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Reservoir properties of light tight oil bearing shelly limestone and corresponding EUR in the central Sichuan Basin, China

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The EURs and decline types of 120 vertical wells spread across the central Sichuan Basin and targeting the Da'anzhai formation were calculated by fitting monthly production data. Core observations, thin section analysis and scanning electron microscopy (SEM) were used to determine the storage space type and oil-bearing properties of the shelly limestone. The aim of this study was to determine the relationship between the estimated ultimate recovery (EUR) and geological factors. The results showed that all the matrix pores and fractures in the shelly limestone were oil-bearing. The type of reservoir space structure in the Da'anzhai formation can be classified as fracture-cave, fracture-pore and fracture. Vertical wells targeting the shelly limestone with these reservoir space structures might have respective production decline types corresponding to exponential decline, logarithmic decline and power-law exponential decline. Wells with each empirical decline type had diminishing EURs of 86.1, 39.3 and 5.9 MSTB (P50). Both the fractional thickness of the limestone occupied by the fracture and the ratio of the cave shelly limestone in the reservoir were positively and linearly related to the EUR. The proportions of megapores, macropores, mesopores, micropores, and nanopores in the shelly limestone were 1.6%, 3.7%, 18.1%, 27.8%, and 48.8%, respectively, and the corresponding EUR range of each pore size class tended to be above 294 MSTB, 110 to 294 MSTB, 37 to 110 MSTB, 4 to 37 MSTB, and below 4 MSTB. The results indicated that nearly 77% of the vertical wells targeting the Da'anzhai formation may have been uneconomical if stimulation was not conducted.

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Free-piston drive that use hydrocarbons as the primary fuel

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In the period 2005-2015 R&P Co "EKIP" realized the complex of research and development work on the creation of free-piston drive. The result is a valid model sample of 5 kW, realizing diesel cycle on methane. Due to the fact that in the free-piston drive can be realized thermodynamic cycle with a pressure ratio of up to 100 and more, as the primary fuel is possible to use a wide range of hydrocarbons: syngas, pyrolysis gas, methane of coal bed, associated oil gas, biogas, biodiesel, landfill gas, hydrogen, etc. Designed in EKIP free-piston drive can be used as: driving the compressor, the hydraulic pump or the linear electric generator; generator of the syngas; and generator of the working fluid for the gas turbine. At present time, R&P Co "EKIP", together with the Razumovsky University, created the pilot free-piston diesel-hydraulic pump up to 10 kW and the pressure was up to 30.0 MPa, has broad prospects for use in transport and agricultural machinery. Furthermore, R&P Co "EKIP", together with the Razumovsky University, developed the pilot free-piston compressor for heat pump on carbon dioxide at 100 kW.

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