UNIVERSITI TEKNOLOGI MARA

EFFECT OF POWER AND FREQUENCY OF ULTRASONIC ENERGY TOWARDS DIESEL SEPARATION FROM SAND

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ABSTRACT

Produced sand is considered as one of major problems during the production of petroleum. When produced sand rise up from the well into the separator, it actually contains some crude oil in it. Produced sand cannot be disposed without proper treatment. Known as ultrasonic separation technique, it is a method for separating the crude oil from the produced sand and at the same time treating the oil sand so that it can be disposed into the environment without harming it. This experiment tests the efficiency of ultrasonic cleaning technique towards different sand weight (10g, 20g, and 30g), different cleaning time (30 minutes and 45 minutes) and also different diesel volume (1.5 ml and 2.5 ml) as well as to see the effect of ultrasonic power towards the morphology of sand after the separation process. By fixing the input of ultrasonic energy to 68 kHz and the power input to 100 watt, the results for the three tests were recorded and the separation percentage obtained from 10g, 20g and 30g sand weight for 30 minutes are 86.57%, 85.84%, and 84.97% respectively. Meanwhile for the test of 45 minutes for the same sand weight, the results obtained are 96.34%, 92.87%, and 90.75% respectively. Results shown that the efficiency of ultrasonic energy affected by the sand weight, cleaning time, and volume of diesel. Also, the size of sand grain before and after separation process was observed and the size of sand grain does decrease due to the effect of ultrasonic energy where it produce bubble which produced and collapsed during the separation process.

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INTRODUCTION

1.1 Research Background

In oil and gas industry, produced sand or oil sand has been considered as major problem that rises during the production of crude oil. Oil sand is referred to a mixture containing sand, water, clay and bitumen. It migrate from the reservoir induced by the flow of reservoir fluids [22]. When the sand particles started to disintegrate from its parent rock, it will flow along with the reservoir fluids into the borehole. Produced sand is the initial point of various problems which related to oil and gas industry that eventually will affect the completion process [22]. This is because oil sand can caused problems which may affect the crude oil production process. For example, sand production can erode equipment, plug wells, and not to forget reduce well productivity [29].

Restraining forces is the force that hold the formation sand in place by opposing the fluid forces in which restraining forces consist of friction between sand grains, natural cementation, the fluid pressure in the rock's pores, and also the capillary pressure. The engineers must have a detailed knowledge of in-situ, mechanical strength of the formation and the ways in which rocks can fail so that they can predict the Sand Production [22]. Usually there are several factors which affect the production of oil sand such as unconsolidated formations, water break-through for weak to intermediate strength formations, reservoir pressure depletion in relatively strong formations, abnormally high lateral tectonic force in relatively strong formations, and sudden change in flow rate or high flow rate [17].

Oil sands can be found in nearly 70 countries. Alberta, Canada, is home to the largest known oil sands deposits, underlying about 140,000 square kilometers of boreal forest after Saudi Arabia [5]. Although Albertan oil sands extraction was not officially recognized as economically viable until 2003, production in the province are known more than doubled between 1995 and 2004, to 1.1 million barrels a day [12]. It is predicted that the region can produce up to five million barrel per day or maybe more by 2030.

Oil sands possess treat to the environment as it is considered toxic because of