FOLLOWING

IS A

BRIEF REVIEW

OF

FUNDAMENTAL PRINCIPLES

OF

ESTIMATING OIL IN PLACE

AND RECOVERABLE RESERVES

THROUGH ANALYSES

OF

PRODUCTION STATISTICS

PRODUCTION HISTORIES
OF
SOLUTION GAS DRIVE RESERVOIRS
GENERALLY REFLECT THAT
CUMULATIVE PRODUCTION IS PROPORTIONAL
TO EITHER:

a) Direct percentage decline of production rate (rate-time relationship is exponential), or

b) Hyperbolic decline of production rate,

or infrequently,

c) Harmonic decline in production rate.

All can be used through
the Rate-Time
or
Rate-Cumulative
formulas

RATE-TIME METHODS:
CONVENIENT AND POPULAR:
BUT
CONTAIN INHERENT INFIRMITIES

Rate-time declines curves are convenient to use (especially the constant percentage decline, and even for wells whose production is declining hyperbolically, stepwise rate changes of the constant percentage decline method can - when properly used - closely approximate near term production rate and income rates). Plotting of constant percentage rate-time curves is simplified through the use of semilog graph paper.

IF

CUMULATIVE PRODUCTION

IS

DIRECTLY PROPORTIONAL

TO

PRODUCTION RATE

THEN:

