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AIR POLLUTION LEGISLATION: STANDARDS AND ENFORCEMENT

Introduction

Gross contamination of the air of many large towns in different parts of the world is part of the price that has so far had to be paid for the development of industry and the resultant concentration of large numbers of people in relatively small areas. It is mainly from the use of coal and its products that the air of densely populated areas in the industrialized countries is heavily polluted with smoke, grit and dust, and oxides of sulfur, though there are some areas receiving large quantities of pollutants from the manufacture of chemicals, iron and steel, cement, and other materials. Moreover, during the last fifty years there has also been an increasing amount of pollution from the use of petroleum oils for furnaces and transport.

With few exceptions, air pollution control legislation in the various countries is inadequate. A frequent disadvantage is that the first control measures were introduced many years ago, and the legislation at present in force takes no account of the enormous growth of industry, new types of air contaminant, and new sources of pollution, such as motor vehicles and heating installations. Some laws provide solely for the payment of compensation for damage caused by air pollution. In several countries, therefore, the need is becoming apparent to introduce effective legislation enforcing the adoption of adequate control measures and fixing the maximum permissible concentration of the various contaminants.

The following pages are mainly concerned with air pollution control legislation in the United Kingdom, the USA, and the USSR, but some information is also presented on the situation in certain countries of Western Europe, the source of which is a study published in 1957 by the Organisation for European Economic Co-operation (OEEC).[1] In addition,

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[1] Organisation for European Economic Co-operation, European Productivity Agency (1957) *Air and water pollution: the position in Europe and in the United States*, Paris.

material has been extracted from the *International Digest of Health Legislation*, describing the control measures adopted in recent years in Australia, Canada, Czechoslovakia, and New Zealand.

United Kingdom

In the earlier years of the 19th century, when the great acceleration in industrial development began, the boilers and furnaces burning coal were not so efficient as they are today. Large quantities of smoke must have been emitted from every ton of coal burned. By 1819, the smoke nuisance was increasing to such an extent that Parliament appointed a committee to inquire if persons using engines and furnaces could erect them in a manner less prejudicial to public health and comfort. In 1843, another select committee recommended legislation to deal with nuisances from steam engines and furnaces.

Since that time, the desirability of greatly reducing the pollution of the air from the burning of coal has been stressed by many expert bodies. For example, during recent years various aspects of the problem have been considered by a Heating and Ventilation (Reconstruction) Committee of the Building Research Board of the Department of Scientific and Industrial Research, a Fuel and Power Advisory Council appointed by the Minister of Fuel and Power, and a Departmental Committee on National Fuel Policy, also appointed by the Minister of Fuel and Power. The findings of these three authorities were published in 1945,[1] 1946,[2] and 1952 [3] respectively.

In relation to air pollution by discharges from chemical and other special manufacturing processes, it should be mentioned that in the middle of the 19th century there was a public outcry as a result of the establishment of processes for making alkali from common salt. From these processes large quantities of hydrochloric acid were discharged. A Royal Commission was appointed, and following its first report, the first Alkali, etc., Works Regulation Act was passed in 1863. Later, the Act was extended on several occasions to cover a number of special processes, including many that are not related to the manufacture of alkalis.

In 1953, after the disastrous smog in December 1952, which caused the death of about 4000 people in the London area, a Committee on Air Pollution was appointed by the Government " To examine the nature, causes and effects of air pollution and the efficacy of present preventive measures; to consider what further preventive measures are practicable;

[1] Great Britain, Department of Scientific and Industrial Research (1945) *Heating and ventilation of dwellings*, London (Post-War Building Studies No. 19).

[2] Great Britain, Ministry of Fuel and Power, Fuel and Power Advisory Council (1946) *Domestic fuel policy*, London.

[3] Great Britain, Ministry of Fuel and Power, Departmental Committee on National Fuel Policy (1952) *Report of the Committee on National Policy for the Use of Fuel and Power Resources*, London.

and to make recommendations." That Committee, which dealt with the many aspects of the subject, issued an interim report in November 1953,[1] and a final report in November, 1954.[2] Many of the recommendations of the Committee on Air Pollution have formed the basis of the Clean Air Act, 1956.

