WEEK OF INDONESIA-NETHERLANDS EDUCATION AND RESEARCH

Innovation of Eco-Friendly Detergent Based on Community Empowerment

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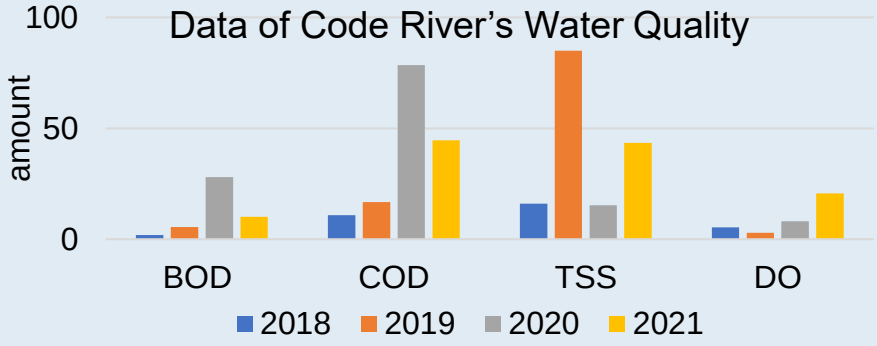
Abstract

The level of water contamination will depend on how people behave along the river. The Code River in Brontokusuman, Yogyakarta, demonstrates this phenomenon. The environmental pollution of the river has significantly increased over the last three years. Replacing eco-friendly detergents instead of conventional detergents is one method to solve this issue. The research team at Industrial Engineering UAD has begun to promote an eco-friendly detergent through educational training in partnership with the Kamulyan Waste Bank. Therefore, the objectives of this research are to determine the composition of an eco-friendly detergent using the Design of Experiment (DoE) method and to design the production equipment using the Green Quality Function Deployment (GQFD) method. The research results in the composition of an eco-friendly detergent based on lerak fruit and other plant-based ingredients, as well as the design of production equipment that considers the customer and environmental aspects. This idea is expected to empower the community and to increase their awareness to the environment.

Keywords: Eco-friendly detergent; Community empowerment; Design of Experiment; Green Quality Function Deployment.

1. Problem statement

The people's habits around the river will affect the level of water pollution. This condition can be seen in the condition of the Code River in Brontokusuman, Yogyakarta. As shown in the following figure, there has been a large increase in the environmental pollution of the river in the past three years. One way to overcome this problem is to replace the use of conventional detergents with eco-friendly detergents. Through educational training, the research team of Industrial Engineering UAD collaborated with the Kamulyan Waste Bank have started to promote an eco-friendly detergent. Therefore, the objectives of this research are to determine the composition of an eco-friendly detergent and to design the production equipment. This innovation is expected to establish a green community that has awareness of the environment.



Source: Environmental Agency of Yogyakarta

2. Methods

2.1 Determination of the composition of eco-friendly detergent

- Design of Experiment (DoE)

  In determining the best composition, the DoE method is used to obtain several different formulas, then several quality tests of detergent products were carried out to get the best quality of an eco-friendly detergent.

2.2 Design of the eco-friendly detergent production equipment

- Green Quality Function Deployment (GQFD) and Life Cycle Assessment (LCA)

  GQFD has integrated quality and environmental impact in its development process. The GQFD method will combine QFD and LCA methods in the design process to produce a design alternative that considers the customer's need aspect and environmental aspect.

3. Results

3.1 Composition of eco-friendly detergent

Based on the research results, the 7th formula becomes the main priority. The detergent composition consists of the essence of lerak fruit (*Sapindus rarak*) and other plant-based ingredients (coconut oil, vegetable surfactants, preservatives, distilled water).

3.2 Design of detergent production equipment

Based on the research results, it was indicated that the customer needs eight attributes for the tool. According to the arrangement of the morphology chart, eight alternative designs were obtained which were then assessed based on their function and impacts on the environment. Subsequently, the 3rd alternative design was selected as the best alternative. The specification of the tools includes stainless steel as the material, electric stirrer, LPG heater, and helical ribbon as the typical stirrer.

4. Conclusion and suggestion

4.1 Composition of eco-friendly detergent

Eco-Friendly detergent composition based on the essence of lerak (*Sapindus rarak*) with other plant-based ingredients

4.2 Design of eco-friendly detergent production equipment

The research resulted in the design of eco-friendly detergent production equipment based on customer needs and environmental impacts.

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