Design and Operation of Intermittent Gas-lift Systems

API RECOMMENDED PRACTICE 19G10
FIRST EDITION, SEPTEMBER 2018

AMERICAN PETROLEUM INSTITUTE

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Design and Operation of Intermittent Gas-lift Systems

1 Scope

This API recommended practice provides guidelines and considerations for the design and operation of intermittent gas-lift systems including designs with chamber and plunger lift equipment. Included are the background and theory of each of these systems as well as considerations for system design and operation. This information is intended for well engineers who seek to gain a general understanding of the theory and practices of intermittent gas-lift systems.

Not addressed in this recommended practice are absolutes in the development of an intermittent gas-lift system design or operation because of the range of variables for each well and field combination.

This document also contains three annexes. Annex A contains mathematical derivations and models of some of the most pertinent intermittent gas-lift calculations. Annex B contains a comprehensive example of an intermittent gas-lift design. Annex C describes how to use the Field (U.S. Customary) Units Calculator and SI Units Calculator.

The calculations described within the recommended practice are separately provided within excel spreadsheets to allow the effective use of this information by users of this document. They are referenced within text boxes inserted into the text prior to the details of the formulas. The spreadsheets can be downloaded at http://alrdc.com.

2 Terms and Definitions

For the purposes of this document, the terms and definitions provided in API Q1 and the following apply.

2.1
chamber gas-lift
An artificial lift method that uses a downhole accumulation area that allows for the capture of more fluid than can be achieved with tubing alone and increases the volume of liquid produced with each intermittent lift cycle.

2.2
functionality
Capability of the equipment to conform to defined properties, characteristics, and limits.

2.3
mechanistic models
Mathematical models that describe the multiphase flow mechanisms (including related fluid properties and physical relationships) using physical flow equations for each of the phases within the system as opposed to empirical models that are based solely on observation rather than theory.

2.4
open installation
A completion without a packer or standing valve.

2.5
PI
productivity index
The ratio of liquid production rate, in barrels per day, to the difference between static and flowing bottomhole pressures, in pounds per square inch.