PERFORMANCE EVALUATION OF BIODIESEL PRODUCED FROM WASTE TYRE PYROLYTIC OIL AS LUBRICANT ADDITIVE FOR REDUCING LUBRICITY COEFFICIENT IN WATER-BASED MUD.

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(08CN08398)

OCTOBER 2020

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE (M.ENG) DEGREE IN PETROLEUM ENGINEERING IN THE DEPARTMENT OF BIOCHEMISTRY, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY.

OCTOBER 2020.

ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfilment of the requirements for the award of the degree of Master of Engineering/ Sciences/ Arts in Chemical Engineering in the Department of Chemical Engineering, College of Engineering, Covenant University, Ota, Nigeria.

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DECLARATION

IWUAJOKU SANDRA CHIAMAKA (08CN08398) declares that this research was carried out by me under the supervision of Dr Emeka Okoro of the Department of petroleum Engineering, College of Engineering, Covenant University, Ota, Nigeria. I attest that the dissertation has not been presented either wholly or partially for the award of any degree elsewhere. All sources of data and scholarly information used in this dissertation are duly acknowledged.

IWUAJOKU, SANDRA CHIAMAKA

Signature and Date

CERTIFICATION

We certify that this dissertation titled "**PERFORMANCE EVALUATION OF BIODIESEL PRODUCED FROM WASTE TYRE PYROLYTIC OIL AS LUBRICANT ADDITIVE FOR REDUCING LUBRICITY COEFFICIENT IN WATER-BASED MUD.** is an original research work carried out by **SANDRA IWUAJOKU (08CN08398)** in the Department of Petroleum Engineering, College of Engineering, Covenant University, Ota, Ogun State, Nigeria under the supervision of Dr Emeka Okoro. We have examined and found this work acceptable as part of the requirements for the award of Master of Science/Engineering/ Arts in Microbiology, Mechanical Engineering/English.

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(External Examiner) **Signature and Date**

Prof. Akan B. Williams

(Dean, School of postgraduate Studies) **Signature and Date**

DEDICATION

I dedicated this research work to God that is so faithful and gracious to me. To my dear mother Lady U.S.A Iwuajoku for her prayers, words of encouragement and support.

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ABBREVATION

Tpo	Tyre Pyrolytic Oil.
Lc	Lubricity Coefficient.
Rpm	Revolution per Minutes.
Cof	Cofficient of Friction
Cn	Centane Number.
Sv	Saponification Number
Sn	Steric Number
Ofite	Ofi Testing Equipment

ABSTRACT.

Friction, wearing of downhole equipment, torque and drag are a common problem in the drilling operation, therefore, there is need to reduce these drilling problem. Drilling mud plays an important part in drilling oil and gas well because they help transport cutting and lubricate drilling bits. For drilling mud to be effectively used to reduce torque and drag, the mud's lubricity must be improved by adding a lubricant additive. This study aims to experimentally show how pyrolytic oil extracted from waste tyre is used as an environmentally friendly lubricant additive after undergoing a chemical process to reduce the lubricity coefficient of water-based mud. The pyrolysis process was used to extract pyrolytic oil from waste tyre, and the oil comprises hydrocarbons, hetero compounds, and aromatic fractions. These Heterocompound contains Sulphur and nitrogen. The pyrolytic oil was further treated using distillation process to reduce the Sulphur content to an acceptable environmental limit. After the distillation process, the oil was characterized using GC-MS to identify the oil composition, and the result shows that it contains 2.04 g/100g of aliphatic hydrocarbons, 1.96 g/100g of Naphthalene, and 5.99 g/100g of paraffin. The produced biodiesel's through transesterification was analyzed and the structure was identified and the result shows the presence of decanoic acid methyl ester and methyl ester from the analysis. Also, from the analysis, the yield of the produced biodiesel was 56.83%.

The physicochemical properties such as iodine value, free fatty acid, kinematic viscosity, and saponification value and friction of the oil were analyzed, and from the result, kinematic viscosity is reduced from 11.2 mm^2/sec to 5.3 mm^2/sec, which is within the U.S specification (ASTM Standard). Saponification value was 203.36 mg/g for the distilled pyrolytic oil, and the value was then reduced to 197.35 mg/g after the trans-esterification process; also, the coefficient of rolling friction was 0.010, which was done experimentally. Water-based mud was formulated with the produced biodiesel, and a lubricity test was conducted on the formulation to know the performance of the produced lubricant additive in reducing the lubricity coefficient. The lubricity test was done in a lubricity tester, and the analysis was carried out by formulating eleven samples of the water-based mud. The lubricity test result shows that as the concentration of the lubricant additive increases the torque and drag reduces. Comparative analysis of the friction-reducing physicochemical properties and lubricity test of the additive shows that the biodiesel produced from the waste tyre is a suitable additive for improving lubrication and reducing lubricity coefficient.

Keywords: Waste tyre, trans-esterification, physicochemical properties, lubricant additive, Water-based mud, pyrolysis, lubricity test, biodiesel, and distillation.