SELECTION OF SHALE GAS DRILLING TECHNIQUE FOR SHALE GAS PLAYS IN EGYPT

By

Ibrahim Abo-Zaid Abdel-Hay Mohamed

A Thesis Submitted to the
Faculty of Engineering / Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Petroleum Engineering

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SELECTION OF SHALE GAS DRILLING TECHNIQUE FOR SHALE GAS PLAYS IN EGYPT

Key Words:

Shale Gas Plays; The Drilling Techniques; The Geochemical Properties; The Rate of Penetration.

Summary:

Recently, the shale gas drilling operation has high cost due to low rate of penetration and the encountered problems during the drilling operation which increase the trip time and rig cost. There are eight techniques of shale gas drilling were used in different shale gas plays and achieved improvement in the drilling performance in all case studies. The optimum shale gas drilling technique is selected to be applied in Egypt's shale gas plays by the selection of the closest geochemical properties of shale gas play to shale gas plays in Egypt.

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DEDICATION

I would like to dedicate this work to my dear family especially my daughter who inspired me to work hard to achieve my goals.

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NOMENCLATURE

APL	Annular pressure losses, psi
B	Bit cost, $
BHA	Bottom hole assembly
C_a	Drillcuttings concentration, %
CPF	Cost per foot, $/ft
D	Depth
DAT	Drilling agitator tool
DFV	Dual float valve
D_h	Hole diameter, in
ECD	Equivalent circulating density, ppg
EIA	Energy Information Administration
F	Footage, ft
fph	Foot per hour, ft/hr
G_g	Geothermal gradient
GIP	Gas in place, Tcf
Gp	Pressure gradient, psi/ft
HD	Horizontal displacement, ft
HPJG	Hydraulic pulsed jet generator technique
KES	Kafr El Sheikh
MAST	Mean annual surface temperature, ^oF
MUL	Make-up length, in
OD_p	Outside diameter of drillpipe, in
OVA	Oscillating valve assembly
PDM	Positive displacement motor
Q	Flow rate, gal/min
RDM	Reelwell drilling method
ROP	Rate of penetration (drilled footage/drilling time), ft/hr
R	Rig cost, $
R_o	Vitrinite reflectance, %
SDP	Shale drillpipe technique
SPP	Standpipe pressure, psi
SVA	Stationary valve assembly
Tcf	Trillion cubic feet
T_d	Drilling time, hr
T_F	Formation temperature
TFA	Total flow area, in^2
TR	Torque rocking technique
TRR	Technical recoverable resource, tcf
T_r	Trip time, hr
TOC	Total organic content, % wt
TVD	True vertical depth, ft
WOB	Weight on bit, Ib

Subscripts

a	Annular region
d	Drilling
h	Hole size
o	Percentage of vitrinite particles in individual sample
p	Drillpipe
r	Trip
s	Slip of cuttings in the wellbore
t	Transport of cuttings to the surface