

[translated from the Russian]

Russian U.S. Environmental Law Task Force

Introduction of Method 9 in Russia: An Experiment in Establishing a New Environmental Standard

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The Russian-US Environmental Law Task Force was established in November 1994 by the US Environmental Protection Agency (USEPA) and the Center for International Environmental Law (CIEL) with the support of the US Agency for International Development (USAID) as part of the Environmental Policy and Technology Project.

The Task Force included Russian and US environmental lawyers acting as project consultants. During its existence, the Task Force has supported a number of the Environmental Policy and Technology Project's demonstration projects designed to protect water and air quality in various regions of the country.

This pamphlet is the result of the work of the Task Force under the Volgograd "Russian Air Management Project." It is designed to document the experiment in Volgograd to implement a visual method of air emissions evaluation known as "opacity" or "method 9." The materials can be used to develop this method in other regions of Russia.

It is designed for people working on such environmental demonstration projects, state authority officials, members of public environmental agencies, and a wide range of readers interested in legal environmental protection issues.

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Attachment 2. Visual determination of the opacity of emissions from stationary pollution sources. US Collection of Federal Regulations. Environmental Protection. 40 C.F.R. Ch. 1 (7-1-96 Edition)

Attachment 3. Order of the State Committee of the Russian Federation for Environmental Protection “On Conducting an Experiment for Introducing the Method for Visual Determination of the Opacity of Polluting Emissions” No. 293, dated June 30, 1997

Attachment 4. Draft decision of the Volgograd Administration “On Conducting an experiment for using the visual-and-optical method of control over emissions into the atmosphere by Volgograd industrial enterprises”. [Appendices omitted from English translation]

Attachment 5. The list of legislative, statutory and legal documents regulating paid nature use and the system of establishing and collecting payments for environment pollution. [Omitted from English translation]

Attachment 6. The certificate of State meteorological acceptance. The methods of carrying out visual determination of the opacity of dust-and-gas flows emitted by stationary atmosphere polluting sources (M-MVI-5-96). [Omitted from English translation]

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Part I. Fundamentals of the Visual-And-Optical Method for Determining the Opacity of Visible Emissions of Enterprises (Method 9)

A. Contents of Method 9.

The State Committee of the Russian Federation on Environment Protection and the US Environment Protection Agency (EPA) participate in a mutual program, financed by the US Agency of International Development (USAID), for improving air quality management in Russia. The Russian Air Management Project is a demonstration project aimed at introducing better methods of air quality protection and control in the city of Volgograd. The preliminary results of the experiment are to be introduced in the cities of Kemerovo, Novokuznetsk and Nizhni Tagil. Application of the visual method for determining normal operation of equipment and stationary sources of visible emissions into the atmospheric air from industrial enterprises with the purpose of reducing emissions of pollutants is among the most valuable elements of the pilot project. Inspectors able to determine opacity levels of emissions from enterprises without any special equipment were trained within the framework of the program of visual determination of emissions. Determination of opacity levels allows one to discover the quality of operation of baghouses. The method of evaluating the opacity of emissions (Method 9) for enterprises proved effective in the United States as an environmental protection tool. In the United States, Method 9 is established by federal regulation.

Sources of Emissions

Unorganized point-source:

unpaved roads
slots in pipelines
doors
piles
Conveyors

Mechanical processes:

crushing
drilling
polishing
transport movement
grinding
sweeping
demolition of buildings

Description of purposes of using the method

The program for visual determination of emissions is applicable to solid and liquid (except for uncombined water droplets) aerosol kinds of pollutants and includes:

- training and testing of specialists (observers) capable of determining an opacity or dust-content density level at regular intervals,
- determination of opacity values for sources of emissions at enterprises,
- introduction into practice of mechanisms for observing established opacity standards by enterprises.

Description of application of the method

Opacity differs from common emissions indices and accepted standards of air quality because opacity is not a direct indicator of total quantity of dust or specific

volumes of emissions of other pollutants. The opacity index is based on the transparency of dust-and-gas flows from stationary sources, *i.e.* smokestacks. Measurements are carried out by trained and tested inspectors who have received certificates qualifying them as trained observers. Within a few minutes a qualified “opacity inspector” can visually determine whether a smoke column has an opacity of, for example, <10 percent (*i.e.* 90 percent of the background light can be seen through the smoke column) or whether opacity is much greater, up to 100 percent (*i.e.* the smoke column is absolutely non-transparent).

Opacity

- 1. The degree to which the transmittance of light is reduced when light passes across the diameter of the smoke plume.*
- 2. The degree to which background visibility is reduced when observation is made across the diameter of the smoke plume.*

The opacity method, called Method 9 in the United States,¹ provides for the training and testing of inspectors (specialists - observers) to determine opacity of emissions from individual enterprises. Opacity levels which are visually determined outside an emitting object reflect how well pollution control equipment at each source is operating. Using this method, inspection services establish opacity levels corresponding to normal operation of pollution control equipment and on that basis determine an opacity standard at or below which the given enterprise is to function. Then, through subsequent visual observations, qualified opacity inspectors monitor opera-

[¹ In Russia, Method 9 has been adopted provisionally by the State Committee on Environmental Protection and is designated Method M-MVI-5-96. The decree adopting this method is attachment no. 3 to this pamphlet.]]

tion of the enterprise and their compliance with established opacity standards.

Some Elements of Visible Emissions

Smoke
Carbon black
Ash dust
Vapors of metal compounds
Non-Water liquid aerosols

Opacity standards differ from norms of emissions and traditional indices of environment quality used in Russia. Opacity is not a determination of the quantity of a specific pollutant (for instance, carbon dioxide) emitted by a certain smoke stack. Thus determination of compliance with an opacity standard does not require expensive methods of analysis and determination of volumes of pollutants or setting up monitoring systems. The opacity method is also not a way of determining the concentrations of specific pollutants in the air. Opacity standards are visually determined indices reflecting the management of pollution control equipment.

Training of opacity observers

Within the framework of the visual determination of emissions program, State inspectors, employees of enterprises and representatives of the public are trained to determine opacity levels under various meteorological conditions.

The method of determining opacity through visual observations does not lessen the meaningfulness and trustworthiness of opacity standards and transparency measurements. As for any other method, standardization and quality guarantee are required for permanent utilization of the methodology. Within the framework of the standardized opacity method, opacity inspectors undergo special training and testing with the use of specially developed equipment – smoke generators. Such training

guarantees a quantitative determination of opacity levels. Opacity inspectors are obliged to undergo regular training (usually every 6 months) to confirm their certificates as qualified inspectors for the visual determination of opacity levels of emissions.

An example of using the method

The technological process at steel plants emit a significant quantity of dust. The plants have filtering chambers for controlling emissions but they are so old that they must be replaced in order for the plant to meet the established maximum permissible emissions (MPE). However, replacement of the chambers costs so much that plant managers prefer to pay fines for violating requirements and penalties for emissions over the established norm. As a result, experts established that emissions could be greatly reduced through regular cleanings of the chambers even though they would not reach the MPE. A qualified opacity inspector made opacity measurements (under specific meteorological conditions) by making visual observations with the chamber uncleaned and determined that he could barely see through the smoke column, *i.e.* opacity was close to 90 percent. When the same inspector carried out observations under the same weather conditions after the chamber had been cleaned it turned out that much more light was passing through the smoke column – the quantitative opacity level was determined to be 40 percent. Further observations of opacity showed that with regular cleanings of the chamber indices were equal to 40 percent or less. As a result, inspectors can easily determine whether the chamber is regularly cleaned simply by measuring the opacity value. Establishing a 40 percent opacity level norm allows one to more easily determine the conformity of the plant operation to requirements and encourages plant managers to regularly clean the chambers.

Usual Normative Requirement

No source should allow appearance within its territory or an emission into the atmosphere with an opacity exceeding or equal to 20 percent during 3 minutes within an hour.

B. The Role of Method 9 in the United States

Opacity standards are one of the key elements of the U.S. air quality control system. Under the US clean air laws, both the Federal Government and state governments have the right to set air standards at pollutant levels attainable with the utilization of special types of technological equipment. These “technological standards” are not always sufficient for reducing emissions to healthy levels. However, these standards guarantee that enterprises will use special pollution control equipment and technological processes for reducing emissions to a reasonably acceptable level and for some to the maximum attainable level. The opacity index often serves as the primary tool used by regulatory bodies to determine an enterprise’s compliance with established technological standards. This is possible because the use of opacity standards does not require inspectors to visit the area surrounding an enterprise in order to take samples. Instead, an inspector can perform a visual test without going to the production site, without the manager’s knowledge and with minimal material expenses. As a result, opacity standards can be an effective way of stimulating enterprises to use and operate equipment insuring a reasonable reduction of emissions.

Attachment 1 contains an example of a typical American opacity standard. The standard is only applicable for the American method of visual determination of opacity of emissions - Method 9. Fig. 1 is an example of a written report drawn up by an opacity inspector trained and certified in accordance with the Method 9 standard program. This

kind of documentation may be used as evidence in a court of law in proving that an enterprise violated its opacity standards (for civil or criminal cases).

A brief content of a version of Method 9 used within the framework of the Volgograd pilot project is set out in Attachment 2.

Part II. The Air Quality Control System in Russia and the Need to Introduce Opacity Standards.

A. The Russian Air Quality Control System

A system of normative legal and technical documentation of various levels has been created and is in operation today in Russia. The following are the main types of regulatory documents:

- Federal laws;
- Laws and other normative legal acts (regulations) of subjects of the Federation;
- Presidential decrees;
- Decisions of the Government of the Russian Federation;
- Administrative agency regulations (normative legal acts);
- State standards (GOSTs).

From multiple norms regulating the quality of air outside of working and dwelling premises the most fundamental ones for maintaining a safe living environment for humans and for preserving the environment are those regulating the following three problem areas:

- 1) determination of air quality;
- 2) control over air quality;
- 3) economic mechanisms for regulating air quality

These three areas, on the one hand, ensure maintenance of air quality at the level established by State standards as safe air, and, on the other hand, guarantee observation of requirements for air quality protection through the use of economic mechanisms for stimulating or restricting activities of objects having, or capable of having, a negative impact on air quality. The introduction of Method 9 should directly assist the first two areas. Introduction of this new air quality control method would also help

develop additional mechanisms for regulating economic activities of enterprises in protecting and maintaining safe air quality.

In order to successfully implement air quality evaluation and control measures and most effectively regulate compliance of enterprises with legislative requirements, it is necessary to have a clear understanding of the existing air quality standards, the bodies establishing them, and the documentation containing the standards. The standards are most helpful when they can control activities of enterprises and monitor their compliance with acting environmental requirements. However, public organizations and concerned associations do not always possess the necessary information and knowledge to determine such standards and competently request documents containing such information from polluting enterprises. Therefore, we will analyze these aspects in more detail.