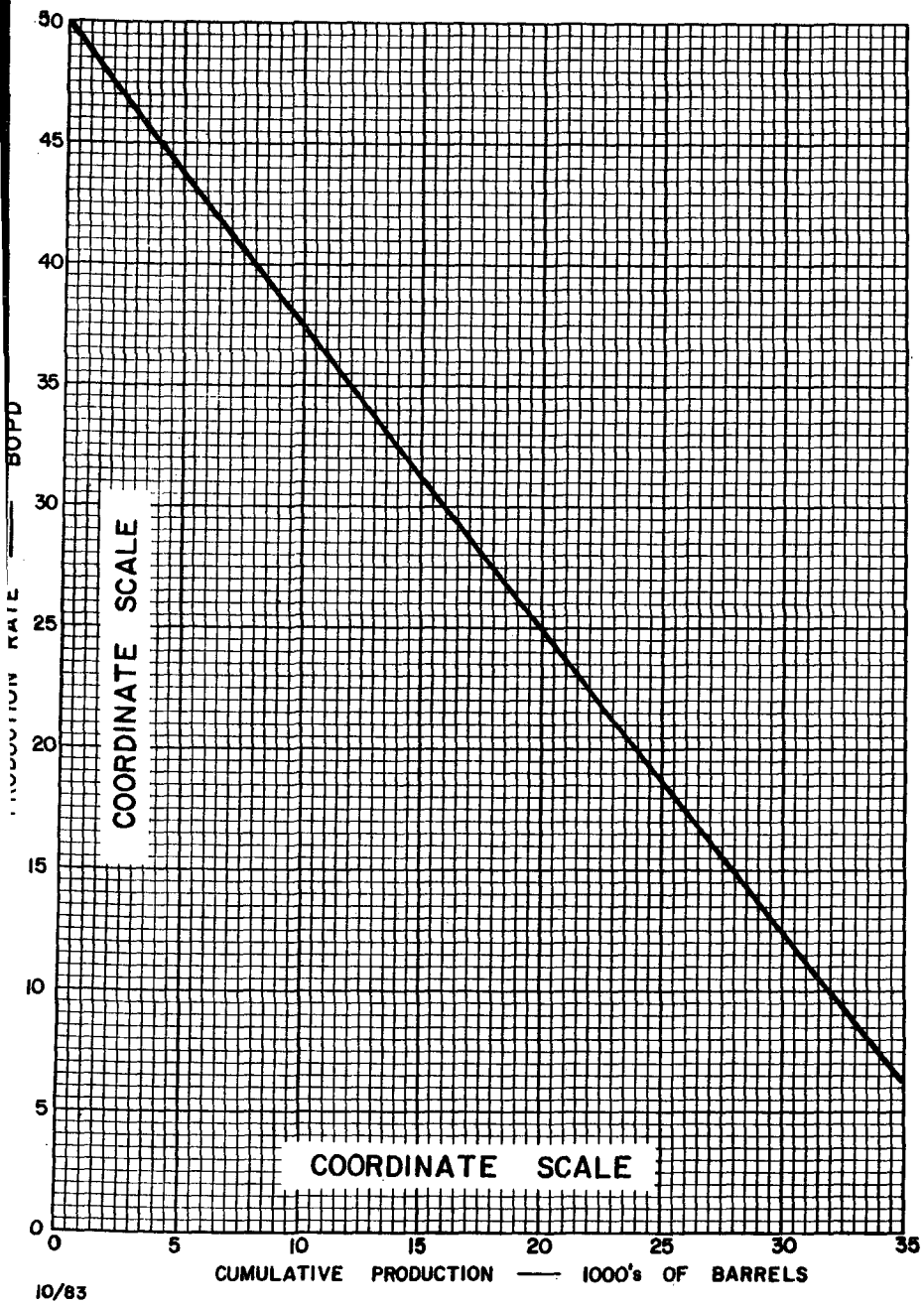
PRODUCING TIME

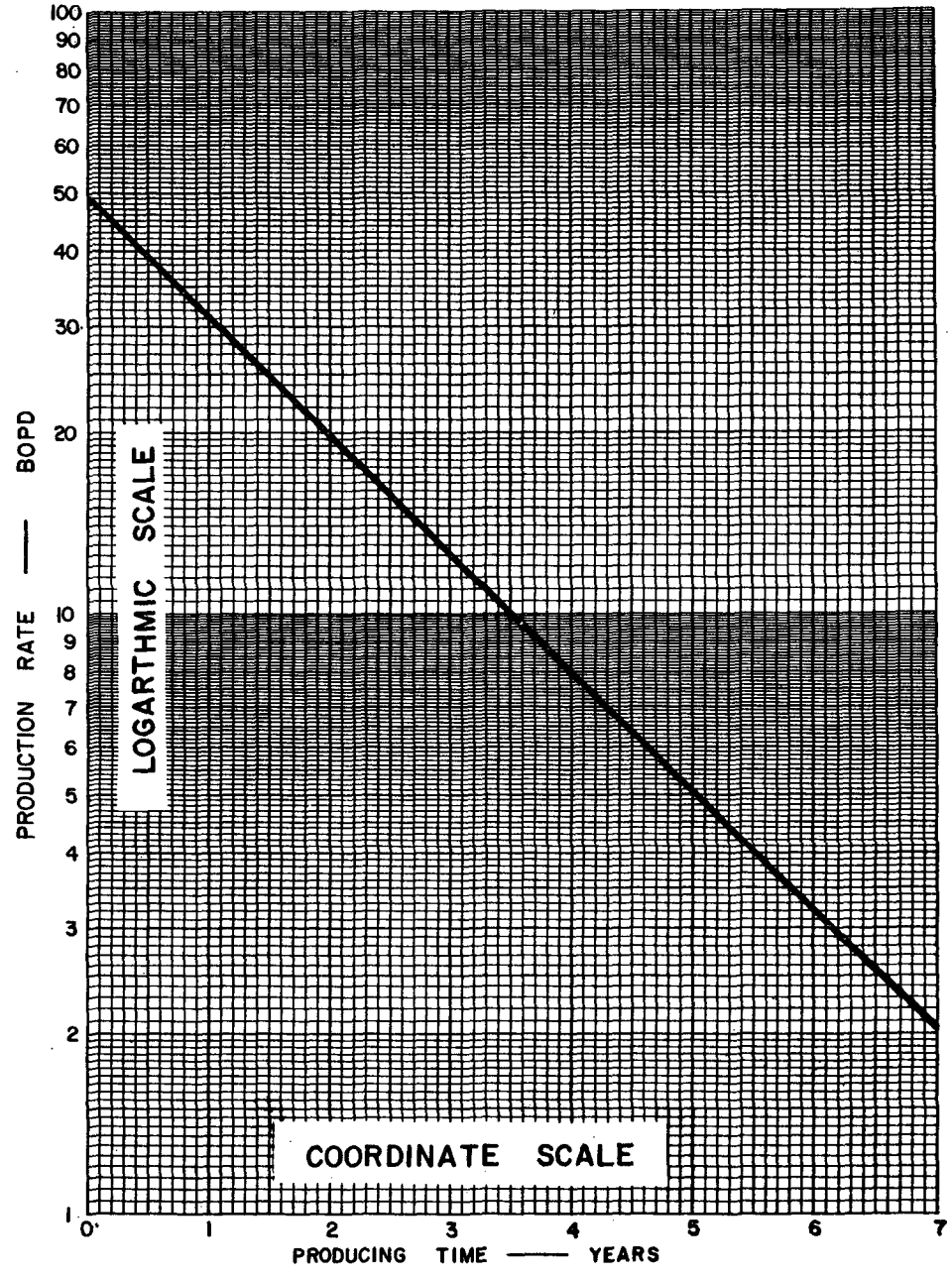
IS

PROPORTIONAL

TO

LOGARITHM OF PRODUCTION RATE





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RATE-TIME METHODS:
CONVENIENT AND POPULAR:
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However, when used to estimate average ultimate recovery from a group of wells rate-time decline methods (the type most frequently used - especially constant percentage) have inherent infirmities for the reasons described below:

In selecting wells to analyze production decline behavior, one is tempted to use the first well, or wells, in a group, because they have the longest history and - hopefully - offer the most complete data.

This introduces three inaccuracies or problems:

(1) Plotting of individual well histories requires knowledge of individual well production - and this may not be accurately known.

(2) Averaging of current production rates as new wells come into production will give erroneous data, so it is necessary to "set back in time" each individual well's production curve. This is especially difficult to do if wells are not produced continuously - or have long shut-in periods.

(3) The first well, or wells, may drain more than their allotted spacing unit. Consequently they may produce substantially more than the average, and accordingly are not representative of what the formation - on average - is capable of producing.