Engineering of Platform, Drilling, Logging and Testing

in Offshore Oil Exploration and Development

海洋石油勘探与开发：平台建造、钻井、测井与测试

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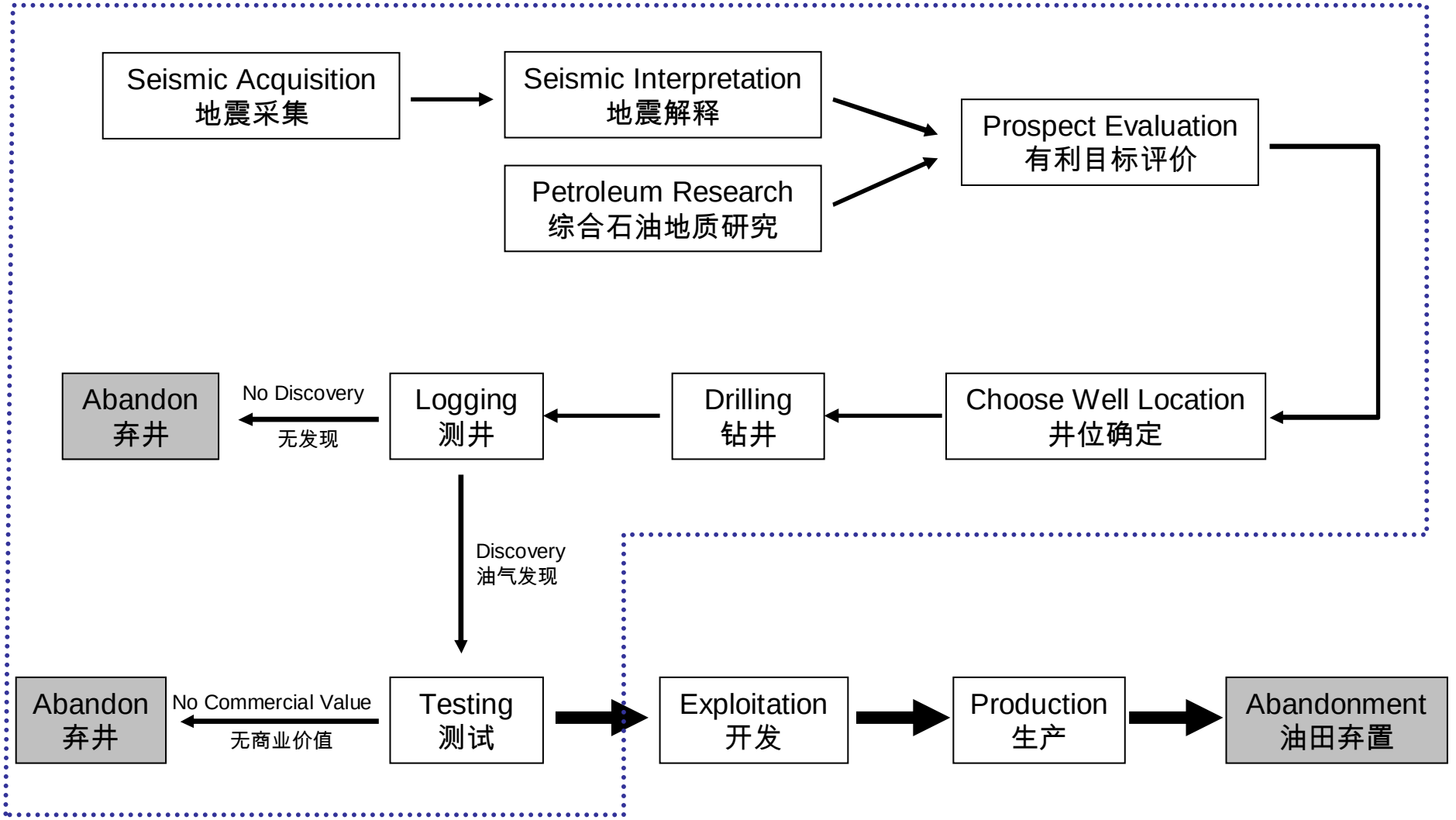
August 22-25

Offshore Oil Exploration, Exploitation, Production and Abandonment
海洋石油勘探、开发、生产和弃置



