalists. The technologies and applicants are listed below.

Technology/Product	Applicant
Coal combustion emission control & clean energy substitutes (non-power sector)	
Clean Square Honeycomb Briquette + Dedicated Matched Stoves	Inner Mongolia Xinhongqing Energy Technology Development Co.,LTD.
Diesel engine emission reduction technologies & clean energy substitutes	
Genset Emission Treatment System	Best Purifying Equipment Limited
AFC Fuel Cell	GenCell
Baotou Goodoing industrial Engine Technology	Baotou Goodoing industrial Engine Technology
OILTAC	Alpstec Limited
Indoor air pollution control	
AQIFD	Diesel engine exhaust Treatment SCR sysytem
Smart Fresh Air Purification	Beijing Loveair Science and Technology Co. Ltd.
Kitchen exhaust filtration system	MayAir Technology (China) Co., Ltd.
Thinpair Photocatalyst Air Purification Disinfector	Dalian Thinpair Technology Co., Ltd.
Sight Plants Indoor Cyclic Growing And Natural Oxygen Making System	Beijing FreshAir Space Technology Development Co, Ltd.
Air Comprehensive Treatment System Based On Electrostatic Dust Removal Technology	BEIJING ORIENT INSTITUTE OF MEASUREMENT AND TEST
Advanced pollution source and air quality monitoring	
SyPAC	ECOLOGICSENSE
Photoionization Detector for Volatile Organic Compound	Honeywell
Laser Vehicle Emission Remote Sensing System	Dopler Eco Technologies Co., Limited
VOCs substitution, monitoring and pollution prevention	
Waste Degradation Using Microwave Plasma Torch	Tsinghua University Dept. Electrical Engineering Startup Team

Previous Winners

1st Bluetech Award Winners

Technology	Applicant
Diesel Engine Pollution Control Technology	
Multi Functional Diesel Performance Additive	Total Petroleum (Shanghai) Co., Ltd.
Diesel Particulate Filter System	Wuxi Weifu Lida Catalytic Converter Co., Ltd.
VOCs Pollution Control Technology	
Low Emission Control Technology for Valves	Garlock Sealing Technologies (Shanghai) Co., Ltd.
Indoor Air Purfication Technology	
Mayair Electric-Pocket Technology	Mayair Technology (China) Co., Ltd.
EKEAIRTM MKJ-4000 Air Purfication Disinfector	Jiaxing Sanyin Environmental Purfication Technology Co., Ltd.

2nd Bluetech Award Winners

Technology	Applicant
Diesel engine emission reduction technologies & clean energy substitutes	
Air Powered Start-up System	Shanghai ShenZhou Vehicle Energy Saving & Environmental Protection Co., Ltd.
Ammonia Storage and Delivery System (ASDS)	Faurecia China
Ultra-low emission* control for coal-fired power plants	
The deep desulphurization technology of flue gas by slurry atomization and swirl flow field	Beijing Chutian ruiping Environmental Technology Co.,Ltd
Coal combustion emission control & clean energy substitutes (non-power sector)	
Zeta Electrode Boiler	Beijing Zeta Energy Technology Corp.
Indoor air quality monitoring and air purification	
Intermetallic compound Parer-like membrane air purification technology	Intermet Techonology Chengdu Co., LTD.
Escaping current particle measurement	Pegasor Oy

3rd Bluetech Award

Technology/Product	Applicant
Coal combustion emission control & clean energy substitutes (non-power sector)	
Catalytic Candle Filter (CCF) Technology for Multi-Pollutant Exhaust Emissions Control	Dürr Paintshop Systems Engineering (Shanghai) Co.,Ltd.
Comprehensive Utilization Technology of Low Temperature Waste Heat Recovery of Blast Furnace Slag Flushing Water and Steam	Beijing IVYQUEN Energy Saving Technologies Ltd.
Integrated Condensing Gas Boiler Technology	Suzhou Boehmer Thermo Products Co.,Ltd.
VOCs substitution, monitoring and pollution prevention	
Improved Vapor Recovery Unit	SYSTEM ENG SERVICE CO.,LTD. Japan
Advanced pollution source and air quality monitoring	
Fast, Multi-point Magnetic-sector Mass Spectrometry VOCs Online Monitoring System	Thermo Fisher Scientific Inc.
Environmental Air Quality On-line Monitoring System	ShangHai DST Technology Co., Ltd.

Bluetech Clean Air Alliance

Bluetech Clean Air Alliance (BCAA) is a non-profit professional organization focusing on the development of clean air technologies and industries in China and the world through technology transfer, technology assessment and demos, investment service, IP protection, and policy research. BCAA is evolved from the Clean Air Alliance of China, an integrated platform launched in 2013 by 10 leading Chinese research institutions to tackle China's severe air pollution problem. Over five years' operation, the Alliance has conducted and participated in various clean air research projects, carried out pilot projects in 10 provinces and cities in China, published 46 policy and market research reports, assessed nearly 300 advanced clean air technologies from 20 countries, and established collaborations with partners across 20 countries.

中关村创蓝清洁空气产业联盟
BLUETECH CLEAN AIR ALLIANCE

+86-10-65155838

bluetech@iccs.org.cn

www.cleanairchina.org

Suite 709, East Ocean Center, 24A Jianguomenwai Street, Beijing 100004