

Proposition Paper on Improving City Environmental Air Quality

Shenyang is an old city with long history. Through the construction of more than forty years after the foundation of Peoples Republic of China (PRC), it has formed a complete national economic system of industry, agriculture, traffic, post and telecommunications, construction, business, etc. and has become one of the important industry bases emphasizing engineering industry in China. With the rapid development of industrial production, the energy consumption and the pollutant discharge increasing year by year. In addition, affected by the inappropriate industrial structure, power structure, city layout, the rapid expansion of motor vehicle and the low rate of city afforestation, the air pollution problem in Shenyang City has been very obvious, thus has restricted the development of society and economy. Controlling the air pollution, protecting the people's health, and improving city environmental air quality are matters of prime importance to benefit future generations and promote city's sustainable development.

I. The Causes of Air Pollution in Shenyang

In general, there are two main causes: on the one hand, the direct pollution of city production and pollutants discharged in daily life on the other hand the indirect pollution due to inappropriate city layout, also called structure pollution. The pollution caused by pollutant discharging has been the stress of environmental protection in many years. The solution depends on science and technology progress and environmental management. The structure pollution is gradually realized through environmental practices in many years. The solution needs policy regulation of plans and management.

1. The industrial structure out of balance

The industrial structure of Shenyang emphasizes the second industry (Industry), assisted by the third and the first industry (agriculture). As the prime industry, the second industry has formed a complete industrial system stressing on machinery processing including these pillar trades such as metallurgical industry, chemical industry, medicine, light industry, electronics, building materials, etc.

In 1995, the city had 7,878 industrial enterprises beyond town level, with general industrial production of RMB 67,178,450,000 yuan. The number of heavy industrial enterprises was one and a half times as much as that of the light industry, and the heavy industrial production twice as much as that of the light industry. The general industrial production in the primary trades such as engineering industry, electric engineering industry, equipment-making industry, communications and transportation equipment-making industry, non-ferrous metallurgy and processing industry, accounted for 54.20% of the whole city industrial production. Such industrial structure caused enormous energy consumption and pollutant discharge in Shenyang and is a very disadvantageous factor of Shenyang environmental quality.

2. The inappropriate industrial layout

The industrial layout not only concerns the industry itself, but also the investment results of industrial fundamental construction and a series of economical and technological criterions. Considering the environmental aspect, it concerns more the proper application of resources and protection of ecological environment. The inappropriate industrial layout of Shenyang City is mainly shown by too much industrial land and highly intensive industry. The industrial land area in Shenyang is 43.3 Km², accounting for 23% of the total area, exceeding the city average. In the city, 90% of the big and medium enterprises are distributed in urban districts. The Tiexi district, for example, has 102 big and medium enterprises covering 30 trades.

Within the over 50 Km² area of the No.1 Round-the-city highway, there are more than 1,700,000 in habitants, with the industrial land rate amounting to 50%. And considerable neighborhood industries are mixed in residential district, culture and education district, and business area. Such industrial layout structure has a big influence on air quality and people's health.

3. Coal as the main source of energy

The energy structure of Shenyang is mainly based on coal. And most of the crude coal is not selected by washing, just burned directly. Moreover, the heat efficiency of the burning equipment is low without desulfurization equipment. They result in the typical smoke pollution of Shenyang. In 1995, the total coal consumption in Shenyang was 11.589 million tons, accounting for 72.50% of the total energy consumption. The annual growth rate of coal in the "Eighth/ Five-year Plan" was 5.7%. As the energy structure mainly based on coal won't change in short term, the pollution problem caused by coal will exist in long term.

4. Backwards energy-burning process and serious waste

The city's boiler heat efficiency is about 60%, and that of the kitchen range is about 30%. Especially the heat efficiency of a certain number of small household kitchen ranges is only 15-20%. The discharge heights of various sources are low, making the low altitude air polluted. According to the statistics result in 1992, chimneys below 20 meters accounted for 45%, 20 - 50 meters 54.6%, over 50 meters only 0.4%. The lower the chimney height is located the more polluted the ground air gets.

