SPREADSHEET PROGRAM FOR DETERMINATION OF RESERVOIR CHARACTERISTICS AND INFLOW PERFORMANCE RELATIONSHIP OF WELLS BY ANALYSING PRESSURE TRANSIENT TESTS

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Abstract: Importance of pressure transient analysis during preparation of development schemes and performance analysis of oil/gas reservoirs is accredited in oil and gas industry due to its usage in estimation of petrophysical parameters of the reservoir and analysis of inflow performance relationship of oil wells, open flow performance of gas wells etc.

In general, data analysis may be stated as a two-fold process: (i) data management, selection and calculations and (ii) plotting of the required data. Most of the available PC based software packages for pressure transient analysis perform complex calculations but are deficient in their data management / graphic output capabilities which usually is rigid and limited. Based on the popular spreadsheet software package Quattro Pro™, a powerful and time-saving spreadsheet program for pressure transient analysis is presented. The spreadsheet prepared is simple to use and can be customised to user's needs by modifying the given format with a provision of further expansion.

Key Words : Spreadsheet program, Oil and Gas Reservoir, Pressure transient test

INTRODUCTION

One of the important goals of reservoir engineering is the attainment of maximum efficiency in the exploitation of oil/gas reservoirs leading to maximum recovery (Nolen-Hoeksema, 1990). This requires that the limits and heterogeneity of reservoirs is properly understood to work out an optimum development plan and to implement enhanced recovery methods. Estimating the unknown properties and a detailed reservoir description is critical in a mathematical reservoir simulation to give a best fit to the measured performance and for future performance predictions (Lee et al., 1986; Kossack, 1989).

It is well known since long that reservoir rocks are heterogeneous at megascopic (kilometer-scale), macroscopic (meter-scale) and microscopic levels. At least for the time being, however, we know very little about these variations and are unable to modify this state of non-homogeneity. Pressure transient tests constitute one of the important tools used for predicting the heterogeneity of reservoirs. Analysis of such test data provides useful information about reservoir extent, formation permeability, fluid pressure, skin (wellbore conditions), flow efficiency etc.

Pressure transient tests requires that the flow rate of a well be changed and the associated changes in bottomhole pressure measured as a function of time. The resulting data provides valuable information for a comprehensive reservoir analysis. These tests are advantageous over many other well testing techniques, most important being that it can be run at any time during the life of a well. A single test can give the data required to infer the desired reservoir

information. Further, the technique is applicable in oil, gas or water wells, fluid/air injection wells or hot water and steam wells.

Unfortunately, pressure transient tests are influenced by several factors that can invalidate part, or all of the test data. A care must, therefore, be taken not only about the stress for accuracy but also for what if situations.

The spreadsheet developed here makes use of the transient tests data to make various calculations and simultaneously generates plots pertaining to pressure buildup, pressure drawdown, two-rate test, influx study, inflow performance tests, isochronal test, pressure fall-off test in water injection and in-situ combustion wells, etc.

THE DATABASE

An electronic spreadsheet is a table made up of columns and rows, where each intersection constitute a cell, making the computer into a giant ledger sheet. Each cell stores a data value or a formula. Whereas a ledger sheet used in accounting is limited in their capacity the electronic spreadsheet is have a maximum size of 234 columns and 8192 rows.

The cells of spreadsheet prepared here can be divided basically into 2 parts. One set contains the basic input data required and the other set is used for calculations. This way each cell contains a data pertaining to pressure, time, formation parameters, oil/gas constants, or a formula. Various graphs are prepared and stored in the spreadsheet with the built-in graphics facility using the above sets of data.

DATA MANAGEMENT

Data management in the spreadsheet not only utilizes the most important features of electronic spreadsheet (ability of automatic incorporation of all the required changes in data and the graphs prepared in the spreadsheet, if even one value changes), but also provides wide applicability along with other facilities.

For preparing the spreadsheet, after invoking the worksheet in Quattro Pro™, data on deflection, division, time, pressure, various constants etc. along with different formulae are entered at appropriate places in the required cells for performing calculations pertaining to the methods used in transient testing. These formulae can be copied up to desired number of rows depending upon the requirement of input data. Design of formulae is limited only by user imagination; one can invoke any simple or multiple logical functions and apply it to any of the fields.

GRAPHIC PRESENTATION

Built-in graphics routines allow up to six ranges of Y data to be plotted against the X range on a cartesian / semi-log / log-log diagram. Various graphs with different graphics settings can be made, stored and recalled. Portions of the graphs can be analysed microscopically using range and scale facilities. Titles and legends can be typed directly on a spreadsheet cell. High quality graphics can be produced with the spreadsheet, including full color ones. The graphics also can be exported to drafting software in order to produce publication-ready laser or dot matrix prints.

PRESENT WORK

Application area of the developed spreadsheet covers up related calculations and various plots pertaining to pressure build-up, pressure drawdown, two-rate test, influx study, inflow performance test, isochronal test, pressure fall-off test in in-situ combustion processes and pressure fall-off test in water injection wells. These plots are Zero time pressure correction plot, Diagnostic plot, MDH plot, Horner plot, Muskat plot, Semi-steady state analysis plot, Two-rate test plot, Plot for static reservoir pressure and productivity index from influx study, Plot for selection of optimum bean size for oil wells, Plot for open flow potential for gas wells (pressure square approach), Plot for isochronal test, Plot for calculation of burnt volume by pressure fall-off test in in-situ combustion wells and plot for pressure fall-off test in water injection wells. This spreadsheet also calculates results of various methods if basic data from the graphs is entered at appropriate places after drawing the semi-steady state / required lines for determining reservoir parameters from the graphs used for calculation of results.

CONCLUSION

The program developed here was used for pro-

cessing transient pressure data. Once the spreadsheet is ready, it does calculations and make graphs as quickly as the new data along with the required constant is entered at the appropriate places. Calculation accuracy with the spreadsheet is far better than measurement precision.

The program is simple to use and can be customised to user needs by modifying the given format, with a capability of further expansion to accommodate wide range of calculations and plots.

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APPENDIX

SPREADSHEET LISTING

- A1: [W23] 'SPREADSHEET PROGRAM FOR DETERMINATION OF RESERVOIR CHARACTERISTICS
- A2: [W23] ' AND INFLOW PERFORMANCE RELATIONSHIP OF WELLS BY ANALYSING
- A3: [W23] ' PRESSURE TRANSIENT TESTS
- J6: (F2) 'ZERO TIME
- K6: [W12] ' OIL
- D7: [W12] ^ Clk. Const.
- E7: [W10] ^ Mano. Const.
- G7: [W11] ^ Measuring Depth
- I7: [W12] ^ Flow Time
- J7: (F2) 'PR.ERROR
- K7: [W12] ^ Rate
- L7: ^ Q2/Q1
- N7: [W11] ^ P1 - cap
- O7: [W11] ^ P2 - cap
- P7: [W11] ^ P3 - cap
- D8: [W12] 0.0144
- E8: [W10] 81.13
- G8: [W11] 900
- H8: [W12] ^ m
- I8: (F2) [W12] 165

J8: (F2) 0
 K8: (F2) [W12] 15.04
 L8: (F2) +K9/K8
 N8: (F2) [W11] 1290
 O8: (F2) [W11] 1390
 P8: (F2) [W11] 1450
 K9: (F2) [W12] 0
 D12: (F2) [W12] ^ D
 E12: (F2) [W10] ^ E
 F12: (F2) [W12] ^ F
 G12: (F2) [W11] ^ G
 H12: [W12] ^ H
 I12: [W12] ^ I
 J12: (F2) ^ J
 K12: [W12] ^ K
 L12: ^ L
 M12: [W11] ^ M
 N12: [W11] ^ N
 O12: [W11] ^ O
 P12: [W11] ' P
 Q12: [W10] ' Q
 R12: ' R
 D13: (F2) [W12] ^ DEL. TIME
 E13: (F2) [W10] ^ PRESSURE
 F13: (F2) [W12] ^ DEL. TIME
 G13: (F2) [W11] ^ PRESSURE
 H13: [W12] ^ PRESSURE
 I13: [W12] ^ DEL - P
 J13: (F2) ^ COR.DEL - P
 K13: [W12] ^ HORNER
 L13: ^ TWO RATE
 M13: [W11] ^ LIN. ANA.
 N13: [W11] ^ MUSKAT PR.
 O13: [W11] ^ MUSKAT PR.
 P13: [W11] ^ MUSKAT PR.
 Q13: (F2) [W10] 'DEL TIME
 R13: 'WATER INJ.
 D14: (F2) [W12] ^ div.
 E14: (F2) [W10] ^ mm
 F14: (F2) [W12] ^ hr
 G14: (F2) [W11] ^ kg/cm2
 H14: [W12] ^ psi
 I14: [W12] ^ psi
 J14: (F2) ^ psi
 K14: [W12] ^ time
 L14: ^ time
 M14: [W11] ^ time
 N14: [W11] ^ psi
 O14: [W11] ^ psi
 P14: [W11] ^ psi
 Q14: (F2) [W10] 'MIN*1 00
 R14: ' time
 A15: [W23] 'TYPE OF STUDIES
 D16: (F4) [W12] 0
 E16: (F4) [W10] 1.029
 F16: (F4) [W12] +\$D\$8*D16
 G16: (F2) [W11] +\$E\$8*E16
 H16: (F2) [W12] +\$E\$8*E16*14.223
 I16: (F2) [W12] @ABS(H16 - \$H\$16)
 J16: (F2) 0
 K16: (F2) [W12] (\$I\$8+F16)/(F16)
 L16: (F2) @LOG((\$I\$8+F16)/(F16))+(\$L\$8)*((@LOG
 (F16)))
 M16: (F2) [W11] @SQRT(\$I\$8+F16) - @SQRT(F16)
 N16: (F2) [W11] (\$N\$8 - H16)
 O16: (F2) [W11] (\$O\$8 - H16)
 P16: (F2) [W11] (\$P\$8 - H16)
 Q16: (F4) [W10] ((\$D\$8*D16*60)/(1000))
 R16: (F4) +F16/(\$I\$8+F16)
 A17: [W23] 'Pr. B/U TEST
 D17: (F4) [W12] 5
 E17: (F4) [W10] 1.0417
 F17: (F4) [W12] +\$D\$8*D17
 G17: (F2) [W11] +\$E\$8*E17
 H17: (F2) [W12] +\$E\$8*E17*14.223
 I17: (F2) [W12] @ABS(H17 - \$H\$16)
 J17: (F2) +I17+\$J\$8
 K17: (F2) [W12] ((\$I\$8+F17)/(F17))
 L17: (F2) @LOG((\$I\$8+F17)/(F17))+(\$L\$8)*((@LOG
 (F17)))
 M17: (F2) [W11] @SQRT(\$I\$8+F17) - @SQRT(F17)
 N17: (F2) [W11] (\$N\$8 - H17)
 O17: (F2) [W11] (\$O\$8 - H17)
 P17: (F2) [W11] (\$P\$8 - H17)
 Q17: (F4) [W10] ((\$D\$8*D17*60)/(1000))
 R17: (F4) +F17/(\$I\$8+F17)
 A18: [W23] 'Pr. D/D TEST
 D18: (F4) [W12] 10
 E18: (F4) [W10] 1.056
 F18: (F4) [W12] +\$D\$8*D18
 G18: (F2) [W11] +\$E\$8*E18
 H18: (F2) [W12] +\$E\$8*E18*14.223
 I18: (F2) [W12] @ABS(H18 - \$H\$16)
 J18: (F2) +I18+\$J\$8
 K18: (F2) [W12] ((\$I\$8+F18)/(F18))
 L18: (F2) @LOG((\$I\$8+F18)/(F18))+(\$L\$8)*((@LOG
 (F18)))
 M18: (F2) [W11] @SQRT(\$I\$8+F18) - @SQRT(F18)
 N18: (F2) [W11] (\$N\$8 - H18)
 O18: (F2) [W11] (\$O\$8 - H18)
 P18: (F2) [W11] (\$P\$8 - H18)
 Q18: (F4) [W10] ((\$D\$8*D18*60)/(1000))
 R18: (F4) +F18/(\$I\$8+F18)
 A19: [W23] 'PR. FALL OFF TEST (WI WELLS)
 D19: (F4) [W12] 15
 E19: (F4) [W10] 1.0625
 F19: (F4) [W12] +\$D\$8*D19
 G19: (F2) [W11] +\$E\$8*E19
 H19: (F2) [W12] +\$E\$8*E19*14.223
 I19: (F2) [W12] @ABS(H19 - \$H\$16)
 J19: (F2) +I19+\$J\$8
 K19: (F2) [W12] ((\$I\$8+F19)/(F19))
 L19: (F2) @LOG((\$I\$8+F19)/(F19))+(\$L\$8)*((@LOG
 (F19)))
 M19: (F2) [W11] @SQRT(\$I\$8+F19) - @SQRT(F19)
 N19: (F2) [W11] (\$N\$8 - H19)
 O19: (F2) [W11] (\$O\$8 - H19)
 P19: (F2) [W11] (\$P\$8 - H19)
 Q19: (F4) [W10] ((\$D\$8*D19*60)/(1000))
 R19: (F4) +F19/(\$I\$8+F19)

