6th International Engineering Conference (IEC6)

"Energy-Efficient Buildings"

Architecture Department - Faculty of Engineering

Islamic University of Gaza, Palestine

Institute of Architectural Science - Vienna University of Technology, Austria

ABSTRACTS

October 25-26, 2016

IEC6 is jointly organized by the Engineering Faculty at Islamic University of Gaza (IUG) and Institute of Architectural Science at Vienna University of Technology (TU WIEN). It comes as part of the academic partnerships project, entitled "Promotion of Energy-Efficient Buildings Towards Developing Sustainable Built Environment in the Gaza Strip-Palestine" |PEEB|, which is implemented by the two institutions. The partnership project and this conference is funded by the Austrian Partnership programme in Higher Education and Research for Development (APPEAR) and Austrian Development Cooperation (ADC).

Sponsored by:

AUSTRIAN DEVELOPMENT COOPERATION | appear

CONTENTS

ABOUT THE CONFERENCE

IEC6 was held in Gaza, Palestine on October 25-26, 2016 at the main conference hall at IUG. It aimed to bring together all key players including architects, engineers, planners, professionals, decision makers and involved researchers and academics worldwide to exchange knowledge and experiences and to discuss the latest findings related to the topic of energy efficient buildings. It also aimed to highlight this design and construction approach of buildings, and to contribute to the international trends towards more sustainable and environmentally-friendly built environment. In addition, the conference was an opportunity to explore new potential international cooperative works, strengthen existing relations, and promote new initiatives and partnerships.

The conference attracted high level papers presenting researches related to design and construction approaches, energy performance, monitoring, modeling and analysis, renewable energy technologies and applications, and policies, standards and management procedures to increase energy efficiency of buildings in order to save energy. It covered both new buildings as well as existing ones, with special focus on good practices towards conserving energy.

CONFERENCE THEMES

Theme 1: Energy Efficient Building Design and Construction

1. Climate Responsive Buildings and Urban Design.
2. Solar Architecture.
3. Energy Efficient Construction Technologies.
4. Energy Efficient Building Systems and Technologies.
5. Smart Buildings.

Theme 2: Building Energy Performance Monitoring, Modeling, and Analysis

1. Energy Conservation Practices.
2. Optimization of Energy Demand and Use in Buildings.
3. Modeling and Analysis of Energy Efficient and Passive Buildings.
4. Energy-Efficient Appliances and Equipment.
5. Green Energy Rating Systems in Buildings.

Theme 3: Renewable Energy Applications in Buildings

1. Design and Performance of Building-Integrated Renewable Energy Technologies.
2. Optimization and Operation of Renewable Energy Systems.
3. Promotions and Commercialization.
4. ICT Applications in Renewable Energy Applications.

Theme 4: Building Energy Efficiency Policies, Standards, and Management

1. Performance Standards for New and Retrofitted Buildings.
2. Energy Saving Policies and Measures.
3. Enforcement Systems and International Agreements.
4. Building Energy Policies and Standards.
5. Sustainable Energy Education, Awareness, and Capacity Building.

CONFERENCE COMMITTEES

Conference Chairman

Prof. Dr. Farid Sobeh Al-Qeeq
Dean of Engineering Faculty at Islamic University of Gaza, Palestine

Chairman of Organizing Committee

Prof. Dr. Ahmed Salama Muhaisen
Dept. of Architecture, Islamic University of Gaza, Palestine

Chairman of Scientific Committee

Prof. Dr. Ardeshir Mahdavi
Dept. of Building Physics and Building Ecology, University of Technology, Vienna, Austria

CONFERENCE COMMITTEES

Organizing Committee

Chairman: Prof. Dr. Ahmed S. Muhaisen

Members

Prof. Ibrahim S. Abuhaiba	Islamic University of Gaza, Palestine
Dr. Mazen T. Abualtayef	Islamic University of Gaza, Palestine
Dr. Sadiq Abdelall	Islamic University of Gaza, Palestine
Dr. Talal F. Skaik	Islamic University of Gaza, Palestine
Mrs. Asma J. Naim	Islamic University of Gaza, Palestine

CONFERENCE COMMITTEES

Scientific Committee

Chairman: Prof. Dr. Ardeshir Mahdavi

Members

Prof. Abdel Karim H. Mohsen	Islamic University of Gaza, Palestine
Prof. Abdel-Majed Nassar	Islamic University of Gaza, Palestine
Prof. Adnan Enshassi	Islamic University of Gaza, Palestine
Prof. Dr. Mohammed M. Ziara	Islamic University of Gaza, Palestine
Prof. Mohammed A. Kahlot	Islamic University of Gaza, Palestine
Dr. Assad Abu-Jasser	Islamic University of Gaza, Palestine
Dr. Basil Hamed	Islamic University of Gaza, Palestine
Dr. Kristina Kiesel	Vienna University of Technology, Austria
Dr. Milena Vuckovic	Vienna University of Technology, Austria
Dr. Nihad M. Almughany	University of Palestine, Palestine
Dr. Omar S. Asfour	Islamic University of Gaza, Palestine
Dr. Sanaa Y. Saleh	Islamic University of Gaza, Palestine
Dr. Taleb B. Alrayyes	Islamic University of Gaza, Palestine