5. Greatly increased vehicles and crowded traffic

The city had 250,000 vehicles in 1995, 76% more than in 1990, with the annual growth rate of 12%. In the No.1 Round-the-city highway, the city construction land area only accounts for 37.6% while the traffic flow reaches 67.9% of the total city traffic. The greatly increased vehicles and much crowded traffic make the average speed of the whole city's vehicles decline continuously with more idling vehicles and tail gas discharge. There are many kinds of poisonous materials such as NO_x, SO₂, HC, CO and lead oxide in the tail gas, which are the sources of air pollution only second to waste gas. As the height of discharging and diffusing is just within the breathbelt, and the peak of vehicle traffic is also the time when most people go to and off work, the influences on people's health can not be ignored.

6. Low technology and management level

The technological structure of industrial enterprises in Shenyang is mainly based on the big and medium sized, forming a technological structure headed by industrial enterprises with their products as the subjects. Such technological structure can not play an obvious role in improving technology progress and products renewal. For example, in the four technologies of forging, casting, heat treating and electroplating, the degree of professionalization is not high enough. If there is intensive production, it will reduce energy consumption and pollution. What's more, among the big and medium enterprises in Shenyang, over one-third equipment are backward facilities decades ago with enormous resources and energy consumption, big investment in end treatment, old pollution treatment facility and bad operation maintaining-results. The environmental protection awareness of a part of enterprises is not strong enough, and serious over-discharge problem still exists with the production benefit at the cost of environment.

7. Low City green rate deepening the second raising-dust pollution

The Shenyang city green work has weak base due to the limitations of historical and physical conditions. Although the green area, green-covering rate and public green area per person in constructed districts have been greatly increased through decade of planting trees, there are still many problems, which are mainly shown by insufficient public green area, incoordinate green and city development and imperfect system of shelter-forest around the city and railway. In 1995, the average green area was 5.2 m²/person, and the green-covering rate was 28%, far less than the national average standard and the extend of developed countries.

Greeneries play a significant role in checking winds, fixing sands and purifying air. Due to the unsatisfactory green result and dry climate in Shenyang, about one-third time of the year is in the wind-speed frequency of the raising dust, and is very liable to result in the second raising-dust pollution.

8. Influences of disadvantageous climate condition

(1) Influences of wind direction and speed

The direction of the wind influences that of the pollutant diffusion. Usually, the pollution source shall be set in the down direction. The main wind directions in Shenyang are south-south-west and north-north-east. The Tiexi industrial district including a smelter is just in the up direction of the dominant south-south-west wind, so most of Huanggu district is polluted.

The wind speed decides dilution and diffusion conditions of pollutants. Generally speaking, fast wind speed is good for dilution and diffusion of gaseous pollutants (such as SO₂, NO_x, etc.). But when the speed reaches a certain break-point, it is likely to cause a second pollution of raising dust, making the density of particulate pollutant (TSP, falling dust etc.) higher. The break-point speed of raising dust in Shenyang is 3.4 m/s. According to statistics, about one-third of the city time is in the wind-speed frequency of raising dust. This is another cause of excess TSP and falling dust in the environment.

(2) The influence of atmospheric stability

The atmospheric stability affects the diffusion of pollutant directly. The phenomenon of higher temperature with higher altitude is called inversion. In the condition of inversion, the air in vertical direction does not move at all, and the air layer is very firm, making the pollutants unable to diffuse. Hence it is liable to cause pollution .

According to statistics, the inversion frequencies at 7:00 a.m. and 7:00 p.m. in Jan. in Shenyang are 90% and 82% respectively. In Oct., they are 70% and 74% respectively.