A20: [W23] 'PR. FALL OFF TEST

D20: (F4) [W12] 20

E20: (F4) [W10] 1.0698

F20: (F4) [W12] +\$D\$8*D20

G20: (F2) [W11] +\$E\$8*E20

H20: (F2) [W12] +\$E\$8*E20*14.223

I20: (F2) [W12] @ABS(H20 - \$H\$16)

J20: (F2) +I20+\$J\$8

K20: (F2) [W12] ((\$I\$8+F20)/(F20))

L20: (F2) @LOG((\$I\$8+F20)/(F20))+(\$L\$8)*((@LOG
(F20)))

M20: (F2) [W11] @SQRT(\$I\$8+F20) - @SQRT(F20)

N20: (F2) [W11] (\$N\$8 - H20)

O20: (F2) [W11] (\$O\$8 - H20)

P20: (F2) [W11] (\$P\$8 - H20)

Q20: (F4) [W10] ((\$D\$8*D20*60)/(1000))

R20: (F4) +F20/(\$I\$8+F20)

A21: [W23] '(IN - SITU COMBUSTION WELLS)

D21: (F4) [W12] 25

E21: (F4) [W10] 1.0745

F21: (F4) [W12] +\$D\$8*D21

G21: (F2) [W11] +\$E\$8*E21

H21: (F2) [W12] +\$E\$8*E21*14.223

I21: (F2) [W12] @ABS(H21 - \$H\$16)

J21: (F2) +I21+\$J\$8

K21: (F2) [W12] ((\$I\$8+F21)/(F21))

L21: (F2) @LOG((\$I\$8+F21)/(F21))+(\$L\$8)*((@LOG
(F21)))

M21: (F2) [W11] @SQRT(\$I\$8+F21) - @SQRT(F21)

N21: (F2) [W11] (\$N\$8 - H21)

O21: (F2) [W11] (\$O\$8 - H21)

P21: (F2) [W11] (\$P\$8 - H21)

Q21: (F4) [W10] ((\$D\$8*D21*60)/(1000))

R21: (F4) +F21/(\$I\$8+F21)

A22: [W23] 'TWO - RATE TEST

D22: (F4) [W12] 30

E22: (F4) [W10] 1.0787

F22: (F4) [W12] +\$D\$8*D22

G22: (F2) [W11] +\$E\$8*E22

H22: (F2) [W12] +\$E\$8*E22*14.223

I22: (F2) [W12] @ABS(H22 - \$H\$16)

J22: (F2) +I22+\$J\$8

K22: (F2) [W12] ((\$I\$8+F22)/(F22))

L22: (F2) @LOG((\$I\$8+F22)/(F22))+(\$L\$8)*((@LOG
(F22)))

M22: (F2) [W11] @SQRT(\$I\$8+F22) - @SQRT(F22)

N22: (F2) [W11] (\$N\$8 - H22)

O22: (F2) [W11] (\$O\$8 - H22)

P22: (F2) [W11] (\$P\$8 - H22)

Q22: (F4) [W10] ((\$D\$8*D22*60)/(1000))

R22: (F4) +F22/(\$I\$8+F22)

D23: (F4) [W12] 40

E23: (F4) [W10] 1.0795

F23: (F4) [W12] +\$D\$8*D23

G23: (F2) [W11] +\$E\$8*E23

H23: (F2) [W12] +\$E\$8*E23*14.223

I23: (F2) [W12] @ABS(H23 - \$H\$16)

J23: (F2) +I23+\$J\$8

K23: (F2) [W12] ((\$I\$8+F23)/(F23))

L23: (F2) @LOG((\$I\$8+F23)/(F23))+(\$L\$8)*((@LOG

(F23)))

M23: (F2) [W11] @SQRT(\$I\$8+F23) - @SQRT(F23)

N23: (F2) [W11] (\$N\$8 - H23)

O23: (F2) [W11] (\$O\$8 - H23)

P23: (F2) [W11] (\$P\$8 - H23)

Q23: (F4) [W10] ((\$D\$8*D23*60)/(1000))

R23: (F4) +F23/(\$I\$8+F23)

A24: [W23] 'PLOTS:

D24: (F4) [W12] 50

E24: (F4) [W10] 1.0821

F24: (F4) [W12] +\$D\$8*D24

G24: (F2) [W11] +\$E\$8*E24

H24: (F2) [W12] +\$E\$8*E24*14.223

I24: (F2) [W12] @ABS(H24 - \$H\$16)

J24: (F2) +I24+\$J\$8

K24: (F2) [W12] ((\$I\$8+F24)/(F24))

L24: (F2) @LOG((\$I\$8+F24)/(F24))+(\$L\$8)*((@LOG
(F24)))

M24: (F2) [W11] @SQRT(\$I\$8+F24) - @SQRT(F24)

N24: (F2) [W11] (\$N\$8 - H24)

O24: (F2) [W11] (\$O\$8 - H24)

P24: (F2) [W11] (\$P\$8 - H24)

Q24: (F4) [W10] ((\$D\$8*D24*60)/(1000))

R24: (F4) +F24/(\$I\$8+F24)

D25: (F4) [W12] 70

E25: (F4) [W10] 1.095

F25: (F4) [W12] +\$D\$8*D25

G25: (F2) [W11] +\$E\$8*E25

H25: (F2) [W12] +\$E\$8*E25*14.223

I25: (F2) [W12] @ABS(H25 - \$H\$16)

J25: (F2) +I25+\$J\$8

K25: (F2) [W12] ((\$I\$8+F25)/(F25))

L25: (F2) @LOG((\$I\$8+F25)/(F25))+(\$L\$8)*((@LOG
(F25)))

M25: (F2) [W11] @SQRT(\$I\$8+F25) - @SQRT(F25)

N25: (F2) [W11] (\$N\$8 - H25)

O25: (F2) [W11] (\$O\$8 - H25)

P25: (F2) [W11] (\$P\$8 - H25)

Q25: (F4) [W10] ((\$D\$8*D25*60)/(1000))

R25: (F4) +F25/(\$I\$8+F25)

A26: [W23] 'ZERO TIME PR. ERROR

D26: (F4) [W12] 80

E26: (F4) [W10] 1.0988

F26: (F4) [W12] +\$D\$8*D26

G26: (F2) [W11] +\$E\$8*E26

H26: (F2) [W12] +\$E\$8*E26*14.223

I26: (F2) [W12] @ABS(H26 - \$H\$16)

J26: (F2) +I26+\$J\$8

K26: (F2) [W12] ((\$I\$8+F26)/(F26))

L26: (F2) @LOG((\$I\$8+F26)/(F26))+(\$L\$8)*((@LOG
(F26)))

M26: (F2) [W11] @SQRT(\$I\$8+F26) - @SQRT(F26)

N26: (F2) [W11] (\$N\$8 - H26)

O26: (F2) [W11] (\$O\$8 - H26)

P26: (F2) [W11] (\$P\$8 - H26)

Q26: (F4) [W10] ((\$D\$8*D26*60)/(1000))

R26: (F4) +F26/(\$I\$8+F26)