AUTHORS LIST

Name	Institution
Prof. A. M. Vural	Electrical Engineering Dept., Gaziantep University, Gaziantep, Turkey
Prof. Ahmed S. Muhaisen	Architecture Department, Islamic University of Gaza, Palestine
Prof. Ardeshir Mahdavi	Dept. of Building Physics and Building Ecology, TU Vienna, Vienna, Austria
Prof. Mohamed M. Abdelati	Electrical Engineering Dept., Islamic University of Gaza, Gaza, Palestine
Prof. Shafik M. Jendia	Civil Engineering Dept. Islamic University of Gaza, Gaza, Palestine
Prof. Wafaa S. Hegazy	Chemistry Department, Ain Shams University, Cairo, Egypt
Dr. Abdel Fattah A. Qaraman	Scientific Research Dept., Israa University, Gaza, Palestine
Dr. Ezzaldeen H. Edwan	Dept. of Engineering Professions, Palestine Technical College, Gaza, Palestine
Dr. Faten Z. Mahmoud	Chemistry Department, Ain Shams University, Cairo, Egypt
Dr. Hashem Badra	Dept. of Engineering Professions, Palestine Technical College, Gaza, Palestine
Dr. Kristina Kiesel	Dept. of Building Physics and Building Ecology, TU Vienna, Vienna, Austria
Dr. M. Tomazovic	Dept. of Building Physics and Building Ecology, TU Vienna, Vienna, Austria
Dr. Milena Vuckovic	Dept. of Building Physics and Building Ecology, TU Vienna, Vienna, Austria
Dr. Mohamed H. Elnaggar	Dept. of Engineering Professions, Palestine Technical College, Gaza, Palestine

Dr. Mohammed H. Alnahhal	Dept. of Engineering Professions, Palestine Technical College, Gaza, Palestine
Dr. Omar S. Asfour	Architecture Dept., Islamic University of Gaza, Gaza, Palestine
Dr. Rabeia M. Alhadi	Dept. of Architecture and Urban Planning, Benghazi University, Benghazi, Libya
Dr. Sanaa Y. Saleh	Architecture Dept., Islamic University of Gaza, Gaza, Palestine
Dr. Yunes Kh. Mogheir	Environmental Eng. Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Abdel Azez S. Elchareef	Architecture Department, Islamic University of Gaza, Gaza, Palestine
Eng. Ahmed Y. Sokkar	Electrical Engineering Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Alaa' Abu Hada	Industrial Engineering Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Ali K. Balaha	Ro'ya Association for Developing Abilities, Gaza, Palestine
Eng. Amal Qarrot	Civil Engineering Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Amany Y. Alshurafa	Architecture Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Amira Abu Rida	Industrial Engineering Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Ashwak Sh. Jendia	Architecture Department, Islamic University of Gaza, Gaza, Palestine
Eng. Doaa G. Ghuneem	Architecture Department, Islamic University of Gaza, Gaza, Palestine
Eng. Eman A. Radi	Industrial Engineering Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Hasan A. Abumeteir	Electrical Engineering Dept., Gaziantep University, Gaziantep, Turkey

Eng. Hashem Badra	Dept. of Engineering Professions, Palestine Technical College, Palestine
Eng. Nidal R. Abu Mustafa	Architecture Dept., Islamic University of Gaza, Gaza, Palestine
Eng. Zeyad A. El-Ghussain	Research and Studies Dept., Palestinian Energy Authority, Gaza, Palestine

Theme 1

Energy Efficient Building Design and Construction

Sub-Themes

1. Climate Responsive Buildings and Urban Design.
2. Solar Architecture.
3. Energy Efficient Construction Technologies.
4. Energy Efficient Building Systems and Technologies.
5. Smart Buildings.

Effect of Addition of ADHE and CABP Surfactants on the Physiochemical and Mechanical Properties of Cement Pastes

ASSOC. PROF. ABDEL FATTAH A. QARAMAN[1]
Scientific Research Dept.,
Israa University,
Gaza, Palestine
fatahdeep@gmail.com

PROF. SHAFIK M. JENDIA[2]
Civil Engineering Dept.,
Islamic University of Gaza,
Gaza, Palestine
sjendia@iugaza.edu.ps

PROF. WAFAA S. HEGAZY[3]
Chemistry Department,
Ain Shams University,
Cairo, Egypt
wafaahegazy67@gmail.com

ASSOC. PROF. FATEN Z. MAHMOUD[4]
Chemistry Department,
Ain Shams University,
Cairo, Egypt
faten_zm@yahoo.com

ABSTRACT

The lightweight aerated concrete, mortar and paste is recently acceptable for the use in civil construction purposes as a result of their peculiar features such as heat-insulating, sound absorption, low self-weight and self-compacting features, hence their high workability, this features depend on their content of air. However, their major demerits are its difficulty of high strength development when compared with normal ones. This paper studies the parameters leads to produce a sustainable aerated paste by choosing a suitable air-entraining agent that entrain wide range of air with minimum lose in strength. To reach this goal a comparative study is carried out between the effect of adding different percentages of each of the cationic surfactant alkyl dimethyl hydroxyl ethyl ammonium chloride (ADHE) and the amphoteric surfactant cocamido propyl betaine (CAPB) to some Portland cement pastes. The influence of the different surfactant concentrations and the mixing times on the air content of the pastes and accordingly the bulk density, compressive strength and

[1] PhD of Inorganic and Analytical Chemistry from Ain Shams Uni., Egypt
[2] PhD of Highway Engineering from Karlsruhe University, Germany
[3] PhD of Physical Chemistry from University of Würzburg, Germany
[4] PhD of Physical Chemistry from Pennsylvania State University, USA

microstructure of the hardened cement specimens is discussed. The results demonstrate the preference of using CAPB over ADHE because its ability to give a wide range of air dosage and its ability to improve the compressive strength.

