The 10th Asia-Pacific Ecological Industry Forum Shenyang-Kawasaki Atmospheric Environmental Monitoring Research Cooperation

Shenyang Environmental Monitoring Center

February 2014

沈阳市环境监测中心站
SHENYANG ENVIRONMENTAL MONITORING CENTER

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Brief introduction of the Monitoring Center-
Main Responsibilities

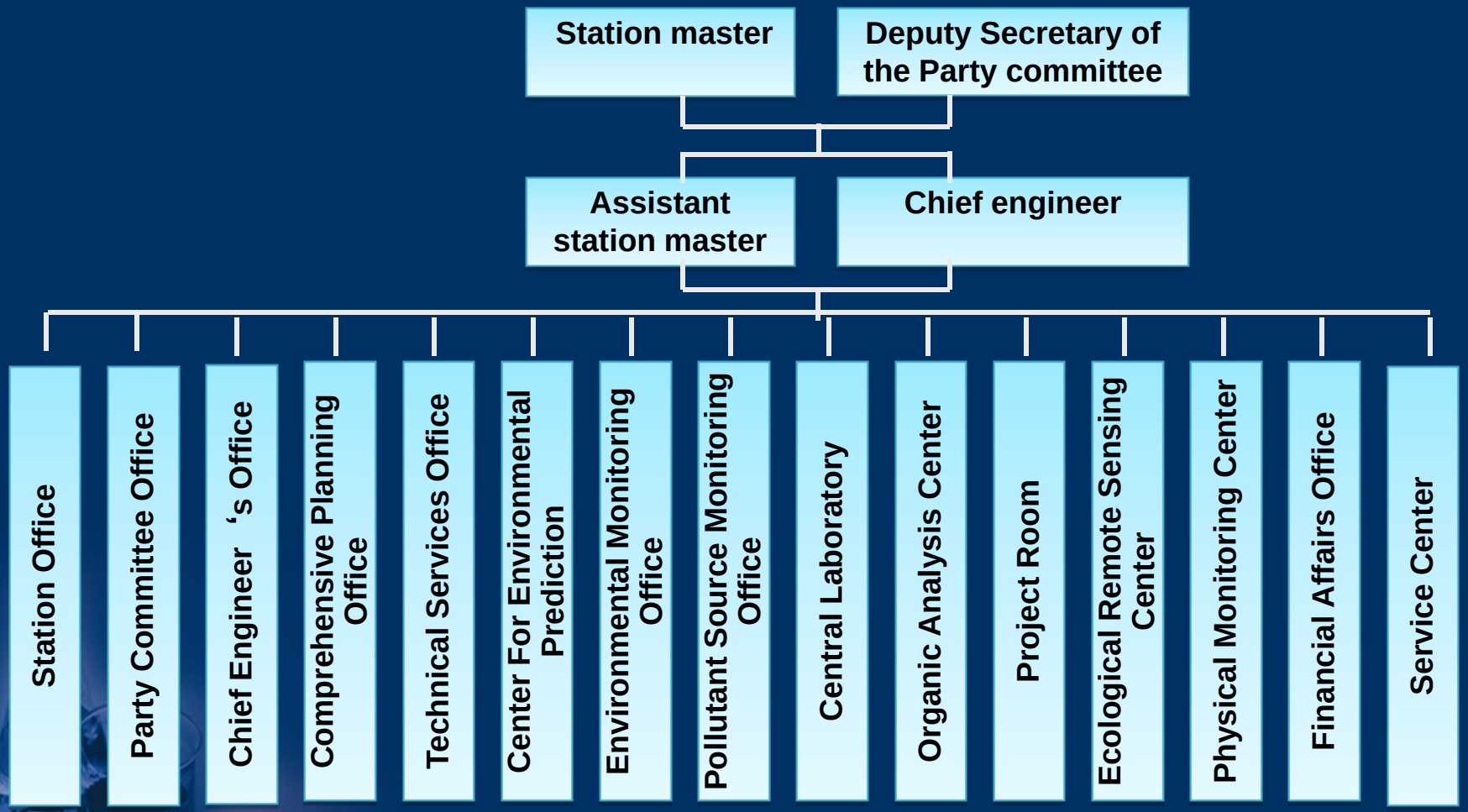
The Shenyang Environmental Monitoring Center was founded in 1975 and affiliated with the Shenyang Environmental Protection Bureau, which is responsible for monitoring of water, gas, noise, electromagnetic wave, radioactivity, biology, ecology, coal, solid wastes, various kinds of pollutant sources, indoor environment as well as construction materials and emergency monitoring of environmental pollution accidents. The center provides evidence for the government to implement environmental management and construction decisions and comprehensive services for society to prevent environmental pollution.