A27: [W23] 'LIN. ANALYSIS

D27: (F4) [W12] 90

E27: (F4) [W10] 1.1021

F27: (F4) [W12] +\$D\$8*D27
 G27: (F2) [W11] +\$E\$8*E27
 H27: (F2) [W12] +\$E\$8*E27*14.223
 I27: (F2) [W12] @ABS(H27 - \$H\$16)
 J27: (F2) +I27+\$J\$8
 K27: (F2) [W12] ((\$I\$8+F27)/(F27))
 L27: (F2) @LOG((\$I\$8+F27)/(F27))+(\$L\$8)*((@LOG
 (F27)))
 M27: (F2) [W11] @SQRT(\$I\$8+F27) - @SQRT(F27)
 N27: (F2) [W11] (\$N\$8 - H27)
 O27: (F2) [W11] (\$O\$8 - H27)
 P27: (F2) [W11] (\$P\$8 - H27)
 Q27: (F4) [W10] ((\$D\$8*D27*60)/(1000))
 R27: (F4) +F27/(\$I\$8+F27)
 A28: [W23] 'DIAGNOSTIC
 D28: (F4) [W12] 100
 E28: (F4) [W10] 1.105
 F28: (F4) [W12] +\$D\$8*D28
 G28: (F2) [W11] +\$E\$8*E28
 H28: (F2) [W12] +\$E\$8*E28*14.223
 I28: (F2) [W12] @ABS(H28 - \$H\$16)
 J28: (F2) +I28+\$J\$8
 K28: (F2) [W12] ((\$I\$8+F28)/(F28))
 L28: (F2) @LOG((\$I\$8+F28)/(F28))+(\$L\$8)*((@LOG
 (F28)))
 M28: (F2) [W11] @SQRT(\$I\$8+F28) - @SQRT(F28)
 N28: (F2) [W11] (\$N\$8 - H28)
 O28: (F2) [W11] (\$O\$8 - H28)
 P28: (F2) [W11] (\$P\$8 - H28)
 Q28: (F4) [W10] ((\$D\$8*D28*60)/(1000))
 R28: (F4) +F28/(\$I\$8+F28)
 A29: [W23] 'MDH
 D29: (F4) [W12] 110
 E29: (F4) [W10] 1.1075
 F29: (F4) [W12] +\$D\$8*D29
 G29: (F2) [W11] +\$E\$8*E29
 H29: (F2) [W12] +\$E\$8*E29*14.223
 I29: (F2) [W12] @ABS(H29 - \$H\$16)
 J29: (F2) +I29+\$J\$8
 K29: (F2) [W12] ((\$I\$8+F29)/(F29))
 L29: (F2) @LOG((\$I\$8+F29)/(F29))+(\$L\$8)*((@LOG
 (F29)))
 M29: (F2) [W11] @SQRT(\$I\$8+F29) - @SQRT(F29)
 N29: (F2) [W11] (\$N\$8 - H29)
 O29: (F2) [W11] (\$O\$8 - H29)
 P29: (F2) [W11] (\$P\$8 - H29)
 Q29: (F4) [W10] ((\$D\$8*D29*60)/(1000))
 R29: (F4) +F29/(\$I\$8+F29)
 A30: [W23] 'HORNOR
 D30: (F4) [W12] 120
 E30: (F4) [W10] 1.108
 F30: (F4) [W12] +\$D\$8*D30
 G30: (F2) [W11] +\$E\$8*E30
 H30: (F2) [W12] +\$E\$8*E30*14.223
 I30: (F2) [W12] @ABS(H30 - \$H\$16)
 J30: (F2) +I30+\$J\$8
 K30: (F2) [W12] ((\$I\$8+F30)/(F30))
 L30: (F2) @LOG((\$I\$8+F30)/(F30))+(\$L\$8)*((@LOG
 (F30)))
 M30: (F2) [W11] @SQRT(\$I\$8+F30) - @SQRT(F30)
 N30: (F2) [W11] (\$N\$8 - H30)
 O30: (F2) [W11] (\$O\$8 - H30)
 P30: (F2) [W11] (\$P\$8 - H30)
 Q30: (F4) [W10] ((\$D\$8*D30*60)/(1000))
 R30: (F4) +F30/(\$I\$8+F30)
 A31: [W23] 'MUSKAT
 D31: (F4) [W12] 140
 E31: (F4) [W10] 1.111
 F31: (F4) [W12] +\$D\$8*D31
 G31: (F2) [W11] +\$E\$8*E31
 H31: (F2) [W12] +\$E\$8*E31*14.223
 I31: (F2) [W12] @ABS(H31 - \$H\$16)
 J31: (F2) +I31+\$J\$8
 K31: (F2) [W12] ((\$I\$8+F31)/(F31))
 L31: (F2) @LOG((\$I\$8+F31)/(F31))+(\$L\$8)*((@LOG
 (F31)))
 M31: (F2) [W11] @SQRT(\$I\$8+F31) - @SQRT(F31)
 N31: (F2) [W11] (\$N\$8 - H31)
 O31: (F2) [W11] (\$O\$8 - H31)
 P31: (F2) [W11] (\$P\$8 - H31)
 Q31: (F4) [W10] ((\$D\$8*D31*60)/(1000))
 R31: (F4) +F31/(\$I\$8+F31)
 A32: [W23] 'SEMI STEADY STAE ANALYSIS
 D32: (F4) [W12] 200
 E32: (F4) [W10] 1.1135
 F32: (F4) [W12] +\$D\$8*D32
 G32: (F2) [W11] +\$E\$8*E32
 H32: (F2) [W12] +\$E\$8*E32*14.223
 I32: (F2) [W12] @ABS(H32 - \$H\$16)
 J32: (F2) +I32+\$J\$8
 K32: (F2) [W12] ((\$I\$8+F32)/(F32))
 L32: (F2) @LOG((\$I\$8+F32)/(F32))+(\$L\$8)*((@LOG
 (F32)))
 M32: (F2) [W11] @SQRT(\$I\$8+F32) - @SQRT(F32)
 N32: (F2) [W11] (\$N\$8 - H32)
 O32: (F2) [W11] (\$O\$8 - H32)
 P32: (F2) [W11] (\$P\$8 - H32)
 Q32: (F4) [W10] ((\$D\$8*D32*60)/(1000))
 R32: (F4) +F32/(\$I\$8+F32)
 A33: [W23] 'PLOT FOR WI WELL
 D33: (F4) [W12] 250
 E33: (F4) [W10] 1.1145
 F33: (F4) [W12] +\$D\$8*D33
 G33: (F2) [W11] +\$E\$8*E33
 H33: (F2) [W12] +\$E\$8*E33*14.223
 I33: (F2) [W12] @ABS(H33 - \$H\$16)
 J33: (F2) +I33+\$J\$8
 K33: (F2) [W12] ((\$I\$8+F33)/(F33))
 L33: (F2) @LOG((\$I\$8+F33)/(F33))+(\$L\$8)*((@LOG
 (F33)))
 M33: (F2) [W11] @SQRT(\$I\$8+F33) - @SQRT(F33)
 N33: (F2) [W11] (\$N\$8 - H33)
 O33: (F2) [W11] (\$O\$8 - H33)
 P33: (F2) [W11] (\$P\$8 - H33)
 Q33: (F4) [W10] ((\$D\$8*D33*60)/(1000))
 R33: (F4) +F33/(\$I\$8+F33)
 A34: [W23] 'TWO - RATE TEST PLOT
 D34: (F4) [W12] 300
 E34: (F4) [W10] 1.116
 F34: (F4) [W12] +\$D\$8*D34

