The oil filter tank separates oil from contaminated wastewater using natural filter materials.

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**Abstract**

Tiny amounts of oil generated by repairs, engine washes, or lubrication change from many small establishments in the community that cannot be stored, sold, or utilized. Most of them are washed and discharged into water sources, causing environmental issues. The objective of the research develop an oil filter tank using foxtail grass to remove oil from contaminated wastewater (*Pennisetum pedicellatum Trin*), by combining the oil retention concept of a foxtail grass filter with the centrifugation of a washing machine. Build a Prototype of the oil filter tank and tests the efficiency of the innovation to filter the oil from the water. The results show that the innovation have a good performance, separating almost 100% of oil from water and the filtered water when exposed to sunlight throughout the day has a temperature change similar to normal water. While the water mixed with oil will rise greatly because there is oil covered on the surface of the water. This innovation could help reduce the amount of oil released into water sources, make the environment in the community better and increase the value of the foxtail grass can generate income for people in the community.

**Key word:** oil filter tank, lubricating oil, oil contaminated wastewater, foxtail-grass
Introduction

Today, because of population growth, so human needs for increased consumption, resulting in technology plays a role in responding human needs. Also technology is rapidly advancing, require the use of machine tools and engines, coupled with technology in various operational processes, resulting in more related establishments due to the fact that using the engine for a long time, so it may be damaged. And if you have to buy a new one, it may cost a lot of money. Therefore, an establishment is needed to repair the engine, maintain the engine, including changing the oil. Using a large amount of oil, most of the used oil is recycled. But there will be another part of the oil attached to the equipment that uses tools and engines that technicians will have to get rid of those oil stains by using engine oil mixed with water to wash away, almost all of the wastewater will be released into the water source. More environmental problems, especially water pollution problems, which are mainly caused by the release of wastewater into the source, the organizers realize the importance and widespread damage be follow. Because the research studying, found that the foxtail grass has many tiny hairs that can hold a large amount of oil inside and it also is a weed that causes a lot of damage to farmers. Therefore our group figured out a way to get rid of this foxtail grass by using it as a material for oil filtration to filter oil from oily wastewater before releasing it to water sources reducing water pollution problems. It will help reduce environmental problems and also reduce weed problems for farmers as well. So we would like to creative the innovation “The oil filter tank uses natural filter materials to remove oil from contaminated wastewater”

Research question

Does the oil filter tank use natural filter materials effectively remove oil from contaminated wastewater?

Scope of the research

Studying only the lubricating oil.
Materials and methods

1. Study area
   Princess Chulabhorn Science High School, Trang

2. Study on efficiency oil trap of foxtail grass.
   2.1 Weigh 2 g. of foxtail flowers into 3 lower perforated containers.
   2.2 Prepare 10 ml. oil and 10 ml. water in each containers. Put into containers 1-3, respectively. Let them drain and then weigh all 3 containers of foxtail grass.
   2.3 Analyze the amount of oil retained by foxtail grass.

3. Study the motor and spinning’s mechanism operation.

4. Innovative design

A sketch of the outer innovation.

Number 1 : A plastic tank cover for opening and pouring waste water into filter oil.
Number 2 : An upper plastic tank to put a steel mesh tank filter and PVC pipe in.
Number 3 : The lower part of the plastic tank contains the motor.
A sketch of the innovation inside.

Number 4 : A sieve cover prevents the grass that fills in a filter from splashing out during oil filtration.
Number 5 : A steel mesh tank for inserting a filter.
Number 6 : A spindle connects between steel mesh tank and motor
Number 7 : PVC pipe prevent water and oil from mixing.
Number 8 : The water exit.
Number 9 : The oil exit.
Number 10 : The motor.