Articles 25-27 of the RSFSR *Law "On Environmental Protection,"* dated December 19, 1991, establish the main requirements for standardizing the quality of the natural environment. Standards are set for establishing the *maximum permissible norms of impact* on the natural environment. Standards of maximum permissible harmful impacts as well as methods for determining them are approved by specially authorized State bodies of the Russian Federation in environmental protection and sanitary and epidemiological supervision and are improved as science and technology develop with due regard for international standards. Standards of maximum permissible norms of impact are set in accordance with production capacities of an enterprise and data on mutagenic effects and other harmful consequences of each source.

Established air quality standards

There are various types of maximum permissible impact standards. Two of these standards in the field of atmospheric air protection are in use in Russia: maximum permissible concentrations and maximum permissible emissions.

The RSFSR Law "On Atmospheric Air Protection," dated 14 July 1982 (Articles 8, 9) states that *maximum permissible concentrations* of pollutants (MPCs) are approved for evaluating the state of the atmospheric air. These standards are *uniform* for the whole territory of Russia (and the majority of them are still used in the majority of countries of the former USSR). When necessary, stricter MPC standards may be established for separate regions (for example, in areas in ecological crisis, areas with especially valuable natural ecosystems and areas with cultural or natural monuments).

Maximum permissible emissions (MPEs) for stationary and mobile sources are established for *specific* enterprises. These standards are established for *each* source of emissions or other sources having a harmful impact on the atmospheric air as well as for each model of transport and other mobile vehicles and installations. MPEs for emissions from specific and other sources in an area are established, taking account of prospects for technological development, at a level which will not lead to an excess of MPC standards in the ambient air or maximum permissible levels of harmful physical impacts. An aggregate MPE is established for unorganized emissions or a totality of small individual sources. Values of MPEs for enterprises or objects on the whole are established based on aggregates of MPEs of separate sources of air pollution.

Thus MPCs serve as initial basic standards of air quality for determining total pollution levels (concentrations of pollutants in the air at a given time which are safe

for humans). MPE standards are used to attain MPC standards and are the principal regulatory tool. Because they are calculated to ensure the observance of MPCs, they determine the operation of each specific enterprise and air pollution source.

Detailed information on standardizing maximum permissible impacts on the atmosphere is regulated by the earlier (1978) administrative document - GOST 17.2.3.02-78 "Rules for establishing permissible emissions of harmful substances by industrial enterprises." It indicates that a maximum permissible emission of harmful substances into the atmosphere is established for each source. The MPC value is determined as a quantity of emitted harmful substances not to be exceeded in a unit of time. The relation of the calculated concentration of a harmful substance in the bottom layer of the atmosphere to the MPE must be equal to or less than 1.

The MPE value is based on the MPC. For the purpose of setting standards, an MPC for a particular pollutant is used. An average *daily maximum permissible concentration* (daily MPC) is accepted as the MPC for a given pollutant in the air when calculating the MPE. When a daily MPC value is not available the maximum permissible one-time concentration is used. If there are no daily MPC and no maximum permissible one-time concentration, a *provisional safe level of impact* is applied.

Introduction of standards at various administrative levels

Article 45 of the RSFSR Law "On Environmental Protection" establishes that enterprises may emit harmful substances with permission from specially authorized State bodies for environmental protection. This means that administrative bodies establish a special MPE standard for objects of various levels (of federal, republican,

territorial, regional or local significance).² The following administrative bodies may grant permission:

- Bodies of federal significance - in the federal body of executive power - the State Committee for Environmental Protection in Moscow;
- Bodies of republican, territorial and regional significance - in territorial bodies of the State Committee for Ecology (committees of subjects of the federation and municipal committees in major cities). In a number of cases in republics such permissions are issued in practice by ministries of environmental protection of these republics, but only in coordination with a territorial body of the State Committee for Environmental Protection;
- Bodies of local significance - in district committees for environmental protection.

Enterprises for which MPEs are established must arrange a system of control over MPE observation. Article 45 of RSFSR Law "On Environmental Protection" require enterprises to ensure effective operation of pollution control facilities. Article 70 of the same Law gives legislative and executive bodies of power at the federal, regional and local levels the duties of State ecological control, including checking the operation of pollution control facilities.

The procedure of control over authenticity of data on emissions of pollutants is determined by the system of normative-and-methodical documentation approved by Russia's State Committee for En-

[² Russia is a federation. The federation has 89 constituent elements which are called republics, territories (*krai*), and regions (*oblasts*). The 89 constituent pieces of the federation, roughly analogous to the states in the United States, are referred to collectively as subjects of the federation.][editor's note]

vironmental Protection. Objects having a harmful impact on air quality, as well as kinds and quantity of harmful substances emitted into the air, are subject to State accounting.

Official documents establishing standards

Basic air quality standards – MPCs – are contained in corresponding GOSTs and sanitary-and-epidemiological requirements.

The procedure for standardizing emissions is established in accordance with the "Instructions on standardizing emissions (discharges) of pollutants into the atmosphere and bodies of water," approved in 1989. This document is supplemented by "Recommendations on execution and contents of the draft of standards for maximum permissible emissions into the atmosphere (MPE) for enterprises" (1989). In accordance with the requirements in these normative acts, each enterprise develops A Draft of Standards for Maximum Permissible Emissions into the Atmosphere (MPE Volume). This document is submitted for approval to a corresponding specially authorized body in the sphere of environmental protection (at the appropriate governmental level, as discussed above). After its approval (the signature of an official and the stamp of a body of the State Committee for Environmental Protection on the title page) MPE values contained in the document become binding on the enterprise for emitting pollutants into the atmosphere. As a rule, this document is valid for 3 years and should then be reviewed in accordance with changes in conditions and again submitted to an environmental protection body for approval. Specialized design and scientific organizations, institutes or trade firms are usually invited to calculate MPEs and draw up the Draft (so-called MPE Volume). The Draft should contain MPE calculations and values for *all* sources of an enterprise's emissions into the atmosphere.

Along with the MPE Volume, an “*Ecological Certificate of the Enterprise*” should be developed at each enterprise. This document is a collection of data on the ecological and environmental protection characteristics of an enterprise. It contains, *inter alia*, in a brief form, principal parameters of maximum permissible impacts on the environment, including MPE standards. The ecological certificate is also approved by a specially authorized body in the sphere of environmental protection. Though it may be regarded as a derivative document from materials regulating impacts in detail (in this case the MPE Volume), it serves as an important source of information on standards established for enterprises. The certificate provides a summary of information on the operations of the enterprise as a whole without describing each source of pollution.

Standards as the basis for using economic mechanisms

All valid economic mechanisms for imposing liability on legal and natural persons for polluting the environment, established in the Government's decisions, are based on MPE indices:

- No. 632 dated August 28, 1992, “*On approval of the Procedure for determining payment and its maximum amount for polluting the environment, waste disposal and other kinds of harmful impacts;*”
- No. 545 dated August 3, 1992, “*On approval of the procedure for development and approval of ecological standards for emissions and discharges of harmful substances into the environment, on limits of using natural resources and for waste disposal;*”
- “*The procedure for transfer of 10 percent of payment for polluting the environment into the income of the federal budget of the Russian Fed-*

eration,” dated 3 March 1993, approved by the Ministry of Nature, Ministry of Finance and the State Tax Service of the Russian Federation;

- “*The instructive-and-methodical directions for collecting payment for environment pollution,*” dated 24 March 1993, approved by the Ministry of Nature, Ministry of Finance and Ministry of Economy of the Russian Federation.

Maximum permissible emissions (MPE) of pollutants into the atmosphere are the basis for determining payment.

B. Shortcomings of the Russian Air Quality Control System

The imperfect system of standards

The use and practical application of the MPC and MPE system is successful. For a variety of reasons, however, Russian enterprises often prefer to pay fines for exceeding established MPE standards rather than following them. First, though MPC and MPE values look impressive from the point of view of safety, they are often so strict that they are not attainable in reality. Though established MPEs reflect the level of emissions required for observing MPCs, they are frequently so high that an enterprise is required to install unjustifiably expensive technological equipment. Second, fines that enterprises are required to pay for exceeding standards are not high when compared to the price of the new technology. Third, MPEs are calculated mathematically, taking into account only those parameters which are essential for attaining MPCs and not whether a given enterprise is able to comply with the standard. Finally, MPE values are established without participation of the public or the enterprise itself. Because the public and enterprise administration cannot effectively influence MPE standards, the result is standards that are unrealistic or in-

sufficiently meaningful and therefore not met. If their values were determined through a process of open discussion by all parties concerned, then such standards would be more acceptable and compliance would improve.

The system for establishing payments and fines

Introduction of economic incentives and regulating methods into the environmental practice of enterprises is a new method for regulating environment protection in Russia. Use and effect of these incentives are directly connected with the problem of introducing the new opacity standards.

Payments for polluting the environment, envisioned by Article 20 of the Law “*On Environmental Protection*,” are economic measures. In compliance with the Law, payment for pollution and other types of harmful impacts are imposed on:

- emissions, discharges of pollutants, waste disposal and other kinds of pollution within established limits;
- emissions, discharges of pollutants, waste disposal and other kinds of pollution in excess of established limits.

Payment for emissions at or above the norm and discharges of pollutants is *indisputably transferred* to special accounts of State ecological funds from assets of an enterprise, institution or organization. Payment is established for a unit of volume of an emission or discharge of a pollutant.

Payment for polluting the natural environment is determined on the basis of basic standards. Basic standards for emissions and discharges of specific pollutants are determined as a product of specific economic damage from emissions and discharges of pollutants within the limits of

permissible standards or limits of emissions and discharges as determined by the relative hazard of a specific pollutant for natural environment and health of the population. Basic standards for emissions and discharges of pollutants into the natural environment are calculated for the most widespread polluting harmful substances.

Basic standards of payment are, at present, the basis for calculating all payments for polluting the natural environment, occurring in the process of construction and functioning of enterprises as well as for calculating damage inflicted on the natural environment as a result of accidents, violation of environmental protection legislation and other illegal activities. Introduction of the “opacity” standard and a corresponding payment allows for the expansion of the list of actions resulting in pollution of the environment and serves as the basis for an environmental tax.

The main methodological document for calculating payments for pollution of the Environment is “*The instructive-and-methodological directions for collecting payment for environmental pollution*,” approved by Russia's Ministry of Environmental Protection and Natural Resources on 26 January 1993. Payment for emissions, discharges, waste disposal and other negative impacts on the environment is a form of *compensation* for damage resulting from legal economic activity. This payment is indisputably collected from enterprises and by its form is a *tax compensating damage to the natural environment*. In cases of illegal economic activity (for example, in case of accidents through the fault of environmental managers) payment for damage inflicted on the natural environment is also collected, and more frequently it is called *compensation for damage to the natural environment*. Terms of payment for use of natural resources and compensation of damage inflicted on natural resources can be understood in a similar manner.

Ecological funds, in compliance with law, may spend their resources to improve the natural environment and health of the population, implement environmental protection measures and programs, restore natural resources, implement scientific environmental protection research, introduce clean technologies, and construct pollution control facilities.