INDEX TERMS

Air-entraining agent, density, compressive strength, XRD, ADHE, CABP, surfactant

The Living Façade: Mashrabbia a Kinetic Envelope Improves Building Energy Performance

ENG. RABEIA M. ALHADI [1]
Dept. of Architecture and Urban Planning,
Benghazi University,
Benghazi, Libya
r.alhadi@yahoo.com

ABSTRACT

How to make buildings acclimate to the climate has been the challenge of architecture for Thermal comfort. Reducing the outdoor high temperature differences is still the significance of building energy efficiency. In particular, there are many locations with great daily or seasonal variation in climatic temperature. Currently, the common strategies for addressing this wide temperature range of climate are the HVAC (Heating, Ventilating and Air-conditioning) systems. Much energy is needed in these locations for indoor thermal comfort.

There are many studies focusing on the high-tech or high-efficient HVAC system to save energy. However, we believe the fundamental point is orientation, materials and other design strategies rather than external treatment like the HAVC system.

This paper proposes a possible solution for coping with hot- climate architecture utilizing advanced building technologies with vernacular architectural elements. The resulting system will intelligently provide thermal comfort, natural energy and reduce energy usage of HVAC.

This system is a bio-inspired dynamic envelope responding to solar radiation and local climate conditions. In order to explore the envelope system, this paper reviews important literatures related to biomimetic design in architecture and kinetic/interactive building envelope applications. A new Parametric Design method in Building Information Modeling (BIMPD) and computational simulation is used in this paper.

[1] Master Degree in Architecture-Electronic Design from Savannah College of Art and Design (SCAD), USA

In short, buildings have be inspired place - both culturally and environmentally. The Living Facade is an attempt to preserve the Islamic character and culture with a strong climatic response and energy efficient design.

INDEX TERMS

Thermal comfort, vernacular architectural, Islamic culture, local climate, digital revolution, kinetic facade, self-reliant building.

Energy and Climate Tower: The Integration of Absorption Refrigeration by Using Ammonia to Build Energy and Climate Tower

ENG. ALI K. BALAHA[1]
Ro'ya Association for Developing Abilities,
Gaza, Palestine
ali.balaha@hotmail.com

ABSTRACT

The idea of my research project in the future, it basis through knowledge and collect information of solar-powered refrigeration technology and Hydrology. The project contributes to the reduction of global warming by pulling moisture from the air and generate electricity. Convection current is the circular current of air caused by difference in air density resulting from the temperature difference between different places. Surface temps higher at equator than at poles. Air can gain heat from warm surroundings & move around. Global air circulation determined by uneven solar heating and Earth's rotation.

INDEX TERMS

Absorption cooling, ammonia, dehumidification, energy.

[1] Bachelor in Mechatronics Engineering from Islamic University of Gaza, Palestine

Theme 2

Building Energy Performance Monitoring, Modeling, and Analysis

Sub-Themes

1. Energy Conservation Practices.
2. Optimization of Energy Demand and Use in Buildings.
3. Modeling and Analysis of Energy Efficient and Passive Buildings.
4. Energy Efficient Appliances and Equipment.
5. Green Energy Rating Systems in Buildings.

The Influence of Canyon Asymmetry on Heating and Cooling Energy Demand of Buildings in the Mediterranean Climate of the Gaza Strip

PROF. AHMED S. MUHAISEN [1]
Architecture Dept.,
Islamic University of Gaza,
Gaza, Palestine
amuhaisen@iugaza.edu.ps

ENG. NIDAL R. ABU MUSTAFA [2]
Architecture Dept.,
Islamic University of Gaza,
Gaza, Palestine
arch.nidal@hotmail.com

ABSTRACT

This paper shows the effect of canyon asymmetry on the energy consumption of buildings in the Mediterranean climate of the Gaza strip. The study was conducted using three-dimensional computer models, namely, ECOTECT and IDA ICE. The ratio of the opposite buildings heights ranging from 0.2 to 3.2 were examined in the study at two different orientations, which are (E-W) and (N-S).

The results showed that the asymmetrical profiles seemed to have a significant influence on the thermal response of buildings. The ratio which ranges between 1.2 to 2.0 is more preferable for both cooling and heating requirements. The received solar radiation is reduced by 14.02% and 55.02% in summer with increasing the buildings heights ratio at (N-S) and (E-W) streets respectively from 1.0 to 3.2. Asymmetrical canyon with the highest ratio provides the maximum energy savings throughout the year especially in the upper floors. About 29.53% of energy consumption can be reduced by choosing the opposite building height equal to the examined building height +5floor.

Therefore, the study recommends to utilize the advantages of the different heights of buildings in achieving shading on the roof and building's façades for the purpose of energy saving.

INDEX TERMS

Asymmetry, orientation, thermal performance, energy, Gaza strip.

[1] PhD in Energy Efficiency of Buildings from Nottingham University, UK.
[2] M.Sc. in Architectural Engineering from the Islamic Uni. Of Gaza, Palestine

Cooling Performance of White Roofs in Residential Buildings

ENG. M. TOMAZOVIC[1]
Dept. of Building Physics and Building Ecology,
TU Vienna,
Vienna, Austria

DR. KRISTINA KIESEL[2]
Dept. of Building Physics and Building Ecology,
TU Vienna,
Vienna, Austria
kristina.kiesel@tuwien.ac.at

DR. MILENA VUCKOVIC[3]
Dept. of Building Physics and Building Ecology,
TU Vienna,
Vienna, Austria
milena.vuckovic@tuwien.ac.at

PROF. ARDESHIR MAHDAVI[4]
Dept. of Building Physics and Building Ecology,
TU Vienna,
Vienna, Austria
ardeshir.mahdavi@tuwien.ac.at

ABSTRACT

A multitude of research efforts explore the possibilities for reducing buildings' energy demand. In general, the cooling load of buildings is affected in part by the solar absorptance of roof surfaces. Therefore, new energy-efficient products with higher reflectance for the building envelope can be favorable in view of energy saving potential. In this context, this paper explores the potential for reducing building's cooling energy demand via application of high solar reflectivity layers applied to the roof surface. For this purpose, three different prefabricated residential buildings in Novi Sad, Serbia, were selected and made subject to systematic thermal performance simulations. The computed performance indicators were then used to investigate cooling demand and overheating tendencies during summer months. The results show a significant reduction in computed cooling loads (from 4% to 37%, depending on the envisioned scenario), thus pointing to the thermal benefits of the cool roof system.

