Chemical and Petroleum Engineering, Vol. 48, Nos. 9–10, January, 2013 (Russian Original Nos. 9–10, Sept.–Oct., 2012)

SAFETY, DIAGNOSIS, AND REPAIR

INSPECTION AS A STAGE IN THE INNOVATIVE DEVELOPMENT OF INDUSTRY

N. N. Gubarev and A. V. Menchugin

Questions related to the order of replacement of the basic assets of an enterprise based on the results of an inspection of industrial safety are reviewed in light of technical and financial policy. Through a resolution of these questions it becomes possible to create a final cost fund for repair and renovation of equipment as well as define a policy of modernization of the production equipment of an enterprise.

Keywords: *industrial safety, economic activity, industrial safety inspection, depreciation allocations, equipment, effective utilization period, standard life of equipment.*

With the adoption of the Federal Law, *On Industrial Safety of Hazardous Industrial Plants*, of July 21, 1997 (No. 116-FZ) [1], industrial safety (a system of measures designed to prevent technogenic accidents) become an independent branch of science and, at the same time, a subject of practical activity.

It should be noted that today the essential point of industrial safety for business entities of economic activity consists principally in stable and dynamic operation of a commercial enterprise, not in ensuring the safety of individuals.

As a system of measures, however, it possesses a number of major drawbacks, for example, it preserves the technical and technological lag of the domestic economy and prevents (or at least does not promote) the introduction of innovation.

Thus, the existing system of industrial safety in Russia does not, in fact, ensure safety.

This is also due to the fact that one of the key trends in the system of industrial safety, industrial safety inspection of equipment that has outlived its standard service life and that is used in hazardous industrial plants, does not encourage the owners of hazardous industrial plants to modernize the existing stock of production equipment and, consequently, undertake thoroughgoing modernization of production processes.

It should be understood that one may speak of industrial safety [1] in exhaustive fashion only when natural (i.e., created by economic means, not administratively) motives for undertaking renovation of the existing stock of production equipment and, together with the latter, thoroughgoing modernization of existing production processes or the introduction of new processes (i.e., processes corresponding to contemporary and future requirements) make their appearance on the scale of the entire economy among the overwhelming majority of plant owners. Note that the process of returning equipment back into the production cycle in the form of production capital is one of the fundamental stimulating motives for renovation of equipment and production processes [2].

Figure 1 presents a schematic diagram illustrating the process of returning equipment as items of fixed assets.

In parallel with the circulation of fixed assets (monetary equivalent of equipment), there also occurs circulation of the equipment itself in the production process (obsolescence and physical wear-and-tear, repair, conversion, replacement).

Figure 2 shows how the balance value of equipment is exhausted in the course of the standard service life and becomes zero (or an infinitely small quantity) and, in addition, how the standardized depreciation allocations and allocations to the fund of repair and renovation work both become infinitely small quantities.

Azot Company, Kemerovo, Russia. Translated from Khimicheskoe i Neftegazovoe Mashinostroenie, No. 10, pp. 33–35, October, 2012.

