UDC 621. 31. (07) / T343 BBK31.37ya73/ T343

REPAIR METHODS AND TECHNICAL CERTIFICATION OF BOILERS

Karshi Institute of Engineering and Economics
Assistant professor ***Samatova Shoira Yuldashvna*** [1]
Kazak National Agrarian Research Institute
Doctor of Physical Technical Sciences (PhD) Associate Professor
Abdirova Mukhabbat Turdialievna [2]
Master students: ***Zhuraev Shukhrat Coal Abdusator*** [1]
Temirova Lobar Zokir kizi [1]
Gifted student ***Khamraev Shirinbek Gulom ugli*** [1]

Abstract. Today, in connection with the aggravation of the global financial and economic crisis, the President of our Republic, I.A. Karimov , in his book “The World Financial and Economic Crisis, Ways and Measures to Overcome it in the Conditions of Uzbekistan”, noted that the technical renewal and diversification of production, the widespread introduction of innovative technologies, a reliable way to overcome the crisis and enter Uzbekistan to new frontiers in the world market . ShGCC is one of such facilities where innovative programs have been introduced.

Keywords: granule, polyethylene, liquefied gas, unstable condensate, products, low-sulphur, drum.

Introduction. In 2001, in the Kashkadarya region of Uzbekistan, one of the world's largest gas industry enterprises, the Shurtan Gas and Chemical Complex (SHCC), was put into operation. According to its technological and production indicators, there is no analogue to this complex in the CIS countries , there are only seven enterprises of similar capacity in the world , and in Asia the ShGCC is the second. fruitful international cooperation. The ShGCC was built on the basis of the Shurtan low-sulphur deposit , the production facilities occupy an area of more than 150 hectares.

Prior to the launch of the SGCC, natural gas in Uzbekistan and most of the CIS countries was used exclusively as a fuel. The technologies used at Shurtan mean a fundamentally new approach to the use of natural resources and resource conservation. The technological part includes a gas treatment plant, a plant for the production of granular polyethylene, liquefied gas, and unstable condensate and other products. An important role in obtaining high-quality final products is the supply of the complex with the necessary amount of appropriate energy resources. To supply technological zones in Shurtan there is a steam and hot water supply workshop (DHW).

The planned preventive maintenance (PPR) system includes: maintenance, current and major repairs. Maintenance is carried out by the operating personnel in strict accordance with the instructions for operating the equipment, includes a set of works to maintain the equipment's performance between repairs and combines the correct operation of the equipment and daily monitoring of the condition of the equipment, compliance with the rules of technical operation [1, 2, 4, 6] . The scope of maintenance includes operational maintenance and minor repairs to the equipment.

Operational care of the equipment is wiping, cleaning, regular external inspection, identifying all faults, lubrication, checking the condition of the oil and cooling systems of the bearings, monitoring the condition of fasteners and connections, checking the condition of the ground. Minor repair of equipment is the elimination of minor defects, tightening of fasteners and contacts, partial adjustment, replacement of fuses, gaskets, identification of the general condition of the insulation.

During operation, heat exchange and chemical equipment wears out and may lose its efficiency due to mechanical wear of individual parts and surface layers, as well as due to corrosion under the action of aggressive chemical environments. This will lead to a loss of strength, accuracy, a decrease in the power and productivity of the equipment.

Systematic supervision and maintenance of the equipment during its operation and carrying out repairs prevents premature wear of the equipment and maintains it in working condition. Normal operation of the equipment ensures its operation for many years without accidents, downtime and costly repairs and makes it possible to increase output and increase labor productivity.

In order to keep the equipment in working condition and improve its use, to prevent breakdowns, it is necessary to rationally operate the equipment and follow the rules for its operation. Equipment must be used in accordance with its intended use; do not overestimate the operating modes, as well as work on an untested unit or in the absence of safety and protective devices on it. [L.1;, 2;,3;,4;].

1 Preparing equipment for repair

Preparation of equipment for repair is carried out in accordance with the requirements of RD-69-94 ’’Typical specifications for the repair of steam and hot water boilers for industrial energy’’ .

The scope of repair work is determined by the owner of the boiler based on the results of technical examination and diagnostics. Prior to the start of work, the repair organization develops technological documentation for repairs, including preparation of the repair site for welding or surfacing. Responsibility for the completeness and quality of the work performed lies with the organization or person who carried out the repair.

Repair of the boiler is carried out by a specialized organization licensed by Gosgortekhnadzor to carry out this type of work. Certified welders, certified non-destructive testing specialists and locksmiths with a rank of at least 4, who have practical skills in boiler repair, are allowed to perform work.