The atmospheric condition is one important factor affecting atmosphere pollution. In the case of unchanging source intensity, the degree of atmospheric pollution is mainly determined by atmospheric factor. The high frequencies of still wind and inversion in winter in Shenyang are not good for pollutant diffusion.

II. Efforts and Measures Taken for Improving Environmental Air Quality

In view of the problems of Shenyang environmental quality condition, the guiding principles of atmospheric pollution prevention and control for Shenyang City are: center on adjusting structure pollution, emphasize city comprehensive treatment and aim at improving environmental quality; make good adjustment, control environmental deterioration and strengthen infrastructure, implement comprehensive treatment, solve key environmental problems, and try to make the environmental air quality reach the national second level by 2000, and enter the rank of national sanitary cities.

1. Gained improvement on industrial structure adjustment

The general policy of Shenyang industrial structure adjustment is “strengthen the first industry, optimize the second industry and develop the third industry vigorously”. Years of adjustments have gained progress, with the whole economic structure developing in a rational, high-level, intensive economy direction.

2. Further optimized city layout structure

- (1) Moved 87 enterprises disturbing inhabitants during the “Eighth Five-year Plan”.
- (2) Constructed dwellings of 14.675 million m² and removed old dwellings of 3 million m².
- (3) City roads increased from 870 km in 1978 to 2865 km in 1996. The development of road construction not only branches vehicles but also conveniences traffic and reduces downtown car tail gas pollution.

3. Developed intensive heat supply and canceled a great number of small boilers

The heat supply in Shenyang has experienced three phases, the small residential kitchen range in the “Sixth Five-Year Plan” -- the boiler heating in the “Seventh Five-Year Plan” -- the intensive heating supply in the “Eighth Five-Year Plan”.

During the “Sixth Five-Year Plan”, there were over 400,000 small kitchen ranges in the city, and their contribution rate to air pollution accounted for 50%. With the development of city construction and the removal of old houses and shantytowns, boiler heating replaced them. This, however, couldn’t meet the demands of environmental protection. In recent years, Shenyang has developed intensive heating greatly with the set-ups of Shenhai Power Plant, Huanggu Power Plant and the North-Station intensive heating boiler room. Up to now, the intensive heating area has been 40 million m², accounting for 48% of the 91.24 million m² city total heating area. Intensive heating is the most important way for the city to get rid of low pollution resources.

4. Developed clean energy and accelerated the construction of coal gas

Since the “Eighth Five-Year-Plan”, Shenyang has completed the general transformation of 2# coke oven in Shenyang coking plant, and 3#, 4# coke ovens in Shenyang oil gas-making plant, adding gas-supply capacity of 180,000 m³ every day; and has developed the Shenxi coal-gas generation engineering, forming a gas-supply capacity of 80,000 m³ every day. The city has also completed the removal project of 165,000 m³ gas tank and liquid gas in the east, and added gas-supply pipes of 100.4 km. During the “Eighth Five-Year Plan”, 200,000 new gas stoves were added and the gas rate of the city reached 97%.

5. Planted trees and spread grass, and widened green area

During the “Eighth/ Five-Year Plan”, the city planted 400,000 trees, spread 400,000 m² grass and planted 10,000,000 flowers per year. The green-covering rate increased from 22.4% at the end of the “Seventh Five-Year Plan” to 28%. The public green area per person also increased to 5.2m². Shenyang has initially formed a dot, line and area combined green system with road green as tie, park scenery as ornaments and district green as background.

III. The Practical Situation of Air Pollution

The government and people have made continuous efforts to improve environment for many years. But as the air pollution in Shenyang is due to a long history and practical difficulties hard to solve, the air pollution is still very serious. The general environmental quality is still very low. According to statistics in 1997, among the 18 cities which have developed weekly air quality newspapers, Shenyang’s pollution extent ranked the fifth, only next to Guangzhou, Beijing, Chongqing and Xian. According to another statistics result in 1996, in the 10 north capital cities and Anshan, Dalian, 12 cities in all, Shenyang ranked the fourth, only next to Anshan, Taiyuan and Lanzhou. Compared to other international cities, it still is one of the ten most seriously polluted cities.

