

What's On Top

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Introduction

My project is about if the color of your metal roof dictates the temperature inside a barn. I want to know this because when it is sunny a building can feel hotter and I am curious if you can change the roof color to make the building cooler. I will talk about the procedure and research of my project. I will also be discussing the purpose/ hypothesis and the materials I used. Lastly I will talk about what my conclusion is and my data collected. This is my introduction to my science fair.

Purpose and Hypothesis

The purpose of this project is to figure out if the color or shade of a metal roof can dictate and change the internal temperature of a bird house to act as a pole barn. I can find this out by multiple buildings and putting the different colors on different buildings. Then I can measure the internal temperature. My hypothesis is that if I put a darker color metal on the roof the temperature will be different than if I used a lighter color. That is my hypothesis and why I am doing this project.

Research

I researched the layers of the sheet to understand how it reflects light normally and found out about a thin white layer to reflect light. I also looked at Metal Supply Depot's chart and it showed that the black metal had a reflectivity percent of 26.7%, and the white had a reflectivity percent of 67.8. I also researched the cost of the heat lamps I will be using and the total cost is going to be around 80 dollars. I also wanted to find out how light bends off of metal to find out what I will be measuring in temperature. I also looked into what other materials I need to use to assemble my models barns for the experiment. That is what I researched about my experiment.

Materials

The materials I used for my experiment are 3 types of metal roofing. I used deep black, bright white, and plain galvalume steel which has no paint. I gathered my materials from Metal Supply Depot from Ashley Curts and Kevin Newton. I got three bird houses from Rural King. I got the brooder lamps from Rural King as well. I got Deep black because it is the darkest color Metal Supply Depot offered and I got Bright White because it was their lightest color. Then I got the plain Galvalume to see if bare metal affects it as well. I used brooder lamps because they keep chickens warm and they can clamp onto the houses for better heating.

Procedure

The procedure for my experiment is to talk to Kevin Newton first. He is the one that made the project possible. Then after figuring out what I need for my project I talked to my aunt, Ashley Curts. She cutted and bent the metal to fit the shape and size of the bird houses I got from Rural King. Then I put the metal roof on the bird house and then hooked up the brooder lamps. I measured the temperature before turning it on to get a more accurate measurement. It then turned the lamp on and measured the temperature inside each of the bird houses. I then recorded the data and assembled my board.

Observation

I noticed during my experiment that the black metal gets warmer on the outside and on the inside than the white metal. The black got hot really fast and slowed down later. The white started off really slow and cold and then it got hot later and the longer it was sitting under the lamp. When I measured the temperature inside my garage as a base it was 47.6 degrees fahrenheit. I then measured my house's temperature before any heat was added and the white was 54.1 degrees on the outside and 47.1 degrees on the inside, and the black was 52.8 degrees on the outside and 46.6 degrees on the inside. After 30 minutes I came back to the garage and retempered my metal and the white was 87.7 degrees on the outside and 50.1 degrees on the inside. The black was 101.8 degrees on the outside and 50.7 degrees on the inside. I went out 30 minutes later and the white was 100.14 degrees on the outside and 51.5 degrees on the inside. The black was 112.4 degrees on the outside and 51.8 degrees on the inside. After an hour and a half outside I went back out and the white was 116.5 degrees on the outside and 52.4 degrees on the inside. The black metal was 119.3 degrees on the outside and was 53.6 degrees on the inside. I noticed that the black was always the hottest and slowed down the heating after a while. The white took a minute to truly get warm, but then was starting to heat up and catch up to the black metal.

Conclusion

In conclusion I found out that black metal gets hot a lot quicker and white gets hot a lot slower. This is because black has a very low reflectivity and very high absorption. White got hot slower because it reflected very highly and had a lower absorption percent. After I gathered my data I found out that the color does matter, but there wasn't as big of a gap in temperature as I thought. My hypothesis was correct, but I was shocked to see how hot metal got so quickly. If I let it sit outside for hours the black metal would still be hotter than the white metal. It is good to know because it helps me understand metal and how what you get does matter and you could throw a fit with the darker color.