DESIGN ENHANCEMENT OF A REFRIGERATOR BY USING RGB LIGHTING THE CONVENTIONAL REFRIGERATOR

A Thesis report is submitted in partial fulfillment of the requirements for the award of Degree of Bachelor of Science in Electrical and Electronic Engineering.

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APRIL, 2023

DECLARATION

We hereby declare that this thesis "**Design Enhancement Of A Refrigerator By Using RGB Lighting The Conventional Refrigerator**" represents my own work which has been done in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering, and has not been previously included in a thesis or dissertation submitted to this or any other institution for a degree, diploma or other qualifications. I have attempted to identify all the risks related to this research that may arise in conducting this research, obtained the relevant ethical and/or safety approval (where applicable), and acknowledged my obligations and the rights of the participants.

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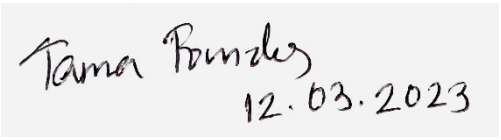
APPROVAL

The thesis entitled **"Design Enhancement Of A Refrigerator By Using RGB Lighting The Conventional Refrigerator"** submitted by **Tanjid Ahmed (191-33-895) & Md. Shahadot.Alam (191-33-834)** has been done under my supervision and accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering** in **April, 2023.**



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Dedicated

To

Our

Parents

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LIST OF ABBREVIATIONS

Abbreviations	Compete Words
RGB	Red, Green and Blue
GDP	Gross Domestic Product
CPU	Central Processing Unit
TDC	Top Dead Center
BDC	Bottom Dead Center
ETC	Et Cetera
LED	Light Emitting Diode
EEE	Electrical and Electronic Engineering
DMX	Digital Multiplex

LIST OF SYMBOLS

Symbol	*Name of the symbol*
•	Bullet
;	Semicolon
,	Comma
.	Full Stop
?	Question Mark
°C	Degree Celsius
( )	Parentheses
[ ]	Square Bracket
-	Hyphen
’	Apostrophe
:	Colon
/	Backslash

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ABSTRACT

This thesis report will be written as a base on the new generation. On the back of the refrigerator, the design is still not finished in the area where the compressor is. In this thesis paper, we filled that space and put in a fan that runs on its own. where the area for the compressor will be set up at 30°C. If the temperature goes above 30°C, the fan will turn on automatically to bring it down to below 30°C. The automatic fan was added to cut down on the heat. As for the heat, it can be caused by a number of things, such as a compressor that doesn't last long, blast in that area, and many more issues can be happened. Nowadays refrigerators look good. But if we look at how people act on a daily basis, we can see that people like products with lights more. With that in mind, the refrigerator body was redesigned with lights (RGB).

Keywords: Refrigerator, Light, Design, Fridge, RGB and Consumers.

CHAPTER 1
INTRODUCTION

1.1 Introduction

The process of removing energy in the form of heat from a medium that is at a lower temperature and its subsequent transfer to a medium that is at a higher temperature is known as refrigeration. This work of energy transfer is generally driven by mechanical methods, but it may also be driven by heat, magnetism, electricity, lasers, or other means. There are many different ways that this work can be accomplished [1].

1.2 Proposed Solution

Introducing some innovative new products to the market for refrigerators. Both the inside and outside of both locations will be reflected. People will notice several differences between this new thing as compared to previous designs of the refrigerators.

1.3 Objectives

A lot of objectives come to our minds when we start the work. The work is focused on the new design and the attraction of the new generation of refrigerators. The objective about this thesis paper:

- Improve the refrigerator front design.
- Improve the refrigerator back (lower side/compressor area) design with adding automatic fan.
- Using RGB lighting for attraction & more premium look.

1.4 Brief Methodology

By installing the RGB light on the front of the refrigerator and the back side of refrigerator fill up the compressor area. People will want to buy products where the spotlight has recently been shining, based on current market trends. Consequently, the RGB lights will be installed in the refrigerator to serve this purpose. if compare to the few products such as CPU, on the home decoration, computer tables area people like to use lighting for much more beautiful. There is not yet a refrigerator with RGB lighting

available anywhere on the market. The new design proposed in this thesis can be put into action.

1.5 Structure of The Report

In the following way, it will be described both idea and the contents of thesis report.

- In chapter 1, discuss about the several things, such as the introduction, proposed solution, objectives, brief methodology and structure of the report.
- In chapter 2, it will discuss about the several things, such as the introduction, related research, compare and contrast and summary.
- In chapter 3, it will discuss about the several things, such as the introduction, basic system design, components, and issues, new design, simulation and summary.
- In chapter 4, it will discuss about the several things, such as the observations and discussions.
- In chapter 5, it will discuss about the several things, such as the target audience, resources and cost management and feedback from the few consumers.
- In chapter 6, it will discuss about the several things, such as the economical, societal and global impact, RGB lighting, advantage and disadvantage.
- In chapter 7, it will discuss about the several things, such as the conclusions, new skills and experiences learned and future recommendations.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Trying to figure out the related topics and related works where the designs can be implements for the refrigerators.

2.2 Related Research

Things such as that related to the thesis those are:

- Novel design and performance enhancement of domestic refrigerators with thermal storage [2].
- The design of intelligent control of a kitchen refrigerator [3].
- Permanent magnet magnetic refrigerator design and experimental characterization [4].
- Performance of a domestic refrigerator under influence of varied expansion device capacity, refrigerant charge and ambient temperature [5].

2.3 Compare and Contrast

As for the recent market refrigerator designs, they have excellent designs. However, there was no lighting on the front side of the design, which is the side that is visible. Implementation of lighting for front doors is going to be a part of this thesis.

In addition to covering the area on the back of the refrigerator where the compressors are located, due to the fact that the compressor region had not yet been entirely covered. Within that location, it will be concealed.

On the other hand, in the case of the totally covered compressor area, heat will most certainly be produced. If heat builds up in that area, it can be dangerous. As a result of this, the compression area was outfitted with an automated fan, which made it possible to maintain a temperature of 30 degrees Celsius.

2.4 Summary

Analyzing the relevant works, contrasting them with current events and developments, and looking at the most recent market designs for refrigerators.

CHAPTER 3

SYSTEM DESIGN AND PROCEDURE

3.1 Introduction

System design with a conceptual framework has been discussed, in addition to the fact that functioning manner of the refrigerator. Also, the part of the refrigerator with the components as well.

3.2 Basic System Design, Components, and Issues

A. The basic Refrigerator working principle:

I. Low pressure + low temperature vapor gas suction compressor. Suction process TDC (top dead center) to BDC (bottom dead center). Discharge prosses: BDC to TDC.