The introduction of a differentiated system of payments for pollution creates a direct economic interest for enterprises to maximize their effective use of pollution control equipment. However, due to insignificant pollution fees as compared with the cost of new pollution control equipment or measures to increase the efficiency of existing pollution control devices, many enterprises prefer to pay regular fines for pollution taxes and for pollution fees than to carry out environmental protection measures. As a result, the current task should be to optimize methods of calculating payments for each specific enterprise and adjusting them depending on activities of an enterprise in the environmental protection sphere.

Fines are imposed for violating standards and requirements of environmental protection norms in accordance with the procedure established by civil, administrative, criminal and environmental protection legislation. The amount of the fine is established in corresponding statutory acts and varies depending on the seriousness of the violation and the type of liability imposed.

In accordance with Article 84, paragraph 1 of the RSFSR *Law "On Environmental Protection,"* enterprises, institutions and organizations that violate environmental standards must pay a fine. Fines for such violations are imposed within the competence of specially authorized State bodies of the Russian Federation in environmental protection, sanitary-and-epidemiological

supervisors, as well as technical labor inspectorates of trade unions. The *Law "On Environmental Protection"* does not grant environmental protection bodies the right to resort to commercial³ court with claims for collecting fines for ecological breaches of law from enterprises, institutions and organizations. Therefore, commercial courts may not accept claims from legal persons regarding failures to pay fines in violation of the environmental law.

Paragraphs 2 and 3 of Article 84 of the *Law "On Environmental Protection"* state that a fine-imposing body will determine the fine for violations of environmental law imposed in an administrative order, depending on the nature and kind of violation, the degree of the lawbreaker's guilt and the damage inflicted. An administrative fine may be appealed in a law court or a commercial court. If in the course of court proceedings it is discovered that the amount of the fine was established without taking these requirements into account, the commercial court will need to declare the administrative fine invalid (in full or in part). Lack of a procedure for imposing administrative fines for violations of environmental laws is not grounds for declaring a fine invalid.

On the whole, the system of payments and fines in the sphere of environmental management and protection is regulated by a great number of legislative acts at various levels. The most important of them are set forth in Attachment 5.

Problems of complying with environmental protection norms

³ [In Russian this is called an arbitrazhnyi sud, which is often translated as "arbitration court." It is, however, more accurately translated as commercial court, as it has nothing to do with arbitration in the English use of that term.] [editor's note]

In the modern legal practice in the Russian Federation there is a certain contradiction in interpreting legal norms regulating pollution emissions. Generally, a breach of law is understood to be an action prohibited by law. The law, however, *does not prohibit* pollution emissions into the atmosphere. Article 20 of *Law "On Environmental Protection"* envisions, as mentioned above, a fee for polluting the environment, in particular, for emissions within and in excess of established limits. Many specialists consider that the actions for which a regular payment is established by the State cannot be regarded as prohibited by law and therefore cannot be considered a breach of law.

Correspondingly, enterprises and other subjects making payments to the State for pollution emissions reasonably believe that they are not violating the law, but performing legal actions for which no sanctions of an administrative, criminal or even civil nature should be applied.

However, many, mostly representatives of public environmental organizations (NGOs), think that payment for pollution emissions does not constitute the legalization of polluting activities as such and that more types of legal liability should be imposed. They refer to Article 20 of the *Law "On Environmental Protection,"* which says that payment for using natural resources does not relieve resource users from compensating for damage inflicted by violations of law. However, Article 26 of the Law does not give any answer to the question of whether pollution emissions constitute a breach of law if a payment has already been made for this emission. Moreover, the article does not discuss any other kind of liability other than compensation for damages.

There is also not a single interpretation of Article 84 of the *Law "On Environmental Protection,"* envisioning admin-

istrative liability for ecological breaches of law.

Finally, there is uncertainty regarding the application of Article 55 of the *Law "On Atmospheric Air Protection"* (1982), which states that persons guilty of exceeding MPE standards bear criminal, administrative or other liability, because the article was valid prior to introducing a payment for pollution emissions.

Payments for environment pollution have turned out to be ineffective not only because of low values but also due to defects in the text of the law. Thus, Article 20, paragraph 4 of the *Law "On Environmental Protection"* envisions a *transfer* of payments in an indisputable order. This wording, from a law enforcement point of view (activities of commercial courts) is illiterate. If it were written "*are enforced in an indisputable order*" and stated how they are enforced, then it would substantially increase the practical significance of this norm. The law does not envision an enforcement mechanism for collecting payments if enterprises do not pay. Courts may not consider cases connected with payments for emissions of pollutants because courts do not consider indisputable cases.

Insufficiency of public participation in the process of establishing standards

Other countries have spent many years developing a practice of involving the public in making decisions concerning the environment, including problems of establishing environment quality norms. In Russia, such a practice is not yet developed. This is due to, on the one hand, a lack of public awareness in matters of ecology and above all law (what they have the right to do and demand) and citizen passivity, and, on the other hand, the imperfection of Russian legislation regulating public participation in decision-making.

At the same time, Russian citizens possess a whole range of rights under current legislation. The *Law "On Environmental Protection"* contains a whole section (section III) devoted to the right to a favorable natural environment and to protect the environment. Besides, Article 72 determines the possibility of arranging public environmental monitoring. This task includes monitoring compliance with ecological legislation by departments, enterprises, institutions and organizations irrespective of their forms of ownership and subordination. Activities of officials and citizens are also subject to control.

Also, Article 10 of the *Law "On Protection of Atmospheric Air"* determines the direction along which public organizations and citizens can render support to State bodies in implementing measures for protecting air quality. This support includes, in particular, introducing proposals for improving air protection and informing them about violations of law known to them.

C. Advantages of Using Method 9 in Russia

Since opacity standards may be established at a level corresponding to any specific type of pollution control equipment, they may be established in such a way as to make their use economically profitable. For example, if an enterprise during a certain interval of time is not capable of spending more than X rubles for improving the operation of their equipment, then authorized bodies in the sphere of environmental protection may establish opacity standards corresponding to a level of technology and equipment costing not more than these X rubles. In this case, conformity to established limited standards which nevertheless may also lead to significant reduction of polluting emissions will be comparatively cheap and quite attainable. Moreover, because monitoring compliance with opacity standards may be performed visually, without using expensive measurements and tests,

it will be more profitable for enterprises to permanently follow these standards. Since opacity standards to a greater extent reflect true working conditions and financial capabilities of an enterprise, these standards will more likely be observed on a voluntary basis than MPEs.

Visually determined levels of conformity to standards

Visual methods for evaluating opacity of visible emissions (Method 9), used by the U.S. Environmental Protection Agency are useful in inspecting air protection activities of industrial enterprises with visible emissions. The main advantage of Method 9 is its efficiency, although there are other important positive qualities, making the use of this method within the framework of State and production control unique. It is an economical method and does not require the involvement of specialized laboratories for identifying violations. As a result, operational costs are substantially reduced and expendable materials and working hours spent monitoring air quality are saved. Laboratory research, when controlling sources of visible emissions using Method 9, is necessary only for determining damages.

Requirements to a Permissible Error in the Method

- *In each case an error should not exceed 15 percent*
- *A total average error should be less than 7.5 percent*

Finally, Method 9 establishes a limiting error when determining percentage of plume opacity, not in excess of 7.5 percent, while methods now used in Russia for determining concentrations of suspended matter in a gas duct are very cumbersome and allow an error of 25 percent.

Registration of Visual Observations

- *An observer registers the opacity level with an accuracy of 5 percent every 15 seconds for at least 6 minutes*
- *An observer should not look all the time at the smoke plume*
- *The average opacity level is an average value of 24 consecutive measurements made in 15 seconds each*

The opacity method is a visual method for controlling air pollution in a certain area or at a certain source of emissions, indicative in the presence of some substances in the air. Gradual complication of observation methods and appearance of new ways of detecting specific volumes and individual pollutants are possible and quite admissible. First, Method 9 is applicable as an indicator of air pollution outside of a polluting source in a spatial (regional) area. In this method one observes the event itself, *i.e.* appearance of an unfavorable air quality. This natural detection of pollution may be only a beginning or a pretext for detecting heavy pollution. Applying criminal, administrative or economic sanctions is possible only after the work of specially authorized bodies.

Second, the opacity method is applied to a specific object - an emission of a gas mixture (smoke) from an enterprise. It is possible to identify a pollution source and a measured (observed) value of an emission exists. Since the availability of a properly executed protocol and witness testimony are recognized as proof in court, then testimony of specially trained witnesses, possessing in addition an appropriate certificate, may serve as grounds for applying sanctions.

Method 9 has some shortcomings. Its use is affected by atmosphere conditions; an observer (inspector) must have access to a correct position on the terrain and a rather intensive regular re-testing of observers is required. Also, the use of Method 9 does

not relieve the necessity to do a preliminary study of a qualitative composition of aerosols, geometric dimensions of a source and its aerodynamic characteristics because these conditions affect opacity.

Part III. The Volgograd Experiment

A. Description of the Experiment

The Volgograd State Committee for Environmental Protection (a territorial body of the RF State Committee for Environment Protection), in conjunction with technical specialists from the United States, has performed a selection of enterprises for carrying out an experiment for introducing the opacity method. The Committee has chosen three enterprises:

- AOOT “Volgogradski alyuminiy” [Volgograd Aluminum];
- Plant “Krasny Oktyabr” [Red October];
- AOOT “Integrated works for silicate-building materials”

The experiment is calculated for 2 years. The experiment consisted of four stages:

Stage one: Analysis of available experience in introducing a permissible level of opacity; development of the project “Provisional methods of determining and controlling observations of the opacity standard in the city of Volgograd,” and the development of drafts of normative documents and provision for technical conditions to carry out the experiment.

Stage two: Approval of “Provisional methods of determining and controlling observations of the opacity standard in the city of Volgograd” by the Russian State Committee for Environmental Protection and the Volgograd Administration; and preparation and adoption of the Municipal Administration's Decision to conduct the experiment at enterprises in the city, the Regulations for determining payment for exceeding the opacity standard, the

Procedure for enforcing payment from enterprises that exceeded the established standard, as well as of sending directive letters to enterprises of the city, participating in the experiment.

Stage three: Conducting the experiment in the city; calculation of specific opacity standards for enterprises, their inclusion into MPE volumes; Licensing agreements on environmental management or Ecological certificates of enterprises and control over observation of established standards.

Stage four: Generalization of results, preparation of conclusions and recommendations for management of the Municipal Administration and State Committee of Environmental Protection on the efficiency and expediency of introducing the adapted Method 9 into other areas in Russia.

Over the last few years inspectors of the Committee were sent to the United States to be trained and certified in using Method 9. They were qualified as opacity inspectors. Trained specialists gathered required technical data on opacity levels for chosen enterprises in order to determine opacity levels attainable with the use of available technologies and equipment for controlling emissions. The Committee in coordination with enterprises developed and established corresponding opacity standards.

