

Isolator Project

Innovating PVC Roofing Systems for Sustainable Urban Development

A Thesis Prospectus

In STS 4500 Presented to The Faculty of the School of Engineering and Applied Science

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Bachelor of Science in Electrical Engineering

By

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**On my honor as a University student, I have neither given nor received unauthorized aid
on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.**

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Introduction

Urban development has advanced rapidly due to the state of the economy of the world constantly trying to expand more and more. While this does benefit our country and can be the foundation of an advancing society, many problems seem to arise from this rapid development, ranging from running out of resources, environmental harm, social inequalities, and many more. With this in mind, a solution needs to be found if we are to both advance rapidly and sustain the resources we have properly, this is what my research aims to tackle.

Due to unforeseen circumstances, I am unable to take my Capstone class this Fall, however as a replacement for the Capstone project, I'm using my ECG circuit project that I am currently making with my group that detects heart signals, which can be used in a multitude of ways. As for my STS project, I'm using my experience interning at a PVC roofing company in Indonesia to start an independent project that focuses on studying how urban development in America can be more sustainable and environment friendly by using PVC more. From this research, I hope that more people can be sold on the idea that PVC is not only a viable option in terms of competitiveness, but also in sustainability, becoming a medium for both problems: one in which we want to advance our infrastructure further everywhere, and the other where we want to be as environmentally friendly as possible while doing so.

However, convincing the public to simply switch into PVC just to do so is not enough, as most people need an incentive in order to adopt a new thing, and that is where the benefits can be further put in the light in order for PVC to be more widely accepted by the public. Which is why through this research, I hope to answer the question: how can we propose PVC so that it can be more widely accepted by not only the general public, but also the people of the government who manage our country?

Technical Topic Section

My technical project involves creating a PCB board that has components that can transmit an ECG signal or in other words, we are making an ECG circuit. The way the ECG circuit works is it picks up signals of electrical activities of the heart, it captures the voltage changes that occur in the heart whenever it contracts and relaxes. In order to do this we are told to design many components of the PCB board for the whole thing to operate.

The first component is to design an RC network that connects to the operational amplifier so that it may preserve electrical flow towards the other parts of the circuits, the design is based on the given requirements that we needed to meet and follow by the ECE department. We then have to design an Integrator, which functions in a very complicated way but the best way to explain it would be that it accumulates the input signal given and outputs something that can be better represented by, in short it manipulates signals to provide an output that we need.

Moving on we have components in the middle of the PCB board which we have to configure for a desired output signal, the area in the middle is called VMid, and in the same way that the other parts are designed, all specifications are given beforehand by the department. And for the last two parts of the ECG PCB board, we have an Anti Aliasing filter which is a 4th order butterworth filter, this part is very crucial as it filters out any unwanted high frequency components, ensuring the accuracy of the reading, and an isolator, which as the name suggests, acts to isolate specific components that we want to work separately but still provide signals to each other, allowing all of them to work simultaneously but not get mixed up with anything that is unwanted.

STS Topic Section

The project itself is to prove or show that PVC is a material that can be viable to the public as an actual option compared to others, this does not necessarily mean that it has to be roofing, as PVC is used in some industries such as the pipe industry, however we will try to further our goal by attempting to encompass every industry we can. This section will provide an in-depth examination of the technical aspects of the research, ensuring accessibility to a general audience. The research primarily revolves around PVC roofing systems and the need to enhance their durability, cost-effectiveness, and environmental friendliness.

We can start by focusing on the main issues that are found when dealing with PVC, we can do that by investigating our issues separately. Firstly, our initial problem will be investigating innovative recycling methods for PVC materials, reducing waste, and establishing a sustainable supply chain for roofing materials. This area is one of the most important aspects of the research as selling the idea that PVC is recyclable will promote to our customers or people investing in our idea that PVC is an environmentally sustainable option compared to the others.

Our next focus lies in the development of energy efficient PVC roof products and installations. Installing PVC in general, especially roof products can be very energy inefficient as is with other products that require heavy and extensive times to install. This section of the research will focus on how to optimize the installations of PVC (starting with roofing as an example) in order to reduce not only cost but also energy inefficiencies.

The last part that we need to investigate is the environmental safety in PVC manufacturing, it is a known fact that most manufacturing processes come at the cost of the environmental health around them, as not only are the resources required very extensive, but the constant use of unnatural ingredients and components during manufacturing causes the

environment to react in an unnatural way. To combat this, we need to investigate if there are ways to combat this problem not only by incorporating more natural components in PVC manufacturing, but also by ensuring a work environment where the nature around it is allowed to coexist with the factories.

Conclusion

To conclude, my STS research involves improving PVC in a way that it can be more widely accepted by the general public as it is very beneficial to use in urban developments, what I hope to achieve from this is that it can convince some people to switch from inefficient energy requiring materials to PVC materials, it does not necessarily have to involve roofing but I will use roofing to provide the comparisons as going in depth would be too complicated. The impact it would have on society if we switched would be tremendous for the environment as most of the mass produced products that involve inefficient energy materials are harming it, and my point is not that it has to be PVC specifically, but that other alternatives are looked upon as an option more.

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