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The Effect of Particle Size Distribution on the Frictional Pressure Drop on Hole Cleaning in the Horizontal Wells

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The oil extraction economy demands the industry to find economical ways to drive down the cost of operations and maximize the economic recovery of oil and gas while optimizing every aspect of the operation. As the most costly parts of the field development are the drilling and transportation, any effort to minimize costs and increasing operational efficiencies and optimization of the controlling factors seems essential.

The effect of particle size distribution on transportation efficiency – here evaluated as bed transport velocity under critical deposition velocities – as well as on friction pressure drop along the pipeline are analyzed.

The dominant particles transport mechanism in the horizontal section of the pipe is turbulent flow, whereas viscosity of the carrying fluid is relevant in the vertical direction. The particle sizes have influence on increasing or suppressing the coherent structures (burst and sweep) near the wall in a turbulent flow and can be controlled in a manner it is needed. The turbulent flow alteration affects the frictional pressure drop. Increments in turbulent flow intensity cause an increase in frictional pressure drop along the transportation pipe and decreases in turbulent flow intensity have a reverse effect.

It is expected that at constant operational parameters it is possible to understand the effect of different particle sizes on frictional pressure drop and by altering the size of particles increase the transport efficiency.

This study was conducted to determine the effect of broad range of particles/cuttings on frictional pressure drop in horizontal sections of the pipes with better understanding of transport mechanisms thereby to reduce the energy consumption by efficient transportation.

Keywords: Particle Size Distribution (PSD); Turbulent Flow; Transport of Bed Particles; Frictional Pressure Drop; Pipeline