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INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEOCONFERENCE SGEM
Secretariat Bureau

Phone: +359 2 4051 841
Fax: +359 2 4051 865

E-mails: **sgem@sgem.org** | **sgem@stef92.com**
URL: **www.sgem.org**

IMPROVING ENVIRONMENTAL SELF-MONITORING PRACTICES OF RUSSIAN INDUSTRIES

Prof. Dr. of Sc. Tatiana Guseva[1]

Dr. Mikhail Begak[2]

Ass. Prof. Dr. Yana Molchanova[1]

Ass. Prof. Dr. Maria Vartanyan[1]

Ass. Prof. Dr. Dmitry Zhukov[1]

[1] D. Mendeleyev University of Chemical Technology of Russia, **Russia**
[2] Saint-Petersburg Scientific-Research Centre for Ecological Safety RAS, **Russia**

ABSTRACT

In 2016, Technical Work Group (TWG) 22.1 under Russian Best Available Techniques Bureau (BAT Bureau, www.burondt.ru) will be presenting the Information and Technical Reference Book (ITRB) "General Principles for Industrial Environment Protection Control and Metrology Provision". This TWG is likely to become the most numerous: after the Government issued the list of industrial sectors and the minimum production capacity of installations to be regulated under the Integrated Environmental Permitting (IEP) regime environmental monitoring practices have become a pressing matter for most sectors of economy, and yet even terminology in this area is still debatable.

The moment for drafting such Reference Book is extremely favourable. Pioneer national ITRBs have already been developed for different sectors of industry, TWGs have proved that they are ready to draft necessary documentation for practitioners. Approaches to Integrated Environmental Permitting based on Best Available Techniques (BAT) are being discussed, national and international projects on BAT identification and implementation are being executed in Russia. Russian expert community is growing rapidly and seems very likely to take part in drafting, commenting and improving Reference Books in accordance with modern management principles.

Keywords: industrial environment protection control, environmental self-monitoring, Best Available Techniques, Information and Technical Reference Book.

INTRODUCTION

According to the Federal Law "On Environmental Protection", 10.01.2002, ed. 29.12.2015, # 7-FZ [1, Article 67] "industrial environmental (protection) control is carried out in order to provide measures of environmental protection, efficient use and restoration of natural resources needed for economic and other activities, as well as to comply with the requirements on environmental protection established by the legislation on environmental protection" (*the sentence is rather coarse but it reflects peculiarities of legislative documents*). It should be noted here, that while the objective of the activity is set, the term itself needs to be redefined. Article 1 of the aforementioned Law [1] states that:

"Environment control is a system of measures aimed at prevention, identification and restraint of violations of environmental legislation, enforcement of requirements, standards and regulatory documents on environmental protection". Thus, industrial environmental control (IEC) is a system of *control measures* implemented directly in-process, on site.

English speakers often describe self-monitoring as a system of requirements that is taken by those being regulated to ensure that they meet compliance obligations. Therefore industry is responsible for monitoring its own activities and such characteristics as emissions of pollutants rather than this being done by competent authorities. On the other hand, environmental authorities remain responsible for monitoring the state of environment.

In the Federal Law "On introducing changes in the Federal Law "On Environmental Protection" and other legislative acts of the Russian Federation", 21.07.2014, # 219-FZ (ed. 29.12.2015) quoted Article 1 is elaborated as follows: "Legal entities … engaged in business and/or other activities on I, II and III category installations develop and adopt the programme of industrial environmental control, carry out industrial environmental control in compliance with statutory requirements, log information and hold data obtained as the result of industrial environmental control' [1, Article. 1].

It should be mentioned here, that information and data which need to be logged and held include both measures for "prevention, identification and restraint of violations of legislation on environment protection" and technological parameters that reflect or may reflect the potential environmental effect and its scale. The Federal Laws mentioned above do not quote this statement directly [1, 2], however it follows from analysis of two closely related yet non-identical concepts of 'environmental control' and 'environmental monitoring' (Fig. 1) [3, 4].

