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The Open ANTON Reservoir Geological Research Institute



Basic Features

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The characteristic geological engineering technology is adopted to improve the efficiency of engineering development, help customers accurately hit the target Oil & Gas reservoirs, and maximize the asset value of customers' reservoirs.



Characteristic Research Direction



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Service-Oriented Research Institute



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An Open Research Institute

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Anton Reservoir Geological Research Institute is striving to build an open platform organization, integrating independent research and development with open collaboration to create a brand new research institute.



Service Capability

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Anton Reservoir Geological Research Institute has the capability to carry out all kinds of project research

and engineering operation at the same time, and cooperate with customers for joint development.

- Kazakhstan acidizing & fracturing stimulation service
- Iraq Conceptual design for Hollfield development
- Fracturing and stimulation services for horizontal Wells in Iraq limestone oil fields
- Digital Core application service for X field, Iraq
- ...
- B Oilfield Risk stimulation service in Pakistan
- ...

• ...

 Comprehensive geological study and production support for O oilfield in Chad

- Geological Engineering Design and Tracking
 Implementation of Side DriJling in Ordos Basin.
- FOS visualization monitoring and production profile Monitoring in Changqing Oilfield.

• ...

• Tarim drilling process optimization and technical support

• ...

- Geo-mechanics and borehole stability analysis of BZ key well in Tarim Oilfield
 - FOS visualization monitoring in Daqing gas storage oilfield
 - FOS visualization monitoring in Jilin
 - FOS visualization monitoring in Liaohe
 - Water block removing service in North China Petroleum Bureau of Sinopec
 - General Contracting Services of Geological Engineering in China Petroleum Bureau of Sinopec
 - Integration study of geology and engineering in Y block of Shengli Oilfield
 - Evaluation of shale gas resources in L block of Hunan
 - Implementation plan optimization, realtime tracking and comprehensive effect evaluation of shale gas wells in Changning
 - Shale gas precise fracturing control service in Changning
 - Sweet pot technical service in Shunan
 - Block N in Guizhou CBM development plan

Characteristic Service-Geological Engineering Technology

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Technical Features

- Real-time iterative fracturing technology, real-time analysis of fracturing process, constantly iteration of geological knowledge, and quick response of "one section, one policy" on site
- Providing technical services which combines geology and engineering at all stages of oil and gas field exploration and development
- ✓ Standardization and software implementation of technical means

Case

- ✓ Real-time iterative fracturing technology service for Changning shale gas
- ✓ General contracting services of geological engineering in China Petroleum bureau of Sinopec
- ✓ Water block removing service in North China Petroleum Bureau of Sinopec
- ✓ Optimization and technical support of operation process in PetroChina Tarim oilfield

Application Results

- Combining geology with engineering tightly, with real-time iteration, improvement of quality and efficiency, thus reform the complex fractures in the well control area, achieve 20.87% increase in output
- ✓ Customed engineering plan based on reservoir geological characteristics
- ✓ Independently software development regarding to drilling and fracturing



Results of Pre-fracturing Simulation and Post-fracturing Matching



Integrated Implementation of On-site Geological Engineering

Characteristic Service-Digital Reservoir Technology

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1. Digital Core Technology

Technical Features

- ✓ Non-destructive rock analysis, no sample shape requirement
- Quantification and visualization of rock internal structure
- Quantification and visualization of complex experimental processes such as displacement

Case

 Evaluation Experiment of Remaining Oil in Ordos Tight Sandstone and Bohai Bay Old Region

Application Results

- ✓ Core pore structure evaluation to guide reservoir evaluation
- ✓ After oilfield development, evaluate microscopic pore structure changes and residual oil status in the core microscopic
- Evaluate residual oil status after displacement by different methods to guide development approaches improvement



Microscopic Pore Structure Changes





Microscopic Residual Oil Distribution Changes

Characteristic Service-Digital Reservoir Technology

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2. Digital Cuttings Technology

Technical Features

- ✓ No down hole equipment; use fresh cuttings for digitization
- Accurately provide elements, minerals, physical properties, rock elastic mechanics parameters
- Fast analysis and high data output rate; meet the needs of rapid decision-making onsite

Case

✓ Southwest shale gas horizontal well, Ordos tight gas horizontal well

Application Results

- ✓ Accurately judge formation changes during drilling and assist geosteering
- Provide real-time important parameters such as minerals, porosity, pore-throat structure, Young's modulus, Poisson's ratio and brittleness index to meet quickly reservoirs evaluation
- ✓ Optimize completion, perforation and fracturing plan
- ✓ Cutting samples are easily stored for unlimited analysis



Horizontal well heterogeneity evaluation map



Comprehensive Map of Digital Cuttings Processing Interpretation

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1. FOS Fracture Monitoring

Technical Features

- ✓ Monitoring perforating clusters opening in real-time
- Monitoring fracture width and orientation, identification of layer channeling and interference between wells or stages
- Evaluate fracturing results on-site and optimize the fracturing work plan in realtime

Case

✓ Fracture monitoring in Fuling shale gas well

Application Results

- ✓ Accurately monitoring of the opening/closing of each fracture stage
- ✓ SRV is expanded by adjusting the fracture treatment in real-time
- ✓ Target well produced about 100 km³/d more gas than same platform Wells
- Real-time fracture dynamics monitoring, interpretation of micro-seismic data, and accurately display fracture shape were compared and analyzed.