G34: (F2) [W11] +\$E\$8*E34
 H34: (F2) [W12] +\$E\$8*E34*14.223
 I34: (F2) [W12] @ABS(H34 - \$H\$16)
 J34: (F2) +I34+\$J\$8
 K34: (F2) [W12] ((\$I\$8+F34)/(F34))
 L34: (F2) @LOG((\$I\$8+F34)/(F34))+(\$L\$8)*((@LOG
 (F34)))
 M34: (F2) [W11] @SQRT(\$I\$8+F34) - @SQRT(F34)
 N34: (F2) [W11] (\$N\$8 - H34)
 O34: (F2) [W11] (\$O\$8 - H34)
 P34: (F2) [W11] (\$P\$8 - H34)
 Q34: (F4) [W10] ((\$D\$8*D34*60)/(1000))
 R34: (F4) +F34/(\$I\$8+F34)
 A35: [W23] 'WRB PLOT
 D35: (F4) [W12] 400
 E35: (F4) [W10] 1.117
 F35: (F4) [W12] +\$D\$8*D35
 G35: (F2) [W11] +\$E\$8*E35
 H35: (F2) [W12] +\$E\$8*E35*14.223
 I35: (F2) [W12] @ABS(H35 - \$H\$16)
 J35: (F2) +I35+\$J\$8
 K35: (F2) [W12] ((\$I\$8+F35)/(F35))
 L35: (F2) @LOG((\$I\$8+F35)/(F35))+(\$L\$8)*((@LOG
 (F35)))
 M35: (F2) [W11] @SQRT(\$I\$8+F35) - @SQRT(F35)
 N35: (F2) [W11] (\$N\$8 - H35)
 O35: (F2) [W11] (\$O\$8 - H35)
 P35: (F2) [W11] (\$P\$8 - H35)
 Q35: (F4) [W10] ((\$D\$8*D35*60)/(1000))
 R35: (F4) +F35/(\$I\$8+F35)
 D36: (F4) [W12] 500
 E36: (F4) [W10] 1.118
 F36: (F4) [W12] +\$D\$8*D36
 G36: (F2) [W11] +\$E\$8*E36
 H36: (F2) [W12] +\$E\$8*E36*14.223
 I36: (F2) [W12] @ABS(H36 - \$H\$16)
 J36: (F2) +I36+\$J\$8
 K36: (F2) [W12] ((\$I\$8+F36)/(F36))
 L36: (F2) @LOG((\$I\$8+F36)/(F36))+(\$L\$8)*((@LOG
 (F36)))
 M36: (F2) [W11] @SQRT(\$I\$8+F36) - @SQRT(F36)
 N36: (F2) [W11] (\$N\$8 - H36)
 O36: (F2) [W11] (\$O\$8 - H36)
 P36: (F2) [W11] (\$P\$8 - H36)
 Q36: (F4) [W10] ((\$D\$8*D36*60)/(1000))
 R36: (F4) +F36/(\$I\$8+F36)
 D37: (F4) [W12] 700
 E37: (F4) [W10] 1.119
 F37: (F4) [W12] +\$D\$8*D37
 G37: (F2) [W11] +\$E\$8*E37
 H37: (F2) [W12] +\$E\$8*E37*14.223
 I37: (F2) [W12] @ABS(H37 - \$H\$16)
 J37: (F2) +I37+\$J\$8
 K37: (F2) [W12] ((\$I\$8+F37)/(F37))
 L37: (F2) @LOG((\$I\$8+F37)/(F37))+(\$L\$8)*((@LOG
 (F37)))
 M37: (F2) [W11] @SQRT(\$I\$8+F37) - @SQRT(F37)
 N37: (F2) [W11] (\$N\$8 - H37)
 O37: (F2) [W11] (\$O\$8 - H37)
 P37: (F2) [W11] (\$P\$8 - H37)
 Q37: (F4) [W10] ((\$D\$8*D37*60)/(1000))
 R37: (F4) +F37/(\$I\$8+F37)
 D38: (F4) [W12] 900
 E38: (F4) [W10] 1.1205
 F38: (F4) [W12] +\$D\$8*D38
 G38: (F2) [W11] +\$E\$8*E38
 H38: (F2) [W12] +\$E\$8*E38*14.223
 I38: (F2) [W12] @ABS(H38 - \$H\$16)
 J38: (F2) +I38+\$J\$8
 K38: (F2) [W12] ((\$I\$8+F38)/(F38))
 L38: (F2) @LOG((\$I\$8+F38)/(F38))+(\$L\$8)*((@LOG
 (F38)))
 M38: (F2) [W11] @SQRT(\$I\$8+F38) - @SQRT(F38)
 N38: (F2) [W11] (\$N\$8 - H38)
 O38: (F2) [W11] (\$O\$8 - H38)
 P38: (F2) [W11] (\$P\$8 - H38)
 Q38: (F4) [W10] ((\$D\$8*D38*60)/(1000))
 R38: (F4) +F38/(\$I\$8+F38)
 D39: (F4) [W12] 1100
 E39: (F4) [W10] 1.121
 F39: (F4) [W12] +\$D\$8*D39
 G39: (F2) [W11] +\$E\$8*E39
 H39: (F2) [W12] +\$E\$8*E39*14.223
 I39: (F2) [W12] @ABS(H39 - \$H\$16)
 J39: (F2) +I39+\$J\$8
 K39: (F2) [W12] ((\$I\$8+F39)/(F39))
 L39: (F2) @LOG((\$I\$8+F39)/(F39))+(\$L\$8)*((@LOG
 (F39)))
 M39: (F2) [W11] @SQRT(\$I\$8+F39) - @SQRT(F39)
 N39: (F2) [W11] (\$N\$8 - H39)
 O39: (F2) [W11] (\$O\$8 - H39)
 P39: (F2) [W11] (\$P\$8 - H39)
 Q39: (F4) [W10] ((\$D\$8*D39*60)/(1000))
 R39: (F4) +F39/(\$I\$8+F39)
 D40: (F4) [W12] 1500
 E40: (F4) [W10] 1.1225
 F40: (F4) [W12] +\$D\$8*D40
 G40: (F2) [W11] +\$E\$8*E40
 H40: (F2) [W12] +\$E\$8*E40*14.223
 I40: (F2) [W12] @ABS(H40 - \$H\$16)
 J40: (F2) +I40+\$J\$8
 K40: (F2) [W12] ((\$I\$8+F40)/(F40))
 L40: (F2) @LOG((\$I\$8+F40)/(F40))+(\$L\$8)*((@LOG
 (F40)))
 M40: (F2) [W11] @SQRT(\$I\$8+F40) - @SQRT(F40)
 N40: (F2) [W11] (\$N\$8 - H40)
 O40: (F2) [W11] (\$O\$8 - H40)
 P40: (F2) [W11] (\$P\$8 - H40)
 Q40: (F4) [W10] ((\$D\$8*D40*60)/(1000))
 R40: (F4) +F40/(\$I\$8+F40)
 D41: (F4) [W12] 1800
 E41: (F4) [W10] 1.1235
 F41: (F4) [W12] +\$D\$8*D41
 G41: (F2) [W11] +\$E\$8*E41
 H41: (F2) [W12] +\$E\$8*E41*14.223
 I41: (F2) [W12] @ABS(H41 - \$H\$16)
 J41: (F2) +I41+\$J\$8
 K41: (F2) [W12] ((\$I\$8+F41)/(F41))
 L41: (F2) @LOG((\$I\$8+F41)/(F41))+(\$L\$8)*((@LOG
 (F41)))

M41: (F2) [W11] @SQRT(\$I\$8+F41) - @SQRT(F41)
N41: (F2) [W11] (\$N\$8 - H41)
O41: (F2) [W11] (\$O\$8 - H41)
P41: (F2) [W11] (\$P\$8 - H41)
Q41: (F4) [W10] ((\$D\$8*D41*60)/(1000))
R41: (F4) +F41/(\$I\$8+F41)
D42: (F4) [W12] 2083
E42: (F4) [W10] 1.1235
F42: (F4) [W12] +\$D\$8*D42
G42: (F2) [W11] +\$E\$8*E42
H42: (F2) [W12] +\$E\$8*E42*14.223
I42: (F2) [W12] @ABS(H42 - \$H\$16)
J42: (F2) +I42+\$J\$8
K42: (F2) [W12] ((\$I\$8+F42)/(F42))
L42: (F2) @LOG((\$I\$8+F42)/(F42))+(\$L\$8)*((@LOG
(F42)))
M42: (F2) [W11] @SQRT(\$I\$8+F42) - @SQRT(F42)
N42: (F2) [W11] (\$N\$8 - H42)
O42: (F2) [W11] (\$O\$8 - H42)
P42: (F2) [W11] (\$P\$8 - H42)
Q42: (F4) [W10] ((\$D\$8*D42*60)/(1000))
R42: (F4) +F42/(\$I\$8+F42)
D43: (F4) [W12] 2916
E43: (F4) [W10] 1.127
F43: (F4) [W12] +\$D\$8*D43
G43: (F2) [W11] +\$E\$8*E43
H43: (F2) [W12] +\$E\$8*E43*14.223
I43: (F2) [W12] @ABS(H43 - \$H\$16)
J43: (F2) +I43+\$J\$8
K43: (F2) [W12] ((\$I\$8+F43)/(F43))
L43: (F2) @LOG((\$I\$8+F43)/(F43))+(\$L\$8)*((@LOG
(F43)))
M43: (F2) [W11] @SQRT(\$I\$8+F43) - @SQRT(F43)
N43: (F2) [W11] (\$N\$8 - H43)
O43: (F2) [W11] (\$O\$8 - H43)
P43: (F2) [W11] (\$P\$8 - H43)
Q43: (F4) [W10] ((\$D\$8*D43*60)/(1000))
R43: (F4) +F43/(\$I\$8+F43)
D44: (F4) [W12] 3750
E44: (F4) [W10] 1.128
F44: (F4) [W12] +\$D\$8*D44
G44: (F2) [W11] +\$E\$8*E44
H44: (F2) [W12] +\$E\$8*E44*14.223
I44: (F2) [W12] @ABS(H44 - \$H\$16)
J44: (F2) +I44+\$J\$8
K44: (F2) [W12] ((\$I\$8+F44)/(F44))
L44: (F2) @LOG((\$I\$8+F44)/(F44))+(\$L\$8)*((@LOG
(F44)))
M44: (F2) [W11] @SQRT(\$I\$8+F44) - @SQRT(F44)
N44: (F2) [W11] (\$N\$8 - H44)
O44: (F2) [W11] (\$O\$8 - H44)
P44: (F2) [W11] (\$P\$8 - H44)
Q44: (F4) [W10] ((\$D\$8*D44*60)/(1000))
R44: (F4) +F44/(\$I\$8+F44)
D45: (F4) [W12] 4166
E45: (F4) [W10] 1.128
F45: (F4) [W12] +\$D\$8*D45
G45: (F2) [W11] +\$E\$8*E45
H45: (F2) [W12] +\$E\$8*E45*14.223
I45: (F2) [W12] @ABS(H45 - \$H\$16)
J45: (F2) +I45+\$J\$8
K45: (F2) [W12] ((\$I\$8+F45)/(F45))
L45: (F2) @LOG((\$I\$8+F45)/(F45))+(\$L\$8)*((@LOG
(F45)))
M45: (F2) [W11] @SQRT(\$I\$8+F45) - @SQRT(F45)
N45: (F2) [W11] (\$N\$8 - H45)
O45: (F2) [W11] (\$O\$8 - H45)
P45: (F2) [W11] (\$P\$8 - H45)
Q45: (F4) [W10] ((\$D\$8*D45*60)/(1000))
R45: (F4) +F45/(\$I\$8+F45)
D46: (F4) [W12] 4219
E46: (F4) [W10] 1.128
F46: (F4) [W12] +\$D\$8*D46
G46: (F2) [W11] +\$E\$8*E46
H46: (F2) [W12] +\$E\$8*E46*14.223
I46: (F2) [W12] @ABS(H46 - \$H\$16)
J46: (F2) +I46+\$J\$8
K46: (F2) [W12] ((\$I\$8+F46)/(F46))
L46: (F2) @LOG((\$I\$8+F46)/(F46))+(\$L\$8)*((@LOG
(F46)))
M46: (F2) [W11] @SQRT(\$I\$8+F46) - @SQRT(F46)
N46: (F2) [W11] (\$N\$8 - H46)
O46: (F2) [W11] (\$O\$8 - H46)
P46: (F2) [W11] (\$P\$8 - H46)
Q46: (F4) [W10] ((\$D\$8*D46*60)/(1000))
R46: (F4) +F46/(\$I\$8+F46)
A51: [W23] 'INFLUX - STUDY:
F51: [W12] 'Pi(psi)
G51: [W11] ^ Po(psi)
F52: [W12] 1750
G52: [W11] 1067.76
D55: (F2) [W12] ^ D
E55: (F2) [W10] ^ E
F55: (F2) [W12] ^ F
G55: (F2) [W11] ^ G
H55: [W12] ^ H
I55: [W12] ^ I
J55: ^ J
K55: [W12] ^ K
L55: ^ L
M55: [W11] ^ M
D56: (F2) [W12] ^ DEL. TIME
E56: (F2) [W10] ^ PRESSURE
F56: (F2) [W12] ^ DEL. TIME
G56: (F2) [W11] ^ PRESSURE
H56: [W12] ^ PRESSURE
I56: [W12] ^ DEL - P
J56: ^ DEL - P/DEL - T
K56: [W12] ^ DEL - P/DEL - T
L56: ^ TIME
M56: [W11] ^ (Pi - Pw)/
D57: (F2) [W12] ^ div.
E57: (F2) [W10] ^ mm
F57: (F2) [W12] ^ hr
G57: (F2) [W11] ^ kg/cm2
H57: [W12] ^ psi
I57: [W12] ^ psi
J57: ^ psi/1hr
K57: [W12] ^ psi/2hr
L57: ^ minute