 0009-2355/13/0910-0632

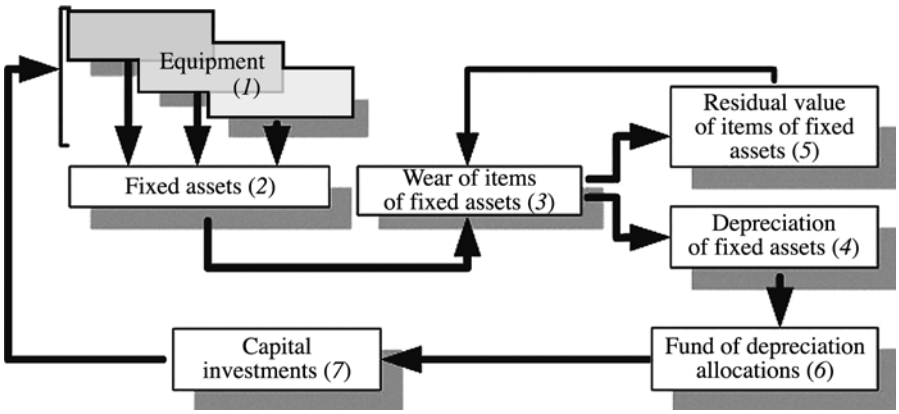

Fig. 1. Cycle of value of equipment (items of fixed assets) in processes of production activity: *1*) assembly and placing of equipment into service; *2*) addition of equipment to accounts as items of basic assets (determination of standard service life and of depreciation methods and standards); *3*) periodic transfer of a portion of the value of equipment to that of manufactured product, reduction of residual value, decrease of service life until fully exhausted; *4*) calculation and addition of depreciation allocations; *5*) calculation of residual value of fixed assets (i.e., reduced by magnitude of depreciation allocations) until fully exhausted; *6*) accumulation of depreciation allocations in a special fund; *7*) financing of capital investments and acquisition of new equipment out of the fund of depreciation allocations.

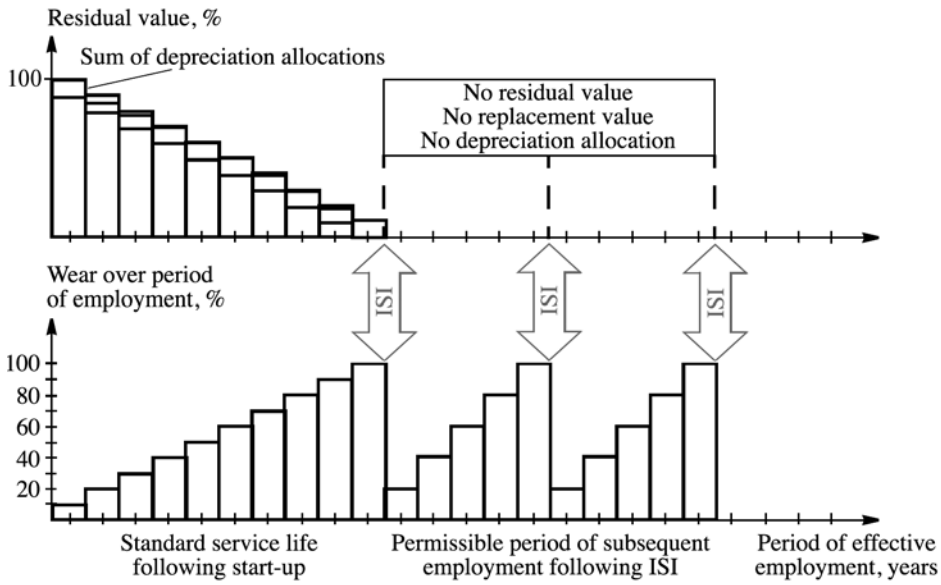

Fig. 2. Relationship between value of production capital and permissible service life of equipment.
ISI – industrial safety inspection.

From the financial point of view, such equipment must be taken out of service, written off and dismantled, and in their place, new equipment must be assembled and placed into service and into the circulation of fixed assets.

However, experience has demonstrated that the bulk of a piece of equipment's standard service life that has been used up is in fact utilized. The cost of manufactured product is reduced due to the lack of mandatory and standardized allocations in form of depreciations and final capital for renovation and maintenance of fixed assets in an serviceable state. But it is not

