

STATUS QUO OF AIR POLLUTION CONTROL AND COUNTERMEASURES IN SHANGHAI

Zhang Quan
Deputy Director,
Shanghai Municipal Bureau of Environmental Protection

1 General Description

Shanghai is the most important industrial base as well as the financial and trade center of China. The city covers an area of 6,340.5 square kilometers and has a population of 14.74 million. The annual consumption of coal and fuel oil in the city is 39.59 million tons and 10.00 million tons, respectively. With the social and economic development air pollution caused by coal burning is under control step by step by adjusting of energy structure, industry restructuring and strengthening comprehensive environmental rehabilitation. Air pollution, however, caused by petrol combustion has a rising trend with the ever-increasing number of motor vehicles. So Shanghai should pay more attention to air pollution caused by coal burning and by petrol combustion in next stage.

2 Status Quo of Air Pollution Control

2.1 Ambient air quality

The monitoring results show that SO₂ and TSP concentration caused by coal burning in the central urban area are decreasing year by year, down 58.5% and 44.2% in recent decades, respectively. NO_x concentration caused by motor vehicle up 32.3%. In 1999, the average concentration of SO₂, TSP, NO_x in the urban area are 0.044mg/m³, 0.168 mg/m³, and 0.099 mg/m³, respectively.

2.2 Pollutant emission

The energy structure of Shanghai is mainly coal. The coal consumption in 1999 reached 39.59 million tons, which accounts for 68.8% of the primary energy.

The total of SO₂ emission in Shanghai reached 403,100 tons in 1999, in which 186,400 tons was from power industry, accounting for 46.2%; 124,500 tons from other industrial sources, accounting for 30.9%; and 922,000 tons from domestic sources, accounts for 22.9%. The total dust emission amounted to 135,700 tons annually.

NO_x emission in Shanghai is mainly from stationary sources and mobile sources. The total NO_x emission from stable sources in Shanghai reached 275,000 tons in 1998, in which 58% from power plants, 25% from industrial furnaces and processes, 14% from middle and small boilers and 3% from residential and agriculture. The total NO_x emission from mobile sources reached 102,000 tons, in which 86% from motor vehicles, 13% from boat, 1% from train and 1% from airplane.

3 Control Measures

3.1 Adjusting energy utilization structure and layout

Although the total amount of coal burning in Shanghai has been increasing since 1990s, the distribution and utilization have been changed. The pollutant emission in the central urban area decreased sharply by adjusting industry structure. The utilization ratio of coal to the primary energy was reduced from 75% to 68.8% in early 1990s by using cleaner energy, the annual coal consumption of low stacks in the central urban area was reduced to more than 50 million tons. The sulfur content in coal was controlled. The average sulfur content of coal in Shanghai was reduced less than 1% in which that of power industry was reduced from 1.4% to 0.8%. The use of town gas raised to 98.3% of households in 1998 from 86.6% in 1995.

3.2 Enforcing industrial sources in compliance with the emission standards

There are 3,702 enterprises listed in industrial pollution sources emission inventory. These enterprises should be in compliance with the standards by October 2000; in which there are more than 1,000 enterprises should treatment their exhaust gas. The expense for air pollutant treatment amounted to 3 billion yuan. The reduction of smoke and dust emission, SO₂ and industrial dust amounted to 8,600 tons, 20,500 tons and 21,300 tons, respectively; which accounted for 6.5%, 4.7% and 22.4% of industrial pollution load, respectively. At the treatment process, 3000 sets of coal-burning stoves/furnaces had been upgraded to cleaner energy. The smoke-and-dust control districts have maintained at 100% coverage in the city.

3.3 Reinforcing the pollution prevention of motor vehicles

In 1997, Shanghai took the leading position of using lead-free gasoline as motor vehicle fuel in China, and further limited the hazardous substance content in gasoline, such as alkenes and sulfur. A total of 20,000 taxis have been refitted with liquefied petroleum gas (LPG) and 35 LPG filling stations have been completed. Electronic fuel injection system (EIS) and three-way catalytic converters on motor vehicles have been introduced actively. "Shanghai light car pollutant discharge standards" has been implemented; the discharge of light motor vehicles in the city reached the level of Europe in 1990s.

3.4 Controlling air pollution from residential, agriculture and other pollution sources

Secondary fly dust from construction activities and roads is becoming one of the major air pollution sources in the urban area. Measures for preventing dust from construction activities have been taken in construction sites. Large-scale afforestation campaign has been launched to increase environmental capacity. The green space covered 20.3% of the city proper in 1999. The city has achieved the goal of public green space per capita of 4 square meters. The city has required high efficient equipment for cleaning gas from restaurants and reinforced prohibiting straw burning in the countryside. The comprehensive use of crop straw is promoted actively.