The Shenyang’s low environmental air quality is mainly shown by the following three aspects:

1. Winter pollution problem. The burning coal in winter is twice as much as in summer. With more inversion weather and difficult pollutant diffusion, the total suspended particles, SO₂ far exceed the second level standard of national environmental air quality, exceeding rates are 84.7% and 63.8% respectively.
2. The part pollution problem. The part pollution refers to the north-south distributed polluted area of 16 km² with Shenyang Smelter as the center. As this area lies in the No.1 Round-the-city Highway, where land is very expensive, the city residents have paid close attention to its influences though it is only part pollution. The pollution of SO₂ and Pb in this area is tremendous. The average density of SO₂ is 190mmg/ m³, more than three times as much as the national second level of 60mmg/ m³. The maximum lead content exceeds the standard by 26 times.
3. Widespread spring wind. Due to the low green rate, the amount of raising dust downtown is more than 1.9 tons. The general density of suspended particles in spring is the highest of the year.

IV. Environmental Air Quality Objectives

1. Short term objective

In the light of the requirements of the nation, Shenyang’s air quality should reach standard by functional districts in the year 2000. In view of this, the Shenyang Environmental Protection Bureau divided the 12980k m² city into environmental air quality functional districts. All the districts are the second level districts, executing the

national second level air quality standard, with the exceptions of Tiexi, Dadong and Shenhai industrial districts, which carry out the national third level air quality standard.

2. Long term objective

In 2010, the whole city will reach the second level.

V. The Measures for Shenyang to Improve Environmental Air Quality

(I) Macro-control measures

1. Energy structure adjustment measure

1) Adjust the one-time energy source density and structure, develop good energy sources vigorously. Go on developing electric industry and intensive heating emphasized on heat-electricity production combination. Form intensive heating network radiating the downtown area around the city. Reduce medium and small smoke sources, gradually and finally cancel the raw coal used by residential kitchen range downtown. Forbid gradually the use of raw coal used by residential kitchen range in city center. Realize that the energy source for one-time use does not go downtown and make the residents use the second-time energy. Develop greatly the mixture of air and liquefied petroleum gas, and integrate it with the gas in the district liquefied gas intensive pipes. Solve the contradictory of supply and demand of coal gas fundamentally. Optimize source consumption structure.

2) Develop the technology of clean coal application

Use the coal gasification and liquefaction techniques and treatments before burning through washing, processing solid coal and water coal to change the way of supply and application. Enhance the coal utilization efficiency and reduce pollutant discharge.

3) Develop industries of resources, energy saving and comprehensive utilization. Enhance the utilization efficiency of resources and energy. Practically adjust the city's industry structure and product structure and develop those with low consumption and high addition; At the same time, through intensive management and technological progress promotion, stress the enterprise energy saving, declare and implement regulations and standards on energy saving, get rid of high-consumption equipment and gain environmental resources, economical benefits by intensive management.

4) Develop new renewal energy source without pollution. According to the physical conditions of our city, make plan to spread and develop the utilization of non-polluted, renewal, ecology-protective methane and solar power. Keep the environment and ecology in balance.

5) Use new technique, new material and wall material in city construction; make it account for over 40% of the total. And quicken the development of energy-saving dwellings, newly built intensive heating dwellings should reach the national standard of energy saving.

2. City layout structure adjustment measures

1) Widen and adjust city space layout

The stress of city construction should shift gradually from city center to second town and satellite town. Center city construction should extend from interior to exterior and shift to structure transformation of layout adjustment, and transform from single center to multi-centers. Develop outer suburbs actively, transform to regional cities (town) group structure, and gradually form the scattered layout structure of one center town, two separate second towns, six satellite towns and fifty small towns. City construction shifts gradually from downtown area to second towns and satellite towns. Facilitate the city's transformation from industry-oriented to multi-functional, comprehensive benefit-oriented.

