Revision of the Legislation of Atmospheric Pollutants Emissions in Portugal

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Introduction

The publication of the European Framework Directive (96/62/EC) and the proposal Daughter Directives for the different pollutants are the most recent legislative instruments concerning a new political strategy and a new air quality management approach for the European Union.

In Portugal, this new Directive introduces deep changes on national legislation. The former legislation establishes the air quality protection and control regime (*Decreto-Lei n.º 352/90 of 9th November 1990*) (1) and integrates both air quality and emissions standards (*Portaria n.º 286/93 of 12th March 1993*) (2). The new directive transposition through the *Decreto-Lei n.º 276/99 of 23rd July 1999* (3) created a new air quality regime and, at the same time, induced the need for a revision of national emissions policy.

On the other hand, the former legislation, mainly for emissions control, emerged up some difficulties on its effective implementation, related to its easy understanding and technical requirements. Over the past years, the administration has been pressured by industrials seeking for explanations and presenting their concerns on technical aspects.

Additionally, new Directives related to air pollutants emissions have been published, such as those on emission of organic compounds (1999/13/EC), on national emission ceilings (2001/81/EC) and on great industrial combustion plants (2001/80/EC). New legislation should also agree with international Portuguese commitments, such as Kyoto Protocol to the United Nations Convention on Climate Change and the Gothenburg Protocol to the Convention on Long Range Transboundary Air Pollution, that establish national emission ceilings for greenhouse gases.

The aspects mentioned above motivated the elaboration of the study presented in this paper, from which the results and the achieved conclusions were used as a basis for the new legislative proposal on emissions control strategy that was just approved (*Decreto-Lei nº 78/2004 of 3rd April 2004)*.

Methodology

In 2000, a first research (4) was developed in collaboration with the Ministry of Environment focusing:

- EU and national legislative framework;
- Evaluation of Portuguese legislation compliance regarding emission limit values and mass flow;
- Stack height estimate;
- Comparative assessment of national emissions legislation of different European countries;
- Use of socio-economical instruments in environmental policy.

This first analysis of the legislation was already presented in a previous edition of CEM (5) and showed that the current legislation was not very efficient on the reduction of the atmospheric pollutants discharge to the atmosphere. Consequently, during the last two years, a complementary study was performed in order to identify the significant aspects that should be improved or even introduced in the new emission control regime.

To carry out the study, permanent meetings were held involving IDAD, UA team and the Environmental Institute Air Department from the administration side. Additional meetings took place with representatives from industrial sectors to get their ideas and contributions (6).

A draft law proposal was made and distributed among relevant entities including Ministries other than Environment, Industrial Associations and Non Governmental Associations.

New legislative structure of emissions control strategy

The ideal structure for air quality management legislation would be the creation of a mother law for air that reflects an integrated assessment of this resource. Nevertheless, the implementation of such a legal instrument reveals too difficult due to burocratic procedures involved. Thus, the proposed structure is based on major regulations: the *Decreto-Lei n.º 276/99*, of 23rd July 1999, and the recent *Decreto-Lei n.º 78/04* of 3rd April 2004.

These two legal instruments are at a same priority level and act as clusters of existing and further new legislation in a hierarchical way (Figure 1). Below the clusters (*Decreto-Lei*) are the transposed Directives (*Decreto-Lei*), and above these, the regulation diploma (*Portaria*).