The principal legislative enactments that have been in operation in the United Kingdom during recent years, or are now in operation, are outlined in the following paragraphs.

Smoke from industrial and domestic premises

Before the passing of the Clean Air Act, 1956, the main statutory provisions in force for the control of smoke were contained in the Public Health Act, 1936, the Public Health (London) Act, 1936, and the Public Health (Scotland) Acts, 1897-1939. The authorities responsible for enforcing the Acts were: in London, the London County Council and the Metropolitan borough councils; in the rest of England and Wales, the councils of county boroughs, boroughs, and county districts; and, in Scotland, town councils and county councils.

There were also in Scotland the Smoke Nuisance (Scotland) Acts, 1857 and 1865, which applied to burghs with a population of 2000 or more, and the Burgh Police (Scotland) Acts, 1892 and 1903, administered by all town councils, except those of certain of the largest towns, who had similar powers under special local Acts.

The Public Health Act, 1936, constituted as statutory nuisances any installation for the combustion of fuel used in any manufacturing or trade process which did not so far as practicable prevent the emission of smoke; and any chimney (except a chimney of a private house) emitting smoke in such quantity as to be a nuisance. Where a notice served by a local authority requiring the abatement of a nuisance was not complied with, proceedings could be taken before a court of summary jurisdiction. The court could impose a fine of up to £50 and make an order for the abatement, or prohibition of recurrence, of the nuisance. It was, however, a defence in any proceedings for discharging smoke, other than black smoke, to show that the best practicable means for preventing the nuisance had been used.

The provisions of the Scottish and London Acts were similar. The term "smoke" was defined in the Public Health Act, 1936, as including soot, ash, grit or gritty particles. There was no definition of smoke in Scottish public general legislation. As a result, difficulties arose in attempts to deal with complaints of grit from factory chimneys.

[1] Great Britain, Committee on Air Pollution (1953) *Interim report, presented to Parliament by the Minister of Housing and Local Government, the Secretary of State for Scotland and the Minister of Fuel and Power . . . December 1953,* London.

[2] Great Britain, Committee on Air Pollution (1955) *Report, presented to Parliament by the Minister of Housing and Local Government, the Secretary of State for Scotland and the Minister of Fuel and Power . . . November 1954,* London.

Under the Public Health Act, 1936, local authorities could make by-laws, subject to confirmation by the Minister of Housing and Local Government, regulating the emission of smoke of such colour, density, or content as may have been prescribed. Such by-laws did not apply to private houses. The by-laws usually made it an offence to discharge black smoke for a total of two minutes within a continuous period of thirty minutes. More than 200 local authorities in England had such by-laws, all of them dealing only with black smoke.

Before the passing of the Clean Air Act, 1956, there was no provision under general legislation for declaring " smokeless zones " or " smoke control areas ". About twenty local authorities, however, obtained special powers for the purpose by local Acts; the powers were used in only a few cases. These local Acts enabled the authority to define areas in which the emission of smoke was either prohibited or strictly regulated. Some local Acts also contained a " prior approval clause ", which made it an offence to install a furnace unless it could be operated, so far as practicable, without emitting smoke. The person installing the furnace, if he wished, could seek the local authority's approval to the installation in advance, and no proceedings could then be taken if the authority approved the furnace or failed to disapprove it within a specified period.

Under the Clean Air Act, 1956,[1] which is operated by local authorities, it is an offence to emit dark smoke from a chimney for longer than such periods as may be specified by the Minister of Housing and Local Government by regulations. Dark smoke, which includes soot, ash, grit and gritty particles emitted in smoke, is defined as being as dark as, or darker than, shade 2 of the Ringelmann chart. Regulations in relation to permitted periods for the emission of dark smoke, and black smoke defined as smoke as dark as shade 4 of the Ringelmann chart, have been issued.

