

## **MODERN STATE OF WELDED JOINTS OF ELEMENTS OF HEAT AND POWER EQUIPMENT**

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One of the most important tasks of modern heat energy in Ukraine is to increase the efficiency of existing power generating units of thermal power plants (TPPs). TPPs play one of the leading roles in the united power system of Ukraine. Power units are an integral part of thermal power plants and represent a large technical complex for power generation. The energy strategy of Ukraine for the period up to 2035 "Safety, energy efficiency, competitiveness" envisages increase of energy efficiency at the stage of generation of electricity and heat. Therefore, an important task is to investigate the damage to the elements of the thermal power plants to increase the reliability of their work.

The power units include many equipment and components that support the operation of the thermal power plants. The main elements of the thermal power plants include: boiler equipment, turbine unit, turbine generator, mechanical and electrical equipment, fuel preparation system, water equipment, pipelines and steam lines. It is relevant to investigate the damage of steam lines, which have already worked out their project and park resources. It should be noted that welded joints of steam pipes are damaged much more than the steam lines themselves. Stopping of power units, which caused damage to metal welded joints, ranges from 50-70% of the total number of forced stops. The power unit's stop is accompanied by significant financial losses. Therefore, it is advisable to study the mechanism of damage, namely welded joints, in order to reduce this damage and increase the life of steam lines.

During the operation of steam lines in their metal, pores and cracks in creeps are beginning, caused by operating conditions - creep, and physical and chemical processes, which include:

- self-diffusion of elements of chromium, molybdenum, vanadium, silicon and manganese;
- formation of segregation in the boundary zones of grains-phase;
- simultaneous displacement of dislocations by the mechanism of sliding and creeping;
- redistribution of alloying elements of chromium, molybdenum, vanadium between grain-phase and corresponding carbides;
- passing of carbide reactions  $M_3C$ ,  $M_7C_3$ ,  $M_{23}C_6$
- Coagulation of carbide phases.

The formation of pores and the development of cracks in creep, in the metal of welded joints of steam pipes, occurs mainly because of the structural inhomogeneity in the metal of the heat affected zone (HAZ). During the operation of steam lines, cracks in fatigue also occur, the origin of which is caused by overheats and start-stop. An increase in the damage to the metal occurs when welded joints work more than 270,000 - 300,000 hours.