INDEX TERMS

Cool roofs, building performance, modeling.

[1] Master of Architecture from University of Novi Sad, Serbia, and Master from TU Vienna, Austria.
[2] PhD from TU Wien, Austria.
3 PhD from TU Wien, Austria
4 PhD from TU Wien, Austria

A Study of Daylighting Performance in Apartment Buildings with Reference to the Gaza Strip

ASSOC. PROF. OMAR S. ASFOUR [1]
Architecture Dept.,
Islamic University of Gaza,
Gaza, Palestine
oasfour@iugaza.edu.ps

ENG. AMANY Y. ALSHURAFA [2]
Architecture Dept.,
Islamic University of Gaza,
Gaza, Palestine
amanyarch@hotmail.com

ABSTRACT

Daylighting in residential buildings is an essential design parameter considering its impact on the visual comfort of users and energy efficiency of buildings. This is more challenging in apartment buildings, where collective residential configurations and deep plans are usually used. This is true in the case of the Gaza Strip, which makes daylighting quality in residential buildings a questionable issue. Thus, this study aims to examine daylighting performance in the Gaza Strip apartment buildings, and to propose some design recommendations to improve this performance. To achieve that, a simulation study has been carried out using Radiance program, where several cases have been examined. The study concluded that there is a direct relationship between the illuminance levels and space orientation, wall-to-window ratio, and reflectance of indoor surface materials. Also, light shelf has a crucial role in improving daylighting distribution in the space. The study therefore recommends applying these design strategies to improve daylighting performance and energy efficiency in the Gaza Strip apartment buildings. In this regard, a quantitative assessment may become part of the requirements of buildings licensing process.

INDEX TERMS

Absorption cooling, ammonia, dehumidification, energy.

[1] PhD degree in Architecture from the University of Nottingham, UK
[2] Master Degree in Architecture from the Islamic University of Gaza, Palestine.

Thermal Insulation in Buildings Using Two Wall Cavities

DR. MOHAMMED H. ALNAHHAL[1]
Dept. of Engineering Professions,
Palestine Technical College,
Gaza, Palestine
mhalnahhal@yahoo.com

DR. MOHAMED H. ELNAGGAR[2]
Dept. of Engineering Professions,
Palestine Technical College,
Gaza, Palestine
mohdhn@yahoo.com

DR. EZZALDEEN H. EDWAN[3]
Dept. of Engineering Professions,
Palestine Technical College,
Gaza, Palestine
eedwan@hotmail.com

ABSTRACT

The present work examines a system that uses two separated wall cavities filled with air which can be used as a thermal insulator in buildings. It is well known that stationary air has lower thermal conductivity 0.026 W/m.K. This has made it of practical interest in many applications such as in thermal insulation materials (e.g. porous materials) and as thermal insulator (e.g. enclosures, wall cavities). Specifically this work investigates the use of two separated wall cavities that trap air inside each one and placed in a building wall where the heat transfer is expected. And to achieve that, the rate of heat transfer through this wall is first calculated with the assumption of pure conduction (i.e. trapped air in the two wall cavities is assumed to be stationary). Then convection heat transfer rates through the two wall cavities are estimated based on the Nusselt numbers and hence the dominating heat transfer mechanism (conduction and/or convection) is explored. Taking into account all the above, introducing two cavities filled with air to building wall can work effectively as thermal insulator as indicated by lower Nusselt numbers and hence lower convection heat transfer rates through the two wall cavities. Advantage of using two wall cavities over one wall cavity of larger thickness is evidenced by the higher convection heat transfer rates which are associated with one wall cavity of larger thicknesses – that's

[1] PhD in Mechanical Engineering from University of Patras, Greece.
[2] PhD in Mechanical engineering from the Universiti Sains Malaysia, Malaysia.
[3] PhD in Electrical engineering from the University of Siegen, Germany.

the wall with two cavities can effectively resist the heat flow than the wall with one cavity of larger thickness.

INDEX TERMS

Thermal insulation, energy and buildings, wall cavities, Nusselt number

An Investigation into Thermal Performance and Thermal Comfort of Houses in Refugee Camps in Palestine Using Computer Simulation

DR. SANAA Y. SALEH[1]
Architecture Department,
Islamic University of Gaza,
Gaza, Palestine
sysaleh@iugaza.edu.ps

ABSTRACT

Exploring buildings' thermal behavior is necessary to predict occupants' comfort, to identify energy consumption, and to examine alternate enhancements for achieving better indoor thermal environments and energy efficient buildings. This paper intended to examine thermal comfort and thermal performance of houses reconstructed by the United Nations Relief and Works Agency (UNRWA) in refugee camps in Palestine. Computer thermal simulation was employed as a main method. Two groups of houses- old and new- were simulated and assessed. It was revealed that the old houses are colder in winter and hotter in summer and the swing in resultant temperature (RT) in the old house is greater than that in the new houses. In old houses, RT fluctuates from (8- 19 oC) in winter and from (22-36 oC) in summer. Internal gain is the highest percentage of heat gain in the majority of the new houses, while fabrics loss represents the highest percentage of heat loss. The highest percentage of heat loss in the majority of the old houses is the Infiltration/Ventilation loss. In terms of fabrics breakdown, in the majority of new houses, walls loss is the highest fabrics loss in winter while roof gain is the highest fabrics gain in summer. In old houses, heat loss and heat gain through roofs are the highest in winter and summer respectively. It can be indicated that the UNRWA obviously improved the houses' thermal performance but the indoor thermal conditions in the new houses still need more modification.