2. FOS Production Profile Monitoring

Technical Features

- The production data obtained by static measurement method, it can get closer results to the real production situation at the bottom of the well
- It could be optimize and guide the production allocation scheme by Multiple production systems monitor the variation and movement law of oil and gas in the well
- ✓ Monitoring integrity of wellbore and reducing wellbore risk
- Without down hole logging tools it is less operation risk and easy to go down the well, the requirement of pipe string drift diameter is low

Case

 Southwest shale gas oilfield, Guizhou shale gas oilfield, Chongqing shale gas oilfield, Liaohe gas storage oilfield etc.

Application Results

- \checkmark Monitor production profile and leaking for each stage.
- ✓ Monitor the well integrity, and identification of leakage point depth.



The Final Interpretation Report

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3. FOS gas storage well monitor

Technical Features

- Using static measurement method, the production data obtained is more real, reliable and has reference significance
- Real-time gas movement monitoring to optimize and guide production allocation
- ✓ Monitor well integrity 24/7 to avoid risk
- Long-term monitoring, find out the gas storage huff and puff law, guide later development plan

Case

✓ Daqing 4th station gas storage, Changqing gas storage, Liaohe gas storage etc.

Application Results

- Strengthen data monitoring, through the database, AI autonomous analysis of wellbore conditions, timely warning
- Through big data analysis, abnormal events can be found in advance to ensure economic benefits
- ✓ In the future, the FOS technology service gas storage should be the full borehole monitoring of geological integrity, wellbore integrity and surface integrity.

integrity



The Final Interpretation Report in Storage Well

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4. Wide Field Electro-Magnetic Monitoring

Features

- Monitoring electrical difference caused by fracturing fluid when entering the formation; then to determine frac-fluid location
- Fracture parameters real-time monitoring including length, orientation, height and stimulated area
- ✓ Residual oil monitoring

Case

✓ Shale Gas Reservoir Operation Monitoring

Application Results

- Identify the direction and extension trend of dominant cluster in time; temporary plugging method had been adopted
- ✓ Slows down dominant clusters extension; speeds up the extension of inferior clusters; Overall SRV had been enhanced



Facility Diagram



Real-time Fractures Monitoring

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Shengli Oilfield Tight oil technology general contracting service: utilized for 50 Wells, increasing test \checkmark production by 20% compared with conventional fracturing processes

Oriental wisdom . Global sharing

Reservoir

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Case

Oil in Iraq

Feature

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2. Nano Fluid Stimulation Technology

Feature

- Easy to enter (small size; anti-absorption); able to wash oil out (high efficiency); able to flow back(low capillary pressure, anti- water blocking)
- Using it alone can improve water blocking issue in gas fields old Wells and reduce pressure and increase injection in oil injection Wells
- can be utilized with fracturing fluid to achieve integrated function during fracturing, flooding and producing

Case

✓ Shengli Oilfield Tight oil; Ordos Basin tight gas, Xinjiang tight oil and Pakistan tight oil

Application Results

- ✓ 18% production increase compared with adjacent Wells (Tight oil and gas wells)
- ✓ Flow back ratio drop by 21% when getting hydrocarbon from tight oil & gas reservoir; achieved dialysis displacement and ignition pressure difference deduction
- ✓ Sulige gas field old Wells were injected with nano-fluid to deal with water blocking, and the production recovered back to more than 10,000 m³, increasing production by 3-4 times



ANTflo-800 Nano Fluid



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3. Fluid Cavitation Stimulation Technology

Feature

- Pure physical method solves conventional issue such as strong water sensitive layer, thin and poor layer and adjacent water layer; and deals with issues relating to secondary and tertiary production; The circular construction has no reservoir damage, and the process is simple, safe and environmentally friendly
- ✓ Deep stimulation : treatment radius up to 150 m
- ✓ Omni-directional: 360° radial action around wellbore
- ✓ High accuracy: affected reservoir Thickness 1.5 to 2.0m

Case

✓ Bohai oilfield, Liaohe oilfield, Daqing oilfield, Dagang oilfield, Shengli oilfield

Application Results

- ✓ permeability enhancement of high porosity and high permeability shale & Sand interlayer in Bohai oilfield. oil production increased from 9.6t/d to 17.5t/d, and oil production is increased by 2100 m³, high input-output ratio
- Low porosity and low permeability water flooded thick layer upper part fine stimulation in Liaohe Oilfield. After the measures, it produces 2t/d liquid and 0.2t/d oil, and has a stable water production of 1.6-2.2t/d, and 521 tons of oil increase
- thin and poor layer water injection well stimulation (middle porosity and low permeability sandstone) in Daqing oilfield, water injection volume is more than 12m³, corresponding oil increase is 2.5T per day. Till now, 1380 tons of oil has been added, and the validity period is 552 days



Fluid Cavitation Stimulation Technology

The production curve of Daqing oilfield



Characteristic Service-Reservior Geology Research TechnologyANTON 安東

Technical Features

- Fine interpretation of structure and restoration of paleogeomorphology
- ✓ Fine reservoir description and fine characterization
- ✓ Natural fracture prediction
- Geo-mechanics research, one and three dimensional, geomechanically modeling for wells

Case

- Integrated productivity scheme of reservoir geology and engineering in Shengli Oilfield.
- High quality reservoir evaluation and development target optimization in * tight oil block.

Application Results

- Based on reservoir geology research, it provides technical support for the whole process of drilling, fracturing and production.
- ✓ Main controlling factors analyze; accurately hit the sweet spot.





Construct fine interpretation - 3D diagrams

Analysis of palaeogeomorphology





Channel distribution map of sand Formation in Shaximiao 8



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