II. High pressure + high temperature. Vapor gas to condenser.

III. High pressure + ambient temperature liquid gas to capillary

IV. low pressure + low temperature liquid evaporator.

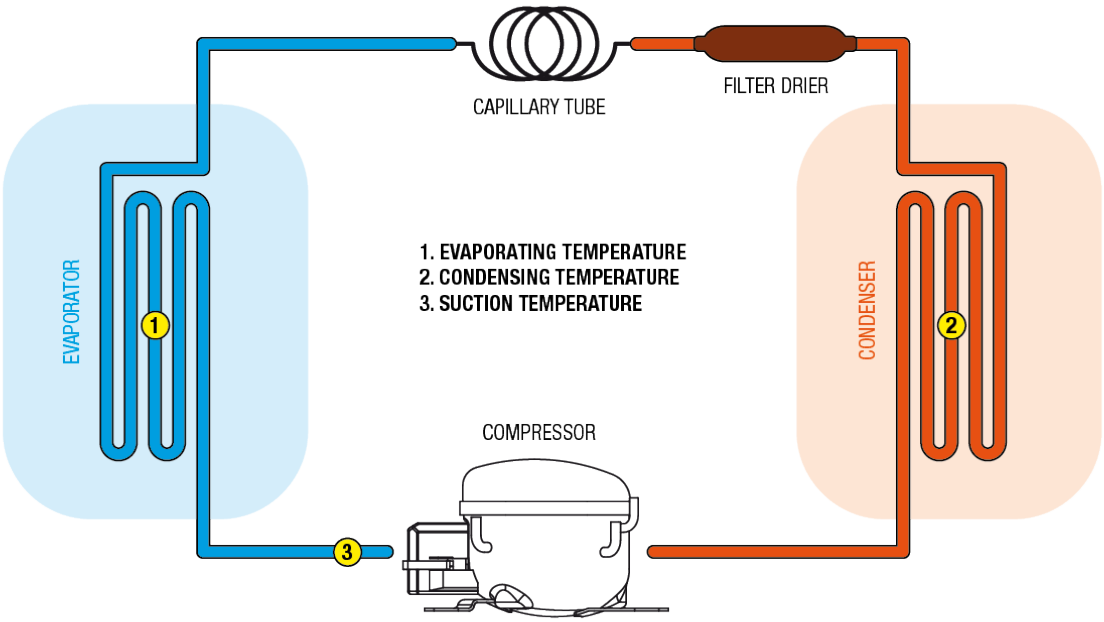

Fig. 3.1 Refrigerator basic diagram

B. Basic Components Needed on Refrigerator

I. Compressor

It is one of the four key components that are responsible for ensuring that the refrigerator is able to carry out its intended function, and one of those components is called the compressor. The compressor is responsible for compressing the refrigerant as well as controlling the flow of the refrigerant through the system. The evaporator is responsible for transferring gas with a low pressure to the compressor, which then increases the pressure of the gas it has received as a result of the process of compression. The act of compressing the gas causes an increase in pressure, which in turn causes an increase in temperature as a direct result of the feedback loop. Compressors for refrigerators may be installed on either the top or the bottom of the appliance. In dry storage facilities, where the floor is prone to becoming dusty and coated with spilled materials. Top-mounted compressors are the most practical choice. Bottom-mounted compressors are preferred for use in hot environments and on the line [6]

Fig. 3.2 Compressor

II. Condenser

A condenser is a type of heat exchanger that is used in systems that involve the transmission of heat to transform a gaseous material into a liquid state by the application of cooling. The result of this is that the material gives up some of its latent heat, which then gets transmitted to the environment around it. In many different kinds of industrial systems, condensers are used for the purpose of effectively rejecting heat.

Condensers can be made in many different ways, and they come in many different sizes, from ones that can be held in one hand to ones that are very big. A refrigerator, for instance, has a component called a condenser that transfers

heat that has been removed from the inside of the device to the air outside. In addition to their employment in air conditioning and other heat-exchange systems, condensers are used in industrial chemical processes such as distillation as well as in steam power plants. It is normal practice for many condensers to use cooling water or the air in the surrounding area as the coolant [7].

Fig. 3.3 Condenser

III. Evaporator

The main things of the evaporator in a refrigerator is to take the heat out of the air, water, and other things inside the appliance. The evaporator in the refrigerator functions as a heat exchanger, which helps to remove heat from the contents of the refrigerator so that it may be cooled [8].

Fig. 3.4 Evaporator

IV. Capillary Tube and Filter Driver

Installed in the space between the condenser and the evaporator, a capillary tube is just a very long tube of predetermined length that has an extremely narrow diameter. In order to accurately measure the amount of refrigerant flowing from the condenser to the evaporator, a capillary tube is used [9].

Fig. 3.5 Capillary tube and filter driver

C. Common Issues of Refrigerators

I. Compressor Problem

Problems with compressors may be based on a wide range of things. As a consequence of this problem, the whole refrigerator will lose its ability to function. The refrigerator's temperature is maintained by a device called a compressor. Without this regulation, any food or drinks that are kept in a refrigerator would go spoil in a short amount of time. Without a properly operating compressor, a refrigerator will not be able to perform its intended functions.

II. Temperature Problems

The most common problem with a refrigerator is that it doesn't cool. Food needs to stay cool in the fridge, so this problem needs to be fixed as soon as possible [10].

III. Water Leaking

This issue is harmful for individuals strolling about your kitchen and difficult to remedy since many factors might cause it. The two most prevalent reasons may be easily fixed without expert intervention. Blocked defrost drains may cause water leaks. The defrost drain is usually on the freezer's rear wall, above the slope. Food debris may plug the drain line, causing ice formation and water leakage in the freezer and fridge. Drain the hole with warm water from the inside. Use a pipe cleaner or turkey baster to unclog. If this doesn't work, physically remove the buildup from the drain hose valve. Pull your fridge away from the wall to access the defrost drain pipe. This pipe should include a rubber valve to avoid clogging. Reinstall a hot water and soap-washed valve. A blocked or frozen water supply might spill on the floor and beneath your fridge, preventing the ice maker and water dispenser from operating. Unplug the fridge and find the shut-off valve. This valve might be beneath your sink, behind your fridge, or in a basement or crawl area. Once you find it, inspect the shut-off valve and plastic supply line for damage. Broken or damaged water supply lines must be replaced. You may still use your fridge if your water line is broken. No ice or water dispensers [11].

IV. Freezer Not Provide Necessary Cold

Perishable food spoiling quickly, or freezer not as cold as usual? It's a frequent, easy-to-fix issue. Check the freezer's rear wall if you discover this issue. If it's chilly, listen for the evaporator fan or feel air coming from the freezer vents. If not, it's probably the freezer evaporator fan. Check the refrigerator's compressor if you can feel air moving and hear the fan. Condenser coils discharge fridge heat into the room. Dust on the coils should be cleaned. Invest in a French-door refrigerator if your condenser coils are clean [11].

V. Refrigerator Is Freezing Food

If we find that your food in the refrigerator is freezing, the fault is probably with the temperature control thermostat. As a result of the fact that this thermostat is responsible for controlling both the compressor and the evaporator fan motor, its malfunction could result in the refrigeration system operating for a longer period of time than is required, causing the appliance to be set to a

temperature that is too low. Whether you turn the thermostat from the lowest setting to the highest setting while listening for a click, you can figure out if it's broken or not. If you hear a click coming from it, you may relax knowing that it is most likely not broken. In the event that you do not hear a click, you should check the thermostat with a multimeter to ensure that it has continuity. Replace the thermostat if you find that it does not maintain continuity at any setting [11].

