Evaluation of corrosion sensitivity in Nanchuan shale gas gathering and transportation pipeline based on multiphase flow transient simulation

Meng Liang[1] ZHAO Xuefen[2] Feng Minyi[1], Long Xue[1], FU Yisheng[1]

[1]*Sinopec Chongqing Shale Gas Co., LTD., Nanchuan 408400, China*

[2]*School of Petroleum and Natural Gas Engineering，Chongqing University of Science and Technology, Chongqing 401331, China*

Abstract For the serious local corrosion in Nanchuan shale gas gathering and transportation pipeline due to the accumulation of liquid during wet gas transportation in hilly areas, the multiphase flow transient simulation software(OLGA) was used to conduct transient modeling and simulation calculation for a shale gas gathering and transportation pipeline, and to determine the distribution of temperature, pressure, velocity,wall shear stress, liquid holdup and flow pattern along the pipeline. The characteristics of fluid accumulation in gathering and transportation pipeline were analyzed. Then, by analyzing the characteristics of the classical CO_2 corrosion prediction models Norsok and de Waard 95 built in OLGA software and pitting model developed by Papavinasam, it was believed that Papavinasam pitting model helped to improve the localized corrosion prediction of shale gas pipelines. The Papavinasam pitting corrosion model was adapted according to the operation conditions of shale gas pipelines.The predicted values of the three corrosion models calculated by using the corrosion sensitive parameters determined by OLGA were compared with the local pitting rates determined by online detection data.The results show that the adapted pitting prediction model with minimum absolute error is more suitable for predicting the pitting rate of gathering and transportation pipeline. Finally, the adapted pitting model was applied to assess the five pitting sensitive areas of the gathering and transportation pipeline. The predicted wall thickness loss is in good agreement with the online MLA-measured results. The results showed that the combination of OLGA transient simulation and adapted pitting model can evaluate local pitting sensitive areas, which would reduce the cost of pipeline excavation and online detection, and perform targeted monitoring and management for pitting sensitive areas.

Keywords shale gas gathering and transportation pipeline; wet gas transportation; pitting, internal corrosion sensitivity

Reference

[1] S.Papavinasam, A.Doiron, R.W.Revie and V.Sizov. a model to predict internal pitting corrosion of oil and gas pipelines, NACE Corrosion 2007 Conference and Expo., vol.07658.