SUMMARY

In recent years, we can see an increase in awareness of the problems associated with climate change. Most countries in the world are striving to reduce the impact of anthropogenic impact on these changes in order to reduce the rate of increase in the average temperature of the Earth. This is achieved, among other things, by reducing the use of fossil fuels and replacing them with low-carbon and emission-free forms of energy generation. One of the main goals of the climate policy of EU countries is to reduce greenhouse gas emissions and achieve climate neutrality in 2050. This work is part of the state's activities in the field of environmental protection, reduction of energy poverty as well as reduction of exhaust fumes and CO_2 emissions.

The main goal of the doctoral thesis was to achieve such operating parameters of the tested Forest boiler that the emissions generated in the combustion process meet the requirements set out in the National Air Quality Program. The research problem was to obtain optimal effects of boiler operation through innovative boiler controller software using both wood pellets and herbaceous pellets. Biomass is characterized by great diversity, so the exact determination of the function of biofuels and their classification depend on the end use. The detail of the characteristics of biomass plays a key role in effective planning and determining the direction of use of this raw material. The more detailed the characteristics, the more opportunities there are for the development of new technologies and new energy carriers with very high energy efficiency. Solid biofuels have found wide application in many sectors of the economy.

The most common use of them can be observed in:

- industry and professional energy for the production of heat and electricity - biomass residues, wood pellets and wood chips on farms,
- household for heating and cooking – wood pellets, briquettes, firewood and biomass residues.

Technological solutions used in currently constructed boilers have evolved over the centuries. The history of the creation of boilers for central heating is inextricably linked with the beginnings of the use of chimney systems, the distribution of heat to heated rooms and all attempts to regulate the amount of energy produced in the form. A breakthrough generation of

wood stoves became central heating boilers for wood, which, thanks to the installation for heat distribution, could heat more than one room. It was the so-called hypocaustum – a Roman system of central heating and / or underfloor heating. This system was used in ancient Greece from the fourth century BC, and in ancient Rome from the first century BC. This solution gave the opportunity to create future central heating systems allowing the use of ecological technologies and renewable energy sources. They are used in individual construction and have been the subject of research in this work.

Keywords:
combustion, biomass, pellet, renewable energy sources, 5th class boilers, ecodesign certificate.