TECHNO-FEASIBILITY STUDY FOR PRODUCING DRA IN EGYPT USING SYNTHETIC POLYMERS

By

Mohamed Eid Mohamed Gouda Eid

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE
In
Interdisciplinary M.Sc. - Petroleum and Natural Gas Technology

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Title of Thesis:

TECHNO-FEASIBILITY STUDY FOR PRODUCING DRA IN EGYPT USING SYNTHETIC POLYMERS

Key Words:
Drag reducing agents; Fanning factor; Drag reduction; Synthetic polymers

Summary:

The thesis is aimed to study the production of drag reducing agents (DRA's) in Egypt using synthetic polymers, carriers, and additives by implementing several formulations with changing the weight percent of both polymer, carriers, and maintain the weight percent of additives as constant. Analysis of physical and fluid flow properties such as viscosity, shear stress. Fourier Transformation Infrared Spectroscopy (FTIR) is executed on these formulations and the commercial product (control sample) which used in Khalda Petroleum Company. Select the best formulations which take the same trend of the control sample or approach them, and tested them in experimental module which located in SUMED Company at Alexandria terminal to assess the field results of local DRA's and compare the results with the control sample. Assessment of the local prepared DRA's, show that there is an improving effect on reducing the pressure drop through the pipeline which leads to reduction in crude oil pumping energy or an increase in the pipeline capacity. The cost of one of the locally prepared samples is greatly reduced i.e. lower than that of control DRA used currently by crude oil producers.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.
I further declare that I have appropriately acknowledged all sources used and have cited them in the reference section.

Name: Mohamed Eid Mohamed Gouda Eid Date: / /2019

Signature:

Dedication

I dedicate this thesis

To

My family, especially my father, mother, wife and some colleagues at work.

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Mohamed Eid Mohamed Gouda Eid

Table of Contents

List of Tables

List of Figures

Nomenclature

Abbreviations

API	American Petroleum Institute
CAPEC	Capital Expenditures
CAMC	Carboxy methyl cellulose
CMC	Critical Micelle Concentration
C16TAB	N,N,N,Cetyl Trimethyl Ammonium Bromide
DIBK	Diisobutyl Ketone
DRA's	Drag Reducing Agents
EBS	Ethylene bis-stearamide
EG	Ethylene Glycol
EIA	Energy Information Administration
FI	Flow improver
FTIR	Fourier transform infrared spectroscopy
IEA	International Energy Agency
kw	Kilo watt
LPH	Liter Per hour
MAOP	Maximum Allowable Operating Pressure
MDRA	Maximum drag reduction asymptote
MS	Magnesium Stearate
NaSal	Sodium Salicylate
OPEX	operating expenses
P elec.	Electric power consumption
PC	Propylene Carbonate
PG	Propylene Glycol
PIB	Polyisobutylene
PPDs	Pour Point Depressants
ppm	parts per million
PPT	Pour Point Temperature
PS	Polystyrene
RPM	Rotation Per Minute
SDBS	Sodium dodecyl-benzene sulfonate
SLES	Sodium laureth Sulfate
SLS	Sodium lauryl sulfate
SS	Sodium stearate

Subscripts

Lab.	Laboratory
Abbrev.	Abbreviation
Cont.	Continues
Conc.	Concentration
Trans.	Transport
h.	Hour

Symbols

DR%	Drag reduction percent	%
ΔQ %	Rate of increase of flow percent	%
P_i	Inlet pressure of fluid	Barg
P_o	Outlet pressure of fluid	Barg
ΔP	Frictional pressure difference	Barg
C_f	Fanning friction factor	Dimensionless
R_e	Reynolds number	Dimensionless
ρ	Density of transporting fluid	Kg/m^3
μ	Viscosity of fluid	Kg/m.sec
ν	Velocity of fluid flow	m/sec
Q	Flow rate	m^3/h
$	United states dollar	$
$P_{elec.}$	Electric Power Consumption	Kw