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NUMERICAL STUDY OF A HORIZONTAL GAS-OIL SEPARATOR USING COMPUTATIONAL FLUID DYNAMICS

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Abstract. The separation of oil-gas mixtures is traditionally performed in horizontal, vertical or spherical separators. The selection of the type of separator is based on the gas-to-oil ratio and space requirements. Current techniques could benefit from enhanced precision in modeling the dynamics of the oil-gas interphase and the wall viscous stress. The objective of this study is to analyze the behavior of two-phase oil-gas separation at varying pressure conditions in a unique geometry arrangement, a control separator, assuming these flows as incompressible and isothermal. Special care is taken to model the oil-gas interphase and the wall viscous stress in order to obtain a precise prediction of the pressure gradient. The computations are performed for a three-dimensional (3D) model of a control separator. The Volume of Fluid (VOF) method is used to determine the phase boundaries and turbulence is treated with the k-epsilon model, as incorporated in the open-source toolkit OpenFOAM(R). Adaptive refinement is applied in order to sharpen the gas-liquid interphase and to compute accurately the velocity gradient, with the aim to reduce the computational cost of the simulations, maintaining the total number of cells in a tractable amount. The results are compared with experimental data from literature and calculations made with traditional empyrical formulas.

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