Brief introduction of the Monitoring Center:

Structure of members

The specialists in the Monitoring Center account for 80.2% who are specialized in 30 majors including chemical engineering, inorganic chemistry, organic chemistry, environmental engineering, hydro-geology, geophysics, atmospheric physics, meteorology, medical science, computer science and so on.

Brief introduction of the Monitoring Center:
Institutional structure

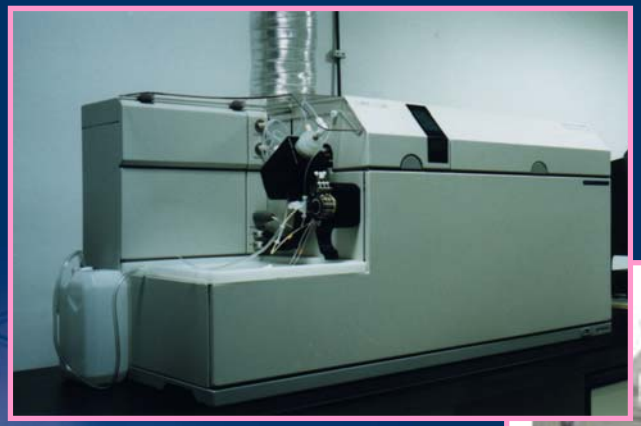


Brief introduction of the Monitoring Center:
main qualifications

- National laboratory approved by People's Republic of China
- Identified measurement unit in Liaoning Province
- Laboratory for national environmental standard sample's constant value
- Identified agency of Chinese environmental symbol products test
- Environmental test agency of pollution-free place of origin in Liaoning Province
- Environmental test agency of the national production place for green food
- Test and technical consultation agency of the national organic food production place
- "Shenyang indoor environmental Monitoring Center" approved by the editorial advisory board
- "Environmental monitoring laboratory" for civil building engineering acceptance granted by the Construction Department in Liaoning province

Brief introduction of the Monitoring Center:
hardware capabilities

The area of the temporary test office buildings of the Shenyang Environmental Monitoring Center at present is 6,400 square meters and the total amount of the monitoring analytical facilities reaches more than RMB50 million. The center has about 600 sets of various kinds of monitoring equipment including Summa canister, gas chromatography-mass spectrometer, liquid color spectrum, and ICP-MS as well as 10 environmental monitoring vehicles, 1 emergency pollution accidents monitoring vehicle and 1 automatic atmospheric monitoring vehicle respectively at present; which reaches the advanced level of the national key station.



Brief introduction of the Monitoring Center:
main jobs

Monitoring on quality of environmental air: there are totally 11 atmospheric automatic monitoring sub-stations in Shenyang (including the super sub-station) as well as the central station, with the monitoring items including inhaled particles, SO_2, nitrogen oxide, CO, ozone, greenhouse gases, sand storm, organics as well as related meteorological parameters and so on; daily forecasts on environmental quality of air; routine monitoring of rainfall, dust-fall as well as negative oxygen ion.