2) The basic function and nature of center districts

Center districts (constructed) are political, economical and cultural centers, besides implementing co-development integrated with large municipal public engineering (such as the comprehensive treatment of

Xinkai River, fast main line engineering). The utilization of land within the No.1 Round-the-city Highway should properly limit dwelling construction, and strictly control the destruction and removal of buildings in the center districts. The controlled districts will focus on foreign investment, Municipal Park construction, municipal construction, science & technology, culture and entertainment constructions. Place the items of dwellings to be built in the constructed marginal area like Hunnan district and on both sides of the city way-out, where there are better infrastructure and convenient traffic. Adjust the layout of the city functional divisions according to scientific method.

3) Actively move the enterprises which pollution disturbs the residents. According to the city's overall planning programme, divide the environmental functional districts, perfect the removal policy of the enterprises which disturb the city residents and through measures such as "empty the cage to replace birds", "Withdraw two steps and march three steps" and the utilization of differential land rent, quicken the removal step of enterprises which pollution disturbs the residents in center districts. Take three years to move a great number of enterprises which pollution disturbs the residents out of the city center. At the same time, strictly control the shift of urban pollution to countryside; avoid the formation of new second pollution source. Control the direction in which the pollution enterprises go and improve management process, make the management of pollution enterprises removal orderly.

4) Utilize the administrative, economical and law instruments to move out the items of production store and particular land utilization. Plant trees reasonably and increase city green area. Improve the quality of city ecological system and enhance the sustainable capacity of the city.

3. Industry and production adjustment measure

1) Strengthen the first industry, optimize the second industry and greatly develop the third industry. Actively extend the city functions, adjust the macro-industry structure. By the end of this century and the year 2010, adjust the rates of the city's first, second and third industries from 7.3:46.3:46.4 now to 6:45:49 and 3:40:57. The implementation of GBP increase will be carried out from mainly by the second industry to by the third and second industries together. Realize the fundamental transformation of macro-industry structure.

2) Develop the potentiality of the available base and implement transformation and expansion based on the available enterprises. Develop the pillar industries greatly, march towards the direction of advanced technology, modernization, scale economy and energy saving. By the end of this century, initially realize the transformation from traditional industry to modern industry. Set up the intensive industrial system emphasized on intensive technology and capital. Starting from controlling the general pollutant discharge, gradually get rid of backward enterprises with serious pollution and low efficiency. Deal with the products and enterprises with big waste, more consumption of energy and raw materials in the light of law. Enterprises with low efficiency and serious pollution which can not recover themselves should be closed firmly to attain the goal of improving transformation, treatment and industry structure adjustment.

3) Actively encourage the enterprises to apply advanced and new technology to change traditional industry. Develop advancedly, intensively and deeply processed products of famous brand, improve the quality and level of products.

4) Actively direct the town and township enterprises of technology-industry-trade and trade-industry-agriculture types onto the road of development of advanced technology and high efficiency. At the same time strictly control the growth of town and township enterprises which compete in resources and environmental contents. Firmly close, stop, annex and transfer the small smelter, chemical plant, paper mill, electroplate plant, commercial foundry and tannery which destroy the ecological environment with serious pollution. Practically control the township industrial pollution.

4. Macro-management control measures

1) Realize the three transformations from pollution and treatment to whole-process control, from density-control to density and total control, from scattered source treatment to intensive and scattered treatment together. Stress

on the whole process control over industrial pollution. Extend “clean production” with plans and steps. Make efforts towards the direction of full use of resources, renewal resources, the minimum discharge of pollutant and the harmless use of products.