Goals of the experiment

The experiment introducing the opacity method for evaluating industrial emissions has the following goals:

- Establish more effective and efficient control over emissions of enterprises;

- experiment using opacity standards at a regional level;
- search for ways of increasing effectiveness of the existing system of payments for air pollution;
- determine an effectiveness means of using opacity standards for air pollution control in the Russian Federation;
- develop and refine opacity standards, determining their functional role in environmental protection activities;
- analyze results and prepare proposals concerning the expediency of introducing opacity standards in other industrial regions of Russia;
- expand the qualification and professional skills of employees of regional bodies of Russia's State Committee for Environmental Protection, training of specialists as experts in visual observation of the level of emissions of industrial enterprises.

Completion of preliminary work for adapting the method is aimed at introducing Method 9 into the practical system of ecological control by environmental protection services in the city of Volgograd. In the process of conducting the experiment at chosen industrial enterprises it is necessary to:

- adapt application of Method 9 to Russian conditions;
- obtain experimental data on the relationship between the opacity of emissions of specific pollutants and the state of pollution control equipment at enterprises;
- determine emission opacity indices for normal operation of pollution control equipment.

Data obtained as a result of realizing the experiment will allow one to:

- establish opacity norms for each pollutant;
- develop proposals for economic sanctions if established opacity norms are exceeded;
- develop a system of compensation measures for each pollution source exceeding opacity norms.

Choice of enterprises

In 1993, work was performed to collect and analyze information on the polluting effects of industrial enterprise emissions and mobile polluting sources (motor vehicles) on the Volgograd urban-industrial environment. The research program analyzed 56 enterprises. All information collected was represented in analytical tables and diagrams. On the basis of information collected, a control group of 12 enterprises was selected and investigated in greater detail:

1. Volgograd industrial and trade footwear association
2. AO "Volgogradsky alyuminij"
3. AOZT "SIM"
4. Volgogradsky electronic engineering plant
5. AO "Promstrojkonstruktsiya"
6. Volgogradsky integrated steelworks "Krasny Oktyabr"
7. Volgogradsky plant "Barrikady"
8. AO "Zavod ZhBI-1"
9. PO "Strojdetal"
10. AO "Volgogradneftemash"
11. AO "Volgogradsky tractor plant"
12. AO "Volgogradmebel"

The control (representative) group was selected based on quantity and composition of emissions. In particular, in 1991 their share in the total volume of emissions into the atmosphere amounted to 63.2 percent and in 1992 - 67.0 percent. They were also principal polluters of especially hazardous pollutants, for example, fluoride compounds, acetic acid and phenol. Selec-

tion of the control group, was in part affected by relations existing between the enterprises and the local environmental protection committee, because of the willingness to cooperate on the part of enterprises and their readiness to participate in the experiment to introduce "opacity" standards is very important.

B. The Current State of the Experiment

Activities of the Volgograd Municipal Environmental Protection Committee

Thanks to efforts of specialists from the Volgograd Municipal Committee for Environmental Protection, Method 9 is currently undergoing active testing and adaptation to Russian conditions. Technical and research documentation containing principal provisions of the method as well as forms for visual observations and instructions for their completion and processing have been translated into Russian within the framework of the project to introduce Method 9. These materials in the form adapted to Russian conditions became attachments to the State Committee on Environmental Protection's Order No. 293, dated 30 June 1997, to conduct the experiment in introducing the visual method for control of opacity of dust-and-gas emissions of enterprises (see Attachment 3).

Observation of visible emissions by air pollution sources at a number of Volgograd enterprises has already occurred. They obtained a series of observations of emitting sources at open-hearth and electric arc furnace steel making at the plant "Krasny Oktyabr" [Red October], at electrolysis and anode production facilities of AOOT "Volgogradsky alyuminiy," [Volgograd Aluminum] at lime kilns of AOOT, "Integrated works for silicate-building materials," and a number of other industrial objects.

The circle of specialists of the Municipal Committee for Environmental Pro-

tection, who have mastered Method 9, has been expanded. However, not all trained specialists have received certificates required for carrying out work in accordance with Method 9. The first draft of the lecture course for teaching Method 9 was compiled on the basis of experience in training new opacity inspectors. A trial course of lectures was delivered to students of the Volgograd Center for Ecological Training.

Promising directions and recommendations for introducing Method 9 into Russia's State ecological control system have been established. A detailed plan determining objects, conditions and sequence of actions has been developed for each of the proposed directions, as well as expected results. Among the key directions for introducing Method 9 the following have been singled out:

- inclusion of some provisions and requirements of the method into federal environmental protection legislation (in particular, into the draft of amendments and supplements to the *Law "On Environmental Protection"*);
- adaptation of Method 9 through the experiment in Volgograd with the results subsequently approved by the Board of the Committee for Environmental Protection;
- inclusion and integration of Method 9 in legislative and normative-technical documents valid in Russia;
- development and approval of a local legislative act valid within the Volgograd Region.

Work with the Russian State Committee for Standardization (Gosstandart)

With the help of technical specialists from the United States, the Volgograd Committee for Environmental Protection has organized joint work with branch insti-

tutes of NPO "Monitoring" and Scientific Research Institute "Atmosfera," developing technical standards for the State Committee on Environmental Protection. This institute is in Saint Petersburg. Under a contract Scientific Research Institute "Atmosfera" had to apply to Gosstandart to get approval on materials for receiving a provisional certificate for the opacity method in order to use the method at initial stages of the experiment. Gosstandart issued the required permission (a provisional certificate of State meteorological acceptance for 1 year) by which it certified the use of the smoke generators imported from the United States for the process of training qualified opacity inspectors on the basis of the study center in Volgograd (Attachment 3). In accordance with terms of the provisional certificate, the Volgograd Committee for Environmental Protection should submit preliminary data on evaluation of work and applicability of the opacity method to Gosstandart in May 1997.

According to the certificate of State meteorological acceptance the procedures developed on the basis of Method 9 were named - *The methods of carrying out visual determination of the opacity of dust-and-gas flows emitted by stationary atmosphere polluting sources (M-MVI-5-96)*.

Plans for further work

The Order of the State Committee of the Russian Federation for Environmental Protection "*On Conducting an Experiment for Introducing the Method for Visual Determination of the Opacity of Polluting Emissions*" No. 293 was issued on June 30, 1997 for enforcing the experiment (Attachment 3). According to the order, the experiment should be expanded to Kemerovo, Novokuznetsk and Nizhnii Tagil in addition to Volgograd. Training of specialists as observers (opacity inspectors) for all cities participating in the experiment is supposed to be conducted on the basis of the Volgograd Center for Ecological Training. For

such purpose, a lecture course for visual determination of emissions in accordance with the curriculum attached to the order should be developed and approved.

In order to introduce the use of the new method of visual evaluations into the practice of control bodies during the first half of 1998 on the basis of results of the experiment, a package of normative documentation for regulating visible emissions from stationary sources must be developed.

C. Training of Opacity Observers

As stated above, opacity inspectors initially underwent training in the United States. While receiving the certificate for the right to carry out visual observation of opacity of industrial emissions, inspectors also obtained the right to train other specialists in using Method 9. Training of a wider circle of specialists and opacity inspectors should be conducted mainly through existing study centers. Thus in Volgograd, training under this experiment is carried out by the local Center for Ecological Education. To be able to train specialists in using Method 9 study centers must receive a corresponding license. All problems connected with training opacity inspectors are set forth in greater detail in Part V of this booklet.

Part IV. Legal Basis for Introducing Opacity Standards into Russian Practice

A. Existing Legal Basis for Establishing Opacity Standards.

In air quality monitoring the principal tool should be direct methods of measuring concentrations of harmful substances and volumes of gas-air mixture either after passing through control equipment or being directly emitted into the atmosphere. GOST 17.2.3.02-78 provides for the use of indirect methods, such as balance, technological and other methods, where direct monitoring is not possible and also to improve control over MPEs. This norm is a required basis for introducing and using Method 9.

Articles 16 and 32 of RSFSR *Law "On Protection of Atmospheric Air"* (1982) and Article 45 of RSFSR *Law "On Environmental Protection"* (1991) (see Attachment 7) may be used to support application of the opacity method. These articles require that enterprises observe technical standards of environmental quality by maintaining equipment in working order, using pollution control devices and arranging effective control of pollution emissions.

General requirements for methods of identifying pollutants are established in GOST 17.2.4.02-81, which corresponds to CMEA Standard 2598-80. Requirements contained in this GOST should be taken into account when submitting Method 9 for approval. There are also specialized GOSTs and Gosstandart-approved methods for determining concentrations of specific substances.

The following may serve as basic data for determining the actual mass of an emission:

- data of environmental managers' monitoring laboratories, State ecological control bodies, other labo-

ratories accredited to carry out analytical work;

- data on expenditure of fuel, raw and other materials;
- data on time mode of equipment operation for a year;
- data on time and effectiveness of operation of pollution control equipment, etc.

Thus, the opacity method (Method 9), designed for indirect control over emissions from individual pollution sources, does not contradict current Russian legislation. Moreover, application of such indirect methods is directly contemplated for determining compliance with MPEs (GOST 17.2.3.02-78, para. 4.2). The method of measuring the opacity of emissions may be used most efficiently for controlling operation of pollution control equipment.

The opacity method is simple, convenient, informative, accessible to everyone, and requires minimal expenses. This is a way to create a fundamentally new approach to controlling air quality. In order to integrate the opacity method into the existing legal system and to accept it as an admissible fact in legal proceedings, its place, role and significance in the system of control of air quality must be defined in all legislative acts from the *Law "On Environmental Protection"* and the *Law "On Protection of Atmospheric Air"* to standards and rules in the sphere of regulation of impacts on and protection of air.

B. Requirements and Certification Procedures of Method 9.

To provide the most secure basis for legal preparation of the opacity method as a normative method of measuring air quality it is necessary to:

1. Make amendments to the *Law "On Environmental Protection,"* Section IV, Articles 25-27 "Regulation of environment quality," defining the opacity method as one of the methods of regulating air quality.
2. Introduce into the *Law "On the Sanitary and Epidemiological Well-being of Population,"* Article 17 "Atmospheric Air over Populated Areas," the following revised wording: "to prevent pollution of the atmospheric air over populated areas, residents of a district or town have the right, to monitor air quality in the district and directly at an enterprise, using the opacity method, and all required conditions are created for this purpose. All data on violations and pollution facts should be recorded in a special book."
3. Introduce the possibility of determining air quality with the opacity method into the *Law "On Protection of Atmospheric Air,"* having adjusted in detail the grounds and procedure for its use.
4. Introduce supplements into the RF Government's *Decision "On Approval of the Procedure of Developing and Approving Ecological Standards of Emissions and Discharges of Pollutants into the Environment and Limits of Using Natural Resources,"* dated August 3, 1992:
"Ecological regulation includes determination of the degree of air pollution by the method of visual determination of the opacity of emissions."
5. Introduce supplements into the "*Procedure for determining payment and its maximum sizes for polluting the environment, waste disposal and other kinds of harmful impacts,*" approved by the RF Government's Decision on August 28, 1992.
6. Approve, along with the MPC standard, the MPE opacity standard and establish its parameters, description and methods of determination in the environment.
7. Give a corresponding explanation in decrees of the Supreme Commercial Court and the Plenum of the Supreme Court concerning practical use of the opacity method with recommendations to use the method as evidence in court to prove the guilt of enterprises and organizations for damage inflicted on public health and the environment.
The Method's insufficient development, lack of prepared procedures, specialists and approval in various regions will complicate its introduction.
8. Introduce into the ecological certificates of regions and enterprises a special section devoted to determining opacity parameters for each installation discharging emissions.
9. In each specific case and for each type of equipment, give characteristics of opacity and establish them as a basic standard, subject to proper certification. Comparison of an already certified "opacity" standard with emissions being observed at a given time will allow the value of deviation from the standard to be determined legislatively, and, consequently, to be accepted as evidence in court concerning the amount of pollution in a specific case.

