

Application of Nanometer Technology: Production and Injection Enhancement

Technology introduction

Nanometer production and injection enhancement technology is an advanced technology, which is relying on nanometer composite liquid as the core product. Nanometer composite liquid helps working fluid enter further and smaller reservoir space, improve reservoir wettability and the ability to dissolve organic matter, then to increase stimulated reservoir volume, remove organic matter blockage and together with other comprehensive effects. Finally, to achieve the improvement of reservoir stimulation and injection capacity.

Through investigation and analysis, design and implementation, this technology has formed comprehensive geological analysis, engineering design, material storage, site operation and finally later stage operation evaluation system. With mature technology and experienced personnel, this technology can meet the needs from both domestic and foreign markets.

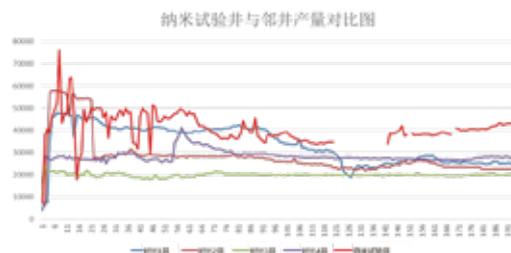
Technology states

He 1 and He 3 from Hangjinqi block of Sinopec Huabei is low - extra low porosity and low permeability reservoirs, with average porosity of 9% and 11.8% respectively. The average permeability is 0.87 mD and 1.25 mD. Pore throat is small (average median radius of pore throat is 0.1188 μm , 0.2265 μm); high displacement pressure (average median pressure is 15.6 MPa and 6.3 MPa). It is easy to form water locking when conventional fracturing fluid enters into tiny pore throat and difficult to flow back. Formation is sensitive to gel fracturing fluid residuals, easy to form sediments and cause damages then eventually impact formation stimulation outcomes.

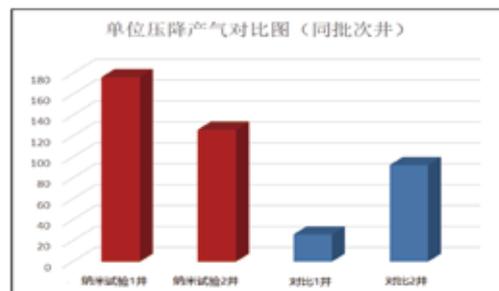
To solve the problems above, nano-composite fluid is added into conventional fracturing fluid to form multi-functional nano-fracturing fluid system. This is able to reduce surface adsorption and surface interfacial tension, remove water locking damage, restore permeability, prevent deposition and blockage of liquid particles in reservoir, effectively protect reservoir and improve production.

Application case

2 wells had been done in 2018, total stages were 23. The following few sectors all in a relatively high level or leading the industry by comparison with the other wells from same layer in the block: long-term stable production, gas production per unit pressure drop, gas production per unit thickness.



Production Diagram of Nanometer Testing Wells and Adjacent Wells



Comparison Chart of Gas Production per Unit Pressure Drop (Wells from the same batch)