

ABSTRACT

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Development of the Approaches to Environmental and Technological Regulation of the Industrial Activities throughout Installation Lifecycle

Relevance of the research topic.

Transition to the environmental technological regulation of the large industrial installations based on the concept of Best Available Techniques (BAT) has been undergoing in the Russian Federation since 2014. Legislative and regulatory legal acts have been developed, BAT information and Reference Documents (BREFs) prepared, issued and are being consistently reviewed. At the same time, the research attention is focused on the procedures for granting integrated environmental permits (IEP) for Category I installations. This category embrace all large chemical installations. For them, sectoral BREFs have been developed and BAT-related technological parameters approved by the orders of the Ministry of Natural Resources and Environment of the Russian Federation.

The overall objective of the research is to develop approaches to the application of the concept of the best available techniques as the basis for environmental and technological regulation throughout the life cycle of the Installations implementing chemical and technological processes for the product manufacturing.

To fulfil the objective, the following logically interrelated **tasks** should be accomplished:

- to analyse the main technological regulation tools in the field of environmental protection; to determine the sector-related specifics in their application (primarily in the chemical industry) at installations;
- to determine the procedure for applying the BAT concept in order to consider alternatives and select technological solutions during the environmental impact assessment procedure;
- to develop proposals for the application of BATs, technological and resource efficiency parameters during the development of environmental and energy management systems, taking into account the applicable BAT requirements;
- to prove the expediency of considering the results of the implementation of environmental and technological modernisation programmes and BAT compliance in the context of fulfilling the international environmental obligations of the Russian Federation;
- to identify the specifics of BAT application and developing appropriate procedures for the decommissioning of technological processes (or installations);
- to determine the role of the BAT concept in improving the processes of preparing and disseminating open reporting on the environmental performance and resource efficiency of industrial installations.

The scientific novelty of the research.

- A classification of General Binding Rules (GBR) has been developed and recommendations have been formulated on the GBR application to control insignificant environmental impact sources operating at the sites of large industrial installations; the classification and recommendations are based on the results of the analysis of international and

national instruments for the environmental and technological regulation and the generalization of the BAT and GBR key characteristics.

- The necessity of the BAT concept application was substantiated and the procedure for applying the BREFs while running the environmental impact assessment (EIA) and selecting alternative technological solutions for the implementation of the planned activities was proposed.

- Approaches have been developed to substantiate the goals and objectives of improving environmental and energy efficiency during the development of environmental management systems (EMS) and energy management systems (EnMS) at large industrial installations classified as BAT implementation areas in the Russian Federation.

- A modified procedure for exclusion of industrial Installations from the Barents Euro-Arctic Region Environmental “Hot Spots” List is proposed; the modified procedure takes into account the results of environmental and technological modernisation programmes implementation and achieving compliance with BAT requirements.

- The BAT requirements should be established for the stage of preparation for the decommissioning of obsolete technological processes (primarily those in the implementation of which hazardous chemicals are used or formed); the green chemistry principles should be taken into account during this procedure.

- Approaches to the BAT concept application to improve the objectivity and comparability of information on the environmental and resource efficiency of production for the development of social and environmental reporting and pilot case studies implementation are proposed.

The practical significance of the research involves the possibility of using its results for (1) improving the EIA procedure for planned activities at large industrial installations classified as BAT application areas in the Russian Federation; (2) substantiation of target indicators for the development of industrial EMS and EnMS; (3) development of programmes for conducting environmental case studies in the regions where chemical installations are located.

The procedure for the for exclusion of industrial Installations from the Barents Euro-Arctic Region Environmental “Hot Spots” List is modified by the author and based on the results of environmental and technological modernisation programmes implementation and the BAT compliance was implemented in 2020-2021 for the pulp and paper industry, the mining and chemical complex and for municipal wastewater treatment plants.

Provisions of the research for defence are following:

- Classification of General Binding Rules as instruments for technological regulation of industrial installations.

- The procedure for applying BREFs (1) for running environmental impact assessment procedures and (2) for developing programmes for industrial environmental and energy management systems development by substantiating target indicators for improving efficiency.

- Modified procedure for exclusion of Russian industrial installations from the Environmental “Hot Spots” List of the Barents Euro-Arctic Region by considering results of the implementation results of environmental and technological modernisation programmes.

- Justification of the expediency for including decommissioning procedures into BREFs for sectors where hazardous chemicals are used and (or) generated.

- Recommendations on the application of BAT parameters while preparing information for open reporting on the environmental and resource efficiency of Russian chemical industries.

Outputs

As a result of the research the author

- has developed a GBR classification for (1) insignificant environmental impact sources (2) explaining the specifics of using BREFS to reduce the negative impact on the environment; (3) environmental management procedures, including the decommissioning of technological processes using and (or) generating hazardous chemicals;

- has identified possible approaches for convergence of the BAT concept and green chemistry concepts;

- has substantiated the necessity of applying BREFs during environmental impact assessment procedures;

- has proposed the procedure on applying BAT-related parameters for setting goals and objectives for industrial EMS and EnMS development with recommendations to develop and apply GBR for insignificant environmental impact.

- has finalised and tested at the pilot pulp and paper installation the exclusion procedure of Russian industrial installations from the Environmental “Hot Spots” List of the Barents Euro-Arctic Region; the modified procedure uses as an evidence the environmental and technological modernisation programmes and compliance with BAT requirements.

- has substantiated the expediency of including the procedures for preparing for the decommissioning of technological processes and (or) industrial installations using hazardous chemicals;

- has formulated recommendations on using BAT parameters for increasing the comparability and objectivity of open reporting.