ABSTRACT

This research focuses on the design and implementation of a cooling system for the condenser of a Soxhlet extractor using a Vapor Compression Refrigeration System. This system is necessary because the Soxhlet extraction process depends on the effectiveness of solvent condensation, where excessively high cooling water temperatures can reduce process efficiency. Therefore, a system capable of maintaining low and stable water temperatures throughout the process is required. R-134a refrigerant was chosen due to its favourable characteristics in absorbing and releasing heat.

The system is designed using main components such as a compressor, condenser, expansion valve, and evaporator, arranged into a closed cycle. Cooling is carried out by circulating water chilled in the evaporator to the Soxhlet condenser, to help recondense the solvent vapor back into liquid form. The system was then tested based on several main parameters: temperature, cooling water flow rate, electrical energy consumption, and system efficiency through the Coefficient of Performance (COP) value. These tests were conducted in stages under various temperature and flow conditions to obtain accurate data.

The test results show that the COP values obtained indicate a fairly efficient cooling performance with relatively low energy consumption. In addition, the system can operate automatically according to the predetermined temperature setpoint using the STC-1000 thermostat. This makes the system suitable for extraction processes that require continuous cooling over a long period of time.

Thus, the developed VCRS cooling system can be an efficient and practical solution for improving the performance of a Soxhlet condenser. This research is expected to serve as a reference for further development related to cooling systems and to support energy efficiency through the use of low power systems in operation.

Keywords: COP, Energy Consumption, Refrigeration, Vapor Compression Refrigeration System, Soxhlet.