5. Testing the efficiency of innovation.
   5.1 Measure 2,000 ml of water mixed with 300 ml of oil.
   5.2 Pour water mixed with oil into the steel mesh tank.
   5.3 The foxtail grass will trap the oil, water will flow into the water pipe, then start centrifuging to shake off the oil from the filter.
   5.4 Wait for the oil flow out into the oil pipe to drain completely.
   5.5 Observe the separation of oil and water and measure the amount of water and oil after the innovation already worked.
   5.6 The experiment was repeated 5 times.
6. Water quality measurement

We monitor water quality using the GLOBE Hydrology protocol for data collection and water characterization. We will examine the physical characteristics of water, namely temperature, because it is the main factor affecting the quality of other types of water such as pH, Conductivities of water or Dissolved Oxygen in water. After that, we will submit the data to the Globe data entry.

**Measuring the water temperature by the thermometer**

Measured the water temperature by the thermometer in the beaker. Then read the obtained temperature value and record the result. The water temperature will be measured every 1 hour, from 7:00 a.m. - 5:00 p.m.

7. Data analysis

We used mean and standard deviation to study efficiency oil trap of foxtail grass, efficiency of innovation and quality of the water.

**Results**

Studying on the innovative the oil filter tank separates oil from contaminated wastewater using natural filter materials. The results were as follows:
Experiment 1: the study of the efficiency of oil and water retention of Foxtail grass was completed as follows: when using water, lubricating oil and lubricating oil mixed with water, through foxtail grass 2 g, the results are as shown in Table 1.

Table 1: The amount of lubricant that is stored in the grass clipping.

<table>
<thead>
<tr>
<th>Filtered substance</th>
<th>weight of grass growing(g)</th>
<th>Retention volume (times)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lubricating oil mixed with water</td>
<td>17.98 ± 0.28</td>
<td>8.99</td>
</tr>
</tbody>
</table>

From the test results, found that when the oil was poured into the foxtail grass, it able to absorb up to 8.99 times the weight of the foxtail grass. This data was used to calculate the maximum of the oil’s volume that the innovation can trap in each time. The innovation also be designed that can contain oil not more than 7 times the weight of the filter material (80%), and then have to spin out the oil.

Experiment 2: examines the performance of innovative. The oil filter tank separates oil from contaminated wastewater using natural filter materials. The results are shown in Table 2-3.

Table 2: The efficiency of the innovation in separating oil from water mix lubricating oil.

<table>
<thead>
<tr>
<th>water mixed with lubricating oil</th>
<th>Volume before filtering (ml.)</th>
<th>Volume after filtering (ml.)</th>
<th>difference before and after filter</th>
<th>Volume obtained from separation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>water</td>
<td>2,000</td>
<td>1,930.80 ± 7.53</td>
<td>69.20± 7.53</td>
<td>96.54</td>
</tr>
<tr>
<td>lubricating oil</td>
<td>300</td>
<td>253.80 ± 7.50</td>
<td>46.20± 7.50</td>
<td>84.60</td>
</tr>
</tbody>
</table>

** The remaining water and lubricating oil from the centrifugation will remain in the innovation.

** The lubricating oil is not released into the water sources.

Table 3: The amount of water and oil obtained after testing.

<table>
<thead>
<tr>
<th>Times filtering water mixed with lubricating oil</th>
<th>filtered water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>There is a slight oil stain on the water surface.</td>
</tr>
</tbody>
</table>
Filtered water will be brought to test the quality of the water by using GLOBE Hydrology protocol to test the water temperature. From the water quality test, the results are as shown in the graph below.

From the graph, it shows that in measuring the temperature of the water at each time interval. The temperature of the water mixed with the oil is the most highest because the oil floating on the water surface causes more temperature accumulation. While filtered water and water have similar temperatures. Because of the reason that temperature is very important factor affecting the quality of other types of water, therefore, it can be concluded that water that has been filtered through innovation, and be released into water sources, it has less environmental impact than water mixed with oil.