VI. Sheet Of Ice On The Freezer Floor

A layer of ice might form on the floor of your freezer if the defrost drain is clogged for whatever reason. A second possibility is that you may sometimes see water dropping into the refrigerator. Fixing this issue is often a fast and simple process. Remove the plug from the refrigerator and let it defrost on its own while you put the food you need to eat now someplace else. However, if you want to be absolutely certain that everything is in order, you should remove the back wall of the freezer compartment very gently before reconnecting the power cord to the appliance. Check to see if any food or other particles are obstructing the little hole at the base of the evaporator coils, and then remove them if you find any. If the issue persists, you may want to think about installing a drain warmer to assist in the defrosting process [11].

VII. Overflowing Ice Maker

This is an issue that occurs very often and has a number of possible root causes. The water input valve is often the source of the principal issue. If the water pressure in this valve is too low, the possibility exists that it may not completely close when the power is turned off. Because of this, the valve will start leaking water into the icemaker, which will cause the icemaker to overflow with water. Make sure the water pressure is at least 20 psi to fix this problem. If you check and find that the water pressure is normal, then it is possible that the water entry valve is broken. It is possible that it is not turned off completely or that it is jammed open, both of which can cause water to escape through the valve. Therefore, if the ice maker is overflowing even when there is adequate water pressure, you might think about changing the water entry valve and many more [11].

3.3 New Design

On the back of the refrigerator, we filled that space and put in a fan that runs on its Automatically. where the area for the compressor will be set up at 30°C. If the temperature goes above 30°C, the fan will turn on automatically to bring it down to below 30°C.

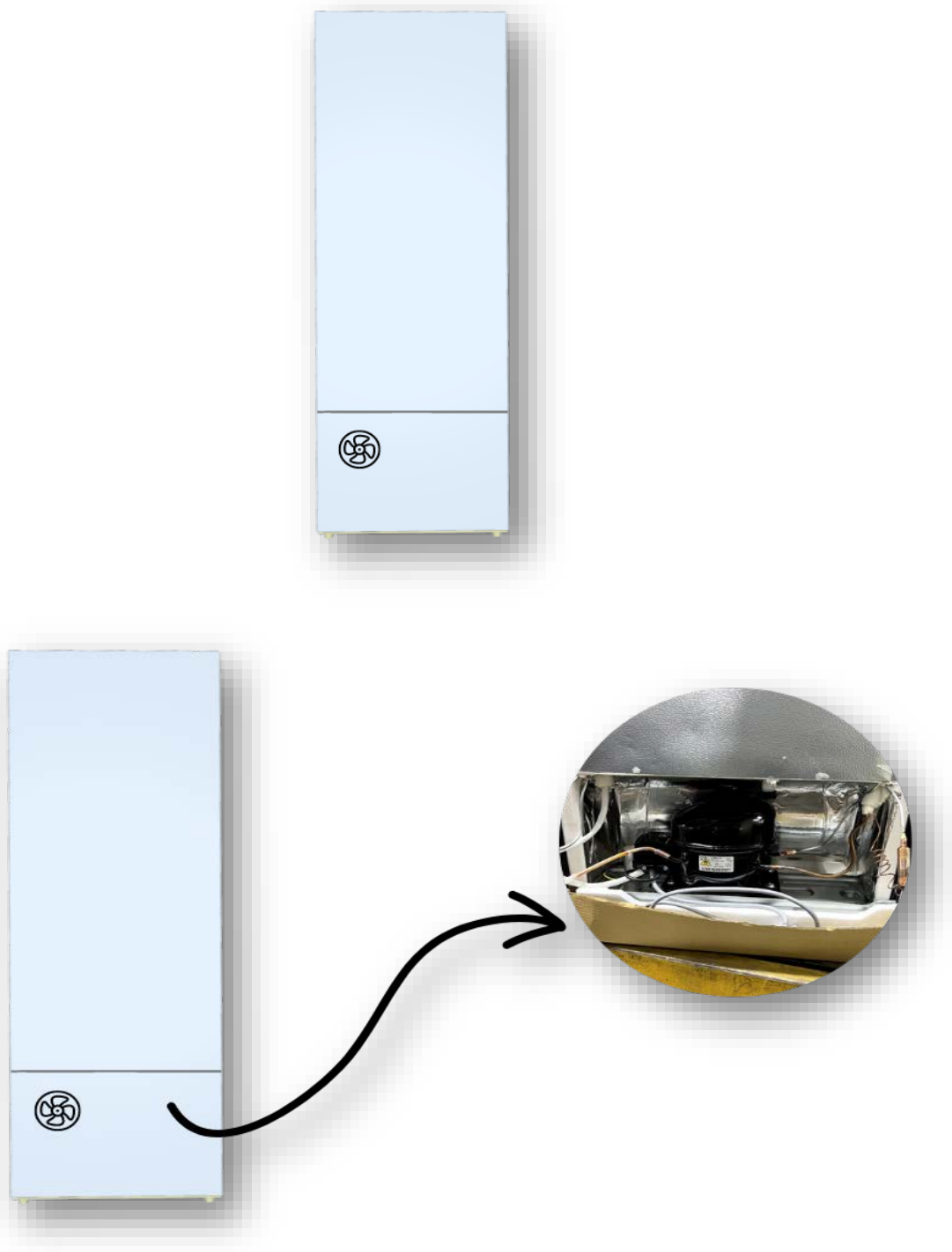

Fig. 3.6 Refrigerator fill area on back side

On the front side the refrigerator body was redesigned with lights (RGB). In can be comes many designs with lighting on the base of needed point of view where the refrigerator will be set up such as like if it's set up on home so its different design, if its on office its different, if it's for party center its different lighting set up, etc.