2) Further transform the function of government in environmental protection. According to the market economical rule, include the environmental protection in the market economical behaviors. Through periodically declaring technological implementation and items of equipment with serious pollution which are to get rid of within the stated time, adjust the operation time of pollution-producing equipment and the overhaul time of treatment facilities, the direction to waste discharge, audit and the forceful macro-measures. Keep the macro-control, loosen the micro-control while supervising and managing in the light of law, and improve the efficiency and level of services. Create a comfortable environment for enterprises to develop healthier.

5. Environmental and economical policy adjustment measures

To realize sustainable development, it is essential to set up environmental and economical policy matching the market economy.

1) Adjust the resource and energy price policy

The current prices of resources and energy are low, which somewhat encourages the development of extensive economy and increases the discharge of pollutant. This is one important cause for serious environmental pollution. So we must take measures to set up resources and energy price system matching the intensive production way, improve the repaying utilization system and price system of resources, build resources renewal and ecological compensation system, save and comprehensively use resources and energy, protect environment.

2) Adjust the charge policy of waste discharge

a. Enhance the level of charges to make it higher than that of pollution treatment. More use economical lever to improve the pollution treatment in the enterprises.

b. Develop multi-factor and total charges. Charge the pollutants like SO₂, car tail gas, radiant waste, life rubbish and waste water.

c. Strengthen the levy of pollutant charges on the third industry, township, district and street enterprises. Extend the range of levying.

d. Set up environmental resources tax or ecological environment compensation tax like fuel environmental tax, water resources tax, mineral resources tax and forest resources tax, etc.

3) Adjust environmental protection investment and credit policy. Deepen the environmental protection investment reform. Implement comprehensively the repayable utilization system of environmental protection capital. And widen the capital channels, reduce exemption, accelerate the accumulation of environmental protection capital, enhance investment efficiency, meet the capital demands of pollution treatment programmes. Serve for the realization of general control and environmental quality improvement.

4) Coordinate the current policies of waste-discharge charges, time-limited treatment and centralized control. Try to set up waste discharge trading system and enhance the enterprises' zeal to reduce pollutant.

(II) Comprehensive treatment measure

1. Implement energy control

In 1997, Shenyang strengthened the energy control within the No.1 Round-the-city Highway, and gained initial achievement. There are altogether 806 gas stoves below 1 ton/hour within the No.1 Round-the-city Highway. Currently 204 stoves are replaced, 58 transformed, 103 sealed up, 83 stopped, moved and wasted and the left 358 ones are mainly for heating boilers. Time-limited reform of the left boilers will keep on. As to energy control, the following measures are taken:

- The various kitchen ranges in the constructed districts mustn't use coal with S content exceeding 1% as direct fuel. Boiler with single content more than or equivalent to 4 ton/hour must take desulphurization measures on the base of smoke and dust elimination.

- The kitchen range below 1 ton/hour (not including 1 ton/hour) within the No.1 Round-the-city Highway must use clean fuels like gas, liquid gas, light diesel oil and clean coal, to restrict coal burning in a scattered way.
- All the districts with intensive heating conditions should remove temporary heating boiler.
- The districts within the No.1 Round-the-city mustn't approve the factory heating boilers with content below 10 tons.
- In the city way-out and within the range of 1 km on both sides of the railway and highway, such serious air-polluted items as the constructions of limekiln cupola and brickkiln must not be implemented.

2. Develop clean energy sources

Make plans of developing clean energy source to solve the air pollution problem caused by raw material and one-time energy consumption.

