

The reservoir potential of the Bazhenov Formation: regional prediction

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Abstract

The petroleum potential of the Bazhenov Formation reservoir has been assessed on the regional scale using several criteria inferred from published evidence, available geological and geophysical data, and well logging results from Upper Jurassic reservoirs.

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Keywords: Bazhenov Formation; criteria of reservoir potential; regional prediction

Introduction

In the 1950s–1960s, the Bazhenov Formation in the Jurassic–Cretaceous section of the West Siberian basin was universally considered to be the largest oil source (Kontorovich et al., 1967; etc.), as well as a regional-scale screen between the Jurassic and Neocomian reservoirs. However, already in 1962, Gurari hypothesized that it could be also an oil reservoir, which was proved valid in 1970 (Novikov et al., 1970). The Bazhenov Formation turned out to store oil accumulations and to be a unique reservoir rather than only a petroleum source bed (Dobrynin and Martynov, 1979; Dorofeeva et al., 1983; Efremov et al., 1988; Gurari and Gurari, 1974; Gurari et al., 1988; Trofimuk and Karogodin, 1981; Khalimov and Melik-Pashaev 1980; Kontorovich et al., 1986; Melik-Pashaev et al., 1979; Mikulenko, 1974; Nesterov, 1979; Skorobogatov and Krasnov, 1984; Zaripov et al., 1982; Zubkov, 1989, 2014). Therefore the interest of petroleum geologists to the source and reservoir of Bazhenov Formation is understandable as it is characterized by an extremely large territory of $\sim 1 \times 10^6$ km².

The most exhaustive and valuable evidence, which remains relevant nowadays, can be found in early reports on the Bazhenov Formation studies by teams from various institutions (*GlavTyumen'geologiya*, SNIIGGiMS, ZapSibNI-IGeofiziki, SibNIINP, VNIIneft, VNIGRI, MINKHiGP, IGIRGI, VNIIGAZ, and many others). In this study, we use the classical works of 1970 through early 1990 complemented with data collected for the past three decades to characterize

the reservoir potential of the Bazhenov Formation at the regional scale.

Previous assessment of this kind was based on testing results and was made in the context of oil accumulation mechanisms known at that time (Dorofeeva et al., 1979, 1983; Efremov et al., 1988; Gurari and Gurari, 1974; Gurari et al., 1988; Kontorovich et al., 1986; Nesterov, 1979; Skorobogatov and Krasnov, 1984; Trofimuk and Karogodin, 1981; Zaripov et al., 1982; Zubkov, 1989; etc.).

Gurari and Gurari (1974) suggested a model of a shale reservoir formed by hydraulic fracture of laminated sediments by oil generated from kerogen. The model was later used by other researchers (Dobrynin and Martynov, 1979; Dorofeeva et al., 1979, 1983; Efremov et al., 1988; Gurari et al., 1988; Nesterov, 1979; Skorobogatov and Krasnov, 1984; Trofimuk and Karogodin, 1981; Zaripov et al., 1982; Zubkov, 1989). We chose several criteria for assessment of the regional-scale reservoir potential of the Bazhenov Formation using the shale reservoir model, with reference to the cited data.

Criteria for assessment of the regional-scale reservoir potential of the Bazhenov Formation

Reservoir thickness

As follows from the model of the Bazhenov Formation reservoir, the amount of hydrocarbons in it may depend on the reservoir thickness, which was estimated to be at least ~ 20 m in the producing organic-rich rocks of the Multanovskoe field. This thickness (of no less than 20 m) was assumed to be the first criterion of petroleum potential (Fig. 1a).

