



## Cover page

Project title: Data Center's Cooling      Academic Year: 2024

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## Project's Abstract:

This study addresses the substantial energy consumption challenge posed by data centers, essential infrastructure dealing with extensive data and electronic devices. Cooling these devices for proper functionality demands significant energy usage. Therefore, elevated energy consumption resulting from mixing hot and cold air is intended to be mitigated. This will be achieved through research on more efficient cooling technologies and the design of a system aligned with these objectives. Specifically, the study compares data center cooling methods, focusing on a case study of the Palestinian cellular communications company "Jawwal". The company seeks to transition from its current rack-level cooling system to a more efficient and sustainable one. Based on the literature review, cold aisle containment cooling emerged as the most suitable method, requiring a total cooling load about 150 kW.

The research analyzes cooling load requirements and device specifications to guarantee that electronic devices are kept in the best possible environment. Notably, the comparison shows a reduction in cooling loads between the old and new systems: the sensible cooling required for the old system is 262.7 kW, whereas the new system is reduced to 133.3 kW, which saves 129.4 kW.

The study compares various CRAC (Computer Room Air Conditioning) methods used in data centers to determine the most efficient and cost-effective option for Jawwal Company's data center. A key comparison between DX and chiller systems was conducted, showing that DX systems provide simplicity, lower initial costs, and easier maintenance, while chiller systems require higher initial investment but offer scalability for larger data centers. Based on this analysis, DX air-cooled was chosen as the most suitable option. Additionally, Vertiv Double Circuit models P1094 were selected, featuring a maximum net sensible cooling capacity of 105.1 kW and a minimum net sensible capacity of 15.1 kW.



The study also addresses safety measures in the data center, specifically focusing on fire suppression systems. A comparison was made between FM200, Novec 1230 and other suppression systems. The analysis considered various factors, including effectiveness, environmental impact, and cost. However, Novec 1230 was chosen as the preferred protection solution due to its balance of effectiveness, safety for people and equipment, and environmental friendliness, ensuring enhanced protection for Jawwal Company's data center infrastructure.

Finally, the project calculates the break-even point based on sensible cooling load to determine the cooling system's financial feasibility. The break-even point is crucial because it determines the minimal return required for the project to be viable, guaranteeing that the initial costs are covered by the present worth (PW) of future cash flows. The savings used to calculate the PW were 419,411 ILS per year, and the project lifespan is considered to 20 years.

At a 10% MARR, the PW is 3,570,685 ILS, which is the highest determined value. At a MARR of 25%, the PW is 1,658,303 ILS. These values demonstrate that MARR has a significant impact on the project's financial assessment.