

## **Abstract**

The main objective of the thesis is to study the multistage heat pump with thermoelectric modules and compare it with the single stage. Heat pumps with 5,10,15 and 30 thermoelectric modules are manufactured. It is concluded that multistage heat pumps have a higher COP than single-stage. It is concluded that as the number of stages increases, so does the rate of performance, and the rate of COP increment decreases. Multistage heat pumps can produce higher temperature differences than single stage ones, but require much more time to reach equilibrium state. The parallel electrical connection of the thermoelectric modules reduces the electrical resistance, and therefore increases the electrical conductivity, while the thermal connection in series reduces the thermal conductivity. The Seebeck coefficient of the system remains constant. These three variables increase the figure of merit. This results in an increase in the COP of the heat pump. Finally, it is concluded that multistage heat pumps work near their maximum COP.