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ANALYSIS OF THE «RULES OF PROCURING INDUSTRIAL SAFETY OF THE EQUIPMENT OPERATING UNDER EXCESSIVE PRESSURE» APPLICATION AT BELARUSIAN OIL & GAS REFINERIES

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In this article the analytical results of the «Rules of procuring industrial safety of the equipment operating under excessive pressure» application at Belarusian oil & gas refineries are given. It has been identified that in the current redaction of the «Rules of procuring industrial safety of the equipment operating under excessive pressure» there is a wide range of contradictions that have to be worked up in details. Also it calls for introduction of essential changes in the document in order to transform impracticable formal requirements into operative industrial safety procuring of the equipment operating under excessive pressure.

Introduction. Type and construction variety of columns, reactors, heat exchangers, vessels, tanks, cisterns, etc. where, as a rule, liquid or gaseous hydrocarbons (generally toxic explosive hydrocarbons) are being kept under high pressure, nowadays form a principal part of modern oil & gas refinery. Questions on procuring industrial safety of equipment at oil refineries and chemical plants are obviously essential and have paramount importance [1-6].

Methods of research. The «Rules of procuring industrial safety of the equipment operating under excessive pressure» (here and after the Rules) had been introduced on the territory of Belarus since the 1st of March 2016 in accordance with the act № 7 since the 28th of January 2016 by the Ministry of Emergency Situations of Belarus. These rules have substituted previous «Rules of organization and procuring industrial safety of the equipment operating under excessive pressure» (the first edition in 1956). The radical renewal was made with the necessity to create the unified regulatory framework on the territory of the Eurasian Customs Union, where Belarus is one of the founding states.

It is generally accepted that the Rules is the significant document which is sufficient to provide safe, trouble free equipment functioning in case of strict rules observation, especially at oil & gas refineries. In particular, during practical application of the Rules at refineries some contradictions had appeared. These contradictions need to be analyzed, studied and discussed. The above problems determined the object of the research.

Results, their discussion and perspectives. We consider that the abolition of concept “supervising of technical condition of device on the part of owner” is the most important and doubtful Rules innovation. During the last period of USSR technical control group activity its actions had been regulated by “the standard technical supervision approved by the USSR enterprises of Minchimprom” affirmed in 1983, and “the provision of technical control group activity at Minneftechimprom enterprises of the USSR” affirmed in 1983. That means that some Acts, which identified in details and regulated technical control group activity functioned together with the Rules of organization and procuring industrial safety of the equipment valid in the USSR. Such requirements are found in Byelorussian national TNPA: “Rules of organization and procuring industrial safety of the equipment (vessels) operating under excessive pressure”, “Rules of organization and procuring industrial safety of the process pipeline”, “Rules of organization and procuring industrial safety of lifting cranes”, which established practical technical codes of tanks technical operation, ventilation system, industrial buildings and structures, “the provision of technical control group activity at Belneftechim organizations.

Requirements for the qualification and education level of specialists, demand for responsible specialists for supervision of certain types of technical devices had been specified by TNPA. In practice, appointed specialists were postgraduates or those who finished college. They had enough experience in maintenance, exploitation and repair of the equipment.

With reference to previously listed TNPA and in accordance with current law acts, in particular, requirements 4.4.3 TKP 506-2013 “Chemical plant and facility explosion. General requirements”, technical control group has functioned for more than 50 years at Naftan, which nowadays is guided by “provision of technical control group activity at Belneftechim organizations”. Groups have been working from the very start-up at “Grodno Azot”, “Mozyr oil refinery plant”, “Mogilevchimvolokno”, Naftan, Polymir, etc.

At the same time, in the article 30 of the law of Belarus “About industrial safety” dated the 5th of January 2016 №354- the following basic rights of industrial safety specialists are noted:

Technology, Machine-building, Geodesy

- industrial safety inspection, compliance with requirements of industrial safety, consideration of document on issues of industrial safety;
- demand for written explanations from officials and employees who have violated the requirements of industrial safety;
- informative explanatory work with employees on industrial safety issues;
- advancement of proposals concerning industrial safety to the site manager to prevent accidents and incidents.

Here we need to pay attention that all above functions (from the act 30 of the Low) are determined and used by technical supervision specialists in accordance with "provision of technical control group activity at Belneftechim organizations and local enterprises".

For comparison, technical control group specialist gives prescriptions and monitors their implementation and technical supervision specialist, besides the monitoring of the equipment functionality during between - repair periods, carries out an equipment audit and tests, identifies defects, looks for technical solutions, controls defect elimination, and by his own signature and seal allows the operate equipment for the period indicated by the TNPA. In case of the equipment operating under excessive pressure, above functions are carried out by Gospromnadzor MES of RB experts. In addition to previously indicated responsibilities, the technical supervision head specialist has to fulfill preventive safety work on the equipment usage.

