

Abstract

Amr A. Mohamed Mohamed Hassan

CFD Study of the Flow in the Vicinity of a Subsea Pipeline

Subsea pipelines located on the seabed are vulnerable to failure due to hydrodynamic stresses caused by marine currents. In the present work, a second-order accurate upwind finite volume computational fluid dynamics model was used to simulate isotropic turbulent flow around a subsea pipeline located on flat seabed. A comparison between four turbulent viscosity models and measurements revealed that Menter's SST model yields the best results. Trenching and double barrier methods which are used to protect the pipeline from the hydrodynamic stresses were simulated with different geometrical characteristics. A comparison between those two methods was conducted and discussed. It is found that at small aspect ratios, the double barrier method prevails over trenching in terms of its ability to isolate the pipe from the main current. While at large aspect ratio, trenching provide near-zero pressure coefficient profile along the pipe wall, which demonstrate its prevalence in protecting the pipeline.