M57: [W11] $\wedge$ (Pi - Po)
D59: (F4) [W12] 0
E59: (F4) [W10] 0.9366
F59: (F4) [W12] +\$D\$8*D59
G59: (F2) [W11] +\$E\$8*E59
H59: (F2) [W12] +\$E\$8*E59*14.223
I59: (F2) [W12] @ABS(H59 - \$H\$59)
L59: (F2) (D59*\$D\$8)*60
M59: (F2) [W11] (\$F\$52 - H59)/(\$F\$52 - \$G\$52)
D60: (F4) [W12] +D59+69.44
E60: (F4) [W10] 0.9656
F60: (F4) [W12] +\$D\$8*D60
G60: (F2) [W11] +\$E\$8*E60
H60: (F2) [W12] +\$E\$8*E60*14.223
I60: (F2) [W12] @ABS(H60 - \$H\$59)
J60: (F2) (H61 - H60)
L60: (F2) (D60*\$D\$8)*60
M60: (F2) [W11] (\$F\$52 - H60)/(\$F\$52 - \$G\$52)
D61: (F4) [W12] +D60+69.44
E61: (F4) [W10] 0.9917
F61: (F4) [W12] +\$D\$8*D61
G61: (F2) [W11] +\$E\$8*E61
H61: (F2) [W12] +\$E\$8*E61*14.223
I61: (F2) [W12] @ABS(H61 - \$H\$59)
J61: (F2) (H62 - H61)
K61: (F2) [W12] (H61 - H59)
L61: (F2) (D61*\$D\$8)*60
M61: (F2) [W11] (\$F\$52 - H61)/(\$F\$52 - \$G\$52)
D62: (F4) [W12] +D61+69.44
E62: (F4) [W10] 1.0149
F62: (F4) [W12] +\$D\$8*D62
G62: (F2) [W11] +\$E\$8*E62
H62: (F2) [W12] +\$E\$8*E62*14.223
I62: (F2) [W12] @ABS(H62 - \$H\$59)
J62: (F2) (H63 - H62)
K62: (F2) [W12] (H62 - H60)
L62: (F2) (D62*\$D\$8)*60
M62: (F2) [W11] (\$F\$52 - H62)/(\$F\$52 - \$G\$52)
D63: (F4) [W12] +D62+69.44
E63: (F4) [W10] 1.0356
F63: (F4) [W12] +\$D\$8*D63
G63: (F2) [W11] +\$E\$8*E63
H63: (F2) [W12] +\$E\$8*E63*14.223
I63: (F2) [W12] @ABS(H63 - \$H\$59)
J63: (F2) (H64 - H63)
K63: (F2) [W12] (H63 - H61)
L63: (F2) (D63*\$D\$8)*60
M63: (F2) [W11] (\$F\$52 - H63)/(\$F\$52 - \$G\$52)
D64: (F4) [W12] +D63+69.44
E64: (F4) [W10] 1.0552
F64: (F4) [W12] +\$D\$8*D64
G64: (F2) [W11] +\$E\$8*E64
H64: (F2) [W12] +\$E\$8*E64*14.223
I64: (F2) [W12] @ABS(H64 - \$H\$59)
J64: (F2) (H65 - H64)
K64: (F2) [W12] (H64 - H62)
L64: (F2) (D64*\$D\$8)*60
M64: (F2) [W11] (\$F\$52 - H64)/(\$F\$52 - \$G\$52)
D65: (F4) [W12] +D64+69.44
E65: (F4) [W10] 1.07318
F65: (F4) [W12] +\$D\$8*D65
G65: (F2) [W11] +\$E\$8*E65
H65: (F2) [W12] +\$E\$8*E65*14.223
I65: (F2) [W12] @ABS(H65 - \$H\$59)
J65: (F2) (H66 - H65)
K65: (F2) [W12] (H65 - H63)
L65: (F2) (D65*\$D\$8)*60
M65: (F2) [W11] (\$F\$52 - H65)/(\$F\$52 - \$G\$52)
D66: (F4) [W12] +D65+69.44
E66: (F4) [W10] 1.0908
F66: (F4) [W12] +\$D\$8*D66
G66: (F2) [W11] +\$E\$8*E66
H66: (F2) [W12] +\$E\$8*E66*14.223
I66: (F2) [W12] @ABS(H66 - \$H\$59)
J66: (F2) (H67 - H66)
K66: (F2) [W12] (H66 - H64)
L66: (F2) (D66*\$D\$8)*60
M66: (F2) [W11] (\$F\$52 - H66)/(\$F\$52 - \$G\$52)
D67: (F4) [W12] +D66+69.44
E67: (F4) [W10] 1.1072
F67: (F4) [W12] +\$D\$8*D67
G67: (F2) [W11] +\$E\$8*E67
H67: (F2) [W12] +\$E\$8*E67*14.223
I67: (F2) [W12] @ABS(H67 - \$H\$59)
J67: (F2) (H68 - H67)
K67: (F2) [W12] (H67 - H65)
L67: (F2) (D67*\$D\$8)*60
M67: (F2) [W11] (\$F\$52 - H67)/(\$F\$52 - \$G\$52)
D68: (F4) [W12] +D67+69.44
E68: (F4) [W10] 1.12196
F68: (F4) [W12] +\$D\$8*D68
G68: (F2) [W11] +\$E\$8*E68
H68: (F2) [W12] +\$E\$8*E68*14.223
I68: (F2) [W12] @ABS(H68 - \$H\$59)
J68: (F2) (H69 - H68)
K68: (F2) [W12] (H68 - H66)
L68: (F2) (D68*\$D\$8)*60
M68: (F2) [W11] (\$F\$52 - H68)/(\$F\$52 - \$G\$52)
D69: (F4) [W12] +D68+69.44
E69: (F4) [W10] 1.1363
F69: (F4) [W12] +\$D\$8*D69
G69: (F2) [W11] +\$E\$8*E69
H69: (F2) [W12] +\$E\$8*E69*14.223
I69: (F2) [W12] @ABS(H69 - \$H\$59)
J69: (F2) (H70 - H69)
K69: (F2) [W12] (H69 - H67)
L69: (F2) (D69*\$D\$8)*60
M69: (F2) [W11] (\$F\$52 - H69)/(\$F\$52 - \$G\$52)
D70: (F4) [W12] +D69+69.44
E70: (F4) [W10] 1.1501
F70: (F4) [W12] +\$D\$8*D70
G70: (F2) [W11] +\$E\$8*E70
H70: (F2) [W12] +\$E\$8*E70*14.223
I70: (F2) [W12] @ABS(H70 - \$H\$59)
J70: (F2) (H71 - H70)
K70: (F2) [W12] (H70 - H68)
L70: (F2) (D70*\$D\$8)*60
M70: (F2) [W11] (\$F\$52 - H70)/(\$F\$52 - \$G\$52)
D71: (F4) [W12] +D70+69.44
E71: (F4) [W10] 1.1632

