CFD-BASED EROSION PREDICTION FOR SUBSEA CHOKE VALVES

Mazdak Parsi[1], Mustafa Kara[1], Anchal Jatale[2], Partha Sharma[1]

[1] DNV GL, Katy, TX, United States

[2] ANSYS, Houston, TX, United States

KEYWORDS

Sand Particle Erosion, CFD, Particulate Flow, Choke

ABSTRACT

Summary of the paper here – use “Summary” style

This study was conducted to investigate erosion in a typical choke valve used in oil and gas production. Subsea choke valves are used for different tasks, including but not limited to, regulating pressure, start up and shut in wells, preventing reservoir collapse during start up, controlling flowrates and etc. They are complex in structure, expensive, and more importantly key elements of any offshore production system. Yet, due to the presence of sand in production fluids (e.g. oil and gas), subsea chokes can be susceptible to erosion damage especially when there is a large pressure drop across the choke.

To assess erosion, a 3D Computational Fluid Dynamics (CFD) approach was adopted. This included turbulent flow field modeling, Lagrangian sand particle tracking, and finally erosion calculation at various parts of the choke valve using different erosion equations. Commercially available ANSYS FLUENT 16.1 software was employed to conduct the CFD-based erosion modeling.

Simulations were performed for gas-sand and gas-liquid-sand conditions. Effect of different parameters on erosion such as sand particle size, flow rates, and erosion equations were examined. In summary, CFD was successfully employed to explore erosion potential in a complex subsea choke valve; erosion hot spots and magnitudes were obtained. It was noticed that the choke guide experienced the highest erosion rate.

Previous work in the area of erosion has been limited to erosion modeling in simple piping elements such as elbows, and few

researches have addressed erosion in complex geometries such as choke valves. The present study, therefore, provided a procedure for modeling erosion in complex entities such as chokes for which conducting experimental studies can be difficult.