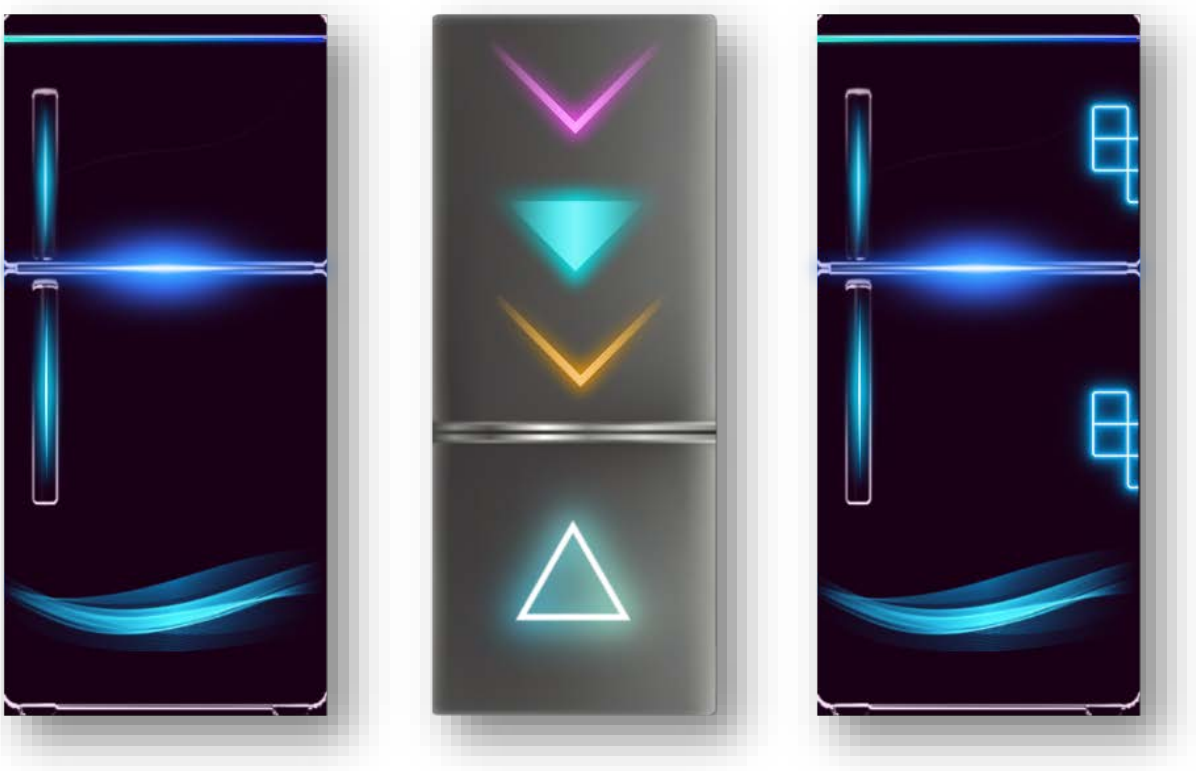

Fig. 3.7 New refrigerator design (sample) on front side

3.4 Simulation

In This provided circuit has been set up at 30°C. If the temperature goes above 30°C, the fan will turn on (Fig. 3.9) and automatically to bring it down to below 30°C (Fig. 3.8).

Apparatus:

i. Diode (1N4007)
ii. Resistor (10k)
iii. Transistor (BC547)
iv. Cell
v. Fan-DC
vi. Temperature sensor (LM35)
vii. Op-amp
viii. Relay

The circuits were made with the help of Proteus Design Suite and AutoCAD software.

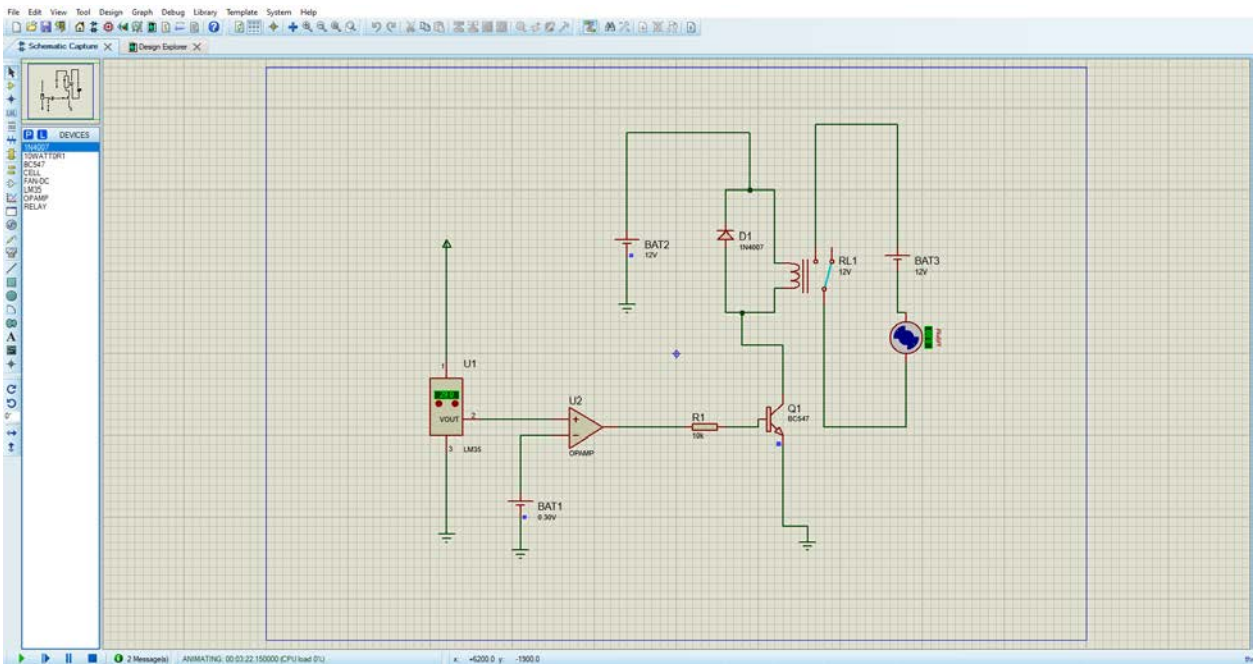

Fig. 3.8 Cooling system circuit (compressor area - inactive)

