

**ANALYSIS OF COOLING TOWER PERFORMANCE OF
WORLD TRADE CENTER IN COLOMBO**

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(2015-148633T)

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Thesis submitted in partial fulfillment of the requirement for the degree
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Declaration

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the thesis under my supervision.

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Prof. K. K. C. K. Perera

The above candidate has carried out research for the thesis under my supervision.

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Dr. (Mrs) M. M. I. D. Manthilaka

Abstract

Energy crisis first experienced in the world during 1975, since then it is ever rising phenomenon felt by every human being on earth. This is due to accelerated industrialization of the world and rapid growth of standard of living of people. Therefore, global Energy requirement is increased day by day deficit between energy available is increasing. It is felt that energy preservation is much more important than searching for New Sources. Sustainability has been introduced to building services to reduce waste of energy and provide for future. Green building concept is increasingly popular in terms of reducing fossil fuel usage and introducing alternative energy utilization. Reducing Carbon foot print of a building is the responsibility of the engineer in modern times to support the sustainability goals. Heating, Ventilating & Air conditioning (HVAC) systems in Commercial buildings accounts for 60% to 70% of their total power consumption. This thesis explores the possibilities of improving the configuration of cooling tower and optimization of the chiller plant.

A central chiller plant for tall-building was analyzed for the effect of improving efficiency to enhance energy saving with varying cooling tower combinations and fan speed regulation. It was revealed that increasing the combination of cooling towers has a limitation of efficiency rise. However, reducing fan speed with increasing chiller combination prove to be success in the increasing efficiency of the chiller plant.

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List of Abbreviations

Abbreviations	Description
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AHU	Air Handling Unit
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BMS	Building Management System
CAV	Constant Air Volume
CHW	Chilled Water
CIBSE	Chartered Institution of Building Services Engineers
CPM	Chiller Plant Manager
CT	Cooling Tower
CTI	Cooling Technology Institute
CW	Condenser Water
DOAS	Dedicated Outdoor Air System
DX	Direct Expansion
FCU	Fan Coil Unit
IT	Information Technology
MAU	Makeup Air Unit
PMV	Predicted Mean Vote
US	United State
VAV	Variable Air Volume
VRV	Variable Refrigerant Volume
VSD	Variable Speed Drives
WTC	World Trade Center