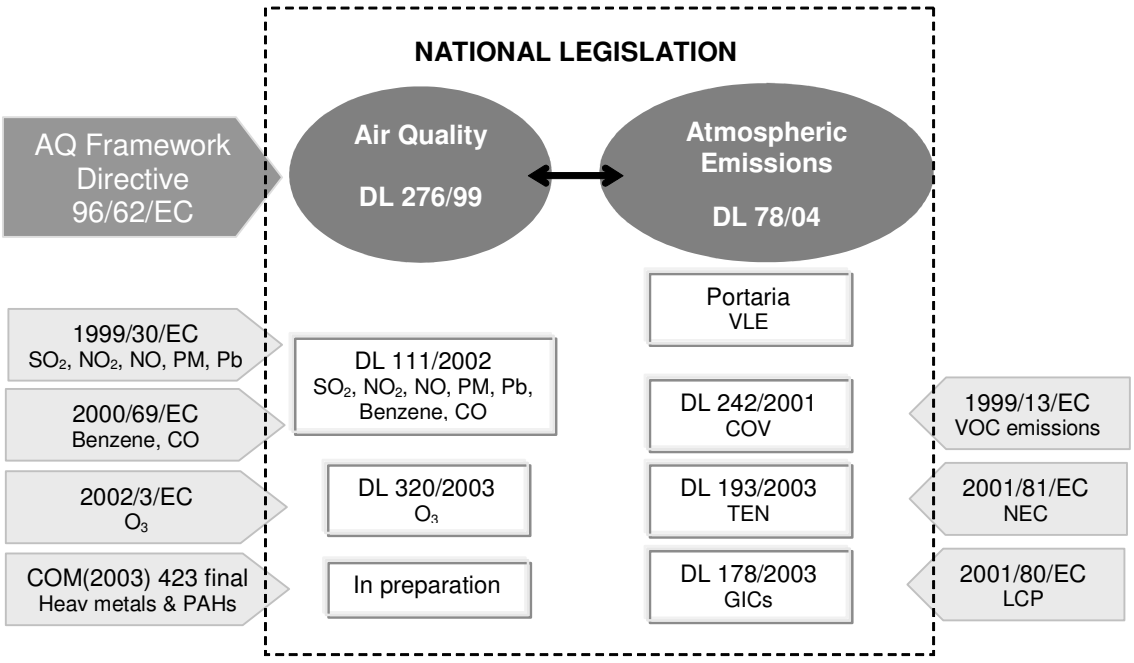

Figure 1 – National and European air quality control legislation framework.

Specifically for emissions control strategy, two new legal instruments are under proposal: the regulation diploma that establishes the emission thresholds and emission standards (EmisReg) and a regulation diploma establishing the methodology to estimate stack height (StackReg).

Identification of significant aspects for legislation review

Enlargement of application scope

Old legislation was oriented for the control of industrial emissions only. New regulation will cover other emissions such as point sources released by commercial and institutional establishments or other services, depending on installed process capacity or combustion power.

Some exceptions have been introduced in the application scope: low power combustion chambers (less than to 100 kW_{th}), emergency generators and ventilation systems. Individually, these sources are not relevant due to the amount of pollutants released, so the monitoring costs and the institutional verification effort are not adequately compensated by environmental benefits.

Mass flow thresholds and monitoring periodicity

In the DL 78/04, two mass flow thresholds, a minimum and a maximum, were introduced to distinguish point emission sources from three groups: low, medium and large capacity.

As each source type has different monitoring requirements, this approach contributes to a more cost-effective emission control by the operator and by the administration.

According to the scheme from Figure 2, large sources, emitting above maximum mass flow threshold for a specific pollutant, should carry out continuous monitoring of that pollutant. Medium sources, which emission rates range between minimum and maximum threshold, need to perform stack gas monitoring twice a year. Low sources, with emissions for a specific pollutant below minimum threshold, must only perform one stack characterization every three years.

It should be noted that one single source could be classified as a large source concerning a specific pollutant but, at the same time, a low source if we take into account another pollutant.

Large and medium type point sources should accomplish emission limit values established in regulation for a particular pollutant. Low capacity sources, due to their smaller impact on air quality, are not obliged to accomplish emission limit values.