Bodies establishing new methods of environmental monitoring

The RSFSR *Law "On Environmental Protection"* (Article 25, para. 2) governs the procedure for approval of Method 9 and can be applied for this purpose even without the legislative changes just described. Specially authorized bodies of the Russian Federation in the environ-

mental protection field must approve methods of controlling harmful environmental impacts. Therefore, approval of Method 9 as an indirect method for air quality determination and control is a task of a specially authorized environmental protection body, which is the State Committee of the Russian Federation for Environmental Protection.

Administrative levels for establishing new standards

Decisions on introducing new methods of ecological control and, in particular, Method 9 for air quality control may be taken at various levels. Thus, the Government of a republic within the Russian Federation, the administration of a territory, region or town may initially adopt a Decision on conducting an experiment in using this new method.

Municipal environmental protection committees are territorial bodies of Russia's State Committee on Environmental Protection. Therefore, territorial bodies of the State Committee on Environmental Protection carry out their activities under the control of the federal body and address matters within competence of subjects of the Russian Federation – under the control of corresponding bodies of executive power of the subjects of the Federation and bodies of local self-government. According to Article 72 of the Constitution of the Russian Federation, environmental management, environmental protection and provision of ecological safety are within the joint competence of the Russian Federation and subjects of the Russian Federation. Moreover, in accordance with federal *Law "On General Principles of Local Self-Government in the Russian Federation,"* dated 12 December 1995, providing for the sanitary-and-epidemiological well-being of population and environmental protection within a municipality is within the competence of a local self-government body.

At the stage of carrying out the experiment to introduce and use a new air (or other natural media) quality determination and control method, it is expedient to develop and adopt the following documents:

- a provisional (for the period of carrying out the experiment) or permanent procedure for controlling quality of air and emissions of enterprises (to be approved by Russia's State Committee for Environmental Protection);
- an order of the State Committee for Environmental Protection to carry out the experiment in a town or subject of the Federation in using this new method;
- a decision of the administration of a city or subject of the Federation to carry out the experiment in using the proposed method.

Kinds of approving documentation

Various kinds of normative documents are adopted at the appropriate levels of approval and by the appropriate decision-making bodies on the implementation and use of the new environmental quality control method. Attachments 3 and 4 contain the Order of the State Committee on Environmental Protection of the Russian Federation and a Draft Decision of the Volgograd Administration on carrying out the experiment in using the opacity method for controlling emissions of industrial enterprises.

C. Opacity Standards as Binding Norms

In the United States the opacity standard is mandatory, has the character of a binding norm, and its violation may be considered in court.

EPA Policy with regard to opacity standards

- *Opacity indices are independent standards provided with legal sanctions*
- *Opacity standards are established at a level that requires correct operation and maintenance of production and pollution control equipment*

Can introduction of the new opacity standard in Russia become a direct legal basis for liability? Why is it necessary? The authors of the present booklet have tried to answer these questions in the following sections.

Opacity standards as an indirect indicator of pollution control equipment malfunctioning

Violation of an opacity standard has significance as a signal for environmental control bodies to immediately check whether a facility is observing the MPE standards. In addition, a properly and legally documented violation of an opacity standard may have significance as indirect (circumstantial) evidence when imposing criminal or administrative liability, compensating for damage, or deciding to suspend or cease operation of an enterprise. However, the value of indirect evidence is recognized only when it is logically connected with direct evidence or with a whole block of other indirect evidence.

Kinds of evidence

- *An opacity determination protocol*
- *A certificate of a qualified observer*
- *Note-books, observation record sheets, etc.*
- *Photos and video-recordings*

Alternative use of opacity standards as a direct indicator of compliance with environmental requirements

To use the opacity standard as a direct indicator of a violation of environmental protection requirements it should correspond to MPE standards. The opacity standard may be established individually for each source of emissions into the atmosphere.

Annex 3 to Order No. 293 of Russia's State Committee on Environmental Protection dated 30 June 1997, "*Provisional instructions for using methods of visual determination of the opacity of dust-and-gas flows emitted by stationary atmosphere polluting sources (M-MVI-5-96) within the framework of the experiment in the cities of Volgograd, Kemerovo, Novokuznetsk and Nizhnii Tagil,*" states that opacity indices are established in conformity with approved standards of emissions (see Attachment 3). Thus, though the opacity standard is not itself a direct measure of emissions, it nevertheless serves as a direct indicator of a violation, not just of operation of equipment, but also of observance of established emissions requirements. This is achieved by calculating for each source that has established MPEs in its permit opacity indices for these specific MPEs (corresponding to normal operation of equipment). In other words direct correlation is to be established between MPEs and corresponding opacity standards.

Documents containing opacity standards

If opacity standards are regarded only as an indirect indicator of improper operation of equipment, they may be entered into technical documentation for this kind of equipment and also included into the section of the ecological certificate of an enterprise devoted to protection of air quality. However, opacity standards indicated in the ecological certificate will have only an informative character.

If opacity standards are correlated with standards of permissible impacts, then they should be approved by a local territorial body of the State Committee on Environmental Protection and entered into the MPE book.

In conformity with Annex 3 to Order No. 293 of Russia's State Committee on Environmental Protection dated 30 June 1997, "*Provisional instructions for using methods of visual determination of the opacity of dust-and-gas flows emitted by stationary atmosphere polluting sources (M-MVI-5-96) within the framework of the experiment in the cities of Volgograd, Kemerovo, Novokuznetsk and Nizhnii Tagil,*" opacity indicators should be approved by the Committee as standards for control purposes and put into force as a valid permit for emissions. Thus, at present a document containing binding opacity standards is clearly authorized for the purpose of carrying out the experiment.

D. Development of Specific Opacity Standards for Enterprises

Calculation of standards

On the basis of existing international experience and Russian practice in establishing environmental quality standards *final* (permanent) and *intermediate* (provisional) standards may be developed both for new and existing sources of air pollution.

1. *Establishing permanent standards.* Standards for visible emissions of a production process are established on the basis of existing data for visible emissions and data on a production process when pollution control equipment is being properly operated and maintained. Standards for visible emissions take into account the specific character of production processes and the type of pollution control equipment.

At present sufficient information has been accumulated on levels of visible emissions from stationary sources under normal operation of pollution control equipment. Such equipment usually includes electrostatic devices for collecting deposits, cyclones, fabric dust collectors and other pollution control mechanisms for production purposes. When the MPEs for production processes do not require installation of additional control equipment, the MPEs are determined for conditions of normal operation of existing equipment for intermittent emissions, for example, those discharged in coke processing.

As applied to the Volgograd experiment, there may be several approaches to establishing specific standards for enterprises chosen in the process of the experiment:

- to use standards valid in other countries for a similar type of production and equipment;
- establish standards of visible emissions for Russian equipment operated under normal conditions in conformity with MPEs;
- establish opacity standards on the basis of a source of emissions and a type of equipment similar to those in Volgograd even if the type of production differs from the one in Volgograd.

In the United States and Europe there are corresponding opacity standards for steel-making and processing enterprises, aluminum-smelting plants and nonmetal unit-type products manufacturing.

2. *Establishing provisional standards.* Such an approach fits well with the system adopted in Russia where coordinated provisional standards of emissions and discharges are used more often than permanent ones. Provisional standards are used where sources of emissions have difficulty

achieving immediately required MPE standards due to imperfection and wear of equipment and adopted production practices. For financial considerations enterprises cannot re-equip production or install adequate control equipment. In these cases provisional standards for certain periods are established for such enterprises as a transition to generally adopted permanent standards. Intermediate standards may be established on the basis of records of observations of visible emissions of an enterprise (a permanent or temporary source) and current information received from a source if its operation is correct.

To establish a provisional standard for a certain source whose emission limit parameters are unknown it is necessary to use a simple mathematical formula (arithmetic mean), for example, 30 percent opacity for 6 minutes. The average time and time for the given standard are determined by the mode of operation of a source or its process characteristics.

A specific example of the procedure for determining provisional opacity standards for an arc furnace is given in Attachment 8.

Part V. Legal Aspects for Setting up “Opacity Schools”

A. Introduction

Training of certified instructors and observers

The first instructors of the opacity school were trained and tested in the United States. The certificates received there give the instructors the right to train opacity inspectors (specialists - observers) in specialized centers (for example, in Centers for Ecological Training). Such centers may be set up in various regions of the country. An example of a standard charter of such a center is set forth in Attachment 9.

Mechanisms for certification of new students

New students receive training in using the opacity determination method in Centers for Ecological Training licensed for this kind of training. Certificates of a qualified observer, issued in accordance with the procedure established in the Russian Federation, will allow inspectors not only to check enterprises but also train new inspectors. An inspector receives confirmation of his certificate in a Center for Ecological Training regardless of whether his initial certificate was issued in the United States or Russia. The form of the certificate is approved in the annex to the Order of the State Committee on Environmental Protection No. 293 (see Attachment 3).

Qualification requirements

A candidate must pass an examination and demonstrate his ability to assign opacity readings in 5 percent increments to 25 different black plumes and 25 different white plumes with an error not to exceed 15 percent opacity on any one reading and an average error not to exceed 7.5 percent opacity in each category.

Validity of qualification

The certification shall be valid for a period of 6 months at which time the qualification procedure must be repeated by all inspectors in order to retain certification

Approved methods of testing observers are set forth in the Annex № 3 to the same Order No. 293.

Use of certified equipment for training

In compliance with Part 7 of Article 33 of federal Law “On Introducing Amendments and Supplements into Law of the Russian Federation ‘On Education’” (hereinafter referred to as Law “On Education”) a license for the right of educational activities is issued on the basis of an opinion issued by an experts' commission. One of the aims of carrying out an experts' examination is to establish conformity of equipment used for training to standards and rules established by legislation of the Russian Federation. A smoke generator, the main training equipment required for training opacity inspectors, should be certified in compliance with the above indicated requirements of Law “On Education.”