INDEX TERMS

Computer simulation, thermal comfort, energy performance, refugee camps

[1] PhD of Architecture, University of Nottingham, UK

Studying the Effect of Orientation and Building Massing on Energy Performance, Case Study: Teba Building, IUG

ENG. ASHWAK SH. JENDIA[1]
Architecture Department,
Islamic University of Gaza,
Gaza, Palestine
a.jendia@hotmail.com

ABSTRACT

Achieving the optimum thermal performance of buildings is widely proposed. It determines how thermally comfortable the building is for its users, and how energy-efficient it is. It's undeniable that improving the energy efficiency of buildings is needed worldwide to be considered as part of the solution to the problems of energy use in buildings, especially in The Gaza Strip which suffers from energy deficit for many years. Accordingly, this paper aims to find out the potential of reducing building energy consumption through the better orientation of buildings and their massing. and it indicates to what extent they affect the building thermal performance. Ecotect Computer program was used to carry out the simulation and validate the result. For the orientation study, 18 angles were taken by rotating the building by 10 degrees for each case. For the massing study, changing the building rectangular shape dimensions graduating from the rectangle shape to the square, creating 3 forms other than the reference, with the same volume and area. The outcome result reveals clearly that the optimum orientation and better building massing affect the building thermal performance so positively, that reduce the energy consumption by the building. The optimum orientation was at the east-west orientation, and the best massing for this climate and orientation is the square. Therefore, the study recommends applying passive solar design strategies, especially with regard to the orientation and geometric shape. Thermal simulation programs have to be used in order to evaluate the thermal performance of buildings.

INDEX TERMS

Orientation, building massing, thermal performance, energy efficiency, Gaza strip.

[1] Bachelor in Architecture from Islamic University of Gaza, Palestine

Effect of Building Shape on the Energy Consumption in the Gaza Strip

ENG. DOAA G. GHUNEEM [1]
Architecture Department,
Islamic University of Gaza,
Gaza, Palestine
dgneem@students.iugaza.edu.ps

ABSTRACT

Proceeding from the big crisis experienced by the current world of a great lack of non-renewable energy sources, where statistics indicate that those sources stocks began to dry up, leading to price increases in the world. All that led to the transformation of the world looked towards the development of alternative ideas and solutions to this problem, including the use of energy-efficient buildings. The tendency of producing more energy-efficient buildings has, additionally, special importance in the Gaza strip, considering the crisis experienced by the residents of the Gaza Strip from the constant power cuts over recent years.

Therefore, the research focuses on finding out the optimum shape of buildings located in the climate of the Gaza Strip. The research examines the effect of the building shape on reducing energy consumption. Computer programs were used to simulate the building behavior for all seasons. Ecotect and IES VE programs were used to carry out the simulation and validate the results.

The outcomes of the research concluded that the shape of a building affects considerably its thermal performance and energy consumption. The building shape should be, therefore, configured properly to ensure an optimum thermal performance in the first stage of a building design.

INDEX TERMS

Building shape, thermal performance, energy consumption, Gaza strip.

[1] Bachelor in Architecture from Islamic University of Gaza, Palestine

Thermal Comfort Assessment: Study Towards Workers Satisfaction in Office Buildings, Khanyounis Municipality Building as a Case Study

ENG. ABDEL AZEZ S. ELCHAREEF[1]
Architecture Department,
Islamic University of Gaza,
Gaza, Palestine
achareef2015@gmail.com

ABSTRACT

Thermal comfort within a building is the result of interaction between the occupants and the building and its surrounding areas that directly influence the human satisfaction levels in a particular building. And the thermal comfort has been one of the major decision makers to decide the utility of ventilation systems in a building, so that all efforts of decision making are aimed to achieve a suitable thermal comfort.

In this paper, the author reviewed two common thermal comfort models, compared the effectiveness of the models, and proposed an enhanced model framework based on integrated evaluation approach for both thermal comfort and ventilation effectiveness to be applied on office buildings. Khanyounis municipality building was taken as a case study to examine the thermal comfort of staff and the effectiveness of building design based on the suggested model.

The results showed that the thermal conditions in the building were within the acceptable range of ISO7730 and ASHRAE-55. To ensure an optimum comfortable workplace, temperature between 20-26°C and relative humidity between 40-60% must be maintained.

INDEX TERMS

Thermal comfort, office building, ventilation, Gaza strip.

[1] Master in Architecture from Islamic University of Gaza, Palestine

Theme 3

Renewable Energy Applications in Buildings

Sub-Themes

1. Design and Performance of Building-Integrated Renewable Energy Technologies.
2. Optimization and Operation of Renewable Energy Systems.
3. Promotions and Commercialization.
4. ICT Applications in Renewable Energy Applications.

