

# THE IMPORTANCE AND BENEFITS OF WATER PURIFICATION FOR BOILERS

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## Abstract

Water treatment in the thermal power industry is an effective way to maintain and increase the efficiency of the heating system, extend the service life of equipment, and save fuel and energy. Water, which is used as the main coolant, must enter the system purified from mechanical impurities, organics and surfactants, dissolved salts, including silicates. Otherwise, the boilers may become unusable, and the heat exchangers will not be able to perform their functions. This article presents the main solutions to the problems of unusability of boiler installations.

**Keywords:** Fuel, energy, boilers, demineralization, heating system, desalination, water treatment, key source.

## Introduction

Water treatment for heating systems is a very important process that can fundamentally change the economics and approach to safety in this segment. Untreated and untreated water can turn from the main heat transfer medium into a key source of destructive impact on all elements of the system: from boilers to pipes and pumps. Water treatment in the thermal power industry consists of two main operations: - getting rid of mechanical impurities and demineralisation[1-7].

The first task is solved by the use of special filters;

The second - by ion exchange or reverse osmosis technologies, which can be used as separate or complementary technologies.

Reverse osmosis has found the main application, now it is the most effective technology of desalination and water treatment for boilers[8-14]. Problems when using untreated water in heating systems:

- decrease in the efficiency of heat exchange processes due to scale (1 mm scale on the surface increases heat energy costs by 10 per cent);
- foaming of water in the boiler due to its organic and surfactant content;
- corrosion of all elements of the heating system, leading to breakdowns and disrepair.

The production of water treatment and water purification systems does not stand still. In this field, innovations and new approaches to common issues appear no less frequently than in other areas. Due to this, the quality of water treatment and water purification is constantly improving, and now it is possible to purify water from impurities to 99.9 per cent. But we must not forget that the compliance of water to all standards is the result of quality service of water treatment, and the service life of heating systems, generating and boiler equipment, as well as shut-off valves and heating systems directly depends on how regularly and thoroughly its professional



diagnostics for faults[15-22]. Must carry out installation services for water treatment plant maintenance such as:

- diagnostics of the water treatment equipment already available at the enterprise, after which the manager is given a conclusion on how effective the further use of this equipment is;
- economic calculation of the costs that will be required to replace the equipment;
- installation of reverse osmosis and water treatment systems and other equipment;
- start-up and adjustment works for special equipment;
- service maintenance of all parts of the system;
- timely replacement of consumables used in water treatment systems.

The production of solvents, galvanic liquids, reagents, semiconductors, printed circuit boards and other products is impossible without water because of the stringent requirements for pH, specific electrical resistance, salts, insoluble substances and metal impurities[23-27]. Previously, steam distillation was used for water treatment in the chemical and electronics industry, but today this method has been abandoned in favour of more efficient and economical technologies, in particular membrane technology. Reverse osmosis plants are based on the use of membranes that act as a filter. As the water passes through the pores, the dissolved substances are trapped on the membranes. The degree of purification depends on the size of the pores. Thus, on the basis of our proposed units it is possible to create water treatment systems for chemical and electronic industry: for boiler houses, thermal power stations, thermal power plants, industrial enterprises, steam plants. At the same time, water treatment costs will be lower than when using outdated methods (e.g. ion exchange).



**Fig.1.** Water treatment for boiler plants

Water treatment for boiler plants is a mandatory process for every production of the category under consideration. Water treatment systems are used to prevent the formation of deposits on the working elements of boilers. In this case, it is quality water treatment of boilers is the main guarantee of trouble-free and highly efficient operation of boiler equipment during the heating season. Water treatment is the process of supplying liquid to the boiler plant after undergoing preliminary softening. At the same time, purification is performed through the use of block filters of multistage type. Water is treated before it is used in shipboard as well as hot water boilers. The equipment used for softening softens hard water very effectively [28-30].

The first stage of boiler water treatment involves mechanical filtration. The second one is more complicated and labour-intensive, requiring preliminary removal of mineral salts dissolved in the working medium. Softening in this case is performed using a modern method of fine purification, which has high efficiency. It involves the use of membrane technology. The majority of boiler-houses responsible for heat supply of objects of various purposes receive water from water supply systems, which does not need additional purification - degassing and softening is enough. The whole point is that the composition of tap water liquid includes a large amount of gases and salts that need to be removed, as they settle as sludge and begin to accumulate on the working surfaces of boiler units. Over time, the volume of layered deposits increases and the heat transfer coefficient drops. Ultimately, this leads to overconsumption of fuel. The danger of deposits that form scale is the increased risk of accidents - this is due to the constant overheating of the boiler walls. At the same time, aggressive compounds in the form of gaseous impurities regularly come into contact with the boiler walls, causing corrosion processes.

### CONCLUSIONS:

1. In order to prevent scaling on boiler walls and main working elements, it is necessary to use water of optimum hardness and to degasify and soften it. Degassing is carried out by vacuum deaeration.
2. Backfilling of softening agent should be done in advance. The liquid produced at the outlet of devices with chemical treatment method is not suitable for drinking.
3. The most durable are ion-exchange type softeners, but they also cost a lot. Magnetic devices are universal, and the most productive are the units operating on an electro magnetic generator.

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