In any proceedings for an offence under the section prohibiting the emission of dark smoke from industrial chimneys, it is a defence to prove that the contravention was due to (*a*) the lighting up of a furnace which was cold, or (*b*) some failure of a furnace or apparatus that could not be foreseen, or (*c*) the use of unsuitable fuel as suitable fuel was unobtainable. During the seven years from the passing of the Act, it is also a defence to show that the contravention was due to the nature of the building or its equipment and that it had not been practicable to alter or equip the building so that it could be used for the purpose for which it was intended without the likelihood of contravening the Act.

The Clean Air Act, 1956, also provides that no furnace, except small furnaces designed mainly for domestic purposes, shall be installed unless

[1] An Act to make provision for abating the pollution of the air (The Clean Air Act, 1956). Dated 5 July 1956. *(Public General Acts and Measures of 1956,* 1957, ch. 52, pp. 377-415) (published *in extenso* in *Int. Dig. Hlth Leg.*, 1958, **9**, 181).

it can be operated, so far as practicable, continuously without emitting smoke when burning fuel of a type for which it was designed. Notice of the proposal to install the furnace must be given to the local authority, which may or may not approve the plans and specifications.

Regulations may be made by the Minister of Housing and Local Government requiring the provision of apparatus for indicating or recording the density or darkness of smoke emitted and for making the results available to the local authority.

A local authority may, by order confirmed by the Minister, declare the whole of a district or any part of it to be a smoke control area in which only approved appliances or approved fuels or both may be used. When such an order applies to dwellings or to churches and buildings used by charities, there is provision for financial contributions from public funds towards the cost of adapting fuel-using appliances or installing new ones to meet the requirements.

Smoke from railway engines and ships

The Railway Clauses Consolidation Act, 1845, and the Regulation of Railways Act, 1868, and the corresponding Scottish Acts, provided that every railway locomotive steam engine should be constructed on the principle of consuming, and so as to consume, its own smoke; and made it an offence if any locomotive failed to consume its own smoke. No particular body was invested with the duty of enforcing these Acts. In England and Wales, any person or corporate body could complain to the courts. In Scotland, the complaint would be made to the Procurator-Fiscal, who would decide whether or not to prosecute.

Under the Clean Air Act, 1956, the provisions whereby the emission of dark smoke from industrial chimneys is prohibited apply also to railway locomotive engines. They apply, in addition, to vessels in waters not navigable by sea-going ships and in certain waters navigable by sea-going ships which are within the seaward limits of the territorial limits of the United Kingdom.

Grit and dust

The Public Health Act, 1936, constituted as a statutory nuisance any dust or effluvium caused by any trade, business, manufacture, or process, which is injurious or dangerous to the health of, or a nuisance to, the inhabitants of the neighbourhood. As with smoke emission, under the same Act it was a defence to prove that the best practicable means of prevention or alleviation of the emission had been employed.

Under the Clean Air Act, 1956, it is obligatory to use any practicable means there may be for minimizing the emission of grit and dust from a chimney serving a furnace, except for small furnaces intended mainly for domestic purposes. Further, no furnace shall be used to burn pulverized

fuel, or to burn solid fuel in any other form at a rate of one ton an hour or more unless plant is provided to arrest grit and dust, which has been approved by the local authority. The Minister may direct that any application for approval under this section shall be referred to him to be dealt with by him instead of by the local authority. In addition, the Minister may, by regulations, require measurements to be made and recorded of the grit and dust emitted.

Height of chimneys

Where there are plans for the erection or extension of buildings, other than buildings to be used wholly as residences, shops, or offices, the local authority must be satisfied, under the Clean Air Act, 1956, that the height of any chimney to be constructed to carry smoke, grit, dust or gases will be sufficient to prevent, so far as is practicable, the discharges from becoming prejudicial to health or a nuisance. In reaching a decision, account must be taken of such local conditions as the levels of the neighbouring land and the position and description of nearby buildings.

Mine refuse

Under the Public Health (Coal Mines Refuse) Act, 1939, and the corresponding Scottish Act, local authorities had the power to deal with, as statutory nuisances, any deposit of refuse from a coal mine where there was cause to believe that spontaneous combustion was likely to occur. It was a defence to show that the best practicable means were being used to prevent an outbreak of fire. The Clean Air Act, 1956, provides that the owner of a mine or quarry from which coal or shale is got shall employ all practicable means for preventing combustion of the deposited refuse and for preventing or minimizing the emission of smoke or fumes.