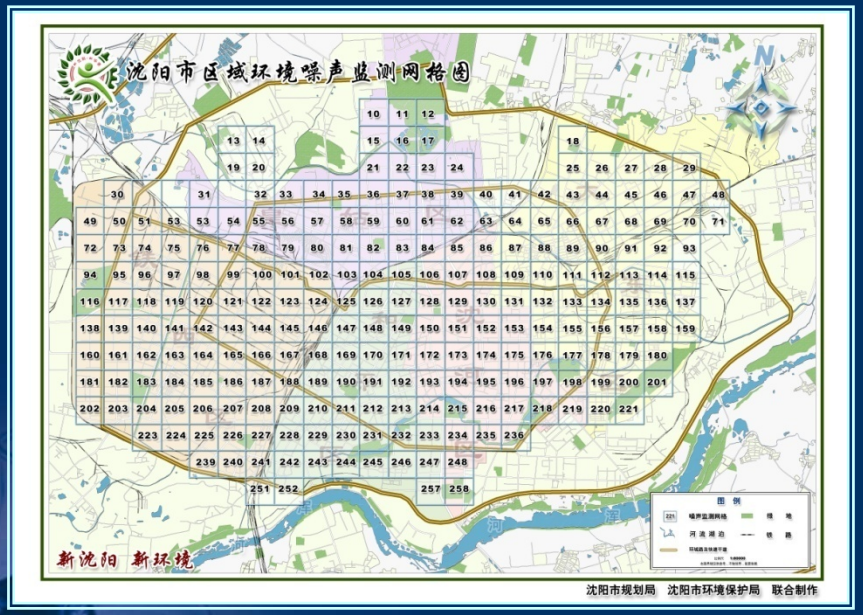
Brief introduction of the Monitoring Center:

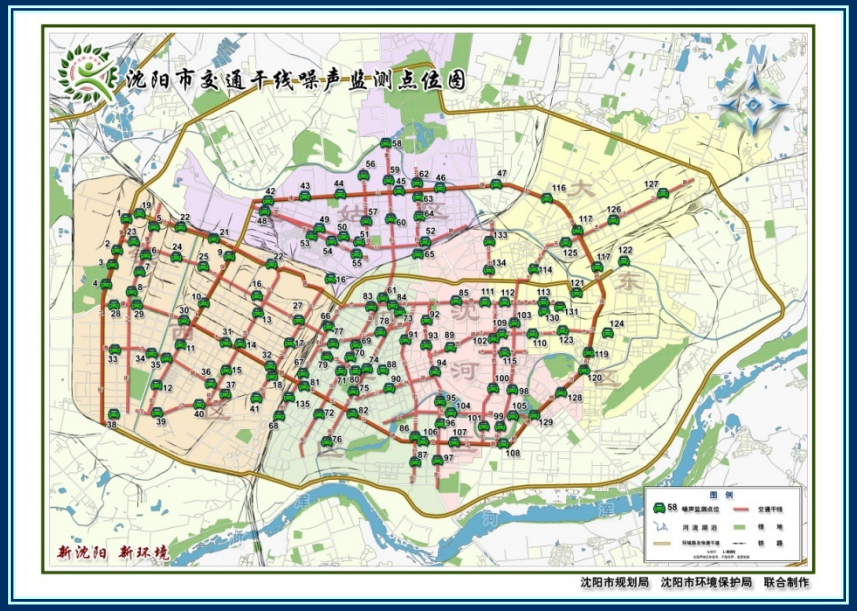
main jobs

Quality monitoring of water environment: Automatic monitoring on quality of Hunhe River in the jurisdiction of Shenyang, routine monitoring on main stream of Liaohe River and 9 tributaries, main stream of Hunhe River and 5 tributaries, Beishahe River, lakes and reservoirs, city drainage canals, city drinking water as well as underground water.

Brief introduction of the Monitoring Center:
main jobs

Monitoring on environmental quality of sound: routine monitoring on environmental noise and traffic noise in the jurisdictional area as well as noise in the functional area.





Brief introduction of Monitoring Center:
main jobs

Ecological monitoring: hydrobiontic algae and benthic animals, fecal coliform bacteria in the jurisdictional area, total coli group in waterworks; fecal coliform bacteria in sewage disposal work.

Developing evaluation on ecological environment situation based on remote sensing monitoring technology; soil environment monitoring as well as environment monitoring in rural area.

Brief introduction of the Monitoring Center:
main jobs

Pollutant source monitoring: supervisory monitoring on wastewater, waste gas as well as key heavy metal pollutant source enterprises and sewage treatment plants in the jurisdictional area.