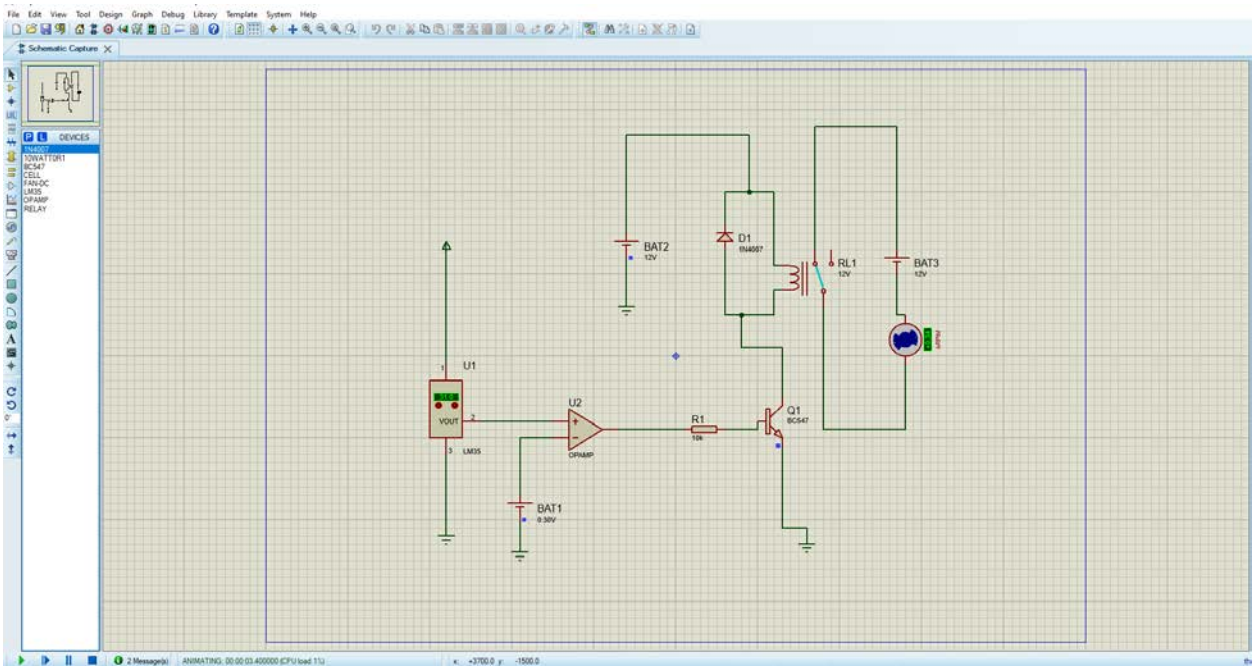

Fig. 3.9 Cooling system circuit (compressor area - active)

This is the Common Wiring circuit of the refrigerator.

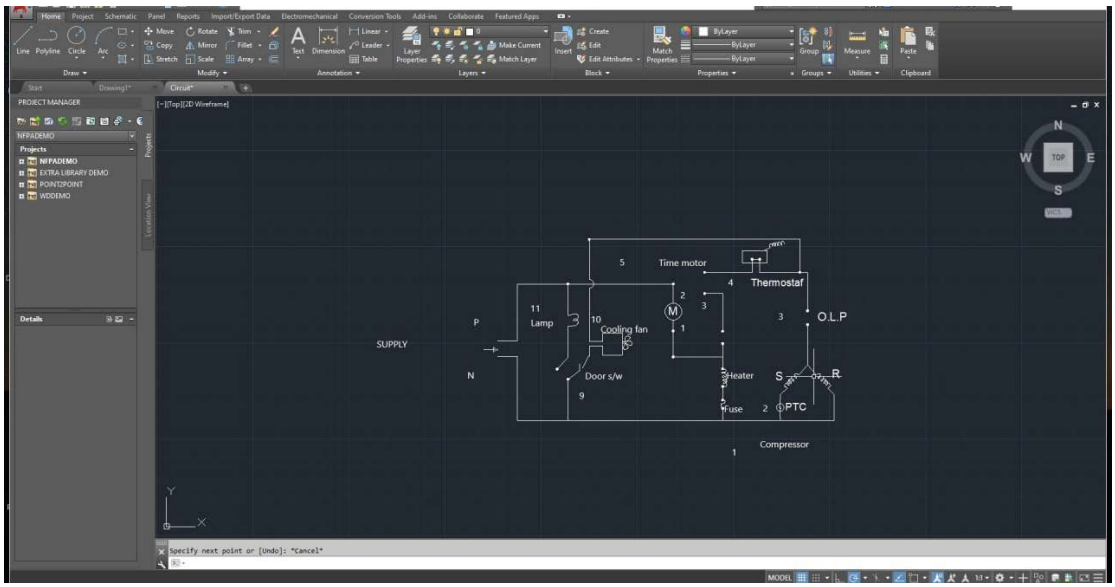

Fig. 3.10 Typical wiring circuit of a refrigerator

3.6 Summary

The system designs include both the components and any new designs for components that will be used in future generations. It is possible to rebuild the system such that it has a higher output and the lighting schemes are improved.

CHAPTER 4
RESULTS AND DISCUSSIONS

4.1 Observations

There have been expected Observations such as that:

- Improve the design on Front and back
- Looks much more premium
- Ability to run more years as compare to recent refrigerator

4.2 Discussions

According to the thesis, the new design of the refrigerator's front side has been implemented, and the new design of the refrigerator's rear side has also been implemented. The younger generation of consumers that have an appreciation for contemporary lighting design will be more inclined to purchase such products. The light is currently uncontrollable; however, in the future, it may be possible to manually regulate it. Overall, it will consist of the new design of the refrigerator. Which are usually new products with new upgrades on the refrigerator as compared with recent market refrigerators.

CHAPTER 5
THESIS MANAGEMENT

5.1 Target Audience

The next generation of young peoples (Approximate born after the year of 2000). In this regard, they like sawing a great deal and make extensive use of various pieces of lighting equipment's. If we were to compare the RGB items available today we would find that they are quite comparable more and more popularity.

5.2 Resources and Cost Management

According to the thesis, as compared to earlier models, there would surely be an increase in the size of the budget. On the other hand, it will not be easy to arrive at an accurate estimate of the cost of this task. Because of this, refrigerators come in a variety of sizes; thus, the cost will change depending on the refrigerator's particular dimensions. However, it is almost certain that the ultimate budget will be higher than that of the earlier versions.

5.3 Feedback From The Few Consumers

We took a short survey for taking consumer feedback regarding the work.

On the survey have done in between 53 people of different ages.

We divided age on 2 sections such as below 30 and more than 30 sections. so, in there 31 people have been below 30 and 19 people will be more than 30 age. Also, 2 people will didn't provide their ages.

So,

- Age Below 30 - 31 People
- Age More Then 30 - 19 People
- Note Provided Age - 2 People

On the main thing 42 people choice option-1 and 11 people choice option-2. Where Option -1 is "with RGB light design" and Option -2 is "without RGB design".