Road traffic

The Road Traffic Acts, 1930-1947, empower the Minister of Transport to make regulations as to the construction and equipment of motor vehicles, and to the consumption of smoke and emission of visible vapour, sparks, ashes and grit. The Motor Vehicles (Construction and Use) Regulations, 1951, require every motor vehicle to be constructed, maintained and operated in such a way as to prevent avoidable emission of smoke or visible vapour. Failure to comply with these Regulations is an offence under the Road Traffic Acts. Under these Acts, action lies with the police. The Clean Air Act, 1956, does not apply to motor vehicles.

Pollutants from chemical and other special processes

Control of the emission of noxious and offensive gases from certain defined processes is exercised under the Alkali, etc., Works Regulation Act,

1906. This Act is not administered by local authorities as in the case of the Public Health Acts and the Clean Air Act, 1956, but by Alkali Inspectors, who are Government Officers appointed by the Minister of Housing and Local Government and the Secretary of State for Scotland. It includes a schedule of processes and a list of noxious and offensive gases to which it applies. The schedule and list can be modified by such Orders as seem necessary to keep pace with the developments and changes in industry. Local authorities cannot take proceedings under the Public Health Acts and the Clean Air Act in relation to the scheduled processes, without first obtaining the consent of the Minister, if action could be taken under the Alkali Act.

The Alkali Act includes the following requirements:

(1) Scheduled processes must be registered annually.

(2) A condition of registration is that the scheduled process must be provided to the satisfaction of the Chief Inspector with the "best practicable means" for preventing the escape of noxious or offensive gases to the atmosphere and for rendering such gases harmless and inoffensive.

(3) The best practicable means must thereafter be maintained in efficient working order and must be used continuously.

(4) For certain processes, upper limits are specified for the concentration of total acidity in waste gases discharged to the atmosphere.

In the schedule are included processes concerned with the manufacture or production of such materials as sulfuric acid, hydrochloric acid, nitric acid, picric acid, hydrofluoric acid, chlorine, bromine, fluorine, ammonium sulfate, and other chemical fertilizers, sulfides, bisulfites, carbon bisulfide, sulfocyanide, pyridine, tar, benzene, paraffin oil, arsenic, aluminium, lead, zinc, and cement. Electricity generating stations burning liquid or solid fuel, gas- and coke-works, and many metallurgical processes are also included in the schedule.

Electricity generating stations

Electricity generating stations are subject to control under the general Acts in relation to the control of air pollution. It is worthy of mention, however, that at two power stations, equipment is in operation for the removal of sulfur dioxide from the chimney flue gases before discharge to the atmosphere. At one of these stations, coal with only about 1 % of sulfur is being burned and, at the other, the fuel is oil containing between 3 % and 4 % of sulfur. These are special cases in which permission to build the stations included the condition that practicable methods of removing sulfur dioxide from the flue gases should be employed.

USA

In the USA, unlike the United Kingdom, there is no nation-wide or general legislation directed towards the mitigation or control of air pollution. Air pollution control is exercised under state or local powers relating to the control of nuisances and conditions affecting public health and welfare. State laws usually give authority to counties or cities. For example, California has an Act providing for the creation of " Air Pollution Control Districts " within its various counties. Such Districts are in operation in the counties of Los Angeles and Santa Clara. In the state of New Jersey there is a " Smoke Control Code " that may be adopted by county or municipal boards of health. Almost every city in the USA now has a smoke or air pollution regulation of some kind. In some instances there are inter-state compacts to improve controls, and there is an international compact between the USA and Canada to cover adjacent areas in the two countries.

Interest and action, backed by strong public opinion, have developed rapidly within the last twenty years with obvious reduction in air pollution in many areas, especially by smoke.