Moreover, it is important to note that there is no head to exercise control over the dangerous industrial facility during technical survey of the equipment operating under excessive pressure. Earlier these functions had been carried out by a person responsible for supervision, but in the renewed Rules edition, these duties are transferred to a person responsible for exploitation of the equipment operating under excessive pressure.

Based on the facts, there is the need and expediency to add the concept "technical supervision group" to the «Rules of procuring industrial safety of the equipment operating under excessive pressure» with the same formulation as in the general document in the industrial safety exploitation of the equipment operating under excessive pressure area.

The second and no less important Rules usage problem is connected with new equipment purchase and old equipment repairing, in particular with weld control. Earlier requirements and methods of control were strictly determined in "Rules of organization and procuring industrial safety of the equipment (vessels) operating under excessive pressure". In accordance with the Application 9 the vessel group was specified by pressure, temperature and working conditions. In the application 14 content of control process was defined. Today in Belarus there is no affirmed document to specify weld control details during the process of vessels producing or repairing. In the 157-th Paragraph of the renewed Rules edition it is written: "Control requirements for each type of equipment operating under excessive pressure are indicated either in project or in technical documentation". From our point of view the idea "indicated in project or technical documentation" is incorrect because project organization during documentation development is to take into account some TNPA requirements, nonexistent in Belarus,

It should be noted that the Rules are also applicable to equipment repairing without formulated project documentation. Here we have the following question: Where should the details of weld control process be taken from?

There is an example: the 1st group vessel by TR TS 032-2013 certification was bought, but in project documentation extent of weld control was established as 30%. Moreover there is an explosive fire hazardous mixture or a mixture of the 1st or the 2nd hazardous class as per GOST 12.1.007 in the vessel.

Earlier, for safety, 100% of welds were under control, but according to present Rules edition it's enough to control 30, 5 or 0% of all welds (as indicated in the project). Then it's necessary to enclose TR TS 032-2013 correspondence certificate and to provide standard application, which confirm accordance of TR TS. As a result, enterprises can face an unqualified equipment application at different dangerous production lines because of impossibility to have weld control requirements by TNPA. In this situation it seems logical to use volume control norms indicated in previous Rules editions.

The requirement for the red manometer line has remained unchanged in new Rules edition. According to the requirement of the 249 paragraph: "The red line has to be painted on the manometer scale the red line has to be painted at the division level corresponding the work pressure for the element, taking into account the additional pressure from the weight of the liquid column". Such requirement is realizable at enterprises with 5-10 pieces of equipment with manometers and with stable operation, and is useless at big enterprises like oil refineries. Here is an example of an air preparation unit: normal pressure for dried air is about 0.6 MPa. When air drying unit is switched on the system pressure falls to 0.4 MPa, due to additional hydraulic pressure resistance which is produced when air passes through absorbent.

Normal operation modes established by technological regulations are applied in both cases. Mode alternation can be made several times per day with pressure change. Here is the question: what pressure should be considered working and where should the red line be painted? In this situation the red arrow should be painted at the allowed pressure level for each vessel with the passport. There won't be any regime change dependence; the mode control will be carried out by automatic devices.

One more significant difference of the new Rules is the absence of requirements for calibration of safety valves established on the equipment. In fact, the safety valve is an important part, which prevents a vessel from breakdown in case of unexpected pressure rise in the system. In the previous Rules edition there was the requirement for calibration of safety valves at pressure not exceeding working one for the mentioned valve. In case of pressure rise by some reason in the system above specified limits, safety valve disruption happens. After the pressure decrease hermetic valve closure is sometimes impossible due to abrasives from working mixture, scavenge formations under the valve seat, that lead to process unit emergency stop. However, the general usage of the safety valve is to prevent a vessel from breakdown, not to control technological regime. For each vessel the calculated (for the new equipment) and allowed (for technically diagnosed equipment) pressure values are noted in the passport. Based on these pressure values the hydrotesting pressure calculation was made, under which the vessel is being tested before its exploitation. With the calibration of valves under calculated (allowed) pressure safety and stability of the vessel is guaranteed in emergency situation (the vessel stability under such pressure is confirmed by hydrotesting pressure which 1.25 times higher than the working one taking into account temperature coefficient), valve fault with pressure change in the system is excluded.

Conclusion. Hence, there are a few contradictions in the present edition of «Rules of procuring industrial safety of the equipment operating under excessive pressure», which require a detalization and changes in order to maintain safe work of the equipment operating under excessive pressure. In fact, there is some weakening of responsibility at a present time period for industrial safety control. It leads to some exploitation difficulties of the equipment operating under excessive pressure.

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