

## ABSTRACT

The Rankine cycle is widely applied in life, especially in the use of Steam Power Plants (PLTU), where the boiler is one of the main components of the PLTU, apart from the pump, turbine and condenser. A boiler is a closed vessel that is used to convert water under pressure into steam by applying heat.

In the field of education, the need for facilities and infrastructure is an important aspect to support understanding and knowledge, especially in studying courses in Engineering Thermodynamics, Thermal Analysis and Energy Conversion Techniques. However, the lack of educational facilities in the form of Rankine cycle practicum tools in the Telkom University Physics Engineering undergraduate study program can hinder the development of students' understanding abilities. Therefore, this research aims to design a small-scale boiler as an educational tool.

Determining specifications, a literature study was carried out on previous research related to small-scale boiler design. The designed boiler is equipped with a control system and instrumentation such as measuring temperature, pressure, water level and measuring glass to make it easier for users during the process of using the tool. The boiler is equipped with a superheater component to improve the quality of the steam produced into superheated gas. The results of the vertical firetube boiler design process obtained optimal efficiency at medium gas openings or  $25^\circ$  with an efficiency of 55.48%, a steam output temperature of  $582.4^\circ\text{C}$ , and a boiler capacity of 3.61 kg/hour using a superheater with a maximum working pressure of 1.69 bar.

**Keywords: Rankine cycle, Boiler, Temperature**