The American Ordinances are often more severe than the general law for the control of smoke pollution in the United Kingdom, in that they restrict the type and quality of the coals that may be used in hand-fired industrial furnaces and in domestic heating appliances. For example, the St Louis Ordinance forbids the use of solid fuel with a volatile matter content of more than 23 % or of coal of below two-inch size if it has an ash content greater than 12 % or a sulfur content greater than 2 % unless the fuels are used in furnaces of approved design which can burn them smokelessly. The emission of smoke of a density equal to or greater than Ringelmann No. 2 is prohibited, except for a maximum of six minutes in one hour in excess of Ringelmann No. 2 or nine minutes equal to Ringelmann No. 2 to allow for fires being cleaned or new fires to be started. The emission of grit and dust is limited to the equivalent of 0.45 grain per cubic foot (1 g/m^3). All plans for new fuel-burning plants and plans for the repair or reconstruction of existing plants are subject to the approval of the Smoke Commissioner. In the event of contravention of the regulations, the Smoke Commissioner has power to cause the plant to be shut down.

Other typical examples are the Ordinances of Pittsburgh and Allegheny County, which, in general, follow the same lines as those of St Louis. In Pittsburgh, however, solid fuel containing more than 20 % of volatile matter must not be used in hand-fired equipment, as compared with 23 % in St Louis. Allegheny County has a large steel industry and the Ordinance has been directed primarily towards the mitigation of pollution from industry. The limit of volatile matter for solid fuel used in hand-fired equipment

is 23 %. In relation to smoke emission, there are some exceptions or relaxations for certain special processes or industries; and different maximum allowable emissions of grit are prescribed for the several industries.

The situation in Los Angeles County differs greatly from that in most other parts of the USA and even the world, in that the area of Los Angeles is subject to frequent temperature inversion, which reduces dispersion and results in the accumulation of pollutants for extended periods. Much larger quantities of petroleum oils, including motor spirit, are used in relation to the size of population than in almost any other part of the world. Little or no coal is consumed. Air pollution is caused by hydrocarbons and other products of the use of oil, and by the burning of household and garden refuse by individual householders. Recently, arrangements have been made for the centralized collection and disposal of household refuse. Legislation prohibits the discharge of smoke as dark as, or darker than, Ringelmann No. 2 for more than three minutes in one hour. Sulfur compounds may not be discharged in greater concentration than 0.2 % by volume, a restriction that is not great, since it would allow the use of oil containing 3 % of sulfur as the fuel at electric power stations. In relation to dust emission, the Ordinance provides a scale which varies with the total weight of raw material used up to a maximum discharge rate of 40 lb. (18 kg) per hour. This would be an impracticable restriction in some areas, but in Los Angeles no coal is burned, and there are few factories which emit large quantities of dust.

Steam locomotives burning coal in the USA are normally mechanically fired and much has been done to reduce smoke emission from them. Even so, they are prohibited from entering some city areas. There has been a great extension in the use of Diesel locomotives and in railway electrification.

In some areas, for example in Los Angeles, great importance is attached to the prevention of smoke emission from Diesel-engined road vehicles. Special road patrols issue warnings and institute prosecutions when necessary.

There is no doubt that the Air Pollution Control Ordinances vigorously operated with the backing of public opinion have greatly reduced pollution by smoke in many parts of the USA. At the same time, it should be recognized that the task has been facilitated by the availability of oil and natural gas at competitive prices to replace coal for many purposes, and the availability in some areas of coal containing a low percentage of volatile matter. The improvement in grit emission has not been so great, and less systematic attention has been devoted to the reduction of pollution by noxious gases from special processes than has been given by the Alkali Inspectorate in the United Kingdom.

USSR

In the USSR an Order issued in 1949 [1] stipulates that no electric power station may be constructed without the simultaneous installation of equipment for dust and ash absorption. Factories processing non-ferrous metals must likewise be equipped with devices for the absorption of dusts and gases containing compounds of sulfur, arsenic, and fluorine. Coal-tar distilleries are required to install the apparatus necessary for the absorption of hydrogen sulfide and other sulfurous gases. In iron and steel works provision must be made for the filtration of gases from blast furnaces and for the utilization of these gases as fuel, and factories using solvents must be equipped with recovery plant. Instructions issued in 1951 and amended in 1956 indicate the maximum permissible concentrations of noxious substances in urban air (see Table 1).