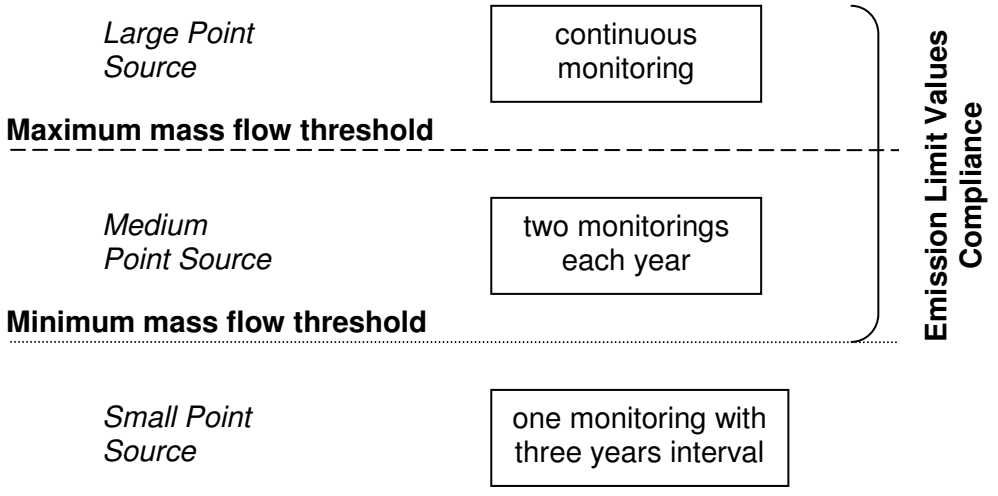

Figure 2 – Scheme for emission monitoring and emission limit values compliance according to source type.

Multiple point sources

Several industries present various stacks that are associated with identical technical equipment and sometimes having the same characteristics. With former legislation, when these stacks were in large number, reaching 20 or even more, the operator had to perform monitoring two times a year. This can represent a large financial effort for small or medium sized industries and the truth is that this monitorization ends up not being performed.

The DL 78/04 introduces the multiple point source concept (stacks associated to identical equipment, with the same installed capacity and that release gases with similar characteristics) and makes it possible for operators to elaborate a specific monitoring plan. The major achievement of this measure is to perform monitoring for a representative number of stacks in a temporal rotational scheme. Emissions from other stacks will be estimated based on emission factors calculated with monitoring data.

Emissions monitoring report

To improve the quality of work when the measurements are performed and to verify compliance with limit values, some guidelines for the emissions monitoring report were introduced in the DL 78/04. The uniformity of the delivered reports will simplify administration appreciation and assessment. Relevant information required in monitoring report guidelines and that should be covered are:

- Identification data concerning the operator and company that will perform the measurements;
- Objective of the measurements;
- Methodology used for measurements and relevant modifications;
- Description of industrial processes;
- Stack characterization;
- Thermodynamics characterization of stack gases;
- Pollutant concentration and comparison with adequate limit values;
- Inclusion of all quality and calibration certificates.

Estimation of stack height

As mentioned before, stack height estimation will be covered by the new diploma proposal StackReg.

Since it was implemented, by the *Decreto-Lei n.º 352/90,* the methodology used to estimate the stack height rose some questions. The formulation only considers the building where the stack will be built and the nearest obstacles larger dimension (height or width). The reason is that, besides its simplicity, the equation variables such as obstacle and the relevant dimension, are not clear, leading to different interpretations and consequently different values for stack height. .

The definition of the air pollutants release conditions to the atmosphere is a key subject for air quality preservation and, consequently, for health and environmental protection. Thus, it is absolutely necessary to settle requirements that assure adequate stack dimensioning for the pollutants dispersion. To guarantee these conditions, not only the existence of obstacles has to be taken into account, but also the characteristics of the released air flow.

With the objective of reformulating the methodology for stack height calculation, different national legislations were consulted, and the respective equations were tested using some local case studies.

The StackReg presents the new methodology to be applied to the new stacks, including the mathematic equation for stack height estimation and the definition of situations where an air pollutants dispersion study is required.