Power Management Device for a Micro Grid Containing a PV System and a Generator

ENG. AHMED Y. SOKKAR[1]
Electrical Engineering Dept.,
Islamic University of Gaza,
Gaza, Palestine
ahm_sokar@hotmail.com

PROF. MOHAMED M. ABDELATI[2]
Electrical Engineering Dept.,
Islamic University of Gaza,
Gaza, Palestine
prof.abdelati@gmail.com

ABSTRACT

Over the last seven years, Gaza Strip is suffering from inveterate crisis in the electricity sector and since that time experts working in this area to find solutions that contribute to alleviate the problem and commensurate with the available resources. Therefore, Photovoltaic PV systems used to overcome this crisis. However, one of the biggest problem using PV sources is its interconnection with the grid. Without any proper control strategy to interconnect the individual systems together, the output powe[3]r of the distribution system cannot be regulated to meet the power demand. This paper proposes a power management device in order to synchronize two power resources namely; PV and generator smart micro-grid in order to meet the load demand while maintaining power quality. Modeling a standalone system is a challenge, and connecting different renewable sources together with the utility grid is the main focus of this research. The proposed power management device constructed at the Islamic University of Gaza IUG to serve the Electrical Engineering Laboratories includes two sources of power; a 5KVA diesel generator and 3KVA PV system along with the mains power supply. The proposed control and management system will be able to synchronizes these sources to the distribution bus according to the instantaneous load taking on consideration supply priorities and load priorities. an electronics board assembled for the purpose of load distribution and switching the source of power from the utility source.

INDEX TERMS

Photovoltaic, power distribution system, smart micro-grid system.

[1] Master in Electrical engineering from Islamic University of Gaza, Palestine.
[2] PhD in ATM networks from Bilkent University, Turkey.

Stepping into Renewable Energy Advantages & Disadvantages – Development & Future

DR. HASHEM BADRA [1]
Dept. of Engineering Professions,
Palestine Technical College,
Gaza, Palestine
hashembadra@hotmail.com

DR. MOHAMED H. ELNAGGAR [2]
Dept. of Engineering Professions,
Palestine Technical College,
Gaza, Palestine
mohdhn@yahoo.com

DR. EZZALDEEN H. EDWAN [3]
Dept. of Engineering Professions,
Palestine Technical College,
Gaza, Palestine
eedwan@hotmail.com

ABSTRACT

The distribution of renewable energy becomes increasingly important in the future, particularly in the areas where the electricity generation is more difficult or impossible. Also, the question of renewable energies is rising for environmental reasons, because the renewable energy use no emissions of pollutants such as carbon dioxide, nitrogen oxide and sulfur dioxide as in the case of conventional electricity generation in power plants.

This article examines the different renewable energy types and their definitions. Stepping into renewable energy is explained and illustrated. Here, the advantages and disadvantages of types of energy are considered and compared in order to determine the use of profitability. In addition, the distribution of individual types of energy taken in general considered.

INDEX TERMS

Renewable energy, solar energy, wind energy, geothermal energy, bioenergy.

[1] PhD in Mechanical engineering from the Technical Uni. of Chemnitz, Germany.
[2] PhD in Mechanical engineering from the Universiti Sains Malaysia, Malaysia.
[3] PhD in Electrical engineering from the University of Siegen, Germany.

Design of a Robust Hybrid DC Coupled Solar Photovoltaic System Utilizing State of the Art Building Applied Photovoltaic Technology A Practical Case Study for the Islamic University of Gaza Laboratory Building

ENG. ZEYAD A. EL-GHUSSAIN [1]
Research and Studies Dept.,
Palestinian Energy Authority,
Gaza, Palestine
zghosain@hotmail.com

ABSTRACT

This paper compares different solar photovoltaic (SPV) systems implemented worldwide including solar fuel saver (SFS) systems and focuses on the advantages and disadvantages of each system discussing the suitability and conformity of each system to the local electrical situation in the Gaza Strip. The case study presented in this paper deals with the laboratory building at IUG which was recently retrofitted by Building Applied Photovoltaic (BAPV) project featuring 141.75kWp hybrid DC coupled solar power system with battery backup. System sizing results is presented. The BAPV system optimizes solar power harvesting by managing energy share between the DC and the AC sources when present simultaneously. It integrates both sources in a hybrid mode via limiting the energy share from the AC source and giving priority to the DC power during daylight operation. The system is expected to commence operation by year 2016. The aggre-gate SPV system is expected to generate a total of approximately210MWh per annumthus reducing 130 tons of CO2 emissions yearly. The annual savings are expected to be around 56kUSD which means that the investment capital cost shall be retrieved after eleven years of commercial operation.

INDEX TERMS

SPV, BAPV, PV-diesel, hybrid DC coupling, solar fuel saver SFS, CO2 emissions

[1] High diploma in electric power system engineering, Norwegian University of Science and technology, Norway.

The Determining Factors of Selecting Energy Storage Systems for the Renewable Energy Sources in the Energy-Efficient Building

ENG. HASAN ABUMETEIR [1]
Electrical Engineering Dept.,
Gaziantep University,
Gaziantep, Turkey
hmeteir@gmail.com

PROF. A. M. VURAL [2]
Electrical Engineering Dept.,
Gaziantep University,
Gaziantep, Turkey
mete.vural@gaziantep.edu.tr

ABSTRACT

Electrical energy storage (ESS) is a key to balancing the supply and demand of energy, optimizing our use of intermittent e^{3}nergy source such as wind or solar, also enabling the electrification of transport. Energy storage systems (ESSs) consider one promising technology that can support the incorporation of smart grids because of their capacity to improve the system reliability and to facilitate the integration of high penetration levels of renewable energy sources (RESs). ESSs can also provide additional benefits for distribution utilities, such as an efficient expansion alternative through peak load shaving and methods of mitigating power quality issues.