So,

- Option 1 - 42 People
- Option 2 - 11 People

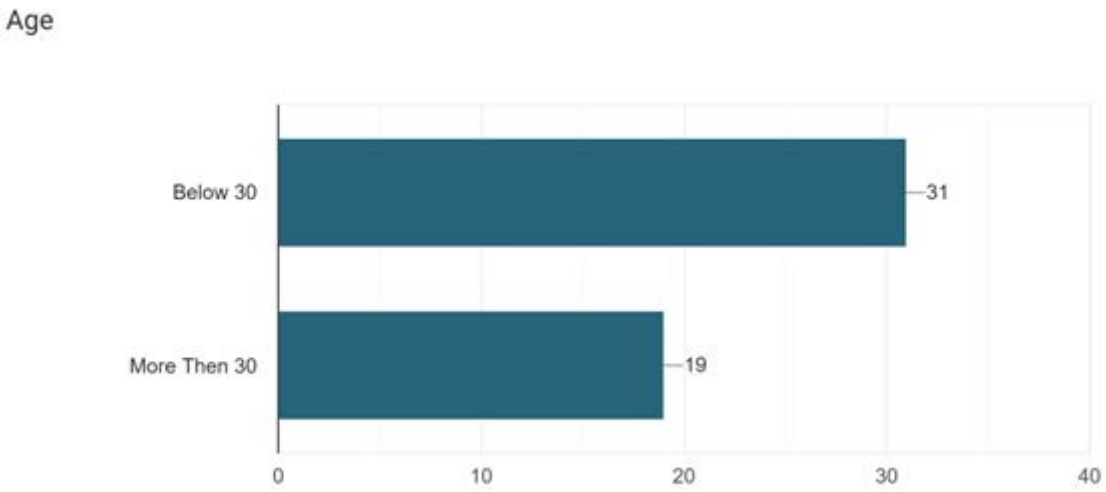

Fig. 5.1 Result of the Age

Fig. 5.2 Main Options 1 and Option 2

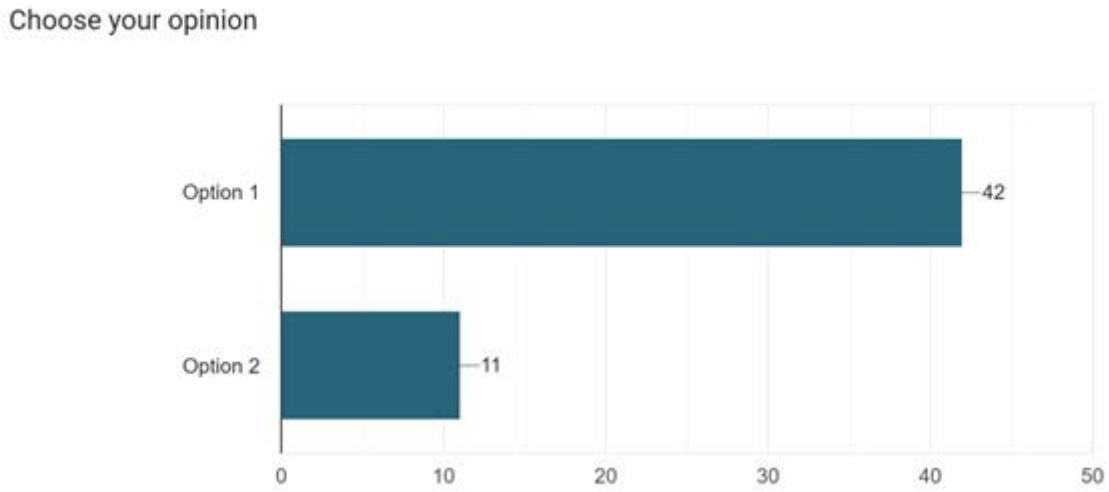

Fig. 5.3 Result of the Options

	A	B	C	D	E
1	Timestamp	Name	Email	Choose your opinion	Age
2	2022/12/28 4:04:12 PM GMT+6	Helal Uddin	helal2uddin@gmail.com	Option 1	
3	2022/12/28 4:11:51 PM GMT+6	Wahid	islamoahidul12@gmail.com	Option 1	Below 30
4	2022/12/28 4:14:36 PM GMT+6	Md. Abdur Rahman Emon	emon10-359@diu.edu.bd	Option 1	Below 30
5	2022/12/28 4:15:28 PM GMT+6	Jubayer ahmed	jubayer.ahmed0724@gmail.com	Option 1	Below 30
6	2022/12/28 4:15:59 PM GMT+6	AR Emon	aremon22399087@gmail.com	Option 1	Below 30
7	2022/12/28 4:16:42 PM GMT+6	Yousuf	yousufmia312@gmail.com	Option 1	Below 30
8	2022/12/28 4:48:08 PM GMT+6	Tanvir Ahmed	tanvir3235@gmail.com	Option 1	More Then 30
9	2022/12/28 4:50:36 PM GMT+6	Md.Zakaria-Al-Hossain	zakaria33-927@diu.edu.bd	Option 1	Below 30
10	2022/12/28 4:55:48 PM GMT+6	Safrin Fahima	safrinfahima@gmail.com	Option 1	Below 30
11	2022/12/28 4:57:12 PM GMT+6	Delowar Hossain	delowarft789@gmail.com	Option 1	More Then 30
12	2022/12/28 5:19:38 PM GMT+6	Sanjida	rahim.khn63@gmail.com	Option 1	Below 30
13	2022/12/28 5:22:17 PM GMT+6	Md.Tariqul Islam	tariqul33-829@diu.edu.bd	Option 1	Below 30
14	2022/12/28 5:22:38 PM GMT+6	Md Nuruzzaman Babu	mdnuruzzamanbabu5@gmail.com	Option 1	Below 30
15	2022/12/28 5:23:53 PM GMT+6	Md atikul haque mim	assasinatik@gmail.com	Option 1	Below 30
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17	2022/12/28 5:26:40 PM GMT+6	Protity Rahman	protybd91@gmail.com	Option 1	More Then 30
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19	2022/12/28 5:31:46 PM GMT+6	JOY	nironjoy141@gmail.com	Option 1	Below 30
20	2022/12/28 5:33:30 PM GMT+6	Rakib Hossain	rakib33-960@diu.edu.bd	Option 1	Below 30
21	2022/12/28 5:39:46 PM GMT+6	Md Shipon	shipon33-874@diu.edu.bd	Option 1	Below 30
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24	2022/12/28 5:51:27 PM GMT+6	Md. Fahim Foysal	fahimrudro.rotary@gmail.com	Option 1	Below 30
25	2022/12/28 5:54:45 PM GMT+6	Shakil Ahmad	mdsaredoy27493@gmail.com	Option 1	More Then 30
26	2022/12/28 5:55:24 PM GMT+6	Sanzida Azad Rima	sanzidarima07@gmail.com	Option 1	Below 30
27	2022/12/28 5:56:22 PM GMT+6	Sanzida Azad Rima	sanzidarima07@gmail.com	Option 1	Below 30
28	2022/12/28 6:00:31 PM GMT+6	Nirjana	nirjana26-316@diu.edu.bd	Option 1	Below 30
29	2022/12/28 6:13:42 PM GMT+6	Sumaya Akter Shikha	sumaya33-887@diu.edu.bd	Option 1	Below 30
30	2022/12/28 6:28:43 PM GMT+6	Md.Borhan Uddin	borhan.to.say@gmail.com	Option 1	Below 30
31	2022/12/28 6:45:25 PM GMT+6	Moriom	moriom33-921@diu.edu.bd	Option 1	Below 30
32	2022/12/28 6:56:51 PM GMT+6	Foysal Ahmed	foysaljr100@gmail.com	Option 1	Below 30
33	2022/12/28 6:57:45 PM GMT+6	FOYSAL	foysalahmedwork@gmail.com	Option 1	Below 30
34	2022/12/28 7:04:09 PM GMT+6	Fatama akter shemu	shemuakter387@gmail.com	Option 1	
35	2022/12/28 7:50:41 PM GMT+6	Shuhul	shuhulamin@gmail.com	Option 2	Below 30
36	2022/12/28 7:51:26 PM GMT+6	Mostakim	shuhulamin244@gmail.com	Option 2	Below 30
37	2022/12/28 8:26:21 PM GMT+6	Tanvir	tanvirahmed.uml@gmail.com	Option 2	More Then 30
38	2022/12/28 8:27:10 PM GMT+6	ariyan	ariyankhanfahim10@gmail.com	Option 2	More Then 30
39	2022/12/28 8:27:38 PM GMT+6	jubayer	jubayerahmed7262@gmail.com	Option 1	More Then 30
40	2022/12/28 8:28:56 PM GMT+6	MD Badal Miah	mdmbadal@gmail.com	Option 2	More Then 30
41	2022/12/28 8:30:18 PM GMT+6	Mst. Baby Akter	babyakter451@gmail.com	Option 2	More Then 30
42	2022/12/29 12:25:45 AM GMT+6	Feana Tasmim Nowrin	feananowrin12@gmail.com	Option 2	
43	2022/12/29 9:31:35 AM GMT+6	Hridoy	mdsaredoy@gmail.com	Option 1	More Then 30
44	2022/12/29 9:32:37 AM GMT+6	Ahmad	sarofficial00@gmail.com	Option 1	More Then 30
45	2022/12/29 9:34:11 AM GMT+6	hridita	skhridita3196@gmail.com	Option 1	Below 30
46	2022/12/29 9:35:12 AM GMT+6	shamima	kamalshamima@gmail.com	Option 1	More Then 30
47	2022/12/29 11:35:54 AM GMT+6	Engr. Md. Raihan Mazumder	mz.raihan07@gmail.com	Option 1	More Then 30
48	2022/12/29 1:11:00 PM GMT+6	Setu	nursadeksetu24@gmail.com	Option 1	Below 30
49	2023/01/02 1:27:18 AM GMT+6	Jakaria Bishwas	jakariabishwas2@gmail.com	Option 2	More Then 30
50	2023/01/02 1:27:18 AM GMT+6	Tasnim Oishi	sreyoshi83@gmail.com	Option 2	More Then 30
51	2023/01/02 1:28:04 AM GMT+6	Zahid	transdor@gmail.com	Option 2	More Then 30
52	2023/01/02 1:28:17 AM GMT+6	Zakariya Bishwas	zakariabishwas927@gmail.com	Option 1	More Then 30
53	2023/01/02 1:28:56 AM GMT+6	Nannan	mana@gmail.com	Option 2	More Then 30
54	2023/01/02 1:29:41 AM GMT+6	Vk Das	vkd@gmail.com	Option 1	More Then 30