TABLE 1
MAXIMUM PERMISSIBLE POLLUTION LEVELS

Pollutant	Maximum permissible concentration (mg/m^3)	
	At any one time	24-hour average
Sulfur dioxide	0.50	0.15
Chlorine	0.10	0.03
Hydrogen sulfide	0.03	0.01
Carbon disulfide	0.50	0.15
Carbon dioxide	6.00	2.00
Oxides of nitrogen	0.50	0.15
Non-toxic dusts	0.50	0.15
Soot	0.15	0.05
Phosphorus pentoxide	0.15	0.05
Manganese and compounds	0.03	0.01
Fluorine compounds	0.03	0.01
Sulfuric acid	0.30	0.10
Phenol	0.30	0.10
Arsenic (non-organic compounds, with the exception of arsine)	—	0.003
Lead and compounds (with the exception of lead tetraethyl)	—	0.0007
Metallic mercury	—	0.0003

The organizational structure of air pollution control in the USSR was approved in 1950. Among the authorities responsible for supervision are the services of the State Sanitary Inspectorate, in the case of industrial

[1] Order No. 431 of 14 June 1949, prescribing measures for controlling pollution of the air and for the improvement of health and hygiene conditions in urban districts. (Summarized in *Gigiena i Sanitariya*, August 1949, No. 8, p. 62) (see *Int. Dig. Hlth Leg.*, 1951, **2**, 454).

undertakings subordinate to a republic, krai, oblast, okrug or municipality, and the local stations of the Sanitary and Epidemiological Department, in the case of undertakings subordinate to a rayon or city.

The first step in the supervisory process consists in the registration of all planned industrial activities that may cause air pollution, as well as of those factories which are existing sources of pollution. The above-mentioned authorities are also responsible for the drawing up of regulations for the prevention and control of air pollution, and for checking that the standards established during the construction or transformation of any enterprise which is a potential source of pollution have been adhered to. Newly built industrial undertakings, or factories which have undergone transformation, cannot begin operations until the necessary permit is issued by these authorities.

Supervision is exercised in the following manner. When building plans for new factories are being drawn up, representatives of ministries, central administrations, factory managers, etc., are asked to frame the measures required to prevent air pollution, and to examine and give their opinion on the plans for filtration, absorption and recovery plant, etc., and on the siting of the new enterprise. These authorities also carry out an inspection at the building stage, and are empowered to prohibit the commencement of operations if the necessary air pollution control equipment has not been installed.

The Order of 1950 makes the approval of building plans subject to the submission of particulars of the production methods envisaged, raw materials to be used, quantity and composition of liquid, solid and gaseous emissions, height of chimney stacks, etc. In its examination of projects, the supervisory authority must consider, *inter alia*, protected areas, meteorological conditions and topography, the efficacy of control apparatus, and possible changes in the quantity and quality of pollution. The sanitary authorities give their final sanction only after having ascertained that all their observations have been taken into account in the drawing up of plans. Regular sanitary inspection is carried out by the local stations of the Sanitary and Epidemiological Department.

Western Europe

Activity towards the mitigation of air pollution, in general, has not been so great in most of the countries of Western Europe as in the United Kingdom, and there has been little effective legislation, though realization of the importance of reducing air pollution is steadily increasing. The following information, describing the position in a few of the countries, is based on material published in the OEEC report, to which reference has already been made.

Belgium

There is a general regulation that prescribes the height of chimneys designed to carry smoke and flue gases containing sulfur dioxide. The prescribed height is related to the concentration of the sulfur dioxide and the temperature of the flue gases. This regulation was framed to deal with the roasting of sulfide ores and the extraction of zinc, but it applies also to other waste gases containing sulfur dioxide.

Denmark

There are no special regulations controlling air pollution. Under general legislation, it is unlawful to cause danger or nuisance to persons or damage to property by smoke, dust, obnoxious odours or noise. The Directorate of Health, which is under the Ministry of the Interior, can take action against infringement of this broad but not very precise legislation.