Brief introduction of the Monitoring Center:
main jobs

Sudden pollution accident emergency monitoring: setting up scientific and perfect emergency monitoring system, responsible for emergency monitoring on sudden environment pollution accidents in the jurisdictional area.

Brief introduction of the Monitoring Center:
main achievements

Main achievements since 2006 until present:

• "The national environmental science base" granted by the national Ministry of Environmental Protection and the Ministry of Science and Technology in 2010.

• Passed the acceptance of the "national environmental protection atmospheric organic pollutants monitoring analysis key laboratory" in 2010

• Responsible for the national ozone pilot project, national sand storm pilot project, national green house gases pilot project since 2008

• Revision works of 38 national environmental protection rules and standard methods

• National environmental protection public welfare industries research project "Research on environmental monitoring data quality control technical system"

• National environmental protection public welfare industries research project "Research on atmospheric pollution comprehensive forecasts and evaluation techniques in industrial accumulation area"

• National environmental protection public welfare industries research project "Research on road traffic noise monitoring and new evaluation methods"

• Sub project of the water pollution control and governing of key national scientific project (water project) "Risks evaluation of water environment quality and demonstration of early warning techniques of Liaohe River in Shenyang"

•38 city level research projects including "Research on development of environmental air quality monitoring and forecasts, evaluation and early warning system in Shenyang"

Atmospheric Monitoring and Research:
execution of new standards

In Feb 29th, 2012, the Environmental Protection Department and the National Bureau of Quality jointly published the standard of environmental air quality (GB3095-2012) together with the new standards, and the Environmental Protection Department published the Air Quality Index (AQI) technical rules which regulate the requirements of implementation of new standard by stages.

Level 1

Beginning to monitor the key areas such as Beijing, Tianjin, Hebei province, Yangtze River Delta, Pearl River Delta, municipalities as well as provincial capitals in 2012

Level 2

Beginning to monitor 113 key environmental protection cities and examples in 2013

Level 3

Beginning to monitor in all cities above prefecture-level in 2015

Atmospheric Monitoring and Research: implementation of new standards

Differences between new and old standards

	New standards GB3095—2012	Old standards GB3095—1996
Environmental air functional area	Second degree subarea (the industrial area merged with the second degree area)	Third degree subarea
Changes in evaluation methods	Air quality index（AQI）	Air pollution index（API）
Increase in evaluation projects	**Increased to 6 kinds with the addition of $PM_{2.5}$, CO and O_3**	Only 3 kinds of pollutants including PM_{10}, SO_2 and NO_2
Strictness and addition of limits of concentration for part of pollutants	The annual value of PM_{10} is limited to 70 microgramme/stere and the annual value of NO_2 is limited to 40 microgramme/stere, added the average limit of concentration of $PM_{2.5}$ and average limit of concentration of ozone for 8 hours	The annual value of PM_{10} is 100microgramme/stere and annual value of NO_2 is 80 microgramme/stere
Effectiveness of data	**20 hours per day and 27 days each month**	12 to 18 hours per day and 21 days each month
Analytical method of pollutants	Updating part of the pollutant analytical method and adding automatic monitoring and analytical method	No national standard of automatic monitoring
Implementation of regulation of standard	Key cities that are not up to the standard shall draw up and implement standard planning according to the law.	No relevant requirements

Atmospheric Monitoring and Research:
implementation of new standards

Differences between new and old standards

New standards		Old standards	
Evaluation items	Annual concentration limits（mg/m³）	Evaluation items	Annual concentration limits（mg/m³）
PM_{10}	0.070	PM_{10}	**0.100**
SO_2	0.060	SO_2	0.060
NO_2	0.040	NO_2	**0.080**
$PM_{2.5}$	0.075		
Daily maximum average of O_3 for 8 hours	0.160		
Average of O_3 for one hour	0.200		
CO average for 24 hours	4		

