Solid Expandable Tubular In Well Drilling

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Abstract

Studies were done to explain a phenomenon which happens in field while expanding tubular against irregularly shaped casing or bore holes. The tubular deforms with an oval shape in which the minor diameter is smaller than a required drift necessary for passing completion tools through the tubular. The tools stuck down hole and require milling of tubular to resolve it. This results in delays and increased cost and must be avoided. Simulations were carried for two and three dimensional models under varying properties of formation. The simulation results were in agreement with the field measurements. This proved that the developed model and results are correct. Later parametric studies were done. It was found that the ovality varies with the variation in expansion ratio and also results in unacceptable length and thickness variations for expansion ratios greater than 16.5%. Also a test-rig for Solid Expandable Tubular is designed to conduct tubular expansion tests for tubular sizes ranging from 4” to 9 5/9” with expansion ratios varying from of 10% to 30%. The test-rig will be able to test the tubular under fixed- free and fixed-fixed conditions. Various conceptual designs of the test-rig were developed and a final design emerged from these designs. Detailed design calculation were done either analytically, if possible, or using finite element method. Instrumentation and control system is also designed to monitor, control and store data for system variables. These variables include strain, displacement, expansion force, tubular thickness and length variations, operating fluid temperature, flow rate, and speed and location of expansion cone. The factors of safety for all components vary from 2.1 to 13.7 indicating that all the components are safe under designed conditions. The test-rig can sustain a maximum load of 250 tons in bending