Under floor Heating by Solar Energy and Fire Place Graduation Project

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Done by : Ahmad Hanani Ahmad Salman Alaa Nuirat Husam Nadeem Jasser Bana

Supervisor :

Dr. Salameh Abd Al Fattah

Presentation Outline:



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Abstract

From a point of view , our system is more efficient , environment friendly and its running cost is low through using renewable energies (solar system and heat losses).

We have shifted our system from nonrenewable energy resources which is:

Costly
 Cause Global Worming

Introduction

Our Problem ! Heating the house by easy and cheap ways

Our System ! Under floor heating system



Our Source of Energy !

Solar energy and waste heat from the fire place system



Our Design Problem !

How to connect three systems to each other to achieve our goal.

Our Target !

Nablus City ,West Bank



Our Marketing Demand !

People who has normal budgets.





Methodology

- In our project, we have done a 500 m² plan considering all specific calculations from A to Z.
 So, the project will be applicable to be done in the real life.
- We have made a model that gives a clear simple picture of the plan construction.

Solar System



Main source of energy.

The system must cover the total heat load of the building 59 kW. The design calculations depend on the number of flat plate collector basically.



Control System





Temperature Differential Thermostat Device

Bypass Valve

Maintenance

 Equipment maintenance and repairing is the same as for other water or electrical based HVAC systems except when pipes, cables or mats are embedded in the floor.

→ For reliability, installation procedures must be precise (specially at joints) and manufacturer's specifications must be carefully followed.

Model Design

Model's solar system structure design:

	The Project	The Model	
Solar Demand	59 kW	0.112810 kW	
Number of Solar Mirrors	10	1	
Area of Each Solar Mirrors	$1.5 * 2 = 3 m^2$	$0.2 * 0.5 = 0.1 \text{ m}^2$	
The capacity of the expansion tank	200 L	0.379 L	
The Circulation Pump	4.0955 KPa 0.666 KPa		

Model's chimney system structure design:

	The Project	The Model	
Chimney Demand	30.86 kW	0.0590057 kW	
Fuel Amount	8.5 Kg	0.21422 Kg	
The length of the chimney	15.75 m	0.0301147 m	
The diameter of the chimney	10 cm	0.1912 cm	

Model's coil (Heat Exchanger) system structure design:

	The project	The model
Number of Coil Turns	111 turns	11 turns
The length of the coil	27.89 m	2.789 m



-Model pumps selection and specifications:

→ No Sound Pump



→ The two pumps have no large vibration reaction on the model.

Model's control units



Temperature Pressure Gage

Model's installation steps :



























Results and Discussion for The Plan

Total heat loss for the plan: 59 kW The volume of storage tank is: 2500 liter The length of the loops is: 1684.893 m The floor Temperature was taken to be 31 C^o The solar system should approach the total heat demand but the

chimney system should approach 46% of the total demand.

We have used 4 pumps in the system.

The best amount of peat equal to 8.5 Kg Each 1 Kg gives 14280Kcal The total price of the project is:

28279.18 Dollars



Results and Discussion for the Model

Chimney System :

Time	Delta Temperature	Pressure	
First Five Minutes	7 ° C		
First Twenty Minutes	32 ° C		
Fist One Hour	46 ° C	Constant at 1 har	
Fist Two Hours	61 ° C		
First Three Hours	72 ° C		
After Five and Half Hours	50 ° C		

- The reference temperature is 19 ° C .

-The maximum temperature that the chimney system produced is $90 \,^{\circ}\text{C}_{\odot}$

Solar System :

Time	Delta Temperature	Pressure
First five minutes	0 ° C	
First twenty minutes	2 ° C	
Fist one hour	10 ° C	Constant at 1 bar
Fist two hours	10 ° C	
First three hours	15 ° C	
After five and half hours	26 ° C	

- The reference temperature is 19 ° C .

-The maximum temperature that the solar system had reached is

45°C.



Double Jacket:

The system had reached a maximum 51°C after working five and a half hour.

The floor:

The temperature reached a maximum 26-27°C .















Discussion



Heaters Source	Unit Of	Energy	Co ₂	Palestinians	Cost
Of Energy	Supply	(KWh	(Kg	Cost	(KWh /NIS)
		/Unit)	/KWh)		
Electricity(KWh	I.	0.43	0.608 NIS /	1.644
Heating pump				Kw	
,Underfloor)					
Firewood (Kg	4		25 NIS / 55 Kg	8.8
Wood burner)					
Diels	Kg /	13 / 10.9	0.25	5.13	2.1247
	Liter			NIS/L	
LPG (Propane	Kg /	3.9 / 7.1	0.23	2.17 NIS/L	3.27
gas)	Liter				
LPG (Butane	Kg /	13.7 / 7.8	0.23	2.17 NIS/L	3.594
gas)	Liter				
Kerosene	Liter	8.9	0.26	5.13 NIS/L	12.5496
Peat (Olives	Kg / Liter	4 (Depends	Depends on	300 NIS / ton	55.35
peat)		on Factors)	the type of		
			the Peat		

Advantages

Disadvantages

-More efficient -Environmental -less energy to run -lower flow temperature -less heat is wasted -Renewable sources -Quieter -Safer -Space saving -Heated distribution

Underfloor

Heating

System

-Higher initial cost
-Maintenance
-More time is needed
-Not famous
-Permanent (modification)
-Only created at the construction
-Can't be applied in public places



Conclusion

Future of heating

Low running cost

High efficiency

Conclusion

Using stove

Saving our environment from pollution

Solution for lack of sun radiation

Done a full plan details

Made a clear simple model for our system

We learned

To do group work effectively

Time Management

Combine the engineering technical work with engineering theoretical work

Thank You

Any Questions