F71: (F4) [W12] +\$D\$8*D71	F77: (F4) [W12] +\$D\$8*D77
G71: (F2) [W11] +\$E\$8*E71	G77: (F2) [W11] +\$E\$8*E77
H71: (F2) [W12] +\$E\$8*E71*14.223	H77: (F2) [W12] +\$E\$8*E77*14.223
I71: (F2) [W12] @ABS(H71 - \$H\$59)	I77: (F2) [W12] @ABS(H77 - \$H\$59)
J71: (F2) (H72 - H71)	J77: (F2) (H78 - H77)
K71: (F2) [W12] (H71 - H69)	K77: (F2) [W12] (H77 - H75)
L71: (F2) (D71*\$D\$8)*60	L77: (F2) (D77*\$D\$8)*60
M71: (F2) [W11] (\$F\$52 - H71)/(\$F\$52 - \$G\$52)	M77: (F2) [W11] (\$F\$52 - H77)/(\$F\$52 - \$G\$52)
D72: (F4) [W12] +D71+69.44	D78: (F4) [W12] +D77+69.44
E72: (F4) [W10] 1.176	E78: (F4) [W10] 1.2412
F72: (F4) [W12] +\$D\$8*D72	F78: (F4) [W12] +\$D\$8*D78
G72: (F2) [W11] +\$E\$8*E72	G78: (F2) [W11] +\$E\$8*E78
H72: (F2) [W12] +\$E\$8*E72*14.223	H78: (F2) [W12] +\$E\$8*E78*14.223
I72: (F2) [W12] @ABS(H72 - \$H\$59)	I78: (F2) [W12] @ABS(H78 - \$H\$59)
J72: (F2) (H73 - H72)	J78: (F2) (H79 - H78)
K72: (F2) [W12] (H72 - H70)	K78: (F2) [W12] (H78 - H76)
L72: (F2) (D72*\$D\$8)*60	L78: (F2) (D78*\$D\$8)*60
M72: (F2) [W11] (\$F\$52 - H72)/(\$F\$52 - \$G\$52)	M78: (F2) [W11] (\$F\$52 - H78)/(\$F\$52 - \$G\$52)
D73: (F4) [W12] +D72+69.44	D79: (F4) [W12] +D78+69.44
E73: (F4) [W10] 1.1879	E79: (F4) [W10] 1.2502
F73: (F4) [W12] +\$D\$8*D73	F79: (F4) [W12] +\$D\$8*D79
G73: (F2) [W11] +\$E\$8*E73	G79: (F2) [W11] +\$E\$8*E79
H73: (F2) [W12] +\$E\$8*E73*14.223	H79: (F2) [W12] +\$E\$8*E79*14.223
I73: (F2) [W12] @ABS(H73 - \$H\$59)	I79: (F2) [W12] @ABS(H79 - \$H\$59)
J73: (F2) (H74 - H73)	J79: (F2) (H80 - H79)
K73: (F2) [W12] (H73 - H71)	K79: (F2) [W12] (H79 - H77)
L73: (F2) (D73*\$D\$8)*60	L79: (F2) (D79*\$D\$8)*60
M73: (F2) [W11] (\$F\$52 - H73)/(\$F\$52 - \$G\$52)	M79: (F2) [W11] (\$F\$52 - H79)/(\$F\$52 - \$G\$52)
D74: (F4) [W12] +D73+69.44	D80: (F4) [W12] +D79+69.44
E74: (F4) [W10] 1.1993	E80: (F4) [W10] 1.2592
F74: (F4) [W12] +\$D\$8*D74	F80: (F4) [W12] +\$D\$8*D80
G74: (F2) [W11] +\$E\$8*E74	G80: (F2) [W11] +\$E\$8*E80
H74: (F2) [W12] +\$E\$8*E74*14.223	H80: (F2) [W12] +\$E\$8*E80*14.223
I74: (F2) [W12] @ABS(H74 - \$H\$59)	I80: (F2) [W12] @ABS(H80 - \$H\$59)
J74: (F2) (H75 - H74)	J80: (F2) (H81 - H80)
K74: (F2) [W12] (H74 - H72)	K80: (F2) [W12] (H80 - H78)
L74: (F2) (D74*\$D\$8)*60	L80: (F2) (D80*\$D\$8)*60
M74: (F2) [W11] (\$F\$52 - H74)/(\$F\$52 - \$G\$52)	M80: (F2) [W11] (\$F\$52 - H80)/(\$F\$52 - \$G\$52)
D75: (F4) [W12] +D74+69.44	D81: (F4) [W12] +D80+69.44
E75: (F4) [W10] 1.2105	E81: (F4) [W10] 1.2675
F75: (F4) [W12] +\$D\$8*D75	F81: (F4) [W12] +\$D\$8*D81
G75: (F2) [W11] +\$E\$8*E75	G81: (F2) [W11] +\$E\$8*E81
H75: (F2) [W12] +\$E\$8*E75*14.223	H81: (F2) [W12] +\$E\$8*E81*14.223
I75: (F2) [W12] @ABS(H75 - \$H\$59)	I81: (F2) [W12] @ABS(H81 - \$H\$59)
J75: (F2) (H76 - H75)	J81: (F2) (H82 - H81)
K75: (F2) [W12] (H75 - H73)	K81: (F2) [W12] (H81 - H79)
L75: (F2) (D75*\$D\$8)*60	L81: (F2) (D81*\$D\$8)*60
M75: (F2) [W11] (\$F\$52 - H75)/(\$F\$52 - \$G\$52)	M81: (F2) [W11] (\$F\$52 - H81)/(\$F\$52 - \$G\$52)
D76: (F4) [W12] +D75+69.44	D82: (F4) [W12] +D81+69.44
E76: (F4) [W10] 1.221	E82: (F4) [W10] 1.2758
F76: (F4) [W12] +\$D\$8*D76	F82: (F4) [W12] +\$D\$8*D82
G76: (F2) [W11] +\$E\$8*E76	G82: (F2) [W11] +\$E\$8*E82
H76: (F2) [W12] +\$E\$8*E76*14.223	H82: (F2) [W12] +\$E\$8*E82*14.223
I76: (F2) [W12] @ABS(H76 - \$H\$59)	I82: (F2) [W12] @ABS(H82 - \$H\$59)
J76: (F2) (H77 - H76)	J82: (F2) (H83 - H82)
K76: (F2) [W12] (H76 - H74)	K82: (F2) [W12] (H82 - H80)
L76: (F2) (D76*\$D\$8)*60	L82: (F2) (D82*\$D\$8)*60
M76: (F2) [W11] (\$F\$52 - H76)/(\$F\$52 - \$G\$52)	M82: (F2) [W11] (\$F\$52 - H82)/(\$F\$52 - \$G\$52)
D77: (F4) [W12] +D76+69.44	D83: (F4) [W12] +D82+69.44
E77: (F4) [W10] 1.2313	E83: (F4) [W10] 1.2836

F83: (F4) [W12] +\$D\$8*D83
 G83: (F2) [W11] +\$E\$8*E83
 H83: (F2) [W12] +\$E\$8*E83*14.223
 I83: (F2) [W12] @ABS(H83-\$H\$59)
 J83: (F2) (ERR-H83)
 K83: (F2) [W12] (H83-H81)
 L83: (F2) (D83*\$D\$8)*60
 M83: (F2) [W11] (\$F\$52-H83)/(\$F\$52-\$G\$52)
 A87: [W23] 'BEAN STUDY: OIL WELL
 B90: [W14] ' B
 C90: [W12] ' C
 D90: (F2) [W12] ^ D
 E90: (F2) [W10] ^ E
 F90: (F2) [W12] ^ F
 G90: (F2) [W11] ^ G
 H90: [W12] ^ H
 I90: [W12] ^ I
 J90: ' J
 B91: [W14] ' DATE
 C91: [W12] 'BEAN SIZE
 D91: (F2) [W12] ^ DEL. TIME
 E91: (F2) [W10] ^ PRESSURE
 F91: (F2) [W12] ^ DEL. TIME
 G91: (F2) [W11] ^ PRESSURE
 H91: [W12] ^ PRESSURE
 I91: [W12] ^ DEL-P
 J91: 'RATE
 D92: (F2) [W12] ^ div.
 E92: (F2) [W10] ^ mm
 F92: (F2) [W12] ^ hr
 G92: (F2) [W11] ^ kg/cm2
 H92: [W12] ^ psi
 I92: [W12] ^ psi
 J92: ' m3/d
 B94: [W14] '07.08.1985
 C94: [W12] 0
 D94: [W12] 4219
 E94: [W10] 1.184
 F94: (F4) [W12] +\$D\$8*D94
 G94: (F2) [W11] +\$E\$8*E94
 H94: (F2) [W12] +\$E\$8*E94*14.223
 I94: (F2) [W12] +H94-\$H\$94
 J94: 0
 B95: [W14] '08.08.1985
 C95: [W12] 3
 D95: [W12] 1100
 E95: (F4) [W10] 1.14
 F95: (F4) [W12] +\$D\$8*D95
 G95: (F2) [W11] +\$E\$8*E95
 H95: (F2) [W12] +\$E\$8*E95*14.223
 I95: (F2) [W12] +H95-\$H\$94
 J95: (F2) 20
 B96: [W14] '09.08.1985
 C96: [W12] 4
 D96: [W12] 1300
 E96: (F4) [W10] 1.096
 F96: (F4) [W12] +\$D\$8*D96
 G96: (F2) [W11] +\$E\$8*E96
 H96: (F2) [W12] +\$E\$8*E96*14.223
 I96: (F2) [W12] +H96-\$H\$94
 J96: (F2) 30
 B97: (D1) [W14] '10.08.1985
 C97: [W12] 5
 D97: [W12] 1500
 E97: (F4) [W10] 1.052
 F97: (F4) [W12] +\$D\$8*D97
 G97: (F2) [W11] +\$E\$8*E97
 H97: (F2) [W12] +\$E\$8*E97*14.223
 I97: (F2) [W12] +H97-\$H\$94
 J97: (F2) 40
 B98: (D1) [W14] '11.08.1985
 C98: [W12] 6
 D98: [W12] 1700
 E98: (F4) [W10] 0.947
 F98: (F4) [W12] +\$D\$8*D98
 G98: (F2) [W11] +\$E\$8*E98
 H98: (F2) [W12] +\$E\$8*E98*14.223
 I98: (F2) [W12] +H98-\$H\$94
 J98: (F2) 50
 B99: (D1) [W14] '12.08.1985
 C99: [W12] 7
 D99: [W12] 1800
 E99: (F4) [W10] 0.833
 F99: (F4) [W12] +\$D\$8*D99
 G99: (F2) [W11] +\$E\$8*E99
 H99: (F2) [W12] +\$E\$8*E99*14.223
 I99: (F2) [W12] +H99-\$H\$94
 J99: (F2) 60
 A103: [W23] 'BEAN STUDY: GAS WELL
 F103: [W12] 'Ps2-1.033=
 G103: [W11] +G110*G110-1.033
 H103: [W12] 'kg/cm2
 B106: [W14] ' B
 C106: [W12] ' C
 D106: (F2) [W12] ^ D
 E106: (F2) [W10] ^ E
 F106: (F2) [W12] ^ F
 G106: (F2) [W11] ^ G
 H106: [W12] ^ H
 I106: [W12] ^ I
 J106: ' J
 B107: [W14] ' DATE
 C107: [W12] 'BEAN SIZE
 D107: (F2) [W12] ^ DEL. TIME
 E107: (F2) [W10] ^ PRESSURE
 F107: (F2) [W12] ^ DEL. TIME
 G107: (F2) [W11] ^ PRESSURE
 H107: [W12] ^ PRESSURE
 I107: [W12] 'PS2-PF2
 J107: 'RATE
 D108: (F2) [W12] ^ div.
 E108: (F2) [W10] ^ mm
 F108: (F2) [W12] ^ hr
 G108: (F2) [W11] ^ kg/cm2
 H108: [W12] ^ psi
 I108: [W12] 'kg/cm2
 J108: ' m3/d
 B110: [W14] '07.08.1985
 C110: [W12] 0
 D110: [W12] 4219

