ABSTRACT

A Generalized Choke Flow Equation of the Gilbert Form for Trinidad and Tobago

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Simple orifice reducing devices, known as chokes or beans, are utilized as pressure regulators, to induce relatively large pressure drops over relatively short flow line lengths. Correct selection of a choke is dependant on the ability to predict the effect of orifice reduction on well head pressures and production rates.

One predictive method available, is a purely empirical equation developed by Gilbert[11], relating the parameters of well head pressure; gas/liquid ratio; total liquid flow rate and choke diameter. The objective of this investigation is to evaluate the unknowns in the Gilbert equation, in order to obtain a solution specific to Trinidad and Tobago oilfields, for flowing wells.

The method of solution involved use of the least squares regression technique, to which end, normal equations for the regression plane were developed, which allowed algebraic solution for the unknowns in the equation.

Utilizing the above and data gathered from 261 well tests, a solution of the form:

$$P = \frac{401.66\ q\ R^{0.626}}{S^{1.872}}$$

Bias of the correlation = 1.964

Standard deviation of the bias = 19.416

Where P_{wh} is in pounds per square inch, gauge

Q is in stock tank barrels per day

R is in thousands of cubic feet per stock tank barrel (dimensionless: volume per volume) and

S is in sixty-fourths of an inch

was obtained. This equation was found to perform better than the solution using Gilbert's constants, having a lesser tendency to over predict tubing head pressures.

In addition the results suggested:

(a) Increases in the water cut caused increases in the magnitude of the indices of S and R up until water cuts of 50 percent, beyond which both indices suffered a dramatic reduction, probably due to the formation of emulsions

(b) Increases in the gas/oil ratio resulted in an increase in the index of R, but a reduction in the index of S

(c) API gravities of approximately 25° and higher, combined with elevated water cuts may cause an increase in the index of R coupled with a decrease in the index of S

In addition, the attempted use of prorated data from 849 further wells, revealed the necessity for accurate, reliable data such as obtained directly from well tests for use in deriving correlations.