The Order of the State Committee on Environmental Protection No. 293 approved, *inter alia*, technical requirements for the equipment used for training and testing observers. In addition, among the annexes to the Order there is a verification instruction for the equipment used for making smoke plumes - IP-93-96 (Attachment 3). This is an imported piece of equipment delivered from the United States.

Necessity of a licensed institution for training observers

Part 6 of Article 33 of the *Law "On Education"* establishes that the right to carry out educational activities is granted to an educational institution when it is issued a license. According to *"The Regulations for the Procedure and Conditions of Professional Re-training of Specialists,"* approved by Decision No. 12 of the State Committee of the Russian Federation on 27 January 1995, a State, municipal or non-State educational institution has the right to carry out professional re-training of specialists if it has a license issued in accordance with the established procedure. Professional re-training of specialists is carried out on the basis of contracts between educational institutions and federal bodies of executive power, enterprises, organizations and institutions of all forms of ownership.

Requirements for Centers for Training and Testing Observers

- 1. A center must be accredited in accordance with the established procedure and have a license*
- 2. A center must be completely equipped with measurement devices required for training specialists according to given methods*
- 3. All measuring devices in a center must be legitimized in accordance with the established procedure and have valid verification certificates issued by Gosstandart bodies*
- 4. A center must conduct training and testing of observers in accordance with approved methods*
- 5. A certificate of a qualified observer is issued by a center in conjunction with a territorial body of RF Gosstandart or the Medelejev State Enterprise Russian Scientific Research Institute for Meteorology.*

B. Description of an "Opacity School"

The Volgograd Center for Ecological Education has a license issued by the territorial⁴ educational body on 14 December 1995. The type of activities connected with training of opacity inspectors is not indicated in the supplement to the license. It is not difficult to make amendments and supplements to the license, provided the certificate for Method 9 and the certificate for the smoke generator are available. Proposals for supplementing the license are set forth in Attachment 10.

The Order of the State Committee on Environmental Protection No. 293, dated 30 June 1997, recognized the Volgograd Center for Ecological Education as a basic institution for training opacity inspectors (specialists - observers). A curriculum for training such specialists is set forth in an annex to the Order (see Attachment 3).

Official documents required for issuing certificates to observers by existing centers

Centers for ecological training that have not passed State accreditation may issue certificates on the basis of an Order of Russia's State Committee on Environmental Protection. Such an Order should contain a paragraph on arranging training of specialists who have mastered the visual-and-optical method of determining opacity of emissions from enterprises and on issuing them certificates of an established form. A certificate issued on the basis of a State Committee on Environmental Protection Order shall be valid for State Committee on Environmental Protection inspectors throughout the Russian Federation provided that a training center has a license from Russia's State Committee on Environmental Protection or its territorial body.

[⁴ *i.e.* the Volgograd Oblast (a subject of the Federation).][editor's note]

Paragraph 4 of the Order of Russia's State Committee on Environmental Protection No. 293, dated 30 June 1997, contains a prescription to organize, on the basis of the Volgograd Ecological Education Center, specialists-observers for making "determinations of light reduction factors of smoke plumes from stationary sources of pollution of the atmosphere" (*i.e.* opacity determination) in accordance with procedure M-MVI-5-96 (Method 9 adapted to Russian conditions).

C. Accreditation of Institutions

Requirements for full accreditation

The rights of an educational institution to issue to its graduates an official certificate (recognized by the government) on a particular kind and level of education appear on its State accreditation. State accreditation is conducted by federal and departmental State education management bodies or on the basis of their powers of attorney by other State education management bodies on the basis of an application of an educational institution and an opinion on its certification (Article 33 of *Law "On Education."*) Certification of an educational institution is carried out on the basis of its application to the State Certification Service. Certification can be accomplished either by an order of the State Certification Service or on the basis of its power of attorney from bodies of State power, education management bodies and local self-government bodies with involvement of leading educational institutions and the public. To obtain accreditation, an educational institution must show that not less than half of its graduates for three consecutive years have successfully completed their certification. The first accreditation of a newly established educational institution may be carried out on the basis of its application after the first graduation of its students but not earlier than three years after receiving a license provided that not less than half of its gradu-

ates had positive results in their final certification.

The procedure for licensing, certification and State accreditation of educational institutions is established by the Government of the Russian Federation (Article 28). Subjects of the Russian Federation have the right to set up, re-organize and liquidate educational institutions of a corresponding level (*i.e.* not federal educational institutions) and license educational institutions (Article 29 of *Law "On Education"*).

For non-State educational institutions that provide supplementary professional training, having State certification and a corresponding certificate, chairmen of State certification commissions are approved by the State Committee of the Russian Federation for Higher Education. Certification commissions may include representatives of the founder, local bodies of executive power, scientific-and-pedagogical personnel of an educational institution, specialists of enterprises, and teachers of other educational institutions. Students who complied with all requirements of the study plan and passed State final certification receive a diploma of professional training of an established form.

Certification of observers for work throughout Russia

According to the *Law "On Education"* federal bodies of executive power, authorized in accordance with legislation in force to conduct teaching within its competence, do not participate in issuing licenses to a corresponding study center. However, besides the above mentioned legal matters of licensing, ecological training is indirectly regulated by the Decision of the Government of the Russian Federation No.168, dated 26 February 1996, "*On Approval of the Regulations for Licensing Some Kinds of Activities in the Sphere of Environment Protection.*" One of the kinds of activities, licensed by the State Committee on Envi-

ronmental Protection and its territorial bodies and mentioned in this Decision, is “execution of kinds of activities connected with work (services) with an environmental protection purpose.” Such services also include ecological training. The Order of the State Committee on Environmental Protection No. 293, dated 30 June 1997, approved requirements to the Volgograd Center for Ecological Education for training and testing observers (see Attachment 3 and the framed text above). For newly established centers (functioning for less than 3 years and not having the right to conduct State accreditation) it is expedient to conduct first-stage training of inspectors from other regions at the Volgograd Ecological Education Center, and then in other centers of this kind ultimately having a corresponding license on the basis of an order of Russia's State Committee on Environmental Protection. The order should contain a paragraph on arranging training of specialists who have mastered the visual-and-optical method of determining opacity of emissions from enterprises and on issuing them certificates of an established form.

Part VI. Introduction and application of Method 9 and opacity standards.

Introduction of opacity standards and assurance of their observance should not be regarded as a detached procedure substantially differing from already valid norms and standards regulating the air quality in a region and the mechanisms assuring their observance. "Opacity" should be integrated into the valid system and be regarded as an important indicator for determining non-conformity of operation of an enterprise to the requirements of air quality protection. Therefore, there is no need to develop something special for using Method 9; it is sufficient to indicate principal functions and an "opacity" place in the already valid system of mechanisms of payment for polluting the environment.

A. Economic Incentives

In 1989-1990 a new ecological policy began to take shape that emphasized developing economic incentives in environmental regulation. Since 1990-1991 a large-scale economic experiment has been conducted to introduce payment for polluting the environment. The RF Law "*On Environmental Protection*," adopted in 1991, legislatively fixed the principle of paid environmental management and obligatory compensation of damage inflicted to environment by industrial pollution. Laws adopted later established principles of determining payment for individual nature resources and for emissions of pollutants into the environment. Payment for pollution charged from environmental managers is a form of compensation of economic damage from emissions and discharges of pollutants into the environment, which covers expenses for eliminating the impact of emissions and discharges of pollutants, stimulating reduction or maintenance of emissions and discharges within the limits of norms, as well as expenses for designing and constructing environmental protection facilities.

Payments

Basic rates of payment are established for each pollutant or a kind of harmful impact, with due regard for their danger to the natural environment and health of population. In the "opacity" case the basic rate of payment should be reestablished on the basis of the opacity level as a whole without setting several rates.

On the basis of the established procedure one may propose to introduce two kinds of rates:

- a rate of payment for the established "opacity" level within the level of a permissible standard;
- a rate of payment for exceeding the established "opacity" level over a permissible standard.

Existing approaches to determining payments may also be used to establish a mechanism of compliance with "opacity" standards. It is evident, of course, that in this case calculation of payments will be simpler. For this it is useful to introduce factors of the ecological situation and ecological significance of the atmosphere in a given region for determining values of the "opacity" standard and norms.

Existing principles of distributing and using funds enforced for exceeding and/or non-observance of "opacity" standards ought to be preserved. At present the evolved system of accumulating and using funds received as a result of collecting payments for polluting is in operation: all funds come to regional ecological funds; 10 percent of them are remitted to the Federal Ecological Fund, 60 percent to local (municipal) ecological funds, and 30 percent remain at the disposal of the region.

A number of researchers believe that the existing system of determining payments for emissions of specific chemical substances into the atmosphere may be revised under certain conditions. In particular, payment for volumes of emissions of substances forming visible emissions (smoke) may be replaced with payment for a certain opacity standard corresponding to certain levels of emissions. In this case such payment for opacity may be integrated into the existing system of payments for impacts on the environment.

Fines

At present no administrative fine is envisioned for violating opacity standards. But when an MPE violation is discovered with the use of data about violating an opacity standard, then a fine may be imposed. Imposition of a measure of administrative liability is followed with a possibility of a court proceedings (in case of an appeal against actions of administrative bodies), and a criminal action may also be brought or material liability imposed.

If opacity standards are equated to MPE standards, fines may be collected on general grounds envisioned by valid legislation for violations of environmental requirements in the sphere of protection of air quality.

Alternative incentives

In addition to known economic incentives of development of environmental-protection activities, such as payments and fines discussed above, there are other types of economic incentives:

1. Establishing tax and other privileges granted to enterprises, organizations and institutions if they introduce low-waste technologies and manufactures, use recoverable resources

or implement other environmental-protection measures.

2. Granting preferential credits to enterprises, institutions and organizations, irrespective of their forms of ownership, for effective protection of the environment.

Such measures are envisioned by Article 24 of the *Law "On Environmental Protection."*

B. Legal Liability

Legal liability for violations of opacity standards may be established in compliance with the administrative or criminal codes, or environmental laws, provided that opacity standards are officially established as binding for all enterprises. Disciplinary, administrative, criminal and material liability are employed in the Russian Federation. Imposition of sanctions in accordance with the various types of liability does not relieve persons guilty of failure to fulfill requirements to use and maintenance of pollution control equipment properly from liability to compensate for damage they cause. This is a general rule of Russian environmental legislation.

Administrative liability

The existing Russian ecological legislation envisions rules of liability for violations of requirements for the normal operation of technological and pollution control equipment, which are indicated by violations of an opacity standard.

Thus, *USSR Law "On Protection of Atmospheric Air"* (Article 28) establishes criminal and administrative liability for:

- violation of operating rules and failure to use installed facilities, equipment, apparatuses for control of emissions;

- non-fulfillment of prescriptions of bodies performing State control over protection of the atmosphere air.

