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The Use of Temperature and Waste Diapers in the Demulsification Process of Crude Oil Samples

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ABSTRACT: Currently, the oil wells in Indonesia are getting older, the older the oil well shows the greater the water content, which will cause the formation of a water-in-oil emulsion. The presence of emulsion that occurs in crude oil will cause a decrease in oil quality and oil production. Therefore, a demulsifier is needed to overcome these problems. Because the existing demulsifier are still very few variants and are not environmentally friendly, a new type of demulsifier that is environmentally friendly is needed. Baby diapers can be used as a new type of demulsifier because baby diapers contain *Polymer Superasorbent* (SAP) which can absorb 200 times water [1]. Superabsorbent Polymer has inert and hydrophilic properties with the working principle of absorbing and trapping water in the emulsion formed on crude oil. In this experiment, the author uses baby diaper waste to separate water and oil in the emulsion formed on the P#441 crude oil sample at a temperature of 26.7^{0}C, 40^{0}C, and 50^{0}C with a centrifuge with a speed of 500, 1000, and 1500. RPM in 1, 2, and 3 minutes. Demulsification process occurs faster in crude oil sample at a temperature of 50^{0}C because of high temperatures can accelerate the process demulsification. The use of baby diapers as nashi demulsifier is in its early stages and can be developed further, but it has been proven to accelerate the demulsification process in the emulsion formed by sample P#441.

KEYWORD: Demulsifier, Diapers waste, Emulsion, Superabsorbent Polymer.

I. INTRODUCTION

The presence of water in crude oil causes the formation of emulsions due to the presence of chemicals that act as natural emulsifiers, namely asphaltene, resin and naphthenic acid. The formation of emulsions in crude oil is highly undesirable because water droplets and salts such as NaCl, $MgCl_2$, $CaCl_2$, KCl trapped in crude oil can cause corrosion of pipelines and petroleum refinery equipment. Therefore, the water dispersed in the crude oil emulsion must be separated. Separation of water from crude oil emulsion can be done by mechanical, thermal, electrical and chemical processes [2]. Among the four methods, chemical treatment using a demulsifier can produce the best separation efficiency compared to other methods. Therefore, chemical methods are widely applied in industry. By integrating several methods, such as chemical separation methods combined with thermal methods, it can increase the efficiency of water separation in crude oil [3].

There are still few demulsifier variants, so a new type of demulsifier is needed that is environmentally friendly and economical. Baby diapers can be used as a new type of demulsifier because baby diapers contain *Polymer Superasorben* (SAP) which can absorb 200 times water. The main ingredient for making baby diapers is using Polyacrylate Super Absorbent Polymer gel which has hydrophilic properties, can reduce interfacial tension, distribute evenly and facilitate uniform dispersion of cross-linked polymers containing sodium atoms. It absorbs water and distributes between textures and water molecules evenly, and swaps the position of sodium atoms so that water is filled and trapped with polymer texture[4].

Baby diapers that are often used for babies are disposable diapers, because once they are used, they are thrown away and result in a lot of garbage from the baby's diapers. The higher the birth rate, the higher the baby diapers used so that the waste from the baby diapers increases. According to data, the percentage of baby diaper usage in Indonesia is around 97.1%. The time required to decompose baby diaper waste is about 250-500 years to fully decompose. Therefore, it is necessary to reprocess baby diapers into things that can be used so that the waste from baby diapers can be reduced. One way to utilize baby diaper waste is to use baby diaper waste as a demulsifier to break down the stability of the oil and water emulsion. Baby diapers contain *Polymer Superabsorbent* (SAP) which can absorb water hundreds of times, therefore with the Polymer Superabsorbent content and with the right method baby diaper waste can be used as a new demulsifier to break the stability of the oil and water emulsion.

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II. METHOD

This paper used an experimental method, where the authors conducted a literature study to prove Polyacrylate SAP from baby diaper waste can be used as demulsifier.