This new proposed methodology for stack height estimation, that includes two components, is based on the French and Spanish approaches. As a first approach to the stack height (denominated H_p), a calculation is performed as function of air flow characteristics, like volumetric flow and temperature of gas released, maximum mass flow of pollutant realised, annual air quality concentration and reference concentration of the considered pollutant. These last two parameters are established in the NPECS to reduce the dependence on external data introduced by the operator who is dimensioning the new stack, and can be updated when needed. The other component, Hc, expresses the influence of obstacles that exist around the area, depending on their distance to the source and their height, as well as the influence of other existing stacks, once the cumulative effect of various sources of the same industry on air quality is considered significant. The final stack height (H), is the highest of these values, H_p or H_c.

Emission limit values

During the study, it was clear that emission standards were out-of-date, taking into account technological developments occurred over the last years. Update of limit values was based on legislation of some European Countries such as Germany, Italy and France, but also took into account new guidelines derived from the best available technologies concept.

On the EmisReg proposal, two kinds of emission limit values were considered; the first one for general application and the other group for specific applications including industrial and combustion processes. General limit values are applied to sources that don't have specific values. A particular point source can be covered by a specific limit value for a pollutant and by a general one for another pollutant.

In this approach, point sources are interpreted as being a stack from a technical unit or equipment and not an industry or plant as a whole.

Emission limits are defined individually by pollutant or by a group of compounds such as metals, organics and carcinogenics. New pollutants have also been included, like non methane organic volatile compounds, Cl_2 e Br.

Emission limits are expressed in $mg.m^{-3}$, and pressure and temperature standard conditions, respectively in 101,3 kPa and 273,15 K.

O_2 standard levels

In the former legislation, emission limit values for general application were referred to with an O_2 level of 8%, so all measured concentrations should be converted to this O_2 level.

This caused some incompatibilities for its application to industrial processes that typically use different O_2 concentrations or don't have any O_2 consumption, particularly when the measured O_2 level is close to 21%.

To solve this problem, each specific limit value will be referred to an O_2 level according to the type of equipments and its normal way of working. For situations where no value is defined,

particularly for non-combustion sources, comparison between measured and limit values is carried out with no corrections.

Conclusions

A revision of Portuguese legislation on atmospheric emissions had to be addressed, due to the implementation of new EU air quality and emissions control strategies that have been established by the European Commission.

Studies performed during the past four years served as a basis to develop the new legislation just published for emissions control strategy and to derive diplomas on emission standards and stack dimension, whose baselines were described in this paper.

Important modifications were introduced in the DL 78/04, concerning stack height calculations, emission limit values, monitoring periodicities, specification of new pollutants, introduction of some particular industrial sectors and correction of the reference levels for gaseous effluents. However, the most significant change concerns the creation of mass flow thresholds for atmospheric pollutants, permitting the identification of low potential emitting sources and the mobilization of resources for the control of more significant emission sources, those with medium and large capacity.

The new legislation helps to clarify some ambiguous aspects and situations present in the former regulations and to concentrate resources on the most relevant (in terms of emissions) point sources.

Some other detected problems were not possible to include in the DL 78/04. Additional effort has to be made in order to make measurement criteria more homogeneous, regarding methods and monitoring periods. The creation of a common report, in terms of structure and contents, is an important improvement, but insufficient measure.

Similarly to what is considered for the water resources control, were a licence is issued, the same approach could and should be applied for air. Defining pollutants to monitor at each point emissions source could lead to a more objective and realistic air emissions control assessment. This approach was not accepted by the administration since its implementation would need additional personal and financial support.

Although some identified aspects were not taken into account in this new legislation, it is of general agreement that the documents answers to the main concerns of industrial and administration entities. It is considered more suitable for application and more realistic to be used as a strategy for air pollutants emissions control.

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Acknowledgements

The work summarized in this paper was developed in the framework of a project sponsored by the *Instituto do Ambiente* from the Ministry of Environment.

The authors wish to thank to the financial support of the 3rd EU Framework Program and the Portuguese Ministério da Ciência e do Ensino Superior, for the PhD grants of J. Ferreira (SFRH/BD/3347/2000) and M. Lopes (PRAXISXXI/BD/13756/97).