- Develop the production of burden coal for new power. The burden coal for new power is mainly used in production and heating. It not only needs considering the burning technological index, but also needs considering reducing pollution problem. The contents of ash and sulfur must be controlled within a certain range to meet the demands of environmental protection. It's estimated that there will be 500,000 tons of burden coal. Currently four types of burden coal have been developed to satisfy the demands of different households.
- Develop the production of clean coal. Clean coal is mainly fit for kitchen ranges below 1 ton/hour used by entertainment, services, organizations and groups, enterprises and institutions. New formula is being developed now to ensure powder processing, sales place and necessary stove accessories.
- Develop and produce batch industrial coal. The development of industrial coal is just beginning, and currently research and plan decision is being done. Products are expected to come out this year.
- Coal allotment work. Coal allotment is to send coals at the fixed time according to the demands of users. Currently, 100 enterprises have been decided as coal allotment experimental units. The coal allotment total amounts to 600,000 tons. The implementation of coal allotment can cancel nearly 100 coal yards and reduce the second pollution of raising dust. Coal yards can be green to improve environment and reduce pollution.

3. Continue to develop intensive heating and "city gas"

Through developing stable gas source of high heat, actively facilitate the development of liquid gas. During the "Ninth Five-Year Plan", develop the mixture of liquefied petroleum gas and air, construct Shenxi coal seam gas engineering, Hushitai gas engineering and the first phase of engineering of Shenyang light oil gas generation plant. Form the pattern of various gas sources supplementing each other. By the year 2000, the gas supply every day will amount to 1,900,000 m³ with new gas users of 200,000, and the gas popularization rate of center district pipes will reach beyond 85%.The key projects are:

(1) To set up light oil gas generation plant: Through taking advantage of the foreign government loan and using the light oil production of Xinmin Paraffin Wax Chemical plant and Shenyang Paraffin Wax Chemical plant as raw material, build a light oil gas generation plant with a gas supply of 350,000 m³/day. This engineering is estimated to finish negotiation and contract-signing by national leaders in 1996, and to start by the latter half of 1997.

(2) The pipe-supply engineering of liquid gas districts

During the "Ninth Five-Year Plan", to lysis the insufficient gas pipes, implement the district pipe supply by building liquid gas station and mixing liquid gas for the second towns which are far from city center and have difficulties in developing pipe gas. In this way, there will be another 1 ~ 20000 users.

(3) To introduce the tail gas of 80,000 m³/day and liquefied petroleum gas of 20,000 tons/year from paraffin wax chemical plant. (Transport by pipes)

(4) To continue to develop coal seam gas: Develop coal seam gas of new districts, dig 6 wells every year and invest RMB 12 million yuan per year form the capacity of gas supply of 100,000 m³/day by the year 2000. From

the year 2000 to 2010, cooperate the nation to open the gas petroleum pipeline from Russia through Shenyang to Beijing. Further expand the light oil gas generation engineering, gradually use the high heat gas source with high exchange rate, low energy consumption and no impurity, no pollution as the dominant gas source in Shenyang. Gradually abandon the oil generating gas plant and coking plant to improve the city environment of Shenyang.

By the year 2010, there will be new users of 300,000 and the gas popularization rate in constructed districts will reach 100%. The small satellite towns will be more than 50%. And the city daily gas supply will amount to 2,400,000 m³. The key projects are:

(1) To further expand the light oil gas generation project, add supply capacity of 1,050,000 m³/day. The whole expansion engineering has two phases: The first phase starts from the year 2001 to construct a set of light oil gas generation furnace and the necessary accessories with daily gas supply of 350,000 m³. It is estimatedly to be finished in 2003; the second phase starts from 2005 to construct a set of light oil gas generation furnace and the necessary accessories with daily gas supply of 700,000 m³. It will be put into production in 2008. By that time, Shenyang will have formed the light oil gas generation scale of 1,400,000 m³ gas supply per day. (Including the scale of 350,000 m³/day constructed during the "Ninth Five-Year-Plan"). At the same time, oil generating gas plant and coking plant will be abandoned. The atmospheric environment will be much improved.

(2) To develop liquefied petroleum gas in the second towns, satellite towns and small towns, where the pipeline network fails to reach.

(3) To continue to develop coal seam gas and form the gas supply scale of 100,000 m³ /day.