Prior to the start of repairs, the following documentation is drawn up for each boiler:

- an act on the technical condition of the boiler before repair;
- a project for the organization of work and technological instructions for carrying out welding work;
- specification for equipment, spare parts, tools, equipment, rigging devices.

A detailed description of the repair work must be recorded in the repair log. In particular, the journal records information about the amount of work performed on cleaning and replacing boiler elements, as well as information about the methods and sizes of samples of unacceptable defects (corrosion damage, cracks, etc.), materials and electrodes used, welding technology and information about welders, about the methods and results of control.

The organization that performed the repair draws up and submits to the customer in a bound form the following technical documentation:

– repair forms;
- certificates for welding of control welded joints or for cutting production welded joints;
– protocols of mechanical tests and metallographic studies of specimens from control welded joints ;
– certificates for welding consumables, pipes, sheet, fittings, flanges, fittings, fittings, fasteners;
– protocol for running a ball through pipes;
- Copies of welder's certificates.

When repairing boiler drums using welding, the following technical documentation is additionally drawn up:

- certificates of inspection of the boiler before and after repair;
- drum repair log (it provides a development of the drum, on which the location and numbers of pipe holes and fittings are applied; the location and numbers of the drum seams, detected defects and samples, etc.
- repair log of pipe holes and fittings;
– technology for repair;
– an act for the replacement of fittings;
– conclusions based on the results of ultrasonic, magnetic particle testing and transillumination for the absence of defects after repair;

– conclusions based on the results of the control of the deposited areas, performed by the ultrasonic method after a hydraulic test;

– an act of checking the technological properties of the electrodes.

The admission of people to carry out repairs inside the boiler should be made only with written permission, called an order - admission.

2 Maintenance and overhaul

Current repair is a type of scheduled repair carried out during operation to ensure the guaranteed operability of equipment with the replacement and restoration of individual parts of the equipment and their adjustment.

During the current repair, the following works are performed: 1) maintenance operations; 2) replacement of wear parts and their connections; 3) repair of linings and anti-corrosion coatings; 4) replacement of gland packings and gaskets; 5) checking for accuracy of dimensions and movements of individual parts and elements of assemblies subject to wear or deformation; 6) cleaning, blowing compressed air windings; 7) measurement of electrical insulation resistance with a megohmmeter, etc.

Current repairs are carried out according to the schedule by maintenance personnel under the guidance of a mechanic or foreman. During the current repair of equipment, a partial disassembly of individual components and mechanisms is carried out in order to identify the technical condition of the parts and eliminate minor malfunctions. At the same time, nicks and scuffs are cleaned , backlashes and gaps are regulated, as well as lubricants and thermostatic fluids are replaced.

For some types of complex equipment (for example, centrifugal compressors, fans, etc.), in order to ensure the required reliability and durability (in the repair standards, indicated by fractional numbers; see Table 9.3.1), current repairs of an increased volume or additional overhaul of a reduced volume. [L.1; 5; 6;7;].

Purpose of the study. Overhaul of equipment is carried out with the aim of restoring serviceability and full or close to full restoration of the resource of equipment with the replacement or restoration of its parts, including basic ones, and their regulation.

The scope of overhaul includes: 1) scope of current repairs; 2) replacement or restoration of all worn parts and assembly units, including basic ones; 3) complete or partial change of insulation, lining, windings, etc.; 4) alignment and alignment of the machine; 5) modernization of equipment (if necessary); 6) verification of explosion protection parameters ; 7) post-repair tests, etc.

Overhaul of equipment is a refurbishment, in which a complete disassembly of machines and devices is carried out in order to replace worn parts or perform repairs that ensure that the dimensions of the parts are brought to assembly tolerances. Specialized construction and installation organizations are involved in the performance of capital repairs under a preliminary concluded agreement. During a major overhaul,

equipment can be removed from its installation site and delivered to specialized workshops or enterprises to perform a better refurbishment.

For the overhaul of equipment, the following documentation is drawn up: 1) a list of defects; 2) cost estimate; 3) work organization plan (POR) for installations, units, production lines; 4) overhaul manual or technical specifications for overhaul; 5) network schedule (for the repair of the most complex equipment, installations, production lines).

The cost of overhauling equipment is charged to depreciation charges, therefore, before the start of work, an estimate and financial calculation is drawn up, approved by the director of the enterprise . Stopping equipment for overhaul is allowed only if the repair is fully provided with the necessary materials, spare parts and labor. The volume of equipment overhaul should include all plumbing, electrical, construction and special work, providing not only the restoration of worn parts, but also the modernization of equipment to improve its performance and productivity.

