ECONOMICS AND ECOLOGY SYMBIOSIS: TRANSITION TO PRINCIPLES OF BEST AVAILABLE TECHNIQUES

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Abstract. The paper presents the successful introduction of BAT depends greatly on the balance of legislation in whole, which takes into account different aspects of state regulation and promotion of energy efficiency in the industrial complex as well as close link of technological, energetic and ecological indicators of efficiency and non-wastefulness.

In accordance with the Federal Law on 21 July 2014 No 219-FZ, large enterprises of the key sectors of industry with serious negative impact on environment and high natural resource consumption (belonging to Category I) are obliged to meet the requirements of the best available techniques (BAT) implementation in Russia and therefore to adopt integrated ecological solutions (IES) within the coming years.

BAT have boasted great potential for the development since the adoption of the Federal Law No 219-FZ in 2014 leading to the amendments in the Law on environmental protection and introducing the scheme classifying enterprises into different categories according to their environmental influence starting with the ones having the greatest impact. It was done to promote their gradual shift to BAT. Therefore, the frames of the scheme, which should be followed up with “vertical” (on different sectors) and “horizontal” (of general methodology) informational and technical guides, have been set. “Horizontal” guides and, in particular, the guide of the best available techniques have no industry specifics and are applicable to any sectors and industries considering certain technological aspects attributable to definite business spheres.

However, if we look at the new ecological legislation and analyze enterprises from its point of view, then, we see that the integrated proportion of the enterprises related to Group I in general consumption of fuel and energy resources (FER) and environmental pollution is considerable (Table 1).

| Table 1. Integrated characteristics of Group I enterprises (in accordance with 219-FZ) |
|-----------------------------------------------|-----------------------------------------------|
| Input                                         | Entry                                         |
| 17 % occupied                                 | 68,7 % of water                               |
| 68,7 % of water                               | 68,7 % of sewages                             |
| 18 % of lands                                 | 79,8 % wastes                                 |
| 52 % of fuel and energy resources             | 75 % emissions to the atmosphere               |
Data processing of nearly 4500 Russian enterprises\(^1\) has helped classify them due to the level of their technological and energy efficiency. The classification of enterprises on their energy and resource efficiency allows to identify the size of major groups, their sectoral belonging and to offer certain proper measures to move to other groups with more favorable indicators of energy and resource efficiency and environmental safety. The leading groups include about 20% of companies from various sectors (see Figure 1).

\[\text{Figure 1. Distribution of industries on their energy and resource efficiency}\]

Energy and resource efficiency indicators of almost 20% enterprises are above average level, about 36% are at the average level and 44% are below the average one. Therefore, the key target of the state authorities implies to relocate outsiders to the group of “intermediates” and, hence, to increase the group of “leaders”.

According to the expert and analytical surveys, while buying equipment, almost 30% enterprises consider the uncertainty in its efficiency to be the core hurdle. With this regard, the availability of such guides might be particularly claimed as reference documents.

Environmental regulation (the reduction of negative impact of enterprises on the environment) is closely connected to energy efficiency increase. A significant part of positive ecological results is achieved by implementing measures and programs of energy intensity reduction. The society of professionals place a lot of hope on the guides of the best available techniques in terms of both comprehensiveness and balance level of the state attitude to BAT and from the point of view of direct involvement of all the entire set of actors.

For instance, without any certain frames of the system under the research, we face the first important methodological issue that enquires what indicators should be taken as the measure of resource, energetic and ecological efficiency for the technologies of energy and technological machines and assemblies, in particular, or workshops and enterprises in whole. Since a significant number of high tem-

\(^1\)The assessment based on the data processing of 4200 enterprises [http://interfax-era.ru/reitingipredpriyatiu/fundamentalnaya-effektivnost/sredneotraslevye-znacheniya](http://interfax-era.ru/reitingipredpriyatiu/fundamentalnaya-effektivnost/sredneotraslevye-znacheniya)
perature heat systems is equipped with recycling appliances, we can use the indicators therewith this recycling process defining their energy and ecological efficiency. (Table 2). In some cases, it can lead to the considerable reduction of indicators of physical energy capacity and specific atmospheric emissions per unit of produced goods.

**Table 2. The list of energy and resource efficiency indicators**

| Efficiency indicators | Ways of determining the indicators |
|-----------------------|-----------------------------------|
| Visible fuel consumption, efficiency ratio of assembly (system) | $B_v = \frac{B_e}{G_{con}}$  \[\eta = \frac{Q_{eff}}{Q_{com}}\] |
| Specific consumption with regeneration and recycling of secondary energy resources | $B^*_{sp} = \frac{(B_v - B_{reg})}{G_{con}}$ |
| Specific wastes and emissions per unit of produced goods (fuel) | $w = \frac{W_{com}}{G_{con}}$  \[w = \frac{W_{com}}{B_{sp}}\] |
| Specific wastes and emissions per unit of fuel with regeneration | $w^* = \frac{W_{com}}{B^*_{sp}}$ |
| Specific wastes and emissions per unit of produced goods with secondary products (steam, electricity, cold) | $w^* = \frac{W_{com}}{(G_{con} + D_{rec})}$ |

Here, $B$ is for fuel consumption, $G$ is for assemblies’ efficiency, $W$ is for emissions, $\eta$ – efficiency ratio, $Q$ is for heat production, $*$ is for values of indicators with secondary energy recycling.

In the process of developing guides, some important issues can occur, that is, for instance, what figure of the indicators in use can be set as the extreme limit of “the best” techniques. In turn, this may affect the way in which enterprises move towards BAT, if this transition is complex and expensive and what proportion of enterprises is considered inefficient by the moment the campaign starts.

The new era of environmental regulation in the Russian Federation set by the amendments in the Federal Law on 21 July 2014 No 219-FZ stipulates the close link among technological, energetic and ecological indicators of functioning of energy-intensive heat technological assemblies and aggregates at almost all industrial sectors.

In 2015 and 2016, 26 informational and technical guides (ITG) were issued. They included information related to pulp and paper industry, sectors of copper, aluminum, mineral fertilizers, cement, lime, ceramic pieces and glass production. Moreover, the guide on thermal neutralization of waste products (waste burning) was published either. It was the first time when the guides, which have no international analogues, were developed, namely, “Wastewater treatment when making products and rendering services at large enterprises” and “Wastewater treatment with the use of water supply and sanitation systems of settlements and urban districts”. In 2017, the development of guides was completed and 51 guides on BAT were approved.

Importantly, the successful introduction of BAT depends greatly on the balance of legislation in whole, which takes into account different aspects of state regulation and promotion of energy efficiency in the industrial complex as well as close link of technological, energetic and ecological indicators of efficiency and non-wastefulness.

**References:**

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