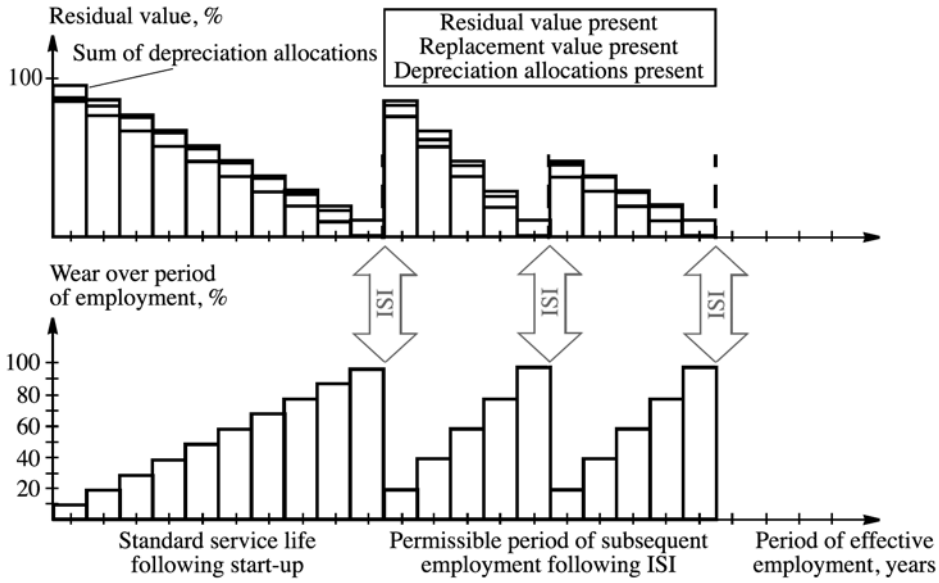

Fig. 3. Relationship between value of productive capital and permissible period of employment of equipment in light of renovation of the value of equipment from the results of industrial safety inspection. ISI – industrial safety inspection.

possible to avoid assignment of capital for repair and renovation operations; in fact, this is realized out of profits and the plant owner generally arrives at a decision on the basis of a residual principle, i.e., the concept of industrial safety is violated.

From the economic point of view, renovation of equipment following exhaustion of service life is not legally regulated, though the order of extension of the period of subsequent employment of such equipment, expressed in the form of an industrial safety inspection, is clearly defined by requirements in the field of industrial safety. Thus, the operational properties of industrial equipment are legally established.

In other words, after the possibility and period of subsequent use of a piece of equipment is determined by means of an industrial safety inspection, a legal basis for use of the equipment is obtained and a new standard service life equal to the permissible service life in fact commences. The value of the equipment (subject of the inspection) as a subject of financial relations is reimbursed out of exchange [2], which in turn leads to even greater wear in the absence of renovation.

Thus, it is understandable that the lack of any relation between the extension of the period of subsequent safe operation of equipment and renovation of the equipment's proven value [2], properly speaking, *generates an essential technological lag and reduces the level of industrial safety* in domestic industry. In view of the fact that it lacks replacement value, equipment provided with extended periods of subsequent safe employment will be eliminated from the circulation of the value of items of fixed assets in the course of industrial activity.

It is reasonable to suppose that simultaneous with the return of a subject of inspection to the production process, this piece of equipment will also resume its place in the process of financial relations.

For this purpose, it is proposed that not only the period of effective employment of a piece of equipment, understood as an article, but also its equivalent value, commensurate with the extended period of employment, be established from the results of an industrial safety inspection (Fig. 3).

This will permit us to fully include the subject of inspection following an industrial safety inspection into both the production and financial processes of the individual enterprise. In accordance with this model, the enterprise will again begin to add in depreciation in the course of employment of equipment following an industrial safety inspection. The full repair allocation, which in fact takes into account the demand for maintenance of available equipment, will be generated from the replacement value.

The plant owner will receive current information concerning what is in service, and this will often have to do with outdated and physically worn-out scrap metal. Thus, it will be possible to arrive at a full understanding of the fact that the efficiency of a particular production process, in the form of a collection of pieces of equipment with extended service lives, obtained from the results of numerous industrial safety inspections, proves to be incommensurably lower than the contemporary equivalent in the form of new equipment. It becomes obvious that not only will the safety associated with employment of equipment drop, but so will the coefficient of effective use, while additional measures to increase efficiency will ultimately significantly increase costs incurred in employment of new safer and more productive equipment. The window of possibilities with regard to the range of possible decisions that may be adopted will expand, which will exert a positive effect on the effort to increase *efficiency* and *safety* of a particular business process over the long term.

Thus, the process presented in this article requires some time interval for use in conducting successive industrial safety inspections to ensure that the "return point" can be crossed sufficiently smoothly, and, correspondingly, it will be impossible to return to a situation of critical wear of equipment and, correspondingly, of production capital. Moreover, the owners of hazardous production plants will have time to create an intelligible technical policy of modernization of shops in light of their financial capacities.

A powerful impulse for the development of the domestic machine-building industry and of branches associated with this industry in the form of an increase in orders for both existing and new and promising production equipment will thus be created.

REFERENCES

1. Federal Law of July 21, 1997 (No. 116-FZ), *On Industrial Safety of Hazardous Production Plants (with amendments).*
2. N. N. Gubarev and A. V. Menchugin, "New capabilities for industrial safety inspection," *Khim. Tekhnika*, No. 12, 18–19 (2011).