France

Included in regulations governing most industrial firms in France, there is a clause prohibiting the discharge into the air of dense smoke, vapour, dust and toxic or corrosive gases likely to be detrimental to public health and safety, agricultural production, public monuments and scenic beauty. There is also an Act of April 1932, which deals with the suppression of noxious industrial smoke. These regulations are not sufficiently explicit as to the degree of pollution considered to be harmful. It is only in the Department of the Seine that there are regulations in relation to furnaces burning coal or oil. They stipulate that during normal working the density of the smoke must not exceed Ringelmann No. 1 and that, with intermittent stoking, any greater smoke density must not last for more than 5 % of normal time of working the furnace. Waste combustion gases must not contain more than 1 % of carbon monoxide by volume and 2 % of sulfur dioxide. Gases issuing from chimneys must not contain more than 1.5 grams of dust per cubic metre, calculated to 0° C and 760 mm barometric pressure, and the total quantity of dust must not exceed 300 kilograms per hour. Chimneys must be of sufficient height to ensure satisfactory dilution and dispersion of gas and dust in the air. The results achieved by these various regulations have not been satisfactory, so the Government has arranged for a study of the problems of air pollution.

Germany, Federal Republic

Under the terms of a law of 21 June 1869, governing industrial establishments, the sanitary authority is empowered to take the necessary measures, at the stage of installation, to prevent any new industrial undertaking from becoming a nuisance to the population in the vicinity. If legal action is

brought, the offending party is required to pay compensation for damages inflicted or to suppress the offensive agents.

It is generally agreed at the present time that such legislation is highly inadequate.

Netherlands

A local authority cannot issue a permit for the construction of plant without first consulting the regional Inspector of Works. If the Chief Inspector decides that there is a risk of undue pollution of the air, he offers a remedy which can then be enforced by the local authority. Any party concerned can appeal to the Crown against a decision by the local authority. The Crown, on the advice of the Minister of Social Affairs and Public Health, makes the final decision. The Minister is advised by experts, including officials from the Inspection of Works Department.

Portugal

No specific regulations exist to provide against undue air pollution, but the authorities concerned may suggest or enforce any action deemed necessary to prevent undue pollution. Under a Decree of August 1922, industrial chimneys must be higher by at least one metre than the highest point of the roof of any building within a radius of fifty metres from the axis of the chimney. By a Ministerial order of November, 1932, it was left to the discretion of visiting engineer inspectors to fix the height of a chimney so that fumes or smoke should not cause any inconvenience in the neighbourhood of the factory.

Sweden

There are no legal provisions in relation to air pollution. Any person suffering damage through pollution can institute a civil action against those responsible and may claim damages and the taking of measures to abate the pollution. Local health authorities have powers to prohibit the carrying on of an industrial process if the pollution caused involves obvious detriment to health. Committees have been set up to inquire into the need for more stringent regulations.

Other Countries

Australia (Victoria)

Under the Clean Air Act of 1957 [1] the emission of dark or dense smoke from industrial chimneys is prohibited, with certain exceptions, and no

[1] An Act (No. 6125 of 1957) to make provision for abating the pollution of the air (Clean Air Act, 1957). Dated 20 November 1957. (*Acts of Parliament, 1957*, 1958, Part II, pp. 1008-1015) (see *Int. Dig. Hlth Leg.*, 1959, **10**, 429).

new industrial fire-places may be installed unless they are as far as practicable smokeless. Moreover, the emission of any other air impurities from industrial fire-places must be minimized, and new industrial fire-places must be fitted with devices to arrest such impurities. The terms " chimney ", " dark smoke ", " dense smoke ", " fire-place " and " air impurities " are defined in detail. In addition, a Clean Air Committee is established under the Act to investigate problems of air pollution and make recommendations to the Minister as to its abatement, with special reference to power stations, locomotives, ships, aircraft and vehicles propelled by the combustion of fuel. At the executive level, the Commission of Public Health is charged with the administration of the Act, and inspectors are granted powers of entry, inquiry and inspection.