The RSFSR *Code on Administrative Offenses* discusses liability in several articles:

Article 77	Emission of pollutants into the atmosphere in excess of norms or without permission having a harmful physical impact on the atmosphere.
Article 78	Commissioning of enterprises without observance of requirements for protection of air quality.
Article 79	Violation of operating rules as well as non-use of pollution control equipment.
Article 84	Non-fulfillment of prescriptions of bodies performing control over protection of air quality.

However, fines charged for violations in the sphere of air quality protection are so small that they do not provide much incentive to comply with environmental protection requirements (see Attachment 11).

Thus, two possibilities exist of imposing legal liability if Method 9 and corresponding opacity standards are introduced into practice:

1. *If opacity indicators are given the status of standards*, guilty persons may be liable for “non-observance of standards, norms and other factors of quality of the natural environment” (Article 84 of the *Law “On Environmental Protection”*) according to Article 77 of *RSFSR Code on Administrative Offenses*.

2. *If an opacity indicator is used as an indirect indicator*, those guilty may be held liable for “violation of operating rules

as well as non-use of installed facilities, equipment, apparatuses for cleaning and controlling emissions into the atmosphere” (Article 28 of the *Law “On Protection of Atmospheric Air”*) according to Articles 78 and 79 of *RSFSR Code on Administrative Offenses*.

To impose administrative liability the fact of violation should be officially recorded. If an observer discovers a violation of an opacity standard he is obliged to draw up a protocol indicating the name and address of the violator. If this is impossible and the statement is drawn up in an arbitrary form, then it must contain detailed information about the event violating a standard. This statement must indicate the place where it was made and give a detailed description of the circumstances of the violation, including the point of observation, distance to observed pollution, time of the day, weather conditions, opacity character, complaints of population, if any, etc. Items of official execution of a statement on violation of an opacity standard should be established in detail in method manuals.

Data of an Observation Determining its Legal Significance

- *Was the observation perpendicular to the longer axis of the outlet?*
- *Was the background seen through the horizontal axis of the smoke plume?*
- *Were observations conducted against a contrasting background?*
- *Are there full data for calculating the 6-minute average?*
- *Was the smoke plume continuous?*
- *Were positive errors of observation taken into account?*
- *Were dimensions of the source sufficient?*
- *Was the distance of the observer to the source recorded?*
- *Were the wind direction and speed recorded?*
- *Was the sky condition described?*
- *Was there any interference present?*
- *Was a steam plume noticeable?*
- *Was a sketch of the source location made?*
- *Were calculations checked?*
- *Are there any general remarks concerning the completed form?*

Such a detailed protocol of determining opacity was developed within the framework of the experiment conducted and approved as an annex to State Committee on Environmental Protection's Order No. 293 dated 30 June 1997 (see Attachment 3).

Disciplinary liability

For violating rules on operation of pollution control equipment (indirectly indicated by exceeding opacity standards of emissions) officials and other guilty employees are disciplinarily liable in accordance with Articles 135-136 of the RF *Labor Code*.

Disciplinary liability for an ecological offense is expressed in imposing a pen-

alty by the administration of an enterprise, organization or higher organization on a guilty employee for a failure to fulfill his service or contractual duties. The following disciplinary penalties may be applied to violators: a remark, a reprimand, a severe reprimand, or a dismissal.

As an example of disciplinary measures officials and other employees may be deprived of bonuses, *i.e.* full or partial deprivation of a yearly bonus, for example, for violations of environmental legislation, including failures of an enterprise to observe technological discipline as well as to use and maintain pollution control equipment in a proper state. A reference paper, issued by territorial environmental bodies, concerning the state of fulfillment of environmental measures and the degree of observance of environmental protection legislation for a corresponding period of time, may serve as grounds for deprivation of bonuses.

Imposition of a disciplinary penalty does not exclude the possibility of application of stricter kinds of liability, be it administrative, criminal, or civil, if there are legal grounds.

Criminal liability

The *Criminal Code* contains a separate Article 251 "Pollution of the Atmosphere," which provides for violating operation of installations, facilities and other objects, a fine amounting from 100 to 500 minimum monthly wages. Sanctions become more rigorous if violations resulted in injuries or deaths (see Attachment 11).

From the above it is clear that without amendments and supplements to legislation in force and adopting new standards and methods, the opacity method may not serve as an adequate method of recognizing a fact of ecological offense. However, even now this method may be used as an information basis for specific actions of author-

ized bodies or the public. Effectiveness of the “opacity method” is sufficiently high if a public control system is established – public monitoring of environment, air in this case.

Let us imagine that through training courses supported by media on the basis of special methods, the population of a region knows and is capable of discerning the degree of opacity with the help of simple visual observation, interpreting it as a fact of polluting the air. In this case the whole system of State monitoring may become a subsystem of public control and vice versa.

Attachment 1

Code of Federal Regulations, Title 40, Part 60

§ 60.193 Standard for visible emissions.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere:

- (1) From any pot room group any gases which exhibit 10 percent opacity or greater, or
- (2) From any anode bake plant any gases which exhibit 20 percent opacity or greater.

Attachment 2

METHOD 9 -- VISUAL DETERMINATION OF THE OPACITY OF EMISSIONS FROM STATIONARY SOURCES

Many stationary sources discharge visible emissions into the atmosphere; these emissions are usually in the shape of a plume. This method involves the determination of plume opacity by qualified observers. The method includes procedures for the training and certification of observers, and procedures to be used in the field for determination of plume opacity. The appearance of a plume as viewed by an observer depends upon a number of variables, some of which may be controllable and some of which may not be controllable in the field. Variables which can be controlled to an extent to which they no longer exert a significant influence upon plume appearance include: Angle of the observer with respect to the plume; angle of the observer with respect to the sun; point of observation of attached and detached steam plume; and angle of the observer with respect to a plume emitted from a rectangular stack with a large length to width ratio. The method includes specific criteria applicable to these variables.

Other variables which may not be controllable in the field are luminescence and color contrast between the plume and the background against which the plume is viewed. These variables exert an influence upon the appearance of a plume as viewed by an observer, and can affect the ability of the observer to accurately assign opacity values to the observed plume. Studies of the theory of plume opacity and field studies have demonstrated that a plume is most visible and presents the greatest apparent opacity when viewed against a contrasting background. It follows from this, and is confirmed by field trials, that the opacity of a plume, viewed under conditions where a contrasting background is present can be assigned with the greatest degree of accuracy. However, the potential for a positive error is also the greatest when a plume is viewed under such contrasting conditions. Under conditions presenting a less contrasting background, the apparent opacity of a plume is less and approaches zero as the color and luminescence contrast decrease toward zero. As a result, significant negative bias and negative errors can be made when a plume is viewed under less contrasting conditions. A negative bias decreases rather than increases the possibility that a plant operator will be cited for a violation of opacity standards due to observer error.

Studies have been undertaken to determine the magnitude of positive errors which can be made by qualified observers while reading plumes under contrasting conditions and using the procedures set forth in this method. The results of these studies (field trials) which involve a total of 769 sets of 25 readings each are as follows:

(1) For black plumes (133 sets at a smoke generator), 100 percent of the sets were read with a positive error n_1 of less than 7.5 percent opacity; 99 percent were read with a positive error of less than 5 percent opacity.

(2) For white plumes (170 sets at a smoke generator, 168 sets at a coal-fired power plant, 298 sets at a sulfuric acid plant), 99 percent of the sets were read with a positive error of less than 7.5 percent opacity; 95 percent were read with a positive error of less than 5 percent opacity.

n_1 For a set, positive error = average opacity determined by observers' 25 observations--average opacity determined from transmissometer's 25 recordings.

The positive observational error associated with an average of twenty-five readings is therefore established. The accuracy of the method must be taken into account when determining possible violations of applicable opacity standards.

1. Principle and Applicability

1.1 Principle. The opacity of emissions from stationary sources is determined visually by a qualified observer.

1.2 Applicability. This method is applicable for the determination of the opacity of emissions from stationary sources pursuant to § 60.11(b) and for qualifying observers for visually determining opacity of emissions.

2. Procedures

The observer qualified in accordance with section 3 of this method shall use the following procedures for visually determining the opacity of emissions:

2.1 Position. The qualified observer shall stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140 deg. sector to his back. Consistent with maintaining the above requirement, the observer shall, as much as possible, make his observations from a position such that his line of vision is approximately perpendicular to the plume direction, and when observing opacity of emissions from rectangular outlets (e.g., roof monitors, open baghouses, noncircular stacks), approximately perpendicular to the longer axis of the outlet. The observer's line of sight should not include more than one plume at a time when multiple stacks are involved, and in any case the observer should make his observations with his line of sight perpendicular to the longer axis of such a set of multiple stacks (e.g., stub stacks on baghouses).

2.2 Field Records. The observer shall record the name of the plant, emission location, type facility, observer's name and affiliation, a sketch of the observer's position relative to the source, and the date on a field data sheet (Figure 9-1). The time, estimated distance to the emission location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), and plume background are recorded on a field data sheet at the time opacity readings are initiated and completed.

2.3 Observations. Opacity observations shall be made at the point of greatest opacity in that portion of the plume where condensed water vapor is not present. The observer shall not look continuously at the plume, but instead shall observe the plume momentarily at 15-second intervals.

2.3.1 Attached Steam Plumes. When condensed water vapor is present within the plume as it emerges from the emission outlet, opacity observations shall be made beyond the point in the plume at which condensed water vapor is no longer visible. The observer shall record the approximate distance from the emission outlet to the point in the plume at which the observations are made.

2.3.2 Detached Steam Plume. When water vapor in the plume condenses and becomes visible at a distinct distance from the emission outlet, the opacity of emissions should be evaluated at the emission outlet prior to the condensation of water vapor and the formation of the steam plume.

2.4 Recording Observations. Opacity observations shall be recorded to the nearest 5 percent at 15-second intervals on an observational record sheet. (See Figure 9-2 for an example.) A minimum of 24 observations shall be recorded. Each momentary observation recorded shall be deemed to represent the average opacity of emissions for a 15-second period.

2.5 Data Reduction. Opacity shall be determined as an average of 24 consecutive observations recorded at 15-second intervals. Divide the observations recorded on the record sheet into sets of 24 consecutive observations. A set is composed of any 24 consecutive observations. Sets need not be consecutive in time and in no case shall two sets overlap. For each set of 24 observations, calculate the average by summing the opacity of the 24 observations and dividing this sum by 24. If an applicable standard specifies an averaging time requiring more than 24 observations, calculate the average for all observations made during the specified time period. Record the average opacity on a record sheet. (See Figure 9-1 for an example.)

3. Qualifications and Testing

3.1 Certification Requirements. To receive certification as a qualified observer, a candidate must be tested and demonstrate the ability to assign opacity readings in 5 percent increments to 25 different black plumes and 25 different white plumes, with an error not to exceed 15 percent opacity on any one reading and an average error not to exceed 7.5 percent opacity in each category. Candidates shall be tested according to the procedures described in section 3.2. Smoke generators used pursuant to section 3.2 shall be equipped with a smoke meter which meets the requirements of section 3.3.

