

Load case - Above/below packer

Oliasoft

Abstract

In this document we describe the load case *Above/below packer* available in the Oliasoft™ application.

Introduction

Above/below packer is a collapse load case, where the unknown is the internal pressure profile of the tubing¹. It describes various pressure profiles that may occur under different production scenarios.

Inputs The following inputs define the above/below packer load case

- 1) The true vertical depth (TVD) along the wellbore as a function of measured depth. Alternatively, the wellbore described by a set of survey stations, with complete information about measured depth and inclination.
- 2) The true vertical depth/TVD of
 - a) The hanger of the tubing, TVD_{hanger} .
 - b) The shoe of the tubing, TVD_{shoe} .
 - c) The packer depth, TVD_{packer} .
 - d) The perforation depth, TVD_{perf} .
- 3) The atmospheric pressure, P_{atm} , and pore pressure at perforation depth, P_{perf} .
- 4) The packer fluid density above the packer, $\rho_{\text{a, fl}}$
- 5) The fluid density below the packer, $\rho_{\text{b, fl}}$. Default value is 0.
- 6) Whether or not *Fluid drop above packer* is possible or not.

Calculations The internal pressure profile is divided into two, one above the packer and one below². If *Fluid drop above packer* is enabled, the fluid level is given by

$$TVD_{\text{FL}} = TVD_{\text{perf}} - \frac{P_{\text{perf}}}{g\rho_{\text{a, fl}}}, \quad (1)$$

where g is the gravitational constant, and the internal pressure profile from hanger to packer is given by

$$P_i = \max(P_{\text{atm}}, P_{\text{atm}} + P_{\text{perf}} - g\rho_{\text{a, fl}}(TVD_{\text{perf}} - TVD)). \quad (2)$$

If *Fluid drop above packer* is disabled, then the pressure profile from hanger to packer is simply given by

$$P_i = g\rho_{\text{a, fl}} TVD \quad (3)$$

If the casing shoe is below the packer, then the pressure profile below the packer is

$$P_i = \begin{cases} P_{\text{atm}}, & \text{if } \rho_{\text{b, fl}} = 0 \\ g\rho_{\text{b, fl}} TVD, & \text{otherwise.} \end{cases} \quad (4)$$

¹We denote any tubular by tubing. All calculations encompass both tubings and casings.

²Assuming the casing shoe is below the packer.