PRACTICAL DIFFICULTIES IN IMPLEMENTING A SMOKE CONTROL PROGRAMME

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Summary

This paper deals with some of the difficulties which may be experienced by smoke control officials in devising and implementing smoke control programmes. It covers some of the legislative aspects as well as the practical problems of operation and design of fuel burning appliances.

Introduction

Smoke control is now fairly well established in South Africa and it is the duty of local authorities to institute programmes to suit their own local circumstances. In essence this consists of an initial declaration of the area as one to which Part III of the Atmospheric Pollution Prevention Act applies, followed by the promulgation of regulations and thereafter, where necessary, the establishment of smoke control zones. The regulations apply to all premises other than private dwelling houses, whereas smoke control zone orders provide the required domestic control.

Programme

After assessment of the problem, which may be based either on visual estimation or on actual measurement of smoke concentrations, a local authority should devise its control programme on a basis of priorities. It is usual to make a start on industrial smoke and then to expand the programme by the establishment of smoke control zones, initially in the business centre and later extending into the residential areas and finally

the Bantu townships. It is preferable to draft the entire domestic programme well in advance of its enforcement in order to allow sufficient time for the public to plan for the possible replacement of appliances in their homes.

Regulations

The Smoke Control Regulations are best suited for the control of industrial smoke. They limit smoke emission to a degree which is reasonably attainable by industry without creating undue economic stress. In fact, in many instances, control methods actually result in financial savings because of the increased efficiency of the process. The regulation limiting smoke emission does not apply, however, to start-up period of an appliance or to reasonable periods when an appliance has suffered a mechanical breakdown. This is a fair concession for industrial boilers but makes the regulation almost unworkable for hot water boilers in buildings. Often these boilers are started up twice or three times a day and are not kept burning throughout the twenty-four hours. Because they are not periodically refuelled the entire smoke emission occurs at start-up which is not defined and therefore has no time limit. This means that the entire emission is exempt from the provisions of the regulation and not subject to control. Consequently it is preferable to use the more stringent requirements of a smoke control zone order for buildings. Zone orders prohibit smoke emission at all times with no exemptions for start-up or breakdown.

Approval of Appliances

Regulation 3 requires that any person installing or altering a fuel burning appliance shall obtain the prior approval of the local authority. Before granting approval, the smoke control official must be satisfied that the appliance will comply with legal requirements. This means that he must be capable of assessing the proposed unit from the drawings and specifications submitted. Technical appraisal of this nature is very

insufficiently large burners, excessive primary air flow or simply the lack of proper maintenance. Owners have also been known to instruct their staffs to switch off the after-burners in order to save expense.

But even where incinerators are well maintained and operated, there is, at the time of writing this paper, not a single unit available that does not emit excessive quantities of fly ash, particularly when the unit is being reloaded. The difficulty in controlling this aspect is to lay down a standard for fly ash emission which is capable of simple assessment. The equipment and methods of determining mass rate of solids emission in flue gases are far too complex for routine control. To overcome these difficulties, Johannesburg has now insisted that no further approvals for incinerators will be granted unless the appliances are fitted with fly ash collectors capable of arresting all particles larger than one millimetre in size. The equipment for assessment will consist of a cyliner wrapped round with suitable adhesive tape - sticky side outward - attached to a light rod. The cylinder will be held in the path of the exhaust gases from the chimney and the particles adhering to the adhesive tape will be examined. Unless the particles have a maximum linear dimension of less than one millimetre the incinerator will not be approved. The tests will, of course, be done during periods when the fly ash emission is known to be at its worst.

Incinerator manufacturers have indicated that, although the additional equipment will increase the cost of the units, the standard is attainable and that the step is a progressive one. They feel that, because of the restrictions inherent in control, the design of small incinerators in South Africa is ahead of the world.

Should the new standards prove successful, control may be extended to existing incinerators by introducing a restrictive clause in the regulations.

Coal and Oil Fired Boilers

Perhaps the most frustrating aspect of a smoke inspector's duties is his pre-occupation with appliances that are capable of smoke-free operation but are not used in the proper way. Incinerators have already been mentioned as a problem for the inspector but by far the greater proportion of his time is spent on coal fired and sometimes oil fired equipment. Problems with oil fired appliances are invariably due to lack of maintenance but coal fired equipment is sensitive to operator technique as well. In industry, where operation is usually under a modicum of control, the problem resolves itself into adequate training of the operator. Smoke inspectors and Bantu stoker demonstrators can achieve a fairly high standard of operator proficiency by education and example but the time and effort spent is often brought to nothing by the high turnover of operating personnel.

Where coal fired boilers are used in residential and commerical buildings, operational problems are aggravated by the fact that the operator has very little interest in the boiler as it forms only a minor part of his activities. Here again, because of the extremely high staff turnover, training of operators has had very limited success. In spite of the more stringent requirements of a smoke control zone, the apathy toward cleanliness, operation and maintenance of appliances in Johannesburg's central area is almost unbelievable.