3.5 Performing international conventions, phasing out ozonosphere depleting substances

The city is one of the major producers and consumers of ozonosphere depleting substance (ODS). The production once occupied one fifth of the whole country, and there are thousands of enterprises used ozonosphere depleting substance. During the course of "The Ninth-five Year Plan", under the support of multi-nation fund and loan from The World Bank, the city has carried out 23 substitute and transition projects in motor vehicle air conditioning, icebox, industry and business refrigeration, fire extinguishing, foaming agent, aerosol preparation and ambulant. At present, the production of ODS was banned and the city has realized partial substitute use for ODS. The city has developed new processes and portable recovery device of HCFC-141b? HCFC-142a? HCFC-152. Shanghai GM Corporation took the lead in adopting HCFC-134a motor air conditioners.

4 Follow-up Countermeasures

In the next stage, Shanghai will mainly adopt following countermeasures.

4.1 Optimizing industry structure and city functional layout

Shanghai will become one of the international economic, financial and trade centers. Shanghai will continue to adjust industry layout. The industry structure will further change from the sequence of "secondary industry, tertiary industry, first industry" to "tertiary industry, secondary industry, first industry". The industry enterprises will be centralized to some industrial areas. There are mainly finance, trade, commerce, culture and resident region within the inner ring of the city. Urban industry and residences will be located between inner ring and outer ring. Along with the further optimization of industry structure and city functional layout, the air pollution caused by irrational energy distribution will be further improved.

4.2 Further adjusting energy structure and energy utilization distribution

For accelerating the process of natural gas supply, a daily production capacity of 1,200,000 cubic meters, 350,000 cubic meters per day gas will be supplied to Puxi district in 2002, and CBD of Puxi will all use natural gas. In 2003, natural gas in western China will be piped to Shanghai; the supply capacity will reach 4 billion cubic meters per year. Then, most part lower frame sources and all households of the city will use natural gas.

For clean energy substitute for coal burning boilers. By 2002, coal burning boilers under 1 ton per hour and all coal burning boilers under 4 tones per hour within the inner ring will be replaced by cleaner energy. Furthermore, the city will actively import electricity from other provinces, the electricity generation capacity of coal burning units will be controlled under 12 million kilowatt. The city will further lower coal proportion in the primary energy, promote centralized heat supply for new construction, reconstruction and expansion projects such as Yangpu co-generation supply system.

4.3 Strengthening vehicle exhaust control

Shanghai plans to develop rapid, high-capacity track traffic system, prioritize the policy of public transportation, pay more attention to the building and perfect of traffic ride exchange hub, emphasize on harmonized development of traffic and urban environment. In 2005, 150 kilometers urban track traffic will be built.

More stringent pollutant discharge standards for motor vehicle will be carried out. In 2002, a total of 40,000 taxis will be refitted with LPG and 3,000 buses will be refitted with CNG. 4500 diesel driven buses will be renovated and treated in 2002. The spot-check eligibility rate of automobiles will be more than 80%. Oil burning vehicles will be gradually substituted and phased out.

4.4 Controlling air pollution caused by coal burning

The sulfur content of coal will be controlled. In 2002. The average sulfur content of coal used in power plants without desulphurisation facility will be controlled within 0.7%. Other coal will be kept under 0.9%. Desulphurisation projects of power plants will be conducted. In 2003, the desulphurisation projects of two set of units in Shidongkou power station and two set of units in Baosteel will be completed with the total capacity of 1.5 million kilowatt.

4.5 Carrying out comprehensive utilization of crop straw in rural area

The prohibited zones for straw -burning will be expanded. In 2002, the coverage area will cover

about 2800 square kilometers. Simultaneously, the comprehensive use of crop straw is promoted actively. The comprehensive utilization rate within the prohibited zones for straw-burning will reach 60%.

4.6 Controlling secondary fly dust of road cleaning, construction sites and pile fields

For reducing the dust from street cleaning, mechanical cleaning and water spray equipment will be widely used. Comprehensive measures for preventing fly dust from construction sites, such as will be adopted. Transportation management of demolish waste will be strengthened for stopping scatter during transportation. Spraying operation and surround block will be conducted in large fuel and building material pile fields to prevent fly dust.

4.7 Paying more attention to controlling airborne emissions

Emission from restaurants has become one of the major complains from their neighbors in the central urban area. The city will require catering sector to take actions to purify its pollutants. Meanwhile, to further control emission from different industrial processes from Taopu and Wujing chemical areas is also one of the major tasks of the city.

Indoor VOC pollution will be reduced to improve indoor residence air quality by adopting measures such as pursuing green construction materials.

4.8 Exercising authority according to laws and strengthening management

“Air Pollution Prevention and Control Regulation of P.R.C ” has been formally put into effect in September 2000. The city should establish relating local regulations. Total loading control and pollution discharge permit system should be updated and high-effective management mechanism of pollution source should be set up. In 2002, environmental air quality automatic monitoring network and coal quality check network will be fulfilled which covers the whole city, and online supervise system of all power plant will be installed.