E110: [W10] 1.8063
 F110: (F4) [W12] +\$D\$8*D110
 G110: (F2) [W11] +\$E\$8*E110
 H110: (F2) [W12] +\$E\$8*E110*14.223
 B111: [W14] '08.08.1985
 C111: [W12] 3
 D111: [W12] 1100
 E111: [W10] 1.6655
 F111: (F4) [W12] +\$D\$8*D111
 G111: (F2) [W11] +\$E\$8*E111
 H111: (F2) [W12] +\$E\$8*E111*14.223
 I111: (F2) [W12] (\$G\$110*\$G\$110) - (G111*G111)
 J111: 18000
 B112: [W14] '09.08.1985
 C112: [W12] 4
 D112: [W12] 1300
 E112: [W10] 1.6399
 F112: (F4) [W12] +\$D\$8*D112
 G112: (F2) [W11] +\$E\$8*E112
 H112: (F2) [W12] +\$E\$8*E112*14.223
 I112: (F2) [W12] (\$G\$110*\$G\$110) - (G112*G112)
 J112: 23000
 B113: (D1) [W14] '10.08.1985
 C113: [W12] 5
 D113: [W12] 1500
 E113: [W10] 1.4962
 F113: (F4) [W12] +\$D\$8*D113
 G113: (F2) [W11] +\$E\$8*E113
 H113: (F2) [W12] +\$E\$8*E113*14.223
 I113: (F2) [W12] (\$G\$110*\$G\$110) - (G113*G113)
 J113: 36000
 B114: (D1) [W14] '11.08.1985
 C114: [W12] 6
 D114: [W12] 1700
 E114: [W10] 1.3469
 F114: (F4) [W12] +\$D\$8*D114
 G114: (F2) [W11] +\$E\$8*E114
 H114: (F2) [W12] +\$E\$8*E114*14.223
 I114: (F2) [W12] (\$G\$110*\$G\$110) - (G114*G114)
 J114: 47000
 B115: (D1) [W14] '12.08.1985
 C115: [W12] 7
 D115: [W12] 1800
 E115: [W10] 1.1719
 F115: (F4) [W12] +\$D\$8*D115
 G115: (F2) [W11] +\$E\$8*E115
 H115: (F2) [W12] +\$E\$8*E115*14.223
 I115: (F2) [W12] (\$G\$110*\$G\$110) - (G115*G115)
 J115: 60000
 A119: [W23] 'MODIFIED ISO-CHRONAL TEST:
 GAS WELL
 C120: [W12] 'Date: 8.8.88
 F120: [W12] 'Ps2 - 1.033=
 G120: (F2) [W11] +\$G\$127*\$G\$127 - 1.033
 H120: [W12] 'kg/cm2
 C123: [W12] ' C
 D123: (F2) [W12] ^ D
 E123: (F2) [W10] ^ E
 F123: (F2) [W12] ^ F
 G123: (F2) [W11] ^ G
 H123: [W12] ^ H
 I123: [W12] ^ I
 J123: ' J
 C124: [W12] 'BEAN SIZE
 D124: (F2) [W12] ^ DEL. TIME
 E124: (F2) [W10] ^ PRESSURE
 F124: (F2) [W12] ^ DEL. TIME
 G124: (F2) [W11] ^ PRESSURE
 H124: [W12] ^ PRESSURE
 I124: [W12] 'PS2 - PF2
 J124: 'RATE
 D125: (F2) [W12] ^ div.
 E125: (F2) [W10] ^ mm
 F125: (F2) [W12] ^ hr
 G125: (F2) [W11] ^ kg/cm2
 H125: [W12] ^ psi
 I125: [W12] 'kg/cm2
 J125: ' m3/d
 C127: [W12] ' 3(Pws)
 D127: [W12] 0
 E127: [W10] 2.69
 F127: (F2) [W12] +\$D\$8*D127
 G127: (F2) [W11] +\$E\$8*E127
 H127: (F2) [W12] +\$E\$8*E127*14.223
 D128: [W12] 69.44
 E128: [W10] 2.545
 F128: (F2) [W12] +\$D\$8*D128
 G128: (F2) [W11] +\$E\$8*E128
 H128: (F2) [W12] +\$E\$8*E128*14.223
 I128: (F2) [W12] (\$G\$127*\$G\$127) - (G128*G128)
 J128: 30000
 D129: [W12] 138.88
 E129: [W10] 2.4828
 F129: (F2) [W12] +\$D\$8*D129
 G129: (F2) [W11] +\$E\$8*E129
 H129: (F2) [W12] +\$E\$8*E129*14.223
 I129: (F2) [W12] (\$G\$127*\$G\$127) - (G129*G129)
 J129: 30000
 D130: [W12] 208.32
 E130: [W10] 2.4104
 F130: (F2) [W12] +\$D\$8*D130
 G130: (F2) [W11] +\$E\$8*E130
 H130: (F2) [W12] +\$E\$8*E130*14.223
 I130: (F2) [W12] (\$G\$127*\$G\$127) - (G130*G130)
 J130: 30000
 D131: [W12] 277.76
 E131: [W10] 2.3331
 F131: (F2) [W12] +\$D\$8*D131
 G131: (F2) [W11] +\$E\$8*E131
 H131: (F2) [W12] +\$E\$8*E131*14.223
 I131: (F2) [W12] (\$G\$127*\$G\$127) - (G131*G131)
 J131: 30000
 C132: [W12] ' 4(Pws*)
 D132: [W12] 0
 E132: [W10] 2.645
 F132: (F2) [W12] +\$D\$8*D132
 G132: (F2) [W11] +\$E\$8*E132
 H132: (F2) [W12] +\$E\$8*E132*14.223
 D133: [W12] 69.44
 E133: [W10] 2.3705

F133: (F2) [W12] +\$D\$8*D133
 G133: (F2) [W11] +\$E\$8*E133
 H133: (F2) [W12] +\$E\$8*E133*14.223
 I133: (F2) [W12] (\$G\$132*\$G\$132) - (G133*G133)
 J133: 46000
 D134: [W12] 138.88
 E134: [W10] 2.2333
 F134: (F2) [W12] +\$D\$8*D134
 G134: (F2) [W11] +\$E\$8*E134
 H134: (F2) [W12] +\$E\$8*E134*14.223
 I134: (F2) [W12] (\$G\$132*\$G\$132) - (G134*G134)
 J134: 46000
 D135: [W12] 208.32
 E135: [W10] 2.0836
 F135: (F2) [W12] +\$D\$8*D135
 G135: (F2) [W11] +\$E\$8*E135
 H135: (F2) [W12] +\$E\$8*E135*14.223
 I135: (F2) [W12] (\$G\$132*\$G\$132) - (G135*G135)
 J135: 46000
 D136: [W12] 277.76
 E136: [W10] 1.9463
 F136: (F2) [W12] +\$D\$8*D136
 G136: (F2) [W11] +\$E\$8*E136
 H136: (F2) [W12] +\$E\$8*E136*14.223
 I136: (F2) [W12] (\$G\$132*\$G\$132) - (G136*G136)
 J136: 46000
 C137: [W12] ' 5(Pws*)
 D137: [W12] 0
 E137: [W10] 2.6076
 F137: (F2) [W12] +\$D\$8*D137
 G137: (F2) [W11] +\$E\$8*E137
 H137: (F2) [W12] +\$E\$8*E137*14.223
 D138: [W12] 69.44
 E138: [W10] 2.2707
 F138: (F2) [W12] +\$D\$8*D138
 G138: (F2) [W11] +\$E\$8*E138
 H138: (F2) [W12] +\$E\$8*E138*14.223
 I138: (F2) [W12] (\$G\$137*\$G\$137) - (G138*G138)
 J138: 54000
 D139: [W12] 138.88
 E139: [W10] 2.101
 F139: (F2) [W12] +\$D\$8*D139
 G139: (F2) [W11] +\$E\$8*E139
 H139: (F2) [W12] +\$E\$8*E139*14.223
 I139: (F2) [W12] (\$G\$137*\$G\$137) - (G139*G139)
 J139: 54000
 D140: [W12] 208.32
 E140: [W10] 1.9089
 F140: (F2) [W12] +\$D\$8*D140
 G140: (F2) [W11] +\$E\$8*E140
 H140: (F2) [W12] +\$E\$8*E140*14.223
 I140: (F2) [W12] (\$G\$137*\$G\$137) - (G140*G140)
 J140: 54000
 D141: [W12] 277.76
 E141: [W10] 1.7217
 F141: (F2) [W12] +\$D\$8*D141
 G141: (F2) [W11] +\$E\$8*E141
 H141: (F2) [W12] +\$E\$8*E141*14.223
 I141: (F2) [W12] (\$G\$137*\$G\$137) - (G141*G141)
 J141: 54000
 C142: [W12] ' 6(Pws*)
 D142: [W12] 0
 E142: [W10] 2.5826
 F142: (F2) [W12] +\$D\$8*D142
 G142: (F2) [W11] +\$E\$8*E142
 H142: (F2) [W12] +\$E\$8*E142*14.223
 D143: [W12] 69.44
 E143: [W10] 2.1959
 F143: (F2) [W12] +\$D\$8*D143
 G143: (F2) [W11] +\$E\$8*E143
 H143: (F2) [W12] +\$E\$8*E143*14.223
 I143: (F2) [W12] (\$G\$142*\$G\$142) - (G143*G143)
 J143: 62000
 D144: [W12] 138.88
 E144: [W10] 1.9962
 F144: (F2) [W12] +\$D\$8*D144
 G144: (F2) [W11] +\$E\$8*E144
 H144: (F2) [W12] +\$E\$8*E144*14.223
 I144: (F2) [W12] (\$G\$142*\$G\$142) - (G144*G144)
 J144: 62000
 D145: [W12] 208.32
 E145: [W10] 1.7966
 F145: (F2) [W12] +\$D\$8*D145
 G145: (F2) [W11] +\$E\$8*E145
 H145: (F2) [W12] +\$E\$8*E145*14.223
 I145: (F2) [W12] (\$G\$142*\$G\$142) - (G145*G145)
 J145: 62000
 D146: [W12] 277.76
 E146: [W10] 1.597
 F146: (F2) [W12] +\$D\$8*D146
 G146: (F2) [W11] +\$E\$8*E146
 H146: (F2) [W12] +\$E\$8*E146*14.223
 I146: (F2) [W12] (\$G\$142*\$G\$142) - (G146*G146)
 J146: 62000
 C147: [W12] ' Pwf
 D147: [W12] 2771
 E147: [W10] 1.497
 F147: (F2) [W12] +\$D\$8*D147
 G147: (F2) [W11] +\$E\$8*E147
 H147: (F2) [W12] +\$E\$8*E147*14.223
 I147: (F2) [W12] (\$G\$127*\$G\$127) - (G147*G147)
 J147: 62000
 C150: [W12] '** - Pressure after fixed time
 A153: [W23] 'BASIC INPUT DATA: FROM PVT & PETROPHYSICAL STUDIES AND FROM GRAPHS
 A156: [W23] ^ viscosity(cp)
 B156: [W14] "pay thick.h(m)
 C156: (F2) [W12] "plhr(psi)
 I156: [W12] 'Steady time
 K156: [W12] 'Beta(Muskat)
 L156: 'Ia(ft3/day)for WRB
 A157: (F2) [W23] 584
 B157: (F2) [W14] 9
 C157: (F2) [W12] 88.8*14.223
 I157: [W12] 60.75
 K157: (S4) [W12] 0.001111
 L157: (S2) 1000000
 A159: (F4) [W23] ^ formation vol. factor
 B159: (F0) [W14] ^ phi(%)