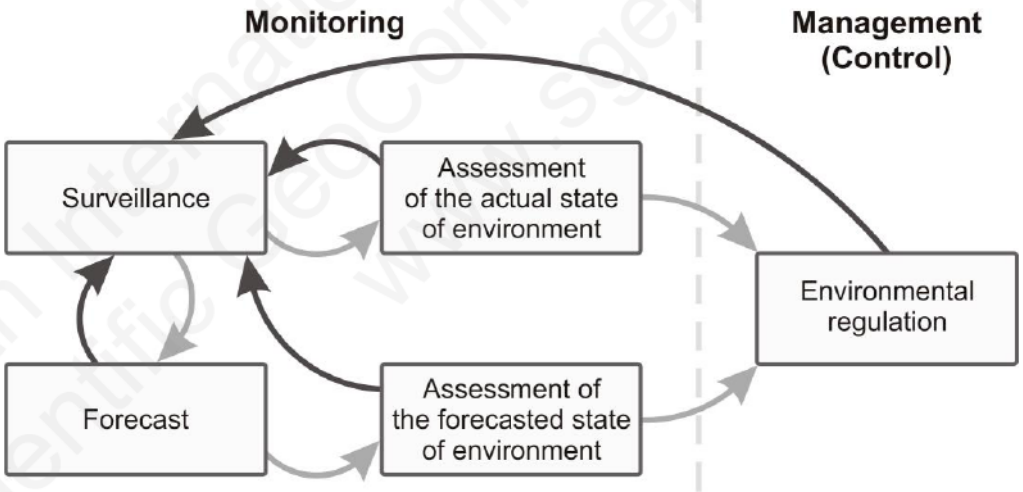

Fig. 1. Environmental monitoring setup diagram (based on [3])

ISO standards series 9000 and 14000 also separate these concepts. 'Monitoring' is usually associated with measurements, observations and evaluation [5], while 'control' is a part of a management system aimed at quality, environmental, energy efficiency and other requirements compliance [6].

Developers of the Information and Technical Reference Book "General Principles for Industrial Environmental Control and Metrology Provision" (further referred to as IEC Reference Book) are ensured that the document should mainly focus on the environmental monitoring aspects of IEC, not on the control itself (which is either inefficient or impossible without monitoring). This policy complies well with the legislation: Article 63.2 of the Federal Law # 7-FZ [1] states, that "State Data Base[1] is a federal information system, that provides data collecting, processing and analysis, and includes:

- information from the State Environmental Monitoring System subsystems databases;
- **results of industrial environmental control** and state environmental surveillance;
- state records on the entities causing negative environmental impacts".

Thus, industrial environmental monitoring is considered to be a component of the environmental monitoring information system. It is positive not to describe the organisation of industrial environmental protection control on production sites and efficiency of control measures, but to contain the results of measurements and observations attributed to primary environmental aspects of operational procedures and key technological parameters.

This statement is supported by Article 67 of the Federal Law # 7-FZ [1], that enacts mandatory development of IEC programmes including the results of emission sources inventory, divisions responsible for industrial environment control, own or engaged **test laboratories** (centres) accredited under legislative documents of the Russian Federation, **rate and methods** of industrial environmental control, **sampling sites and measurement techniques**.

DEVELOPMENT OF IEC REFERENCE BOOK

The aim of developing IEC Reference Book is to provide category I operators, as well as Federal Service for Supervision of Natural Resource Usage (Rosprirodnadzor) bodies with the information on principles for IEC system design and implementation, which is required under Integrated Environmental Permitting (IEP). It is important to clarify here that the list of category I enterprises is very similar to the list specified in the Integrated Pollution Prevention and Control [7] and Industrial Emissions Directives [8]. In addition to the EU economic branches, such activities as oil and gas drilling exploration of ore deposits, etc. are included into category I in Russia. Most of them either cause severe environmental impacts or consume significant amounts of natural resources (including energy).

