News and Highlights

The World's Largest Conglomerate Type Oilfield Has Been Discovered in the Junggar Basin of China

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The Junggar Basin in the northern part of Xinjiang is the second largest inland basin in China. It is located between the Altai and Tianshan Mountains, which is bounded by the Junggar bounded Mountain in the northwest, the Altai Mountains in the northeast and the North Tianshan Mountains in the south. It belongs to a triangular close inland basin, and extends 700 km in EW and 370 km in NS, covering an area of 3810^4 km^2. The elevation is about 400 m, high in the east (about 1000 m) and low in the west. The central basin is the Guerbantonggute desert, which accounts for 36.9% of the total basin area.

This basin is an ancient land platform, and the core strata of the land and platform are about 600 million years ago. It has a double basement structure, i.e., the lower part is Precambrian crystalline basement, and the upper part is the folds basement of the late Hercynian (Devonian to Early-Middle Carboniferous). From the late Palaeozoic to the Mesozoic-Cenozoic, it was a polycyclic superimposed basin, and deposited Carboniferous, Permian, Triassic, Jurassic, Cretaceous, Tertiary and Quaternary strata. This basin has long remained in a sedimentation state, and has deposited shallow sea facies limestone, and continental facies sandstone, mudstone and conglomerate. Paleontological fossils such as coal, oil, silicified wood, dinosaurs, fish and shellfish in strata of the Junggar Basin have recorded and preserved the complete geological development history of the basin, which is a rare "prehistoric Geological Museum" (Appendix 1).

The tectonic evolution of the Junggar Basin can be divided into foreland basin stage (northern Tianshan foreland basin), depression basin stage (Kelameili Mountain front depression) and regenerated foreland basin stage. The basin contains abundant oil and coal resources. In 1955, the Karamay oilfield was discovered in the basin, which is the first oil field discovered in China after the founding of new China. Despite 60 years of exploitation, the total resource amount of oil and natural gas in this basin is predicted to be 8.6 billion tons and 2.5 trillion m^3. At present, the proven resource rate is about 3%, indicative of a huge exploration and development potential.

Previous oil and gas exploration in this area has been mainly conducted around the basin for many years, and the effect is not satisfactory. Since 2005, oil exploration experts have carried out exploration in the central Junggar Basin for oil. They have performed critical research based on the oil-generation model of Mahu source rocks, shallow water facies fan delta deposition model, source reservoir oil conglomerate type reservoir theory and key technology such as conglomerate exploration, and have discovered six main reservoir groups such as Ma 131, Mahu 1 and Ma 18 in the Triassic Baikouquan Formation around the Mahu slope, with well depth of 4400−6000 m, to achieve great breakthrough in searching for conglomerate type reservoir in lacustrine sedimentary center (Fig. 1).

In the end of 2017, the Xinjiang Oil Field Co. of PetroChina announced greater than 1.24 billion tons of predicted petroleum geological reserves in conglomerate type oilfield of the Mahu area, Junggar Basin, including up to 0.52 billion tons of proven reserves. This oilfield contains the largest reserves among the world's conglomerate oilfields, which is larger than the world's second largest conglomerate oil of the Hemlock oilfield in the United States and the world's third largest conglomerate oilfield of the Kamauprice oilfield in Brazil.

The Junggar Basin has built an annular oil and gas pipeline as long as 760 km, which can link the previous pipelines including those in Karamay and Urumqi cities end to end, and can achieve the flexible configuration of resources in the whole Junggar Basin. It is expected to

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establish a new oil base with oil production capacity of more than 6 million tons during the "13th Five-Year plan" period (2016−2020 years).