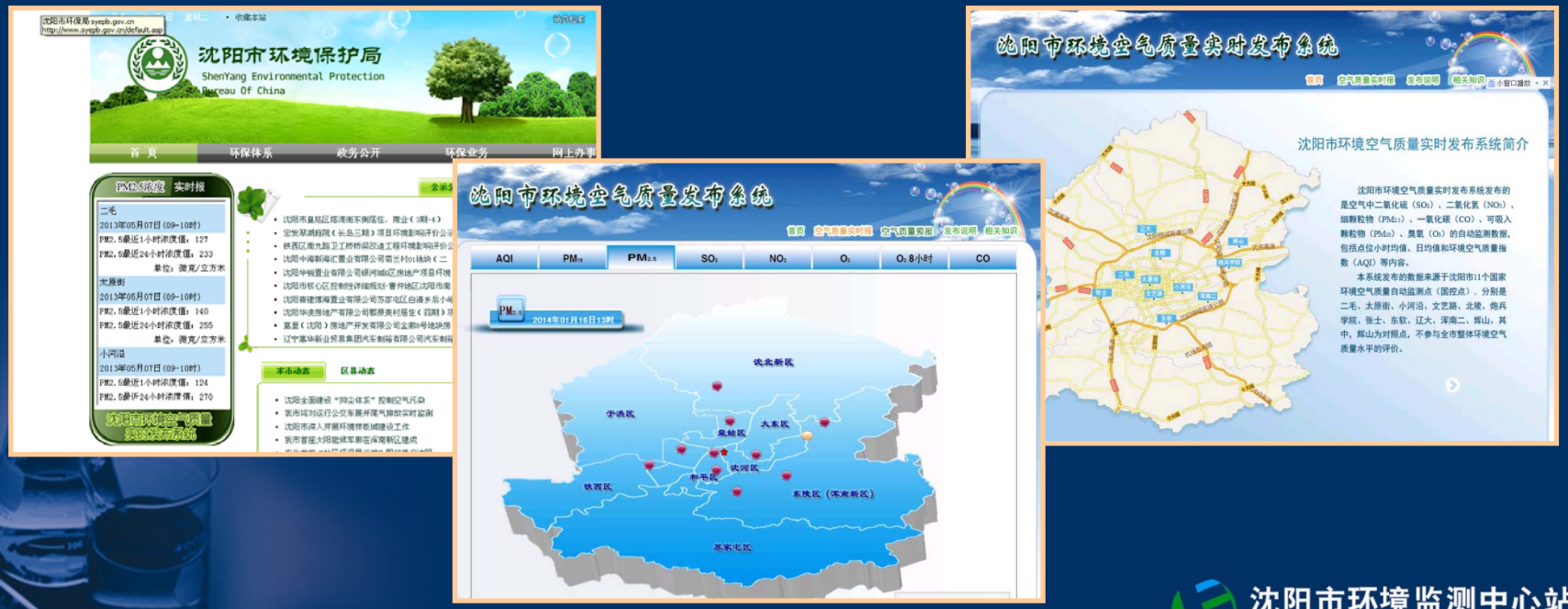
Atmospheric Monitoring and Research:
implementation of new standards

AQI Index Grading

Air quality index	Degrees of air quality index	Air quality index categories and colors		Effects on health	Measures suggested
0～50	First degree	Excellent	Green	The air quality is satisfactory and basically no air pollution	Vairous groups can have some normal activities.
51～100	Second degree	Good	Yellow	The air quality is acceptable but some pollutants may have some weak effects on a very few sensitive groups.	Few sensitive groups shall reduce the outdoor activities.
101～150	Third degree	Slightly polluted	Orange	Symptom for sensitive groups is slightly worsened and irratation for healthy humans	Children, the elderly as well as heart disease and respiratory system patients should reduce outdoor activities for long time and high strength.
151～200	Fourth degree	Middle level pollution	Red	Further wosen the symptom for sensitve groups and may have effects on heart and respiratory system of healthy people	Children, the elderly as well as heart disease and respiratory system patients should avoid outdoor activities for long time and high strength, common people shall reduce the outdoor activities.
201～300	Fifth degree	Serius pollution	Purple	Symbtom becomes obviously severe for heart disease and pneumonopathy patients, reduction in endurance and common symptom for healthy groups	The elderly and heart disease and pneumonopathy patients should stay indoors and stop outdoor activities, common people shall reduce outdoor activities.
>300	Sixth degree	Severe pollution	Brown	Reduction in endurance for healthy people, obviously strong symptom and some illness appeared in advance	The elderly and patients shall stay indoors and avoid physical output, common shall avoid outdoor activities.