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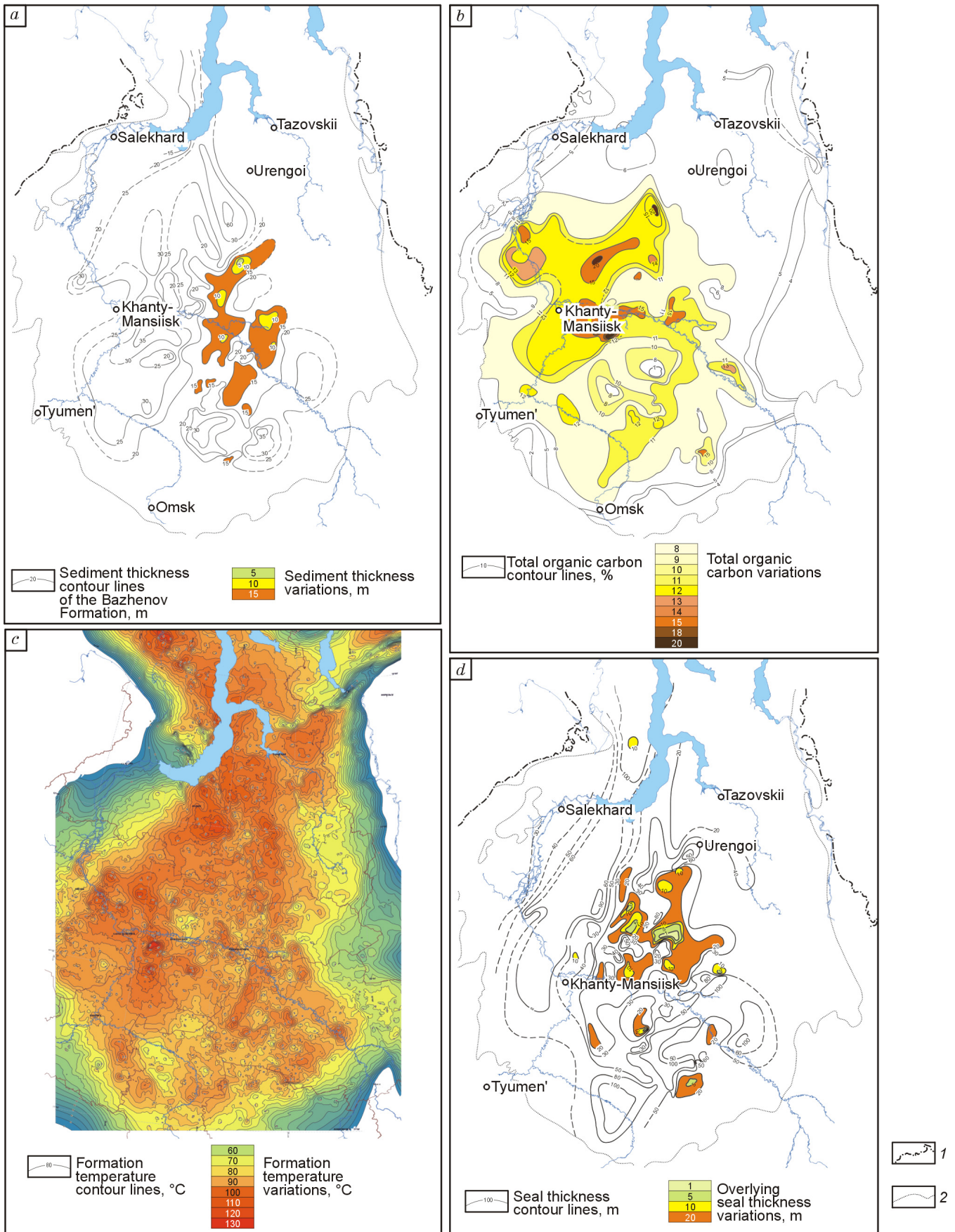


Fig. 1. Criteria for assessment of the regional-scale reservoir potential of the Bazhenov Formation. *a*, Reservoir thickness, after (Zubkov, 1984); *b*, total organic carbon, after (Kontorovich and Fomichev, Pers. Commun.); *c*, formation temperature on the top surface, after (Kurchikov and Plavnik, Pers. Commun.); *d*, thickness of seals, complemented after (Zubkov, 1984). Boundaries of: 1, Paleozoic framing; 2, Volgian–Berriasian sediments.

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