Canada (Ontario)

The 1958 Air Pollution Control Act [1] of the State of Ontario gives the Minister and municipalities a variety of powers. The Minister may engage in the promotion of research on air pollution problems as well as in the framing of control measures. Municipalities are empowered to pass by-laws, subject to certain limitations, for prohibiting or regulating the emission from any source of any class or type of air contaminant. In particular, the Act defines and determines degrees of density, in accordance with which the emission of air contaminants may be prohibited or limited for certain periods of time by municipal by-laws. Municipalities may also prohibit certain combustion operations likely to produce offensive or harmful pollution. In addition, subject to certain limitations, they are empowered to regulate the installation, alteration, maintenance and operation of structures and equipment from which air contaminants may be emitted. In order to administer and enforce the policy of air pollution abatement, by-laws may be passed for the appointment of municipal officers with powers of entry, inspection, inquiry and regulation.

All the proposed municipal by-laws must be submitted to the Minister for approval.

Czechoslovakia

A decree was promulgated in 1954 [2] for the purpose of controlling atmospheric pollution, particularly that arising from the emission of dust, soot, ash, smoke, fumes and odours. The control measures to be introduced are the following: provision of suitable ventilation systems in buildings; planning and selection of the means of communication and fuel and power

[1] The Air Pollution Control Act, 1958. Dated 2 March 1958. (*The Statutes of Ontario*, 1958, ch. 2, 8 pp.) (see *Int. Dig. Hlth Leg.*, 1959, **10**, 489).

[2] Decree No. 24 of the Minister of Health of 7 May 1954 on the control of atmospheric pollution. (*Sbirka zakonu republiky Československé*, 21 May 1954, No. 14, pp. 85-86) (see *Int. Dig. Hlth Leg.*, 1956, 7, 41).

supplies least likely to pollute the atmosphere; suppression of atmospheric pollution around health and educational establishments, and in parks, health and recreational resorts; the siting of gardens in factory zones, residential areas and public places in order to purify the atmosphere; prevention of the emission of dust and noxious substances during building, demolition, public sanitation and industrial operations. In addition, the decree provides for the establishment of protected zones around factories and other undertakings causing atmospheric pollution.

The Hygiene and Epidemic Control Service is responsible for supervising the abatement of atmospheric pollution. Control is exercised through regular inspections, which include physical, chemical and biological investigation. In this connexion, also, the construction of dwellings, factories and other establishments is subject to the approval of the Hygiene and Epidemic Control Service.

New Zealand

The 1956 Health Act [1] stipulates that inspectors with powers of entry, inspection and inquiry may be appointed to investigate the situation in respect of the evolution of noxious or offensive gases in chemical works. Under this Act, the occupier of any chemical works is required to possess effective appliances for the prevention of the escape or discharge of noxious and offensive gases, or for the rendering of such gases harmless and inoffensive. Also, processes and operations in which such gases are evolved must be properly supervised.

Occupiers of fertilizer works and sulfuric acid works must, in addition to fulfilling the above requirements, ensure that acid gases of sulfur and nitrogen evolved in any of the production processes are condensed in such a way as may be prescribed by regulations.

Schedules specifying those undertakings which fall into the category " chemical works " and listing the gases termed " noxious and offensive " are attached to the text of the Act.

Conclusions

Though there have been considerable advances in dealing with problems of air pollution, with many legislative measures adopted in some countries, particularly in the United Kingdom and the USA, excessive and often unnecessary pollution is prevalent in many industrial areas. The legislative measures have not always been effective, partly because they lacked precision

[1] An Act (No. 65 of 1956) to consolidate and amend the law relating to public health (The Health Act 1956). Dated 25 October 1956. (*The Statutes of New Zealand, 1956*, 1957, Vol. II, pp. 959-1048) (published *in extenso* in *Int. Dig. Hlth Leg.*, 1957, **8**, 643, see in particular, Part V, p. 665).

and legal action was beset with difficulties, and partly because there has been insufficient public insistence on the mitigation of pollution. In the present state of knowledge, complete elimination of pollution is not practicable, but there could be much greater improvement than has so far been achieved. Such improvement will only be attained by better legislation more effectively administered, increasing knowledge based on intensified research and development work, and a more determined public opinion. As new industrial processes are developed and conditions change, modifications in legislation and methods of enforcement will be required from time to time; but it must be recognized that no one set of preventive measures will meet all needs everwhere owing to differences in the conditions in various countries and localities.