Title: A New Approach to Estimate Gas-Lift Valve Performance and Valve Troubleshooting

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OBJECTIVES/SCOPE:
This presentation will describe the details of a new approach to model Gas-Lift Valves (GLV) and how to use this approach for valve performance evaluation and for valve troubleshooting. The presentation will include the basic theory, a preliminary validation of this new approach, and a few examples of how to use this model for valve design and troubleshooting.

METHODS PROCEDURES, PROCESS:
This new approach to model GLV is based on a force balance between the force pushing the valve stem to close and the opening force acting on the stem tip from the pressure field from the steady-state gas flow around the stem tip. The pressure field around the stem tip is obtained from CFD simulations as an approximation of the pressure field trying to open the GLV. A database is created using the results from the CFD estimations for the pressure field at the stem tip of the GLV for hundreds of different cases to cover the most likely conditions in the field.

RESULTS, OBSERVATIONS, CONCLUSIONS:
The results from this new model have been compared to experimental results and VPC database. The comparison results show an agreement within ±15% between the new model and experimental data. When compared to VPC database, the new model presents similar performance for all valves tested.

The major advantage of this approach is the reduced number of flow tests needed to characterize GLV. This model should require only one to three tests, while the classical models would require more than 20 tests per valve model and port size. In addition to that, this new model should have higher accuracy when simulating conditions extrapolating the conditions tested, given the additional physics included in this new model.

The results generated for this new model can be used to troubleshoot some common and serious problems in GLVs. For instance, the GLV's stem can chatter heavily while in operation, and the prediction of valve chattering is generally difficult. However, with this new approach, a plot can be created to indicate at which pressures, temperatures, and flow rates the GLV will have a higher probability of chattering. Knowing that, valve manufacturers can also use this approach to re-design valves to avoid chattering.