

Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Invention Design Proposal)

(Word Limit: 1,600 words, Pages: 3 pages only)

Team Number: SCBC091

Project Title: Oil-absorbing hair mat

Project Type: Invention Design Proposal

*To our best knowledge, there are / are no * similar works in the market; (if there are,) related product links are as below:*

<https://edition.cnn.com/2022/05/19/world/oil-spills-human-hair-matter-of-trust-spc-scen-intl-c2e/index.html>

The enhancement our project proposed / the difference with related products are:

Our oil-absorbing hair mat contains more kinds of hair and furs and can be used at home.

**Please delete if not applicable. The competition values the originality of works. Students must do enough literature research to ensure that their works are unique and list relevant reference materials before starting research or invention.*

I. Background

Human hair is considered a waste material in most parts of the world and its accumulation in waste streams causes many environmental problems. Our group members often think it is a waste to throw our hair every time they finished cutting it, so we wanted to reuse it. We were inspired by people who found out that hair can absorb oil and clean up spills effectively. In 1989, hair stylist Phil McCrory from Alabama, US, came up with the idea after seeing a sea otter's fur become saturated with oil. In 2001, Phil McCrory and Matter of Trust partnered and launched the Clean Wave program. They collected hair, fur, wool, and fleece clippings from donations to make petroleum spill clean-up booms. Most recently, the people of Mauritius also used hair to clean up the 1,000 tons of oil spilled into the waters of the Indian Ocean after a ship ran aground in 2020. Also, a non-profit based in San Francisco is using human hair and animal fur to help clean up oil spills. A standard way to clean up oil on land is to use mats made from polypropylene, a non-biodegradable plastic. We hope to modify the hair mat by finding what hair can absorb oil effectively and which type of oil can be easily absorbed by hair so we can use it in our daily life.

II. Objective(s)

According to American Academy of Dermatology Association, it is normal to shed between 50-100 hairs a day. There are around 8 million of people in the world. Every person will shed their hair and will cause a lot of hair thrown into the rubbish bins per day. This leads us to have some ideas about doing some experiments with discarded hair to save the environment. A study from the University of Technology Sydney revealed that dog fur and human hair were the best

material for cleaning up oil spills. Moreover, there are some examples that people using hair to remove oil. Such as they used hair to make petroleum spill clean-up booms, used hair to clean up the 1,000 tons of oil spilled into the waters of the Indian Ocean after a ship ran aground in 2020. Based on the above examples, it arouses our curiosity. Therefore, our main objective is to use different hair from animals such as dogs and people to remove different kind of oil to design a hair mat by testing which kind of fur or hair is best for absorbing oil and which type of oil can be easily absorbed by hair or fur. Our main objective is to find out which type of hair/fur is the best for absorbing oil.

III. Methodology

To study effectiveness of different kinds of hair/fur in absorbing oil as to select suitable hair/fur in our design by an experiment. It is tested by counting the time required to absorb 10 ml oil of different types of hair/fur.

To study which type of oil can be absorbed easily to provide further information about the application of the mat by an experiment. It is tested by recording the volume of different kinds of oils left after the experiment when they are absorbed by the same hair/fur.

To measure the oil absorbing ability of hair/fur as to predict the effectiveness of the mat by an experiment. It is tested by recording the greatest amount of oil can be absorbed by the hair/fur.

IV. Design of Invention

By finding out which types of hair/fur absorb oil better, we adjust the proportions of different types of hair/ fur to make the mat. After testing, we can adjust the proportions of hair/fur mixed in the mat as to exhibit its greatest role of absorbing oil. Regarding the oil absorbing ability, we chose to use human hair and dog fur in the mat as they are effective in absorbing oil. Human hair can be collected through salons easily. It can be used to absorb oil after washing and turning it into hair mats. The layer is thin to increase the surface area of contacting the oil surface. Other than just using human hair, dog fur is also considered as one of our proposed ideas as its effectiveness is similar to human hair. Dog fur can be easily collected through pet shops. However, unlike human hair, fur does not need to undergo the washing process. This is because dog fur does not contain as much dirty oil as human hair. For making the mat after the cleaning process, we add dog fur into the wet hair in a 1:1 ratio. Mix them together to form a ball before it dries out. Then, squeeze the ball tightly and form a mat. The mat can be used after waiting for several hours after the drying procedure. Tests for oil absorbing ability will be carried out to support that the mat can fulfil its application.

V. Application / Market Need

The factor that needed to be considered for hair choices for making oil-absorbing mat is the oil absorbing ability and the fact that whether the hair can be collected easily in daily life. In the background information, problem of environmental pollution is ubiquitous, and protecting the environment needs to start with trivial things. The remarkable ability of hair to absorb oil can be used in the kitchen at home. People can use it to absorb the oil of the sewer, drain, to wipe the table or the floor, etc. Hair mats can be easily hand made by everyone at home by using dead hairs from animals or humans. The mat made by hairs/fur with the most comprehensive

oil-absorbing ability, use low-cost needles of needle felting to weave the hair into an oil-absorbing mat like a usual towel. The hair costs less than conventional materials and it is likely to be beneficial for communities that cannot buy the more expensive mainstream products. Developing in a far-reaching direction, this invention can be used in food waste recycling plants. Let the food waste be absorbed by the hair in the factory for processing, thus there is more room for development for recycling, such as making organic fertilisers. Moreover, a large amount of hair can be collected and then transported into the sewage system in a large factory, so that the sewage can be filtered before being discharged into the sea, reducing the amount of dirty oil discharged into the sea. Hair into big mats can be used to soak up oil spills on land, and booms (long tubes) used for spills at sea. Those hair can also be made into a large oil-absorbing bag and put it on the sea surface of the oil-polluted hardest-hit area to absorb oil. However, there's limitations on using this product. The hair mat may only be used once or no more than few times. The way to deal with hair mat that after used is also a problem. All to all, the hair mat is worth to develop in long term. There are not many people in community and industries know the benefits of using hair to absorb hair.

VI. Conclusion

We found that human hair and dog fur are effective in absorbing oil and they can be easily collected. Also, coconut oil is the easiest type of oil to be absorbed. We designed a hair mat made up of human hair and dog fur which can be effective in absorbing several types of oil as human hair can absorb all types of oils. The hair mat is environmentally friendly, and we don't need to buy towels, tissues, etc for absorbing oil. We can simply turn our hair which is fallen or cut off into a hair mat by ourselves to absorb oil. We can use the hair mat in many places like in the kitchen or restaurants as there are lots of oils everywhere. Furthermore, the design is capable of further development. We can find more kinds of materials to be mixed with hair and fur to absorb oils more effectively to enhance the effectiveness of the hair mat. People can have more choices of materials for making oil-absorbing mats and the oil-absorbing ability can be enhanced.