In Russia, Integrated Environmental Permit is described as a document, that is issued by the authorized federal executive body to a legal entity or self-employed entrepreneur engaged in economic and/or other activities on the object with negative environmental impact, and contains mandatory environmental protection requirements [1, Article 1]. Procedures for setting environmental performance requirements and granting IEPs are still being developed, however it is possible to assume that category I operators will be obliged to carry out measurements, observations, calculations and evaluations, the combined results of which will provide the **necessary and sufficient proof**, that such operators comply with the

[1] State Data Base on State Environmental Monitoring

requirements of environmental legislation and the terms of the IEP granted. As for key technological parameters to be monitored, usually mostly those parameters are discussed which are necessary to determine environmental performance and resource efficiency.

Operators and competent authorities should have a clear understanding of the objectives of self-monitoring before monitoring begins. The objectives and the monitoring system should also be clear for any third party involved, including accredited testing laboratories, any other external contractors and other possible users of the monitoring measurement data (e.g. land-use planners, non-governmental organisations and regional governments). The objectives should be clearly stated and be taken into account in the monitoring/measuring planning and in the reporting of the monitoring results.

To draft IEC Reference Book the developing team will have to analyse practical issues of industrial environmental protection control organisation at Russian installations and to consider the experience at self-monitoring gained in the European Union. In Russia, for the first the Reference Book in this area was published in 2003 under the Integrated Pollution Prevention and Control Directive [7]. In 2008 within the framework of Harmonisation of Environmental Standards (HES) II - Russia project this Reference Book was translated into Russian [9]. Both the Reference Book and articles and training materials were widely discussed with practitioners and experts. At present the website of the European IPPC Bureau displays the final draft for the newer version of this document [10], which falls under the Industrial Emissions Directive (IED) [8]. This version is coded JRC Reference Report on Monitoring of Emissions from IED-installations (further referred to as Reference Report on Monitoring of Emissions). An ample set of examples adds to the 'report' flavour of the document; it is overall useful as a base for national IEPC Reference Book. here are other guides and recommendations issued both in the European Union and in the USA and Canada. One of the newest guides setting minimum requirements to self-monitoring was issued in the United Kingdom in 2014 [11].

A common ground for Reference Report on Monitoring of Emissions and both newer versions of international standards on Quality Management Systems [12] and Environmental Management Systems [5] is risk-based approach (see Fig. 2). There is no doubt that IEC programmes should be developed with regard to potential hazards severity. Most part of the national IEC Reference Book is likely to be dedicated to the discussion of parameter selecting procedure for IEC programmes and measurement profiles (continuous or periodic) verification.

Metrology provision for IEC system should form an integrated part of IEC Reference Book this statement is strongly supported by practitioners who use measurement results as a proof not only in discussions with the parties involved, but also in lawsuits.

There is a strong probability that IEC system requirements will be included in IEPs. This makes it feasible to consider certain time-related parameters, such as sampling and/or measurement period, in which samples are taken and/or measurements are made (i.e., an hour, a day, a week). This in turn may depend on the technological conditions on site, such as time and duration for use of certain types of feedstock or fuel materials; or a stage of the technological process where the equipment works with specified load or performance.