Fig. 5.4 Total result with full information

Based on the feedback received from some consumers, the design has been liked by most of the consumers. Feedback is attended by people of different ages as well as different types of people, like some engineers, some housewives, some students, etc.

CHAPTER 6

IMPACT ASSESSMENT OF THE THESIS

6.1 Economical, Societal and Global Impact

Rebuild the design of the refrigerator and make improvements to the region around the compressor to boost the product production benefits. as a foundation upon which further customers will be attracted. It's probable that this refrigerator has a considerably more modern and sleek design than others that have come out recently. It can sell a huge number of items since it has a new design and seems more expensive than similar products. If more of the items are going to be sold, then the gross domestic product (GDP) will almost certainly grow up as a result.

To improve the design of refrigerators, it would not have a direct impact on nature/weather, but it could potentially have an indirect impact on the environment, depending on the type of light being used and how it is powered. For example, if the RGB light is powered by electricity generated from non-renewable sources, it could contribute to carbon emissions and exacerbate climate change. On the other hand, if the light is powered by renewable sources, such as solar or wind power, it could have a lower environmental impact. Also the cost of the light and the potential energy savings from using more efficient lighting.

6.2 RGB Lighting

Red, green, and blue are the additive main colors, and an LED module can make nearly any color by combining these three hues. An RGB LED is a kind of LED module.

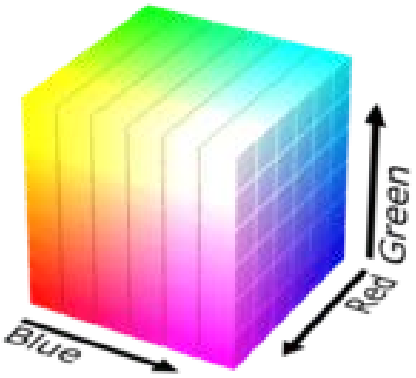

Fig. 6.1 RGB color model

An RGB LED can be broken down into its most basic parts, which are three different light-emitting diodes put together in one housing and protected by a clear lens. This LED package will have a total of four pins: one for each of the three different colored diodes plus one for the common anode (+) or cathode (-) [12].

The three basic LEDs employ the principle of additive color mixing that we discussed before in order to produce a wider range of colors than we could ever imagine. Because LEDs can be turned down, each of the three primary colors—red, green, and blue—can make an infinite number of shades within the same color space. In a purely technical sense, each colored LED is capable of producing 256 different hues. To genuinely acquire every shade that is conceivable, you need a DMX controller of the highest quality and level of sophistication; nevertheless, we shall discuss controllers in further detail in the next section [12].

For the time being, it is clear that in order to come up with the '16.7 million distinct colors' tagline that so many RGB lights come with, light makers mix the three main LEDs with their 256 different hues, which equals 256 times 256 times 256 [12].

The question now is, how exactly does an RGB LED generate the various color combinations?

Adjusting the amount of light emitted by each LED is all that is required. To get a purple hue, turn up the intensity of the red and blue LEDs while turning down the brightness of the green ones. To get a yellow color, dim the blue LED while turning up the intensity of the red and green LEDs. You get the picture. the color wheel below depicts this procedure, and it is what you may expect to see on a variety of RGB Control Smart Phone Apps [12].

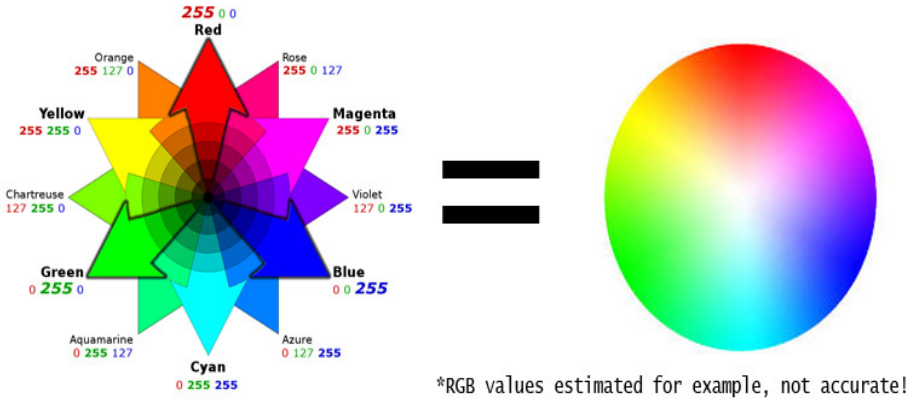

Fig. 6.2 RGB color model with values (approximately)

6.3 Advantage

There have been various advantages such as that:

- More reliability.
- Looking much better as for the RGB Lighting.
- Low heating temperature on Compressor Area.

6.4 Disadvantage

There have been few disadvantages such as that:

- The final product is High Cost.
- Utility bill can be higher.