C159: (F4) [W12] ^ re(ft)for Muskat
 I159: [W12] ' Pwf(TRT)
 K159: [W12] 'Beta(sssa)
 L159: 'Ba(V/V) for WRB
 A160: (F4) [W23] 1.0314
 B160: (F2) [W14] 0.3
 C160: (F2) [W12] 2154
 I160: [W12] 82.4788*14.223
 K160: [W12] (0.0418*26.54*0.001111)/0.115
 L160: 0.0259
 A162: (F4) [W23] ^ slope pr.bu,dd,PFT(WI)
 B162: (F4) [W14] ^ rw(ft)
 C162: (F4) [W12] ^ p bar(psi)for Muskat
 F162: [W12] 'P* psi(PI cal.)
 L162: 'Ca(1/psi) for WRB
 A163: (F4) [W23] 14.233
 B163: (F4) [W14] 0.354
 C163: (F2) [W12] 1287.3
 F163: (F1) [W12] 1285.96
 L163: (S2) 0.00064
 A165: (F4) [W23] ^ b(Muskat)
 B165: (F4) [W14] ^ ct (1/psi)
 C165: (F4) [W12] ^ p ^ (psi)for Muskat
 F165: [W12] 'Pwf(psi)for W/I well
 L165: 'porosity(%)for WRB
 A166: (F4) [W23] 26.5401
 B166: (S4) [W14] 1.7297E - 06
 C166: (F1) [W12] 1390
 F166: [W12] 1286
 L166: 0.3
 A168: [W23] ^ slope(two rate test)
 B168: [W14] ^ Pwf psi
 C168: [W12] ^ Pst psi
 F168: [W12] 'p bar(psi)for W/I well
 L168: 'slope(psi/day)for WRB
 A169: (F1) [W23] 14.233
 B169: (F1) [W14] 1173.1
 C169: (F1) [W12] 1285.96
 F169: [W12] 1173.1
 L169: 800
 B172: [W14] 'RESULTS
 A176: [W23] ' A
 B176: [W14] ' B
 C176: [W12] ' C
 D176: (F2) [W12] ^ D
 E176: (F2) [W10] ^ E
 F176: (F2) [W12] ^ F
 G176: (F2) [W11] ^ G
 H176: [W12] ^ H
 I176: [W12] ^ I
 J176: (F2) ^ J
 K176: [W12] ^ K
 L176: ^ L
 M176: [W11] ^ M
 N176: [W11] ^ N
 O176: [W11] ^ O
 P176: [W11] '
 A177: [W23] ' RESERVOIR ->
 B177: [W14] ^ Kh
 C177: [W12] ^ K
 D177: [W12] ^ Skin
 E177: [W10] ^ Del - p
 F177: [W12] ' J actual
 G177: [W11] ^ J ideal
 H177: (F2) [W12] ^ Flow eff.
 I177: [W12] ^ Radius of
 J177: 'P*(TRT)
 K177: [W12] ^ Pore vol
 L177: 'BURNT VOL
 M177: [W11] 'P static
 N177: [W11] ^ PI
 O177: [W11] ^ OFP
 P177: [W11] '
 A178: [W23] ' PARAMETERS
 B178: [W14] ^ md.ft
 C178: [W12] ^ md
 E178: [W10] ^ skin(psi)
 F178: [W12] 'm3/d/kg/cm2
 G178: [W11] 'm3/d/kg/cm2
 H178: (F2) [W12] ^ %
 I178: [W12] ^ investi. m.
 J178: ^ psi
 K178: [W12] ^ Res. bbl
 L178: 'ft3
 M178: [W11] ^ psi
 N178: [W11] 'm3/d/kg/cm2
 O178: [W11] ^ m3/d
 A180: [W23] 'MDH METHOD
 B180: (F1) [W14] (162.6*\$K\$8*6.289*\$A\$157*\$A\$160)/
 (\$A\$163)
 C180: (F1) [W12] (B180)/(\$B\$157*3.28)
 D180: (F1) [W12] 1.151*(((@ABS(\$C\$157-\$H\$16)/(\$
 A\$163))-@LOG(\$C\$180/(\$B\$160*\$A\$157*\$B\$
 166*\$B\$163*\$B\$163))+3.23))
 E180: (F1) [W10] 0.87*\$A\$163*\$D\$180
 F180: (F1) [W12] (\$K\$8)/(((\$F\$163/14.223)-(\$B\$169/
 14.223))
 G180: (F1) [W11] (\$K\$8)/(((\$F\$163/14.223)-(\$B\$169/
 14.223)-(\$E\$180/14.223))
 H180: (F2) [W12] (\$F\$180G\$180)
 I180: (F1) [W12] (((0.00105*\$C\$180*\$I\$157)/(((\$B\$160)*
 (\$A\$157*\$B\$166))) ^ 0.5)/3.28
 A181: [W23] 'HORNER METHOD
 B181: (F1) [W14] (162.6*\$K\$8*6.289*\$A\$157*\$A\$160)/
 (\$A\$163)
 C181: (F1) [W12] (B181)/(\$B\$157*3.28)
 D181: (F1) [W12] 1.151*(((@ABS(\$C\$157-\$H\$16)/(\$
 A\$163))-@LOG(\$C\$181/(\$B\$160*\$A\$157*\$B\$
 166*\$B\$163*\$B\$163))+3.23))
 E181: (F1) [W10] 0.87*\$A\$163*\$D\$181
 F181: (F1) [W12] (\$K\$8)/(((\$F\$163/14.223)-(\$B\$169/
 14.223))
 G181: (F1) [W11] (\$K\$8)/(((\$F\$163/14.223)-(\$B\$169/
 14.223)-(\$E\$181/14.223))
 H181: (F2) [W12] (\$F\$181G\$181)
 I181: (F1) [W12] (((0.00105*\$C\$181*\$I\$157)/(((\$B\$160)*
 (\$A\$157*\$B\$166))) ^ 0.5)/3.28
 A182: [W23] 'MUSKAT METHOD
 B182: (F1) [W14] (118.6*\$K\$8*6.289*\$A\$157*\$A\$160)/
 (\$A\$166)

C182: (F1) [W12] (B182)/(\$B\$157*3.28)
 D182: (F1) [W12] 0.84*(((\$C\$163 - \$C\$166)/(\$A\$166)) -
 (2.3025)*@LOG((\$C\$160)/(\$B\$163))+3/4
 K182: (F0) [W12] 0.115*\$K\$8*6.289*\$A\$160/(\$A\$166*\$
 K\$157*\$B\$166)
 A183: [W23] 'SEMI STEADY STATE ANA.
 K183: (F0) [W12] 0.0418*\$K\$8*6.289*\$A\$160/(\$K\$160*
 \$B\$166)
 A184: [W23] 'PR. FALL OFF TEST(W/I)
 B184: (F1) [W14] (162.6*\$K\$8*6.289*\$A\$157*\$A\$160)/
 (\$A\$163)
 C184: (F1) [W12] (B184)/(\$B\$157*3.28)
 D184: (F1) [W12] 1.151*(((@ABS(\$C\$157 - \$H\$16)/(\$
 A\$163)) - @LOG(\$C\$184/(\$B\$160*\$A\$157*\$B\$
 166*\$B\$163*\$B\$163))+3.23))
 E184: (F1) [W10] 0.87*\$A\$163*\$D\$184
 F184: (F1) [W12] (\$K\$8)/(((\$F\$166/14.223) - (\$F\$169/
 14.223))
 G184: (F1) [W11] (\$K\$8)/(((\$F\$166/14.223) - (\$F\$169/
 14.223) - (\$E\$184/14.223))
 H184: (F2) [W12] (\$F\$184G\$184)
 I184: (F1) [W12] (((0.025*\$C\$184*\$I\$157)/(((\$B\$160)*
 (\$A\$157*\$B\$166))) ^ 0.5)/3.28
 A185: [W23] 'TWO RATE TEST
 B185: (F1) [W14] (162.6*\$K\$8*6.289*\$A\$157*\$A\$160)
 /(\$A\$169)
 C185: (F1) [W12] (B185)/(\$B\$157*3.28)
 D185: (F1) [W12] 1.151*((((\$K\$8) /(\$K\$8 - \$K\$9)*(\$C\$
 157 - \$B\$169)/(\$A\$169) - @LOG(\$C\$185/(\$B\$160*
 \$A\$157*\$B\$166*\$B\$163*\$B\$163))+3.23))
 E185: (F1) [W10] 0.87*\$A\$169*\$D\$185
 F185: (F1) [W12] (\$K\$8)/(((\$F\$163/14.223) - (\$B\$169/
 14.223))
 G185: (F1) [W11] (\$K\$8)/(((\$F\$163/14.223) - (\$B\$169/
 14.223) - (\$E\$185/14.223))
 H185: (F2) [W12] (\$F\$185G\$185)
 I185: (F1) [W12] '
 J185: (F1) +\$I\$160+(\$A\$169)*(@LOG((\$C\$185*\$I\$157)
 /(\$B\$160*\$A\$157*\$B\$166*\$B\$163*\$B\$163)) - 3.23
 +0.87*\$D\$185)
 A186: [W23] 'WALSH RAMEY BRIGHAM MET.
 L186: (S2) +\$L\$157*\$L\$160/(\$L\$169*\$L\$166*\$L\$163)
 A187: [W23] 'INFLUX STUDY
 M187: [W11] 1750
 A188: [W23] 'BEAN STUDY (OIL WELL)
 N188: [W11] 4.1
 A189: [W23] 'BEAN STUDY (GAS WELL)
 O189: [W11] 90000
 A190: [W23] 'ISO - CHRONAL TEST
 O190: [W11] 90000