Smoke Control Zones

In addition to coal fired boilers and incinerators, appliances fired with anthracite and coke, which, in terms of Johannesburg's First Smoke Control Zone Order, are authorised fuels, can provide difficulties. The authorised fuels are essentially smokeless but copious smoke emission results when a boiler is initially lit up using paper and wood. It becomes necessary therefore to keep such boilers fired continuously over each 24 hours and to eliminate start-ups. This is not difficult if there is sufficient hot water storage capacity but, if the tanks are too small, the heat output of the boiler, even though banked during the night, is sufficient to boil the water. The same ap-

plies of course to continuous-burning coal fired boilers. As wood is not an authorised fuel, smoke emission during the start-up of an anthracite or coke fired hot water boiler is a contravention of the Order.

The principle of continuous burning applies equally to cooking ranges and slow combustion stoves, which are often provided in the servants' quarters of buildings. However, to maintain continuous combustion over 24 hours, it is essential that the appliance is maintained in a good state of repair.

The expansion of the smoke control zone policy to include private dwelling houses has only just got under way in Johannesburg and insufficient time has elapsed for any real experience in this field to have been gained. No real difficulties are anticipated in regard to the houses themselves where the existing trend is away from coal but problems of smokeless appliances in servants' quarters are expected.

The introduction of smoke control zones will mean the end of the open grate fire, which is not capable of burning coal without producing excessive smoke. The obvious replacements are electric, gas, oil and continuous-burning anthracite appliances. New developments in coal burning appliances which are claimed to be smokeless are awaited with interest, particularly in a form suitable for the heating of servants' quarters. The natural trend toward electicity, and to a lesser extent gas, for cooking and water heating will merely be accelerated by smoke control measures.

Surveys carried out in four Johanensburg suburbs indicate that people in a wide spectrum of income groups are quite prepared to accept smoke control not as an inevitable measure but as a desirable one.

It is anticipated, however, that, unless better facilities for the removal of garden refuse are provided, the usual complaints following the illegal burning of this type of refuse will continue.

Nuisances

The Act makes very adequate provision for the abatement of nuisances caused by smoke or other products of combustion. Very often, however, the most practicable means of eliminating the nuisance is to extend a chimney to such a height as will remove the emission to a point above the affected premises. Sometimes this means that the chimney extension has to be affixed to a higher adjoining building. Problems arise when owners cannot reach agreement as to what each one's obligation is in regard to permission to erect the chimney, cost of erection, cleaning and maintenance and possible future replacement. Further complications arise in connection with aesthetic considerations, of which, although they should not be allowed to overrule the pollution aspects, cognisance should nevertheless be taken. The control authority usually has to act as mediator in such cases.

Nuisances other than Smoke

The bulk of complaints received are in regard to smoke, soot and fly ash, but many other forms of air pollution do give rise to nuisances which are often difficult to resolve. The principle sources of these nuisances are sawdust emissions, odours from cooking, paint overspray and dust from building demolitions, excavations or earth moving. Legislation for dealing with nuisances of these types is far from adequate or even non-existent. Instead of having to use the Public Health Act, the Building By-Laws and other statutory requirements, it would be better by far to include all forms of air pollution under one statutory instrument enforced by the same group of officials. This would entail delegation of powers under parts of the Atmospheric Pollution Prevention Act for the control of some activities, while others would require amendments to the Act itself.

Forecast for the Future

Any prognostication is to some extent dangerous because circumstances, both economic and political, can affect the most carefully considered programme. It is however not only expedient but also necessary to project an overall plan, which may require modification in the light of future experience and developments.

With industrial smoke under a reasonable degree of control, Johannesburg's programme is to establish one smoke control zone every three months so as to cover the entire residential area within a period of six years. The programme is, of course, subject to approval by the Government.

Compliance with a zone order will be achieved by each individual householder in a manner best suited to his requirements and his financial circumstances. Electricity and, to a rapidly increasing extent, gas and oil, together with anthracite, will be the acceptable substitutes for coal. A considerable amount of faith is being placed, not only by the coal industry but also by the Government, in the development of smokeless coal-burning stoves but, in my opinion, these units will only fulfil an interim need in the White areas. Apart from the fact that solid fuel under optimum conditions still produces particulate matter and sulphur dioxide, the inconvenience of operation has already, without any pressure, resulted in a steady decline in its use. If this trend continues, the ideal situation of only electricity, gas and oil usage for private homes will eventually be reached.

Whereas solid fuel will provide a useful stop-gap in any clean air campaign in the White areas, it is expected to provide the only available short-term palliative in the Bantu townships. In the long term, electricity and possibly gas may be reticulated to the Bantu areas but it will be many years before the socio-economic circumstances of the Bantu are likely to make these fuels serious competitors with coal. The need for smokeless coal stoves is therefore one of some urgency. Should they prove successful and acceptable, the possibility of ban-

ning the installation or sale of any stove other than an approved one could be considered. By this means old stoves would gradually be replaced and all new houses would have the new approved models. Difficulties in controlling such a programme are obvious and it may perhaps be preferable to insist that manufacturers produce only approved types.

Conclusion

Smoke control is progressing at a favourable tempo at present, which, if it is maintained, should produce visible and measurable results within the next two to three years. Vehicle smoke control is looming on the horizon and all-in-all the next decade should bring a substantial reduction in smoke levels in Johannesburg, the Reef and possibly the entire country.

Acknowledgement

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