Overhauled equipment is tested both at idle and under load. Acceptance of the equipment is carried out by a commission consisting of the chief mechanic, the head of the production shop and those responsible for the overhaul. The acceptance certificate is approved by the chief engineer or director and is stored in the equipment passport along with other documents confirming the quality of the repair. Such documents include certificates for materials from which critical parts are made (bolts, studs and parts of high-pressure pipelines), drawings and sketches, according to which design changes have been made to parts and equipment, protocols and certificates of tests and technical checks for strength [L. 1;,2;,6;,7;].

Repair research methods

1) Scheduled preventive maintenance is carried out according to two methods. For the main equipment, which determines the production capacity of the production line unit, apply *method scheduled periodic repair* , in which all types of repairs are performed in a predetermined sequence after a certain number of hours worked by the unit. For auxiliary equipment *method of post-inspection repairs* , in which repair planning is carried out on the basis of information about the condition of the equipment obtained during the preliminary technical inspection. [L.3;, 4;,5;].

In accordance with the characteristics of damage and wear of the components of the equipment, as well as the complexity of repair work, it is planned to carry out current (T) and overhaul (K) repairs.

2) Overhaul The method of post-inspection repairs. During the technical inspection, the nature of the required repairs, the timing of their implementation, approximate volumes are established, and worn parts are identified that must be replaced with newly manufactured or restored ones.

The nomenclature and frequency of equipment inspections are drawn up in a statement in the prescribed form.

3) Preparation of equipment for repair. In the balance of equipment operation time, its downtime for repair takes a significant part. To reduce equipment downtime and carry out a successful repair, it is necessary to prepare the equipment for repair in advance. Before being handed over for repair, the equipment should be cleaned of dirt and sludge, rinsed and disconnected from communications, and also de-energized. Equipment associated with the production of explosive, flammable, corrosive and harmful substances to human health must be freed from the working environment and rendered harmless (neutralized, steamed, purged with nitrogen, ventilated, etc.). In addition, such equipment is disconnected from the systems using special plugs.

4) The equipment should be handed over for repair as a complete set. Before starting repair work, it is necessary to check all the mechanisms so that there is no accidental activation of the equipment in operation, and make warning labels. The work organization plan should be developed taking into account the use of the greatest mechanization - special repair and assembly devices.

5) Repair of equipment. Particular attention, in accordance with the nature of the equipment being repaired, should be paid to safety during repair work - providing workplaces with proven lifting and rigging equipment, low-voltage or explosion-proof portable lamps, non-sparking tools, portable fans , fire extinguishing equipment, etc.

6) Organization of repair and cleaning of equipment of explosive and fire hazardous installations must be carried out in accordance with the "Rules and norms of safety and industrial sanitation for the design and operation of fire and explosion hazardous production of the chemical and petrochemical industry." According to these Rules, repair and other work inside apparatuses installed in explosive workshops and in the open air (if there was a hot environment in them) should be carried out only with special tools that do not spark when struck. Repair of equipment should be carried out using progressive forms and methods: centralization and specialization of repair work, the use of nodal and aggregate repair methods, mechanization of labor-intensive work. [L.1;, 2;,3;].

Research discussion methods. repair repair heat and mass transfer equipment. During the operation of heat and mass transfer equipment, the following repair methods are used: individual, nodal, bench and sectional. During the overhaul, in order to reduce the time of its implementation, it is advisable to use the nodal repair method, which has a number of advantages over other methods and is characterized by high technical and economic indicators.

Nodal equipment repair method consists in the fact that individual assembly units of machines and apparatus that require repair are removed from their place and replaced by reserve ones, repaired in advance, purchased or prepared. This repair method is

recommended to be used where the overall equipment consists of separate assembly units and assemblies. It is most expedient to apply the nodal repair method for equipment: 1) common models of the same name; 2) limiting production; 3) transport and pipeline (regardless of the quantitative composition).

The use of the nodal repair method contributes to a sharp reduction in downtime of equipment in repair and a high level of organization of equipment repair. As experience has shown, the normative data of equipment downtime given in the PPR system when using this method are reduced by more than 40%.

Aggregate repair method. When placing technological equipment in open areas, it is necessary to provide for an aggregate system of current and major repairs, i.e., the possibility of repairing individual assembly units in mechanical workshops so that the work of repair personnel in an open area is limited only to the dismantling and installation of these assembly units. [L.3;, 4;,6;,7;].