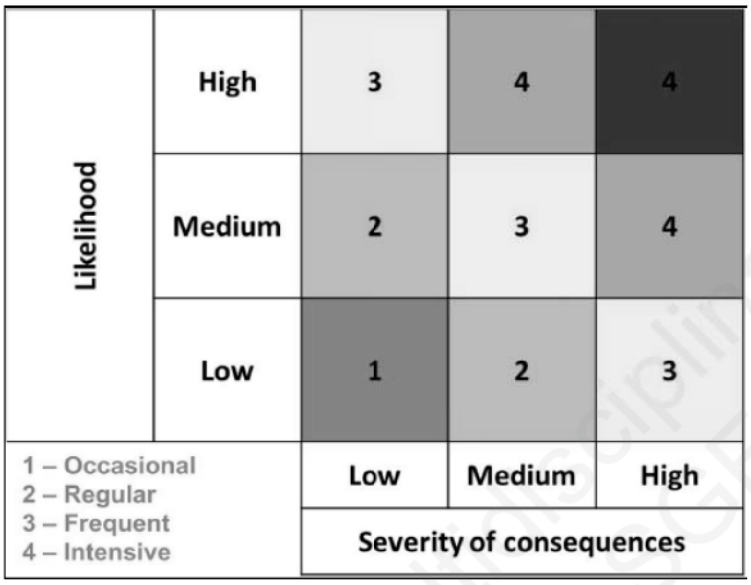

Fig. 2. Monitoring regime according to the risk of exceeding the emission limit values [10]

Potential flaws in technological process should also be considered. Possible reasons for these include start-up and shutdown operations, leaks, malfunctions, momentary stoppages and definitive cessation of operations.

There exist several ways to obtain average values (which are commonly reported). Under continuous (automated) monitoring regime the average is calculated based on the whole data pool from the specified time period. Continuous samples extraction is also possible, or an integrated sample can be prepared and analysed to obtain a uniform measurement result. Another route is analysis of random samples with subsequent averaging of the results.

It should be noted that in order to determine sampling frequency it is highly important to find the balance between measurement requirements, emissions characteristics, environmental risks, sampling routine, and cost issues. For example, high measurement frequency may be preferred using surrogate parameters for their simplicity and economic feasibility (as mentioned in marker parameter related publications [13, 14]).

Fig. 3 shows examples of how emission profiles (to air or water) may influence monitoring regime.

Process **A** is very stable so sampling duration and averaging periods are of minor importance. Measurement frequency may also vary without compromising the results.

Example **B** is a typical cyclic or periodic technological process. Sampling duration and averaging periods may be limited to operating times. Monitoring regime may be periodic, with constant or varying frequency.

Example **C** suggests a relatively stable process with occasional short but high peaks which show almost no effect on total emissions values. In this case it is necessary to decide if the

permits cover peak or total values, this, in turn, depends on potential environmental impact of the contaminants. If hazards may be caused by short-termed actions, then primary attention should be focused on peak not load values, that suggests short averaging periods. Peak values control is best accessed by high-frequency or continuous monitoring.

Example **D** represents a highly variable process. Like in the above-mentioned case identifying ELVs for peak or total emissions depends on their potential environmental impact. Defining an appropriate monitoring regime here is very important; to meet the requirements on peak values the short sampling duration is used, while for total emissions values the prolonged averaging is implied. It should be mentioned that for Process **D** frequent periodic measurements or continuous monitoring might be advisable, data obtained from measurements with a minimum frequency may prove inaccurate.

