During the development of the reservoir, the number of drilled wells was greatly reduced by allocating horizontal or highly-deviated wells based on studies of the geography, landform, and reservoir thickness and spatial distribution, which enabled us to develop the gas field efficiently.

Reservoir identification and gas production were performed simultaneously, thanks to an innovative mode comprising integrated exploration and development, modular design, factory equipment manufacturing, skid-based construction and "PMT+EPC" for capacity building. Compared with traditional approaches, this mode not only reduced the land footprint by 20%, but also significantly shortened the construction period and the time to market.

Environmental Protection

Designed for "zero pollution and zero emissions", the development program employed the most proven technologies for the treatment of waste water and gas in an effort to build a green gas field up to the most demanding standards.

100% wastewater recycling

The produced wastewater goes into the biological treatment facilities through the collection system, and undergoes precision treatment such as aeration, air floatation, oxygen consumption, and anaerobic processing before moving to the further processing unit for electro-dialysis and evaporative crystallization. When soluble solid is crystallized and separated out, the treated water is qualified for recycling. The recycled water is either used for plant irrigation and worksite flushing, or supplied to the circulating water system for gas purification, thereby achieving zero discharge of wastewater.

99.8% sulfur recovery

The 4bcm/a Moxi Purification Plant has four sulfur recovery units, each with a designed capacity of 42 tons per day and equipped with CNPC's proprietary CPS technology. In order to comply with the new national Environmental Protection Law, a renovation project of Shell Claus Off-gas Treatment (SCOT) for the 4bcm/a and the 6bcm/a units was implemented, increasing the total sulfur recovery rate to 99.8%, higher than the national standard of 99.6%.

Longwangmiao Gas Reservoir

Energize · Harmonize · Realize

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China National Petroleum Corporation

The Longwangmiao Formation of Cambrian system in the Moxi block is located at the paleo-uplift of central Sichuan Basin. With proven gas in place of 440 billion cubic meters, it is the largest monomer marine uncompartmentalized carbonate gas reservoir that has ever been discovered in China.

On September 9, 2012, formation testing at well Moxi-8 of Anyue Gas Field obtained a high-yield gas flow of over 1.9 million cubic meters per day, declaring the discovery of the Longwangmiao gas reservoir. On October 20, 2015, the Longwangmiao gas reservoir was put into production, with an annual capacity of 11 billion cubic meters. By the end of 2017, a total of 27 billion cubic meters of natural gas was produced.

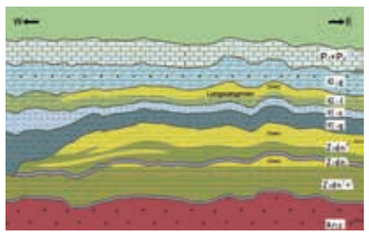
The annual production capacity of 11bcm was achieved within less than three years since the discovery of the gas reservoir, registering a record period for an uncompartmentalized gas reservoir to be identified and put into production in China.

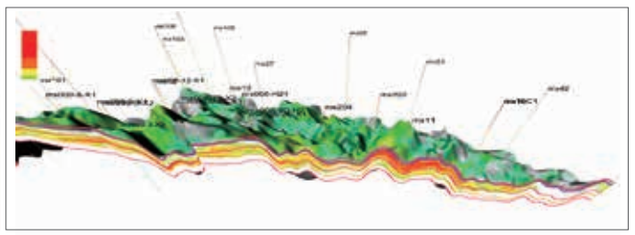
Technological Innovation

Longwangmiao gas reservoir is characterized by deep burial depth, high temperature and high pressure, poor physical properties and strong heterogeneity. Thanks to our new understanding on gas accumulation geology in paleo-marine carbonates and four innovative technologies for seismic prediction, fast drilling, logging evaluation and reservoir stimulation, rapid identification and efficient development of the gas reservoir have been realized.

Geological Theories

1. A Late Sinian-Early Cambrian large inner-platform rift (Deyang-Anyue) was identified for the first time in the deep zone of Sichuan Basin, and gas resource extent in the Sinian and Cambrian systems of the basin was reevaluated.
2. The depositional modes of the Sinian Dengying Formation and the Cambrian Longwangmiao Formation were established.
3. Accumulation model of the cracking gas from the Sinian-Cambrian paleo-oil pools was established.
4. Two gas reservoir modes, i.e. lithological-stratigraphic type of the Dengying Formation and structural-lithological type of the Longwangmiao Formation, were created in the structural setting of the giant Anyue gas field.





Applicable Technologies

1. High-precision 3D digital seismic acquisition, pre-stack depth migration processing, carbonate karst fractured reservoir seismic description, and hydrocarbon detection, led to achievements in fine structural interpretation, paleo-structural evolution, reservoir and fracture prediction and hydrocarbon detection. Key parameters for large-scale structure maps, reservoir prediction and hydrocarbon detection were obtained, providing support for well location selection and OGIP calculation.
2. Logging evaluation techniques for pore structure evaluation, karst cave identification and evaluation, fluid property identification, pore effectiveness evaluation, quantitative parameter evaluation of heterogeneous reservoirs, fracture identification and effectiveness evaluation, and productivity prediction of complex carbonate reservoirs have helped improve the interpretation efficiency and accuracy greatly.
3. Fast drilling was enabled by optimized wellbore configuration, PDC bits, long-life drilling screw, and high-quality drilling fluid.
4. Compound stimulation measures were adopted which integrate deep penetrating acid fracturing, zonal acid fracturing and diversion acid fracturing, greatly improving stimulation efficiency and reducing the average formation testing cycle.