Technical examination of boilers

Technical examination of the boiler is carried out in order to establish the health of the boiler and its suitability for further operation. It consists of external, internal inspections and hydraulic testing. Each boiler must be subjected to a technical examination before being put into operation, periodically during operation and, if necessary, an extraordinary examination. Technical certification is carried out by a specialized organization. Inspections of the boiler are carried out in order to check the correct installation and equipment of the boiler in accordance with the registration documents and for the absence of damage (initial survey) or its suitability for further operation (periodic or extraordinary surveys). When inspecting, attention is drawn to the presence of cracks, tears, detached, bulging, corrosion damage, traces of steaming and gaps in welded and rolling joints, as well as damage to the lining, which can cause a risk of overheating of the metal of the boiler elements.

The purpose of the hydraulic test is to check the strength of the boiler elements and the tightness of its connections. The test is carried out with water with a temperature ranging from 5 to 40 0C and a test pressure equal to 1.25R (if the working pressure P > 0.5 MPa) or a test pressure equal to 1.5R (if P < 0.5 MPa). The boiler is maintained under test pressure for up to 10 minutes, after which the pressure is reduced to the working value and the boiler is inspected. The water pressure is controlled by a working and control pressure gauge, one of which must have an accuracy class of at least 1.5. The boiler is considered to have passed the test if the pressure did not drop, and the inspection did not reveal any leaks in the joints, as well as cracks, ruptures, bulges and residual deformations in the elements of the heating surfaces.

A specialized organization conducts a technical examination within the following periods: inspections - at least once every four years; hydraulic test - at least once every eight years.

The owner of the boiler is obliged to independently carry out, at least every 12 months, external and internal inspections after each descaling and repair of heating surfaces, as well as before presenting the boiler for technical examination. The owner carries out a hydraulic test with working pressure after each opening of the drum, collector and repair of the boiler, if the nature and extent of the repair does not cause it to be extremely important from an extraordinary survey.

An extraordinary inspection of boilers is carried out in the following cases:

- when the boiler has been inactive for more than 12 months;
- if the boiler has been moved to a new location;
- if the repair was carried out using welding of the base elements, with straightening of bulging or dents;
- if during the repair more than 50% of all screen and boiler pipes or 100% of fire tubes are replaced at the same time;
- at the discretion of the Uzbekgortekhnadzor inspector, an engineer of a specialized organization or the Responsible.

If during the examination of the boiler defects are revealed that reduce the strength of its elements (thinning of the walls, etc.), the possibility of operation at reduced pressure is established by strength calculation and verification calculation of safety valves for throughput. [L.6;7;].

Conclusion

1) The operation of boiler plants must be reliable, economical and safe for maintenance personnel. To fulfill these requirements, boiler plants are operated in accordance with the rules for the design and safe operation of steam boilers and work instructions drawn up on the basis of the rules of Gosgortekhnadzor, taking into account local conditions and equipment features.

2) The boiler must be equipped with the necessary number of instrumentation, automatic control system for the most important parameters of the boiler, safety devices, interlocks and alarms. The operating modes of the boiler must comply with the regime map, which indicates the recommended technological and economic indicators of its operation: steam and feed water parameters, $RO_{2\ content}$ in gases, temperature and vacuum along the gas path, excess air coefficient, etc. Most modern boiler plants are fully automated.

3) If the normal operation of the boiler is disturbed due to malfunctions that can lead to an accident, it must be immediately stopped. Overhaul of boilers is carried out every two to three years. The boiler is periodically subjected to technical inspection according to the requirement:

external examination (at least once a year);

internal inspection (at least once every four years);

hydraulic test (at least once every eight years). [L.1;,2;,6;,7;].

Bibliography

1. Khamidov Sh.V. Electric power industry of the Republic of Uzbekistan - state, development prospects and investment climate. Report at the Business Forum in Paris (June 20-23, 2006). 28s. Uzenergy.uzpak.uz.

2. Rational and Efficient Use of Energy Resources in Central Asia: A Diagnostic Report. Geneva: United Nations Economic Commission for Europe. 2003.

3. Zakhidov R.A., Saidov M.S. Renewable energy at the beginning of the 21st century, the state and prospects for the development of solar technology in Uzbekistan // Solar technology. 2009. No. 1.

4. Kirillin V.A. and others. Technical thermodynamics: A textbook for universities . - 4th ed., Revised .- M .: Energoatomizdat , 1983.

5. Porshakov B.P., Romanov B.A. Fundamentals of thermodynamics and heat engineering.- M.: Nedra, 1988.

6. Thermal schemes of boilers / A. A. Parshin , V. V. Mitor , A. N. Bezgreshnikov and others - M .: Nedra, 1987.

7. Heat engineering / ed. IN AND. Krutova .- M .: Mashinostroenie, 1986 .