CHAPTER 7
CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

It is possible that a new RGB design and improvements to the back side of the refrigerator may be able to boost sales of refrigerators even more than they have been in previous times. Because in today's world, more individuals are likely to purchase some shiny stuff. Based on that, it will result in an increase in sales that is exponential. As an additional point of interest, the backside of it fills up appropriately and makes use of a fan to keep it cool in that compressor area. It could also make refrigerators work better and increase the efficiency.

7.2 New Skills and Experiences Learned

New skills and experiences learned on few designing software such as AutoCAD, Proteus Design Suite, Canva and SolidWorks. Also, knowing the refrigerator markets and refrigeration production company’s in Bangladesh.

7.3 Future Recommendations

At the moment, we are making use of a fan in compressor area, but in the future, if we decide to employ a liquid cooler, the results will most likely be much more favorable and efficient. Liquid cooler can heat that is generated by the motherboard is absorbed by the coolant as it travels through the water block and then stored.

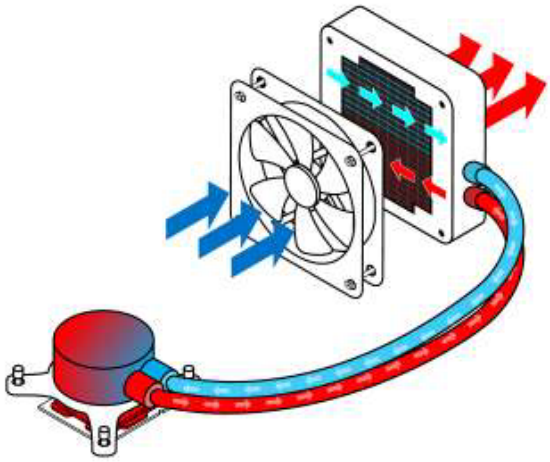

Fig. 7.1 Liquid cooler

Then, it goes through the rest of the system, finally going up through one of the two pipes to reach the radiator. The radiator makes it possible for the liquid to come into contact with air, which assists in the process of cooling. The heat is then moved away from the heatsink by fans that are mounted to the heatsink.

On the other hand, RGB lighting may also be manually adjusted. This is a distinct advantage. Therefore, the light on the refrigerator may be switched off if there is anybody who does not want it at a specific time or who does not need it. Once again, if they want, they are able to turn on the RGB light. which is likely more flexible for consumers.

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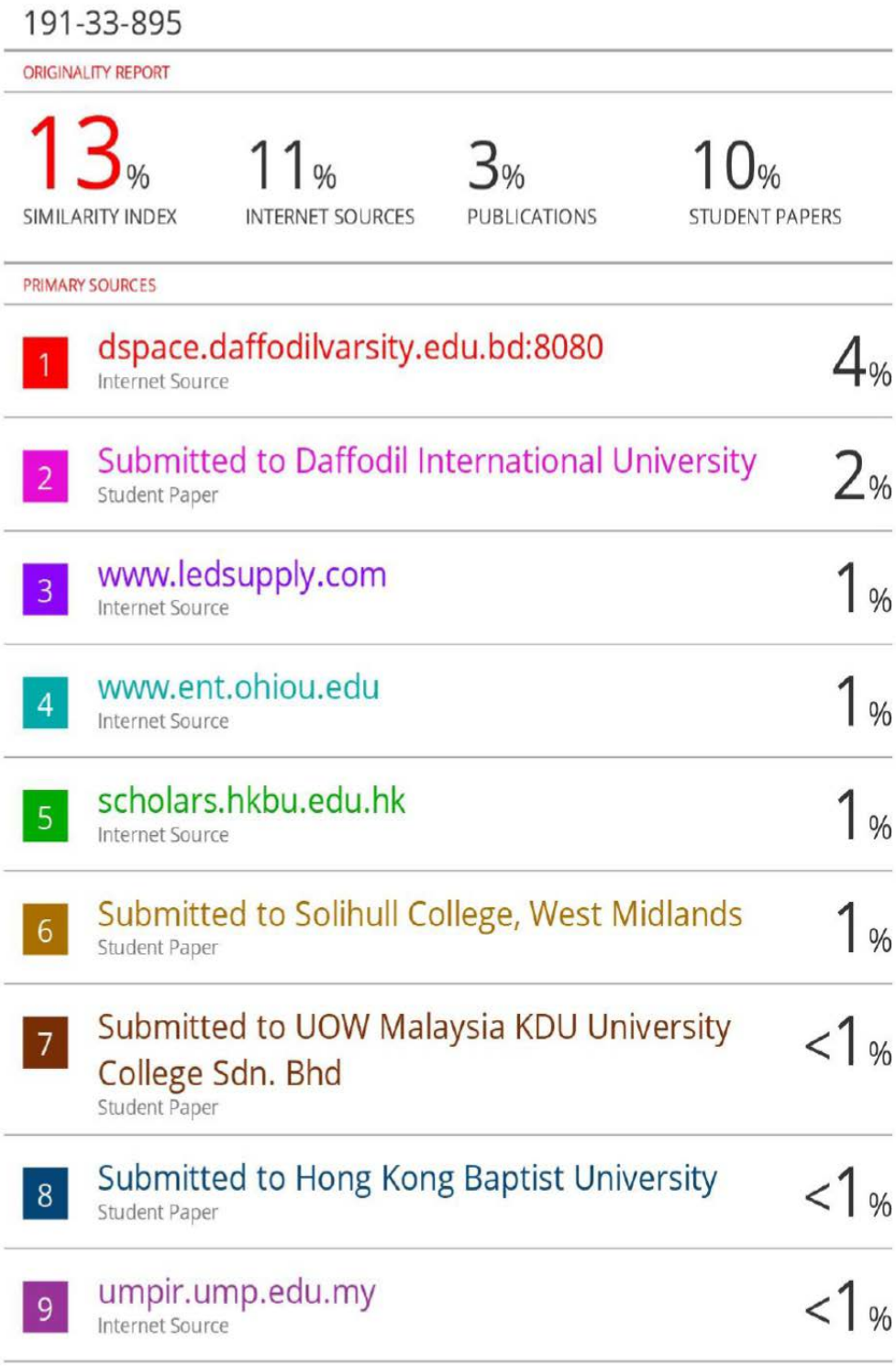
APPENDIX A

TURNITIN REPORT



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APPENDIX B

COMPLEX ENGINEERING PROBLEM SOLVING AND ENGINEERING ACTIVITIES

Complex Engineering Problems (P) Solving		
	Attributes	Statement from students
P1	Range of resources	It can be multiple things. However, for the time being, designs can be created in a variety of ways. Surely, the range of resources is extensive.
P2	Innovation	Using RGB Lighting
P3	Consequences of society and environment	Consequences of society and environment are unaffected.

Complex Engineering Problems (P) Solving		
	Attributes	Statement from students
A1	Depth of knowledge required	Knowledge needed on the refrigerator markets it will help to go on.
A2	Depth of analysis required	Based on consumer needs and attraction need to know deeply.

APPENDIX C

TRAINNING

Short training on **Singer Bangladesh Limited** for getting more thing know regarding this thesis.