

My graduation project focused on designing and analyzing geothermal HVAC systems for both residential and agricultural spaces, aiming to maximize energy efficiency while minimizing environmental impact. I explored both low and high-temperature geothermal systems, recognizing their versatility for various applications, including power generation, snow melting, and hot water supply. The design process involved studying optimized heat pumps for efficient heat transfer between ground surfaces, analyzing various ground source systems for efficient heat exchange with the earth, and comparing different loop designs (vertical, horizontal, and slinky) for optimal performance. One of the biggest challenges was accurately calculating the system's coefficient of performance (COP) and sizing geothermal HVAC components, requiring extensive use of thermodynamic principles and software like MATLAB. This project provided a deep understanding of sustainable energy systems, particularly geothermal energy, and strengthened my skills in problem-solving, system design, and applied engineering.