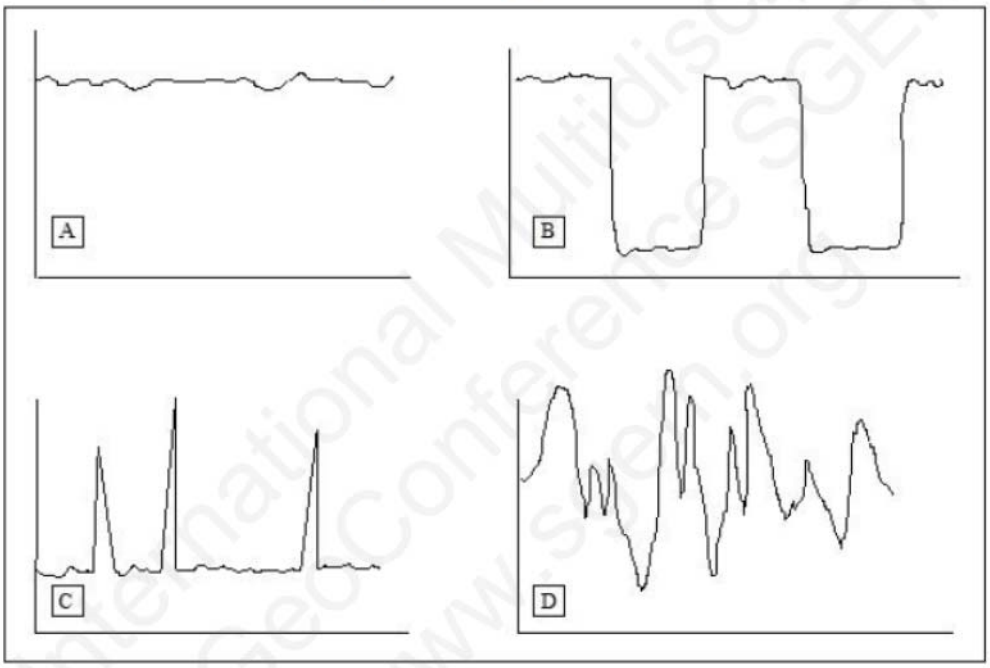

Fig. 3. Examples of how emissions may vary over time [10]

These examples underline the key feature of the IEC Reference Book: it is addressed to all industries listed for implementation of BAT; therefore it needs to be a systematic but rather general guidance. Primary issues which this Reference Book covers are principal requirements to the industrial control system development and implementation (concerning self-monitoring and reporting procedures).

During the data collection for the elaboration or the review of ITRBs for various sectors, it is normally not necessary to provide complete daily, monthly or yearly reports of continuous measurements. However, it is advisable to report at least, the (validated) averages (daily, monthly, yearly), the measurement uncertainty, minimum and maximum values, and the 95-percentile, if available, together with unambiguous information on the operating conditions.

If there is a need to calculate mass emissions, the measured values without subtraction of the measurement uncertainty are necessary. Therefore, for the elaboration or the review of ITRBs, it is advisable to provide the measurement data together with the dedicated measurement uncertainty. This allows the calculation of daily or monthly or yearly averages. Furthermore, if sufficient data are available, it might be possible to mention a specific measurement uncertainty in connection to the range of technological parameters associated with a BAT.

CONCLUSION

Objectives of the environmental self-monitoring as an integral part of the industrial environmental control include: improved control over impacts on the environment; higher environmental awareness of employees; increased management responsibility for regulatory compliance; increased cost-effectiveness; and increased public access to the environmental information.

The IEC Reference Book which being developed in Russia aims to provide industrialists and regulators with the information needed to achieve these objectives while improving self-monitoring practices. This is why representatives of key economic sectors are deeply involved in the preparation of this ITRB suggesting approaches to the selection of marker parameters, enhancement of measurements and data logging.

Discussion of possible approaches to automated measurements becomes futile without feedback from practitioners, and adopting any possible solutions, lest to say legislative acts in this area are yet untimely. Well substantiated selection of parameters fitted for automated measurements and control will only become possible after completion of the respective sectoral ITRBs, hence it is may seem reasonable to issue the Governmental Decree after 2017.

Before that time, development of ITRBs and implementation of pilot projects will grant experience and help to align positions of all parties involved (namely, Rosprirodnadzor, regulated community and public). Also, there is no urgent need for drafting national standards laying down requirements to certain analytical procedures. Firstly, this issue is under detailed attention from the International Organization for Standardization, the ISO standards being implemented in Russia. Secondly, national analytical chemistry and environmental chemical analysis is an area of professional expertise, where both new and conventional test methods are continuously revised and evolved.

It is to be expected that detailed requirements of environmental monitoring for activities already covered by sectoral ITRBs will become the topic for second-level documents, namely national standards, developed in parallel to the IEC Reference Book. The key role here is delegated to the leaders in TWGs who drafted sectoral ITRBs and who work in close contact with Russian operators and regulated community.

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