This work, will focus on the determining factors of selecting Energy Storage Systems for the Renewable Energy Sources in the Energy Efficient Building (EEB).

INDEX TERMS

Energy Storage System (ESS), Renewable Energy Sources (RES), Energy Efficient Building (EEB)

[1] M.Sc. degree in Control Systems from the Islamic University of Gaza, Palestine
[2] PhD degree in Electrical and Electronics Engineering from Çukurova Uni., Turkey.

A Hybrid Solar and Wind Power System, Design, Optimization and Economical Evaluation

ENG. EMAN A. RADI [1]
Industrial Engineering Dept.,
Islamic University of Gaza,
Gaza, Palestine
eman.93.0@hotmail.com

ENG. ALAA' ABU HADA [2]
Industrial Engineering Dept.,
Islamic University of Gaza,
Gaza, Palestine

ENG. AMIRA ABU RIDA [3]
Industrial Engineering Dept.,
Islamic University of Gaza,
Gaza, Palestine

ABSTRACT

This paper is to develop an effective model of a hybrid solar and wind Energy system which is using battery as its storage system. Microsoft Excel software is used to analyze data measurements for both wind and solar radiation measurements in Gaza. Results of analysis illustrate that Gaza has a high potential to use the solar radiation to generate electricity because of the high radiations in summer especially in July, On the other hand the wind speed in Gaza is very low to use it alone to generate electricity. An economical evaluation has been made for ensuring the feasibility of the model , It was concluded that the hybrid system scenario couldn't presently be justified on COE basis, compared to the alternative of simply purchasing electricity from the grid where the COE is 0.50 NIS/kWh. Considering not electrified far from grid remote areas, changes in electricity prices, subsidy levels, costs for renewable energy equipment, or taking into account environmental considerations might alter the position in the future. The potential of applying available such a hybrid system in Gaza Strip is discussed.

INDEX TERMS

Solar power, wind power, hybrid energy system, feasibility study, wind turbine, photovoltaic.

[1] Bachelor in Industrial Engineering from Islamic University of Gaza, Palestine.
[2] Bachelor in Industrial Engineering from Islamic University of Gaza, Palestine.
[3] Bachelor in Industrial Engineering from Islamic University of Gaza, Palestine..

Treatment of Desalination Brine Using an Experimental Solar Pond

ASSOC. PROF. YUNES MOGHEIR[1]
Environmental Eng. Dept.,
Islamic University of Gaza,
Gaza, Palestine
ymogheir@iugaza.edu.ps

ENG. AMAL QARROT[2]
Civil Eng. Dept.,
Islamic University of Gaza,
Gaza, Palestine

ABSTRACT

Brine from seawater desalination plants is deposed to the sea causing a negative impact on the marine life. Solar evaporation ponds are especially suitable to dispose of reject brine from inland desalination plants in arid and semi-arid areas due to the abundance of solar energy. Nearly all forms of salt production require evaporation of water to concentrate brine and ultimately produce salt crystals.

In this article research, an experimental shallow solar pond (SSP) having a surface area of 1*1 m2 and depth of 20 cm was built. Solar pond using two reflector mirrors extending for five days from 12 to 16 July 2015 was tested. Mirrors, which are movable for five different angles that makes with horizontal, were used as reflectors in order to increase the thermal energy for the surface of the solar pond during the day. The main factors affecting the evaporation rate which are relative humidity, wind speed, ambient air temperature and solar radiation were studied.

The results showed that the little of decreasing evaporation rate was observed by increasing relative humidity and maximum evaporation rate was observed at relative humidity of 67.6%, while slight increasing of evaporation rate was observed by increasing ambient air temperature, evaporation rate appears to decrease slightly as wind speed increases and gradual increasing of evaporation rate with increasing solar radiation. Comparisons between experimental and theoretical results have been performed which good agreement has been achieved.

[1] PhD in Water Resources and Environment from University of Coimbra, Portugal.
[2] Master degree in Civil Engineering from Islamic University of Gaza, Palestine.

Results showed that evaporation rate increases with decreasing the mirror's angle that makes with horizontal β. It was concluded that using two mirrors are very effective more than using one mirror when they are used as reflectors and that the best performance of the evaporation can be achieved when the mirrors are employed as reflectors.

In conclusion, this system proved to be promising using two mirrors which reduced the solar pond area and hence reduced area needed for brine evaporation in Gaza strip desalination plants. The research can be further developed to achieve better results using large scale solar pond.

INDEX TERMS

Brine, solar system, shallow solar ponds.

Theme 4

Building Energy Efficiency Policies, Standards, and Management

Sub-Themes

1. Performance Standards for New and Retrofitted Buildings.
2. Energy Saving Policies and Measures.
3. Enforcement Systems and International Agreements.
4. Building Energy Policies and Standards.
5. Sustainable Energy Education, Awareness, and Capacity Building.

Sustainability Assessment of Buildings in the Gaza Strip: a Preliminary Framework

ASSOC. PROF. OMAR S. ASFOUR [1]
Architecture Dept.,
Islamic University of Gaza,
Gaza, Palestine
oasfour@iugaza.edu.ps

ABSTRACT

Considering the current global emphasize on implementing sustainable development strategies, the role of construction sector in this regard is significant. This has resulted in proposing several comprehensive systems that aim at the assessment of sustainability implementation in buildings. These systems are based on a comprehensive investigation of sustainability aspects depending on a set of well-defined indicators of building performance. In the Gaza Strip, Palestine, no such systems are implemented. Considering the great challenges that face implementing sustainability principles in Gaza, these assessment systems are essentially useful to mitigate these challenges. Therefore, the scope of building sustainability assessment methods and their applicability in the Gaza Strip is discussed in this study. Considering the reality of construction sector in the Gaza Strip, this study suggests a preliminary framework of buildings sustainability assessment. This framework is practical and focuses on the fields of land, energy, water, building materials, and health and well-being. Implementing this framework is expected to improve the local building environmental performance and increase people's awareness regarding sustainability application in our built environment.

