RESULTS AND DISCUSSION

The experiment tests are conducted by taking the temperature of the water inlet and outlet sections. The water inlet and outlet sections can be connected and disconnected to the four different coil geometries. We also calculated the mass flow rate of the flow to perform all tests under the same conditions.

Conclusion and Summary

- The team was driven by the desire to make energy available and more affordable for the domestic sector.
- The experiment met the objectives which were designing a test rig coil in different geometries and then designing geometries. Furthermore, provide experiment study results for the best coil geometry in heat transfer.
- Challenges were present during the experiment test that resulted in

Project Relevance:

- 2030 Saudi Vision target is to have 200 GW of solar capacity in Saudi Arabia.
- Simplicity of solar thermal collector systems.
- Free energy cost.
- 80% of radiations are turned to heat energy (high efficiency).

Acknowledgments:

To our Advisor, Dr. Esam Jasim and our Co-Advisor Dr. Nader Swalhi for the great contribution in every step of our Senior Design Project which made this project interesting and helpful for our future career and studies. Mechanical Engineering (ME) Department, Prince Mohammad bin Fahd University as a whole, we thank you for your kind support and assistance to us all through the college life.

Prince Mohammad Bin Fahd Universi

College of Engineering

Mechanical Engineering Department

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DESIGN OF A SOLAR THERMAL COLLECTOR FOR THE PURPOSE OF OPTIMIZING COIL GEOMETRIES

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ABSTRACT AND OBJECTIVES

-This project is intended to design and manufacture the solar thermal collector that used to demonstrate how solar energy could be converted into heat energy.

-The set-up includes a box of the solar thermal collector, different geometries of black pips cooper coils, radiation source.

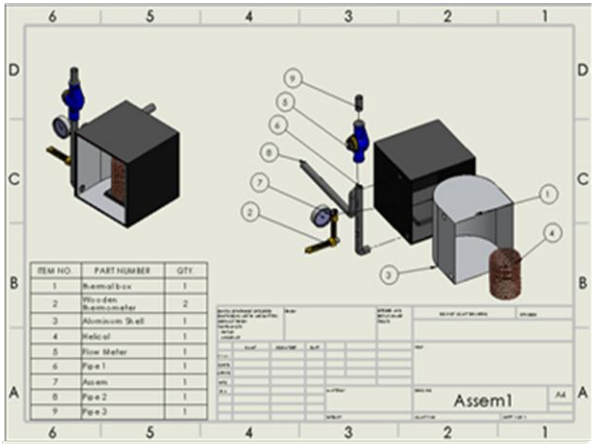
SUMMARY OF PROJECT

Affordable and reliable energy has become a main focus and challenge in recent world. In our project, we have designed a solar thermal collector to test the effect of radiation on different coil geometries. The result established illustrated that the entire different coil geometric had the same change in temperature throughout this experimental research.

ملخص المشروع:

من الملاحظ في السنوات الأخيرة أن هناك إحتياج لتوفير طاقة بديلة بتكلفة ممكنة لجميع شرائح المجتمع. لقد صممنا في هذا المشروع مجمع أشعة حرارية لدراسة تأثير الأشعة على حزم الأنابيب الملتفة. هذه الدراسة طبقت على تصاميم مختلفة من حزم الأنابيب الملتفة لمعرفة ما إذا كان هنالك تاثير للشكل الخارجي أم لا. وبعد التجارب أظهرت النتائج تساوي درجة الحرارة المكتسبة لجميع أشكال حزم الأنابيب

DESIGN CONSTRAINTS AND SPECIFICATIONS



ITEM NO.	PART NUMBER	QTY.
1	thermal box	1
2	Wooden thermometer	2
3	Aluminum Shell	1
4	Helical	1
5	Flow Meter	1
6	Pipe 1	1
7	Assem	1
8	Pipe 2	1
9	Pipe 3	1

Engineering Design standards

In this project system components were selected from several materials. Thermal collector box was made of wood since the woods have high heat transfer absorption and it will act as insulator at the same time. In other side, we design several heat transfer coils with different geometry (cylindrical, helical, and conical). All the heat coils were made of copper since it has the highest thermal conductivity Constance. The coils made from copper of Alloy

TESTING

This project went through experiment tests to study the effect of heat radiation using different coil geometries. The team expectation is to identify if the different coil geometries will give us the same temperature difference or not. In addition, we were looking forward to recommend the geometry that gives the best efficiency.

Results and Discussion:

In this experiment, we had compared the temperature differences among different copper coil geometries. Figure 4.9 depicts the shape of the copper coil vs. the temperature.

The temperature increased by 3 °C for all copper coil geometries. We also figured out from our experiments that all different coil geometries have same ΔT.