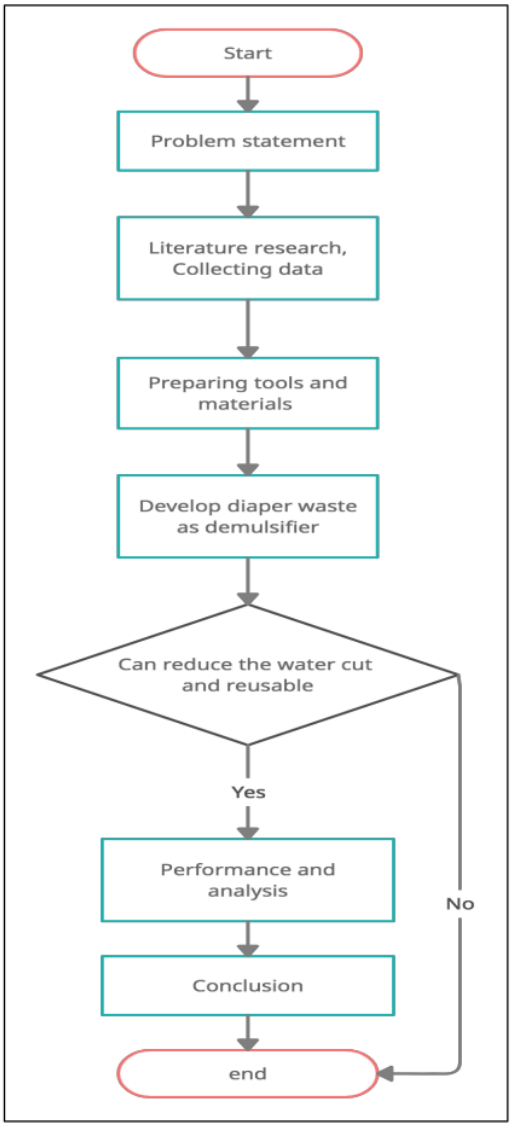

Figure 1. Flowchart

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- Materials

Figure 2. Materials

The following is the materials and procedures that the author uses in this experiment:

1. Prepare tools and materials. The tools needed are centrifuge, spinner/heater, test tube, thermometer. And the materials needed are sodium chloride of 20 gram for 20% salinity solution, 100 mL aqua dest for each solution, light crude oil (P # 441), Polyacrylate SAP from baby diaper waste.
2. Make 20% salinity solutions by inputting 20 gram in each beaker filled with 100 mL aquadest. Then make the solution homogeneous by stirring using a spinner until no sodium chloride settles at the bottom of the beaker.
3. After that, enter 5 mL of P #441, 5 mL of 20% salinity solution, and put 1 mL of baby diaper waste into a beaker, then shake until P #441 with water is mixed to form an emulsion.
4. Then, two samples were put into a centrifuge with a period of 1; 2; 3 minutes at speeds 500; 1000; 1500 RPM, at a temperature of 26.7^{O}C, 40^{O}C, and 50^{O}C. Then note any changes in the volume gain of water from each sample.

III. RESULT AND DISSCUSION

In this study, a salinity solution with a concentration of 20% was made to interpret the existing emulsion if it occurs in the field, because it is known that the emulsion contains salt content. Therefore, the authors used sodium chloride as an emulsion-forming component. To prove that diapers waste containing superabsorbent polymer can be used as a demulsifier, it can be seen in Figure 2 which shows the separation of the volume of water in the emulsion formed in the crude oil sample mixed with a 20% salinity solution at a temperature of 26.7^{O}C at a centrifuge speed of 500 RPM in 1 minute.

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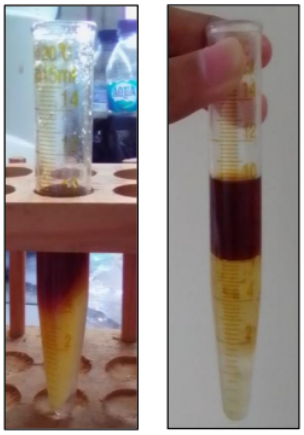

Figure 3. a) The volume of water separated in the 20% emulsion without using waste diapers at a centrifuge speed of 1000 RPM in 1 minute b)The volume of water separated in the 20% emulsion using waste diapers at a centrifuge speed of 1000 RPM in 1 minute

Figure 2 shows that separation with diapers waste is more effective than without using diapers waste, it is proven that diapers waste containing superabsorbent polymer can be used as a demulsifer because of the nature of the superabsorbent polymer which is hydrophilic and can absorb water 200 times its mass.

In addition, to prove that high temperatures can accelerate the demulsification process, it can be seen in graphs 4, 5, 6, and 7.