Atmospheric Monitoring and Research: implementation of new standards

As one of the 74 key cities to implement the new standards of environmental air quality at the first stage across the nation, Shenyang officially implemented the new standards of environmental air quality in 2013. From Jan. 1, 2013, the 11 automatic monitoring points began to monitor the air quality on total 6 kinds of pollutants including PM2.5, PM10, SO2, NO2, CO, and O3, and published the results over the Internet to meet the public right to know and supervision about the environment.



Atmospheric Monitoring and Research:
present situation of environmental air quality

The number of days that met the standards in the year 2013 totals 215 days, which accounts for 58.9% of the total days of one year. The chief pollutant is mainly the particle matter (PM2.5) .

Atmospheric Monitoring and Research:
environmental air quality forecasts

Using environmental air quality monitoring data and meteorological data, the Shenyang Environmental Monitoring Center has established the air quality forecasts model of Shenyang and use the model for starting forecasts. The forecast of environmental air quality in the future 24 hours has been published through various kinds of media such as TV, radio station, website as well as micro-blog. Based on statistic forecasts model and joint meteorological forecasts, the center is gradually exploring the development of 3-day and 7-day forecasts.

Atmospheric Monitoring and Research:
atmospheric organic key laboratory

In 2010, the Shenyang Environmental Monitoring Center passed the acceptance of the "national environmental protection atmospheric organic pollutants monitoring analytical key laboratory". According to the requirements of the national atmospheric organic pollutants monitoring analytical key tests, the laboratory shall focus on application foundation research and basic works in the environmental monitoring research area, developing research on the atmospheric organic pollutants monitoring techniques system; evaluation index system of atmospheric organic pollutants and organic pollution evaluation model, method research; research on environmental air organic pollution situation in typical areas; research on organic pollution from some typical pollutant sources such as exhaust from automobiles, petrochemical industries, pharmacy as well as organic chemical industries.

Atmospheric Monitoring and Research:
atmospheric organic key laboratory

Key research direction at present: to determine the research direction directed at the specific problems that need to be solved in atmospheric organic pollution environmental monitoring and management by combining already existing research foundation based on the research direction in plan:

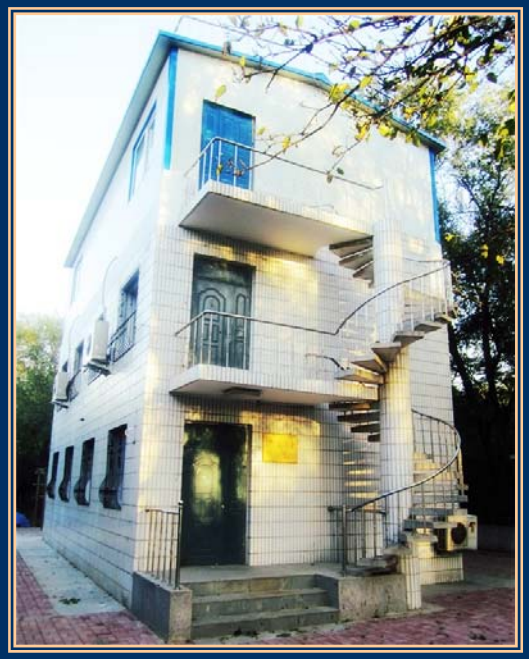
1. Developing research on atmospheric organic pollution monitoring analytical techniques;
2. Developing research on atmospheric organic pollutants monitoring quality guarantee and quality control system;
3. Developing research on situation of environmental air organic pollution in typical area.

Atmospheric Monitoring and Research:
atmospheric organic key laboratory

Capacity establishment - at present the laboratory has formed overall analysis capacities in 6 categories for a total of 157 kinds of atmospheric organic pollutants such as VOCs, aldoketones, PAH, organochlorine pesticide, Titanate as well as polychlorinated biphenyl and so on in environmental air and exhaust gas.