(4) To introduce the Russian natural gas with Tianjin, Beijing and Harbin, try to attain national programme. Utilize various ways like left heat, combination heat supply etc. to practice intensive heat supply focusing on heat & power output combination and intensive heat supply boiler. During the "Ninth Five-Year Plan", expand the third phase engineering of Shenyang Heat and Power Plant, continue to develop district heat & power plant and Huanggu heat & power plant. Construct 80 intensive heat supply boilers, but no longer build heating boilers below 4 tons in urban districts (constructed). And gradually abandon temporary boilers in batches. By the end of the "Ninth Five-Year Plan", the heat supply area of the whole city will amount to 80,000,000 m², with a net increase of 19,000,000 m² than during the "Eighth Five-Year-Plan". Among them, the intensive heat supply area will reach 50,000,000 m², with a new increase of 24,000,000 m². The intensive heat supply rate will increase to 61.5%.

From the year 2000 to 2010, continue to implement heat & power output combination construction. Set up two groups of heat and power machinery of 200,000 Kw in Hunnan district. Realize the 8,000,000 m² heat supply area with the construction of large boiler rooms. Set up heat supply machinery group of 200,000 Kw in Zhangshi Development Zone. Bear responsibility for the heat supply area of 6,000,000 m² in Shenyang Economical and Technological Development Zone; Add machinery group of 50,000 Kw in Sujiatun and Hushitai Power Plants respectively, with new heat supply area of 2,000,000 m². Practice low-temperated nuclear heat supply.

4. Strengthen management of motor vehicles and gas discharge

Shenyang municipal government has done a lot to improve the conditions of road and traffic. Only in 1996 alone, the area of new reconstructed, expanded roads and new lanes amounted to 408,600 m². The road scale of the whole city amounted to 2097, with a total length of 1473 km. In 1997, the No.2 Round-the-city Highway was completed, which alleviated the crowded condition of traffic. The following measures are to be taken to further improve traffic condition, reduce air pollution.

- Optimize vehicle structure, limit the increase of motor cars and bicycles; Practice one-way road and the branch of trucks. Set the limited roads for various vehicles; Construct the Shenyang fast-road system, main and second line system; improve the road conditions, and enhance speed.
- Strictly inspect the motor vehicle tail gas. Unqualified and abolished vehicles must not drive on roads.
- Fix tail gas purification device
- Forbid using petroleum with lead from Nov.11998.

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5. Set up City Green Ecological System(CGES)

City green should be characterized by protection and isolation, focusing on planting trees and constructing parks. And through improving the green of road, park, amusement park, square, unit and residential area, realize the systematic combination of dot, line and area. With forest belt roads around the city as mainline, form a radiant network green pattern with the urban and suburb as a whole. Now the construction and transformation engineering of the No.2 Round-the-city Highway green-color long corridor, and the water system around the city of Xinkai River, Nankeen River, Weighing River, is in practice. It is necessary to choose grass seeds with long green term and tree seeds against pollution. The main urban streets and roads are to realize overall cover this year. It's estimated that there will be new green area of 1,550,000 m².

6. Reach the standard within a limited time and accelerate treatment of old pollution sources

Transform backward burning instrument and method, and closely combined with energy saving. Increase efficiency of energy utilization and dust elimination. The available units with pollutant discharge beyond standard should deal with the pollution within a limited time. The pollutant -discharge unit must guarantee that the facilities against pollution work properly to enhance the treatment rate and standard-reaching rate of pollutants. Through removing and transforming, focus on reducing the discharge of atmospheric pollutant in urban districts. During the "Ninth /Five-Year Plan", Complete the atmospheric pollution treatment engineering of the 32 key enterprises including the copper smelting transformation in Shenyang Smelter. Ensure the discharge to reach standard in the year 2000, and make the dust elimination efficiency reach 90%. By 2010, move the lead smelting of Shenyang Smelter to center urban districts.