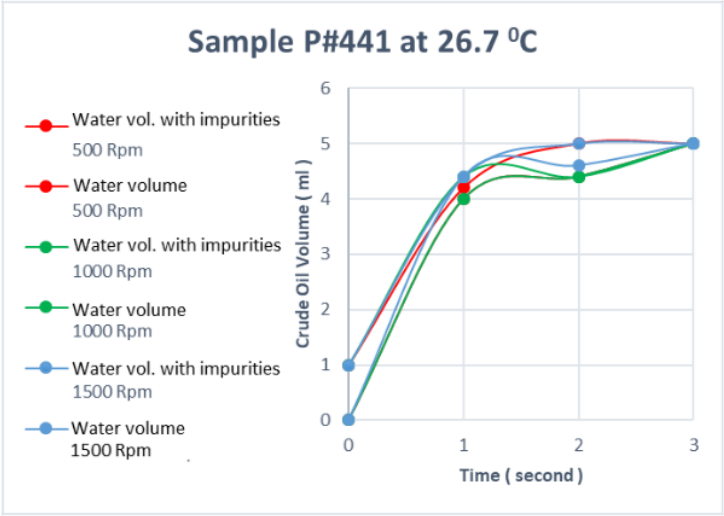

Figure 4. Graph of separate volume of water on a 20% emulsion at 26.7^{O}C

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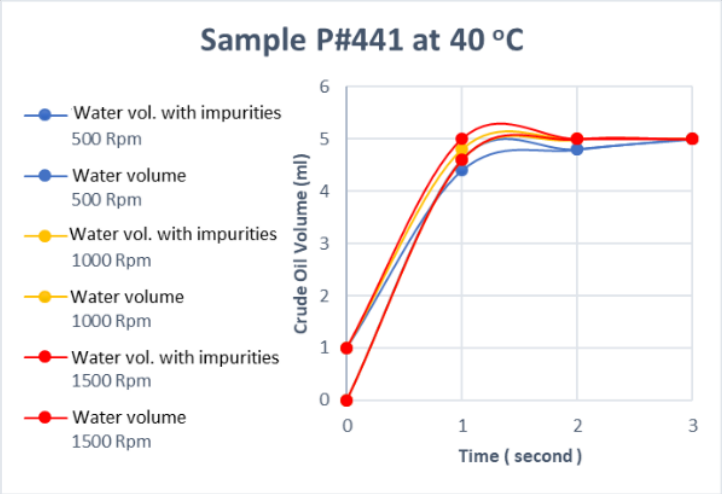

Figure 5. Graph of a separate volume of water on a 20% emulsion at 40^{O}

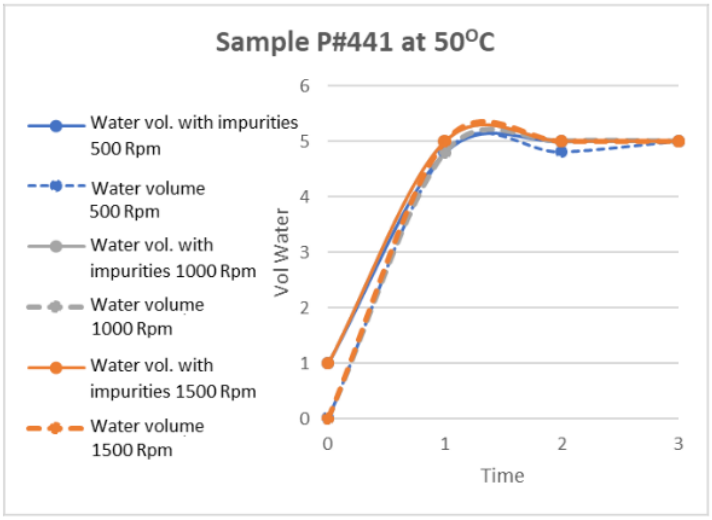

Figure 6. Graph of a separate volume of water on a 20% emulsion at $50^{O}C$

It can be seen in Figure 7 that at a temperature of 50°C the water gain is more than that of 26.7°C and 40°C, it is evident that high temperatures can accelerate demulsification.

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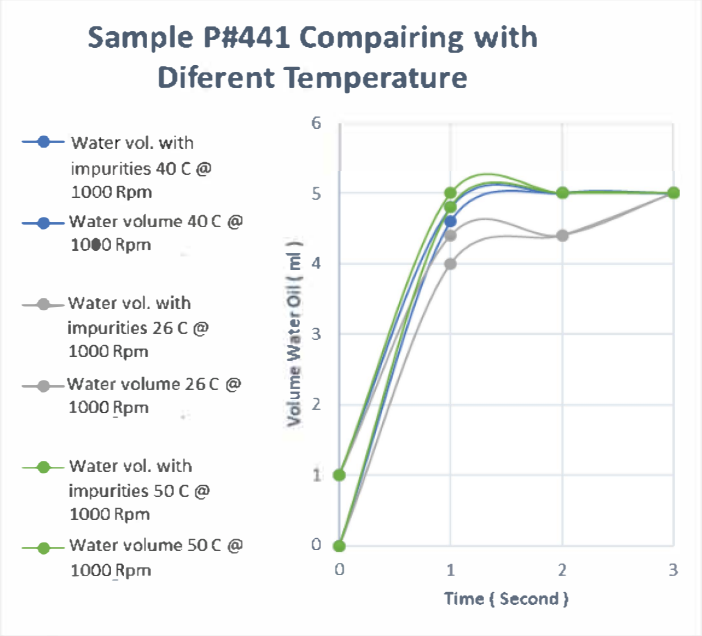

Figure 4. Graph comparison of water volume gain with temperature

IV. CONCLUSION

After To do study in the success diaper baby which containing *super absorbent polymer* which can made emulsifier for damage emulsion stability on oil and water, so Writer can interesting amount conclusion as following:

1. The volume of water obtained is more at the separation by a temperature of 50^{O}C compared to the temperature of 26.7^{O}C and 40^{O}C.
2. High temperatures can accelerate the demulsification process of oil-in-water emulsions.
3. Volume water on emulsion *sample* P#441 which given waste diaper baby which contain *superabsorbent polymer* more many compared to with emulsion *sample* P#441 which no given waste diaper baby.
4. Waste diaper baby proven could made demulsifier on separation emulsion which occur on oil and water, because on study this separation water which use waste diaper baby.

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