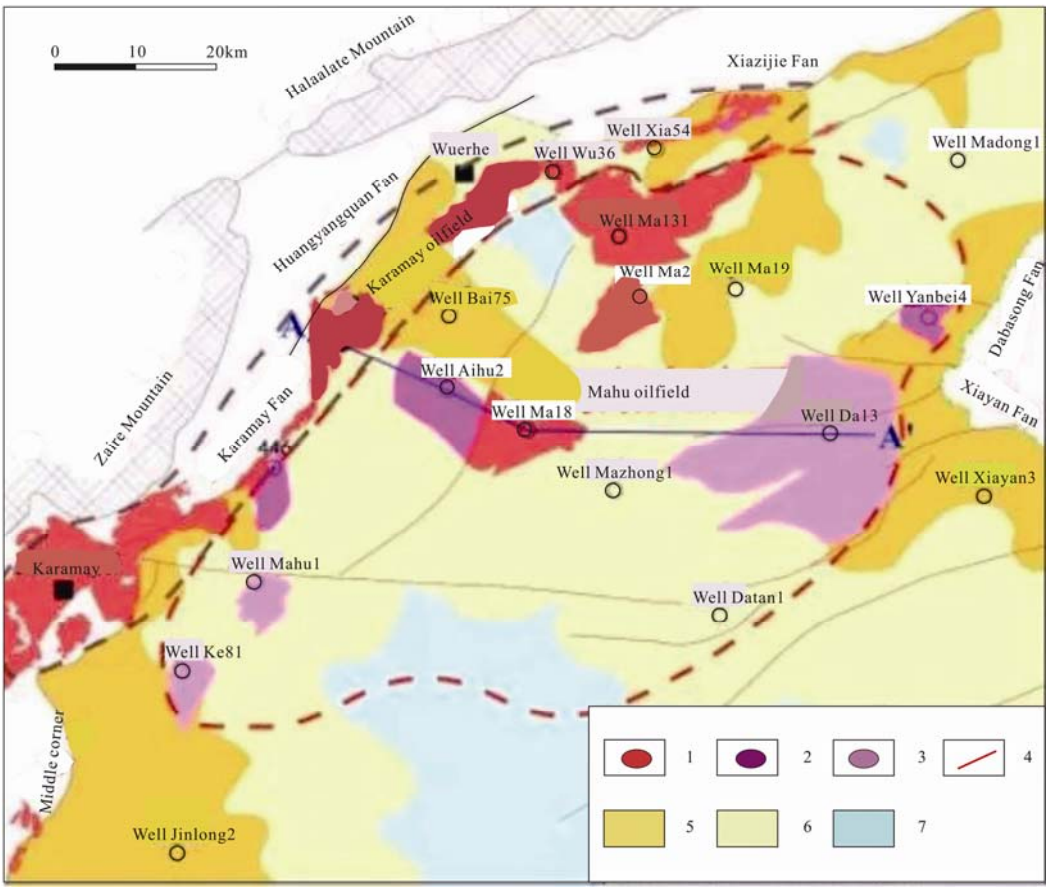

Fig. 1. Geological map showing the distribution of conglomerate type oilfields in the Junggar Basin of Xinjiang.
1, Proven reserves; 2, Probable reserves; 3, Possible reserves; 4, Fault; 5, Fan delta plain facies; 6, Fan delta front facies; 7, Shore-shallow lake facies.

Appendix 1 Stratigraphic column of the Junggar Basin and the distribution of conglomerate layer

Erathem	System	Series	Group	Formation	Formation code
Cenozoic	Neogene	Upper Miocene		Dushanzi Fm.	N_2d
		Miocene		Taxihe Fm.	N_1t
				Shawan Fm.	N_1s
	Paleogene	Eocene-Oligocene		Wulunguhe Fm.	$N_{2-3}w$
		Palaeocene			
Mesozoic	Cretaceous	Upper Cretaceous		Honglishan Fm.	K_3h
				Ailihu Fm.	K_2a
		Lower Cretaceous	Tugulu Group K_1tg	Lianmuqin Fm.	K_1l
				Shengjinkou Fm.	K_1s
				Hutubihe Fm.	K_1h
				Qingshuihe Fm.	K_1q
	Jurassic	Upper Juarassic			
				Qigu Fm.	J_1q
		Middle Juarassic		Toutunhe Fm.	J_2t
			Shuixigou Group $J_{1-2}sh$	Xishanyao Fm.	J_3x
		Lower Juarassic		Sangonghe Fm.	J_3s
				Badaowan Fm.	J_3b
	Triassic	Upper Triassic		Baijiantan Fm.	T_3b
		Middle Triassic		Karamay Fm.	T_2k
		Lower Triassic	**Ore-bearing conglomerate layer**	**Baikouquan Fm.**	$\mathbf{T_1b}$
Paleozoic	Permian	Upper Permian		Upper Wuerhe Fm.	P_2w
		Middle Permian		Lower Wuerhe Fm.	P_2w
				Xiazijie Fm.	P_2x
		Lower Permian		Fengcheng Fm.	P_1f
				Jiamuhe Fm.	P_1j
	Carboniferous				