Future Study

We would like to study more and will focus on water quality such as pH, Conductivities of water, Dissolved Oxygen (DO) and Various heavy metal contamination in water to use as data for water quality analysis. It provides accurate information and can be used as a database for further research or study.
Discussion and Conclusion

The preparation of the oil filter tank separates oil from contaminated wastewater using natural filter materials has been conducted to study the appropriate factors in the development of innovation. The innovation is designed and built, after which the equipment is tested for filtration efficiency. According the results of the study on oil from wastewater, it was concluded that the oil filter tank separates oil from contaminated wastewater using natural filter materials have a good performance, separating almost 100% of oil from water, leaving only the oil stain is a thin transparent film on the water surface and in each water-oil separator test, it was found that the innovation was able to recover an average of 96.64% of the water back and an average of 84.60% of the oil back. Missing will be kept in the filter grass. The filter tank is not completely shaken out. Some of the missing water that is attached to the grass filter will be mixed with oil. It was also found that some water and oil still remained at the bottom of the tank, not coming out 100%. From the water efficiency test, it was found that normal water temperature and filtered water have similar temperatures while the temperature of the water mixed with oil is higher than the other two types of water, which if water contaminated with oil is released into water source there will have a more detrimental effect on the environment than filtered water. Because the oil will cover the surface of the water causing the temperature to be retained in the water, causing the water temperature to rise and affect the quality of water and aquatic life.

Acknowledgment

The oil filter tank separates oil from contaminated wastewater using natural filter materials has been successfully accomplished with the help and assistance of many parties. Thank you Mrs. Patchara pongmanawut, Miss Apasri Chumchuen, Advisor. Thank you Assoc. Prof. Dr. Krisanadej Jaroensutasinee, Assoc. Prof. Dr. Mullica Jaroensutasinee from Walailak University, Dr. Anantanit Chumsri from Rajamangala University of Technology Srivijaya Trang Campus. for supporting the research process would like to thank the administrators and teachers of the Science Group, Princess Chulabhorn Science High School Trang, everyone who supported the research. Thank you to all parents who supported. Thank you Ms. Dolya Chuchan gave additional
suggestions as well as the community and friends who cooperated very well in this research study.

References


I am a collaborator

The exchange of knowledge in this IVSS 2002 activity made us learn to work as a team. Know how to plan to Place the roles of the members within the group and within the school. This work was done in collaboration with team members, including Ms. Pattarawadee Charunsak, to divide the responsibilities according to the person’s aptitude. Thinking and making decisions to solve problems well and Ms. Nattaporn Panitch has high responsibility, prudenc and creatively. We work, plan and take action together as a team to find information. Making the work that comes out as complete and quality as possible. They also cooperate with school friends to help in various ways whether it is labor, the will to work Collaboration with teacher advisors in every step of the work through careful consultation and improvement of ideas. Received assistance and support from scientists and university professors to help check the work data accuracy. Including collaborating with parents and educational institutions, Princess Chulabhorn Science High School, Trang who have helped and supported in various fields. We learn how to work systematically step-by-step work plan to study the information correctly according to the methodology. Learn how to collect samples. And most importantly, learn to live with others in a variety of situations being both the giver and the receiver at the same time.

I make an impact

Water resources are one of the most important for the living things, such as humans, animals and plants. They are related because it be used for our consumption and our livelihood. So we interested in water resources. However the survey of water resources in the community, we found that the water in the water source, it was black and had a lot of oil floating on the surface of the water. And when we surveyed the area near the water source and found that there was an establishment related to repaired car in that area. The effluent contaminated with lubricating oil has been released down the drain, which is one of the causes of oil contamination.
problems in community water resources. Therefore the organizers observe foresaw the problems that will follow on the environment and people in the community. So that, the innovation ‘The oil filter tank separates oil from contaminated wastewater using natural filter materials helps reducing the problem of oil contamination in water resources. Also the community should more realized of the problem of water pollution.

I am an engineer.

We designed an innovation ‘The oil filter tank uses natural filter materials to remove oil from contaminated wastewater’ to filter contaminated wastewater with oil before released into the water source. We researched various information about the invention. Combined principles and revised by taking into account various suitability factors until this innovation comes up. The innovation work more efficiently and reduces environmental problems as much as possible.