Atmospheric Monitoring and Research:
atmospheric organic key laboratory

Capacity establishment - establishing atmospheric organic automatic monitoring and early system, including organic gases monitoring module, greenhouse gas monitoring module, routine 5 parts of environmental air monitoring module, forming automatic monitoring capacity about 77 kinds of pollutants.



Atmospheric Monitoring and Research: research achievements

Developing revision projects about 22 atmospheric national environmental protection rules and standard methods, in which 9 standards have been published by the Environmental Protection Department.

No	Name of projects	Standard numbers	Publishing time
1	enviromental air determination of ozone natrium indigotinum disulfonicum spectrophotography	HJ 504-2009	2009-10-20
2	environmental air determination of nitrogen oxide naphthyl ethylenediamine dihydrochloride spectrophotography	HJ 479-2009	2009-09-27
3	environmental air determination of fluoride membrane sampling fluorinion ISE method	HJ 480-2009	2009-09-27
4	environmental air determination of fluoride lime filter sampling fluorinion ISE method	HJ 481-2009	2009-09-27
5	environmental air determination of SO_2 formaldehyde absorption-Pararosaniline spectrophotography	HJ 482-2009	2009-09-27
6	environmental air determination of SO_2 four chloromercuric salt absorption-Pararosaniline spectrophotography	HJ 483-2009	2009-09-27
7	environmental air and exhaust gas determination of ammonia nessler reagent spectrophotography	HJ 533-2009	2009-12-31
8	environmental air determination of ammonia chloros-ortho-hydroxybenzoic acid spectrophotography	HJ 534-2009	2009-12-31
9	environmental air determination of ozone uv spectrophotometry	HJ 590-2010	2011-01-01


HJ

中华人民共和国国家环境保护标准

HJ 479—2009

代替 GB/T 15436-1995 和 GB 8969-88

环境空气 氮氧化物(一氧化氮和二氧化氮)的测定 盐酸萘乙二胺分光光度法

Ambient air—Determination of nitrogen oxides

—N-(1-naphthyl)ethylene diamine dihydrochloride

spectrophotometric method

(发布稿)

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环　境　保　护　部　发布


HJ

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HJ 504-2009

代替 GB/T 15437—1995

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Ambient air—Determination of ozone

—Indigo disulphonate spectrophotometry

(发布稿)

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Atmospheric Monitoring and Research:
research achievements

Shenyang has been responsible for the national ozone pilot project, national sand storm pilot project, and national greenhouse gases pilot project since 2008. Shenyang has formed relatively complete environmental air monitoring, quality guarantee and analytical system at present. And Shenyang has accomplished the national environmental protection public welfare industries special fund project "Research on atmospheric pollution comprehensive forecasts and evaluation techniques in industrial accumulation area", and the subject sets the industrial accumulation area in Northeast as the example to develop the research on area atmospheric pollution comprehensive forecasts. Also Shenyang has accomplished some city level research such as "Research on development of environmental air quality monitoring and forecasts, evaluation and early warning system in Shenyang" and "Research on Shenyang economic zone environmental air quality forecast integration".

Atmospheric Monitoring and Research:
research achievements

Developing

- Shenyang area-characteristic particle source analysis and research on countermeasurs of pollution control .
- Environmental air particle PM2.5 source analysis and research on countermeasurs of pollution control in Shenyang .

Direction of Atmospheric Environmental Cooperation

1. Forecast on environmental air quality. We are forecasting the environmental air quality with statistics, mainly adopting two models including linear regression model and weather conditions model to make forecasts about the air quality. These two models mainly depend on a large amount of historical data and meteorological data while we are only beginning to monitor the new standard PM2.5 of environmental air quality and the historical data is only one year available, therefore the work is just beginning from January 2014.We will begin to develop the numerical model forecasts the next step and we wish to learn some advanced experiences.
2. We wish to learn some relevant advanced experiences and techniques in resource analysis of particles. At present we are developing the analysis of source of particles with receptor model and the results of analysis is the primary situation of pollutants, and we wish to analyze the secondary transformation of pollutants (PM2.5), accurately recognize and analyze the contribution value and share rate of various sources, key industries and sources for environmental air particles and provide scientific evidence for developing particles pollution control.

We welcome your valuable comments!