The certification shall be valid for a period of 6 months, at which time the qualification procedure must be repeated by any observer in order to retain certification.

3.2 Certification Procedure. The certification test consists of showing the candidate a complete run of 50 plumes--25 black plumes and 25 white plumes--generated by a smoke generator. Plumes within each set of 25 black and 25 white runs shall be presented in random order. The candidate assigns an opacity value to each plume and records his observation on a suitable form. At the completion of each run of 50 readings, the score of the candidate is determined. If a candidate fails to qualify, the complete run of 50 readings must be repeated in any retest. The smoke test may be administered as part of a smoke school or training program, and may be preceded by training or familiarization runs of the smoke generator during which candidates are shown black and white plumes of known opacity.

3.3 Smoke Generator Specifications. Any smoke generator used for the purposes of section 3.2 shall be equipped with a smoke meter installed to measure opacity across the diameter of the smoke generator stack. The smoke meter output shall display instack opacity based upon a pathlength equal to the stack exit diameter, on a full 0 to 100 percent chart recorder scale. The smoke meter optical design and performance shall meet the specifications shown in Table 9-1. The smoke meter shall be calibrated as prescribed in section 3.3.1 prior to the conduct of each smoke reading test. At the completion of each test, the zero and span drift shall be checked and if the drift exceeds +/- 1 percent opacity, the condition shall be corrected prior to conducting any subsequent test runs. The smoke meter shall be demonstrated, at the time of installation, to meet the specifications listed in Table 9-1. This demonstration shall be repeated following any subsequent repair or replacement of the photocell or associated electronic circuitry including the chart recorder or output meter, or every 6 months, whichever occurs first.

TABLE 9-1--SMOKE METER DESIGN AND PERFORMANCE SPECIFICATIONS

Parameter	Specification
a. Light source	Incandescent lamp operated at nominal rated voltage
b. Spectral response of photocell	Photopic (daylight spectral response of the human eye -- Citation 3).
c. Angle of view	15 deg. maximum total angle
d. Angle of projection	15 deg. maximum total angle
e. Calibration error	[+/-] 3% opacity, maximum
f. Zero and span drift	[+/-] 1% opacity, 30 minutes
g. Response time	5 seconds

3.3.1 Calibration. The smoke meter is calibrated after allowing a minimum of 30 minutes warmup by alternately producing simulated opacity of 0 percent and 100 percent. When stable response at 0 percent or 100 percent is noted, the smoke meter is adjusted to produce an output of 0 percent or 100 percent, as appropriate. This calibration shall be repeated until stable 0 percent and 100 percent readings are produced without adjustment. Simulated 0 percent and 100 percent opacity values may be produced by alternately switching the power to the light source on and off while the smoke generator is not producing smoke.

3.3.2 Smoke Meter Evaluation. The smoke meter design and performance are to be evaluated as follows:

3.3.2.1 Light Source. Verify from manufacturer's data and from voltage measurements made at the lamp, as installed, that the lamp is operated within +/- 5 percent of the nominal rated voltage.

3.3.2.2 Spectral Response of Photocell. Verify from manufacturer's data that the photocell has a photopic response; i.e., the spectral sensitivity of the cell shall closely approximate the standard spectral-luminosity curve for photopic vision which is referenced in (b) of Table 9-1.

Attachment 3

**STATE COMMITTEE OF RUSSIAN FEDERATION
FOR ENVIRONMENTAL PROTECTION**

Decree

30.05.97

No. 293

Moscow

**On Conducting an Experiment to Implement a Visible Emission
Evaluation Method for Air Pollutants**

With the goal of having a more operative and effective control over the emission of pollutants into the atmosphere from stationary sources and to decrease the material and other expenses due to its realization I order the following:

1. The State Environmental Control Office (Markin), the State Environmental Committee of Volgograd Region (Zheltobrukhov), the State Environmental Committee of Volgograd [city] (Kosenkova), the State Environmental Committee of Kemerovo Region (Malakhov) and the State Environmental Committee of Sverdlovsk Region (Sobolev) are to conduct, in Volgograd, Kemerovo, Novokuznetsk and Nizhnii Tagil during 1997, an experiment on the applicability of the “Method for the visual assessment of the opacity of dust-and-gas plumes from stationary sources of air pollution M-MVI-5-96” (appendix 1).
2. Confirm the application of the “Temporary regulations for the application of the method for the visual assessment of the opacity of dust-and-gas plumes, from stationary sources of air pollution M-MVI-5-96 in the framework of an experiment in Volgograd, Kemerovo, Novokuznetsk and Nizhnii Tagil” (addendum # 2).
3. The State Environmental Control Office (Markin) is to organize the development and approval of a course of lectures based on the curriculum (addendum # 3).
4. The State Environmental Committee of Volgograd Region (Zheltobrukhov) and the State Environmental Committee of Volgograd [city] (Kosenkova) are to organize the preparation of specialist –observers to determine the degree to which light is reduced as it passes through a smoke plume emitted from stationary sources in accordance with method M-MVI-5-96 on the basis of the approved course of lectures on visible evaluation of emission at the Center of Ecological Training of the Volgograd Branch of the Russian Ecological Academy.
5. The State Environmental Committee of Volgograd Region (Zheltobrukhov), the State Environmental Committee of Volgograd [city] (Kosenkova), the State Environmental Committee of Kemerovo Region (Malakhov), the State Environmental Committee of Sverdlovsk Region (Sobolev), in order to conduct the experiment in the corresponding cities, are to provide training of specialists-observers to determine the degree to which light is reduced as it passes through a smoke plume emitted from stationary sources at the Center of Ecological Training of the Volgograd Branch of the Russian Ecological Academy.
6. The Scientific Research Institute “Atmosphere” (Milyayev) is to provide the accompanying scientific-methodological support for the experimental implementation of method M-MVI -5-96.

7. The State Environmental Control Office (Markin), the Department of Legal Support and Personnel (Dimov), and the Scientific Research Institute "Atmosphere" (Milyayev) are, on the basis of the results of the experiment, to prepare, in the first half of 1998, a packet of normative documents to regulate visible emissions from stationary sources.

8. The control of the implementation of this Decree is placed on the Vice-Chairperson A.A. Solovyanov.

Chairperson of the Russian Federation
State Committee for Environmental Protection

V.I. Danilov-Danilyan

[Appendices to the decree omitted in translation]

Attachments 4-6 Omitted in English Translation

Attachment 7: Legal Basis for Using Method 9 in Russia

Law of the RSFSR “On Protection of the Atmospheric Air,” adopted by the Supreme Soviet of the RSFSR 14 July 1982.

Article 16. Measure for the regulation of emissions of pollutants into the atmosphere from stationary sources of pollution.

Enterprises, institutions, and organizations whose activities result in the emission of pollutants into the atmosphere, must conduct organizational-economical, technical and other measures to ensure compliance with the conditions and requirements provided for in their emissions permits, take measures to reduce emissions of pollutants, provide for regular, effective work [of the enterprise], for maintenance of pollution control equipment in good working order, and for monitoring of that equipment, and also implement a continuous inventory of the quantity and composition of pollutants being emitted into the atmosphere.

Implementation of measures to protect the atmospheric air may not lead to the pollution of the soil, water, and other natural objects.

Article 32. Equipment for cleaning of facilities of sources of air pollution

Enterprises, institutions and organizations whose activities result in emission of pollution substances into the atmosphere, notwithstanding the time they have been in operation, are obliged to be equipped with installation, equipment and apparatus for the cleaning of emissions into the atmosphere and with means of monitoring the quantity and composition of pollution emissions.

Law of the RSFSR “On Environmental Protection,” adopted by the Supreme Soviet of the RSFSR 19 December 1991.

Article 45. General Environmental Requirements for the operation of Enterprises, Installations and Other Facilities.

2. Enterprises, institutions, organizations and individual citizens must comply with established environmental quality standards through application of approved technologies, introduction of environmentally safe technologies and types of production, reliable and efficient operation of anti-pollution installations and equipment and means of pollution monitoring, neutralization and utilization of wastes, and to take measures to protect the land, underground resources, water, forests and other vegetation and animal life and renew natural resources.

Attachments 8-10 Omitted from English translation

Attachment 11. Legal liability for violations in the sphere of atmospheric air protection.

Administrative Code of the RSFSR

Article 77. Atmospheric emission which exceeds standards, or which is carried out without permission, and adverse effect on the ambient air⁵.

Excess of maximum admissible discharge or of temporarily agreed atmospheric emission standards; excess of standards of maximum admissible adverse effect on the ambient air; atmospheric emission without permission by specially authorized state agencies; adverse physical effect on the ambient air without permission by specially authorized state agencies if the legislation of the USSR requires such a permission — results in admonition or fining (up to 100 rubles) of officers.

Article 78. Breaking-in of enterprises with violation of requirements on the ambient air protection⁶.

Breaking-in of new or renovated enterprises, buildings and other objects which do not meet requirements on the ambient air protection — results in admonition or fining (up to 100 rubles) of officers.

Article 79. Violation of operating rules, as well as non-use of equipment for purification of atmospheric discharge⁷.

Violation of operating rules, as well as non-use of installed plants, equipment and facilities for purification and control of atmospheric discharge — results in admonition or fining (up to 100 rubles) of officers.

Article 84. Non-execution of prescriptions by agencies of ambient air protection⁸.

Non-execution of prescriptions by agencies of ambient air protection concerning elimination of violations of requirements on the ambient air protection — results in admonition or fining of citizens (up to 30 rubles) and admonition or fining of officers (up to 50 rubles).

Criminal Code of the Russian Federation.

Article 251. Atmospheric contamination.

1. Violation of regulations on atmospheric emission or violation of operating rules for installed plants, equipment and facilities if those actions have resulted in air contamination or any other change in natural air qualities — are penalized with a fine (from 100 up to 200 minimum wages, or one- or two-months income of the convicted); or with a pro-

⁵ The fine is calculated in accordance with the Law of the Russian Federation, adopted June 14, 1992.

⁶ The fine is calculated in accordance with the Law of the Russian Federation, adopted June 14, 1992.

⁷ The fine is calculated in accordance with the Law of the Russian Federation, adopted June 14, 1992.

⁸ The fine is calculated in accordance with the Law of the Russian Federation, adopted June 14, 1992.

hibition to continue in a certain office, which prohibition is valid up to 5 years; or with correctional work up to 1 year; or with detention up to 3 months.

2. The same actions if they have caused injury to one's health — are penalized with a fine (from 200 up to 500 minimum wages, or two- or five-months income of the convicted); or with correctional work (from 1 year up to 2 years); or with detention up to 3 years.

3. Actions mentioned in the parts 1 and 2 of the present article, if they have by negligence caused one's death— are penalized with detention (from 2 up to 5 years).