A novel method to better predict production decline from a gas isotope perspective: similarity on Barnett and Niu Titang Shale

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Production rate is considered and referred as a direct indicator of the well performance and crucially viewed to forecast future well production and ultimately the total recoverable production from the well (e.g., Cutler, 1924; Callard, 1995; Fetkovich et al., 1996; Rahuma et al., 2013; Tang et al.,2016; Gao et al., 2017). Arps equations (exponential, hyperbolic, and harmonic), as an empirical equation, are still hampered fundamentally in more accurate assessment of future production, although new insights are added and advanced models are improved. Novel tool has been provided with parameters in components and isotope of shale gas. Applications are presented here on shale gas production in a Mississippian Barnett shale well (Texas, US) and a Cambrian Niu Titang shale well (Hubei, CHN). Field-deployable GC-IR2 enables real-time methane carbon isotope ratios and components.

Similarities are:

(1) Development of a continuum flow model to assess the relationship between the methane $\delta^{13}C$ variation, gas components and recovery ratio during production.

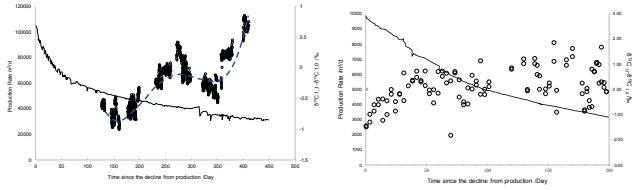

Fig.1.Real-time production rate data and the methane $\delta^{13}C$ variations. Left is Miss. Barnett shale gas. polynomial curve is $y=5e^{-9}x^4-5e^{-6}x^3+0.0018x^2-0.2804x+14.475$. $R^2= 0.81$. *Right is Cam. Niu TT Shale is now on production.*

(2) Realtime data available and field novel field-deployable GCIR[2] instrument excell in both data accuracy and timely.

(3) geological conditions for model parameter are input and cumulative production data are output in well life span.

Reference:

Younchun Tang,Recent Advances of Gas Isotope Geochemistry for Exploration, Production and Operations[C]// EAGE Workshop on Petroleum Geochemistry in Operations & Production.2016.

Gao L, Wu S, Deev A, et al. The gas isotope interpretation tool: A novel method to better predict production decline[J]. Aapg Bulletin, 2017, 101(8):1263-1275.