INDEX TERMS

Buildings, sustainability, assessment, the Gaza Strip.

[1] PhD degree in Architecture from the University of Nottingham, UK

The Experience of Developing a Module on Energy-Efficient Buildings for Architecture Students

PROF. AHMED S. MUHAISEN [1]
Architecture Dept.,
Islamic University of Gaza,
Gaza, Palestine,
amuhaisen@iugaza.edu.ps

ABSTRACT

This paper presents a practical experience of developing a module on energy-efficient buildings for architecture students. The module was developed by a team of staff from the Islamic University of Gaza (IUG) and Vienna University of Technology (TU Wien) as part of an academic partnership project funded by APPEAR program and Austrian Development Cooperation (ADC). The study highlights the various steps followed by the teams to develop the module and then integrate it into the curriculum of the architecture department at IUG. The development of the module contents, including the theoretical and practical parts, was also presented. In addition, the paper focuses on the evaluation processes carried out by different bodies at IUG to find out to what extent the module development and implementation were successful. The results clearly indicate that the developed module contributed considerably to promote energy-efficient approach of building design and construction. And significantly succeeded to increase the students' knowledge and improved their skills in creating such type of buildings.

INDEX TERMS

Energy efficiency, building design, architecture education, curriculum development.

[1] PhD in Energy Efficiency in Buildings from Nottingham University, UK.

محاور المؤتمر

تصميم وانشاء المباني الموفرة للطاقة

- التصميم البيئي للمباني والمناطق الحضرية.
- العمارة الشمسية.
- تقنيات الإنشاء الموفرة للطاقة.
- تقنيات وأنظمة المباني الموفرة للطاقة.
- المباني الذكية.

تحليل ومراقبة الأداء الحراري للمباني

- ممارسات وتجارب ترشيد استهلاك الطاقة.
- ترشيد الطلب واستهلاك الطاقة في المباني.
- نمذجة وتحليل المباني الموفرة للطاقة.
- الأجهزة والمعدات الموفرة للطاقة.
- أنظمة تقييم الطاقة الخضراء في المباني.

تطبيقات الطاقة المتجددة في المباني

- تصميم وأداء المباني التي تستخدم تقنيات الطاقة المتجددة.
- تصميم وتشغيل أنظمة الطاقة المتجددة.
- الترويج والتسويق لأنظمة الطاقة المتجددة في المباني.
- تطبيقات تكنولوجيا المعلومات والاتصالات في مجالات الطاقة المتجددة.

سياسات ومقاييس المباني الموفرة للطاقة وكيفية إدارتها

- معايير الأداء للمباني الجديدة والمجددة.
- سياسات وإجراءات توفير الطاقة.
- نظم الإنفاذ والاتفاقيات الدولية.
- سياسات ومعايير استخدام الطاقة في المباني.
- التعليم والتوعية وبناء القدرات في مجال الطاقة المستدامة.

حول المؤتمر

نظمت كلية الهندسة بالجامعة الإسلامية بغزة المؤتمر الدولي الهندسي السادس للمباني الموفرة للطاقة بالشراكة مع جامعة فيينا التقنية بالنمسا، وبتمويل من وكالة التعاون التنموي النمساوية (ADC) ضمن برنامج أبير (APPEAR) للشراكة الأكاديمية. تناول المؤتمر بالدراسة والتحليل المباني الموفرة للطاقة كتوجه جديد في تصميم وإنشاء المباني في ظل ما يعانيه العالم من مشاكل نتيجة للاستهلاك المفرط للطاقة في المباني وما ينتج عن ذلك من انبعاث للغازات السامة، والتي تزيد من مشكلة الاحتباس الحراري، وتهدد التنمية المستدامة في كثير من دول العالم. وتوافق ذلك أيضاً مع ما تعانيه فلسطين بشكل عام، وقطاع غزة خصوصاً، من أزمة في الطاقة وشح شديد في كميات الكهرباء المتوفرة للسكان، وهو ما يسبب الكثير من المشاكل في المجالات الاقتصادية والاجتماعية والصحية وغيرها.

وقد هدف المؤتمر إلى جمع الباحثين والمختصين من مهندسين ومعماريين وأصحاب قرار لمناقشة القضايا المتعلقة بالمباني الموفرة للطاقة، وتبادل الخبرات والتجارب، بالإضافة إلى تكوين شراكات علمية وتطوير مشاريع مشتركة لزيادة كفاءة المباني وتقليل استهلاكها للطاقة. كما وناقش المؤتمر العديد من المحاور والتي من أهمها: تصميم وانشاء المباني الموفرة للطاقة، وتحليل ومراقبة الاداء الحراري للمباني، وتطبيقات الطاقة المتجددة في المباني، وسياسات ومقاييس المباني الموفرة للطاقة وكيفية ادارتها، بالإضافة إلى مواضيع أخرى ذات صلة.

بتمويل من:

AUSTRIAN DEVELOPMENT COOPERATION | appear

المؤتمر الدولي الهندسي السادس (IEC6)

"المباني الموفرة للطاقة"

قسم الهندسة المعمارية - كلية الهندسة

الجامعة الإسلامية بغزة، فلسطين

كلية العلوم المعمارية – جامعة فيينا التقنية، النمسا

الملخصات

25-26 أكتوبر، 2016