Engineering of Platform

平台的工程建造

Platform of Offshore Oil Exploration and Production

海洋石油平台

Main Facilities of Offshore Exploration and Production

海上设施

生产平台 Production Platform

1.5-7 billion RMB

储油轮 FPSO

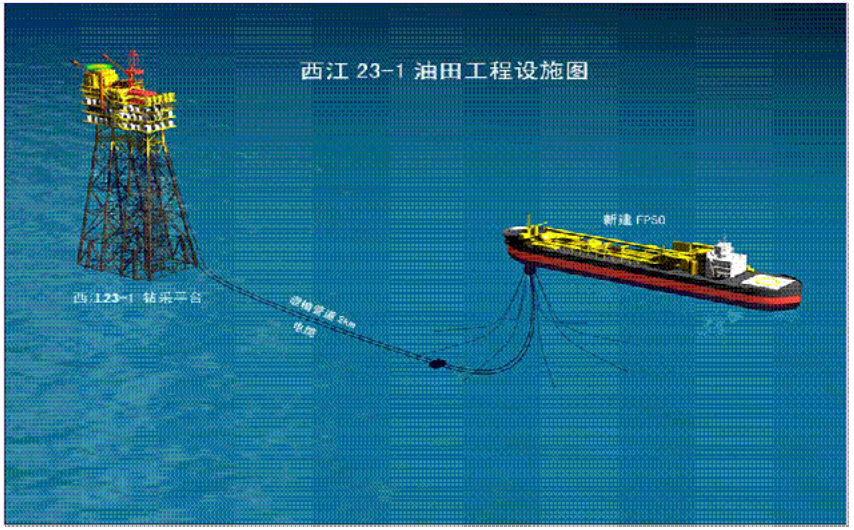
1.5-2.5 billion RMB

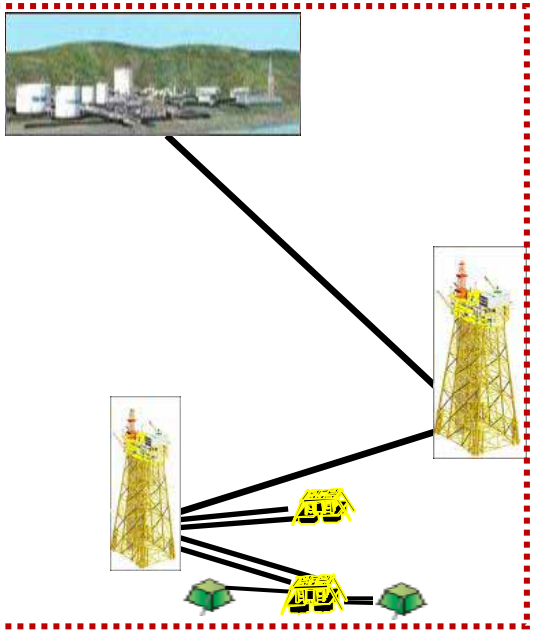
水下设施 Subsea Facilities

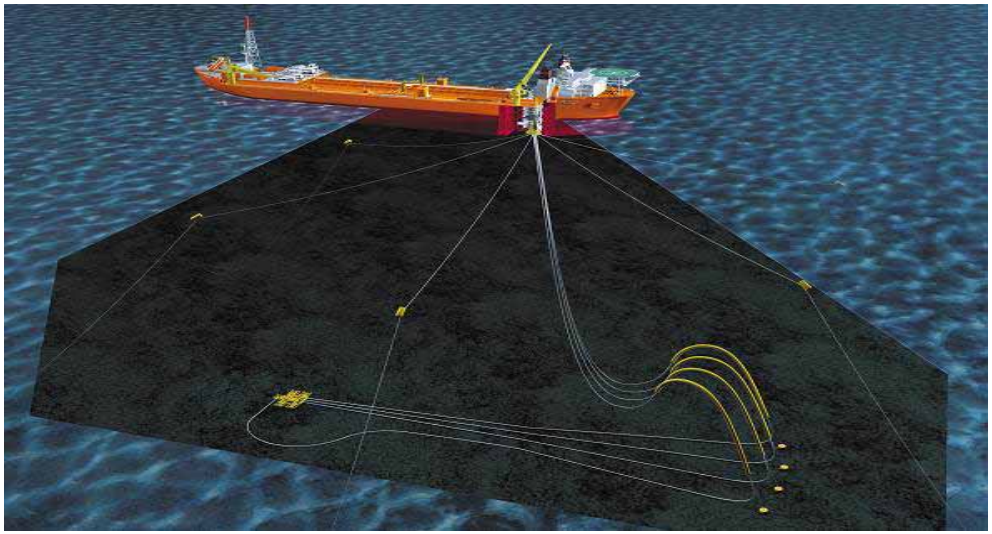
1-3 billion RMB

钻井/勘探平台 Drilling Platform

2-6 billion RMB







Platform of Offshore Oil Exploration and Production

海洋石油平台

油气田设施建设内容按过程分包括：

Building Procedure of a Production Platform

1、设计 Design

2、建造 Building

3、安装 Installment

4、调试 Commissioning

5、机械完工和投产 Putting into Production

Platform of Offshore Oil Exploration and Production

海洋石油平台

导管架建造
Jecket Building

上部组块建造
Top Block Building

钻机建造
Drilling Rig Building

生活楼建造
Living Courter Building

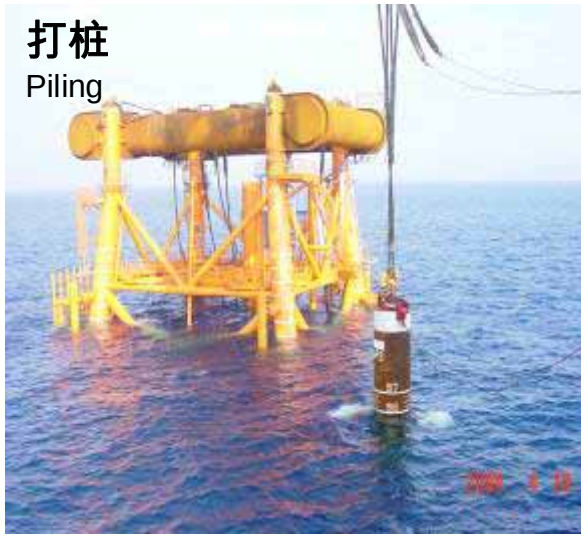
Platform of Offshore Oil Exploration and Production

海洋石油平台

运输
Transport

导管架下水
Jacket Launching

打桩
Piling

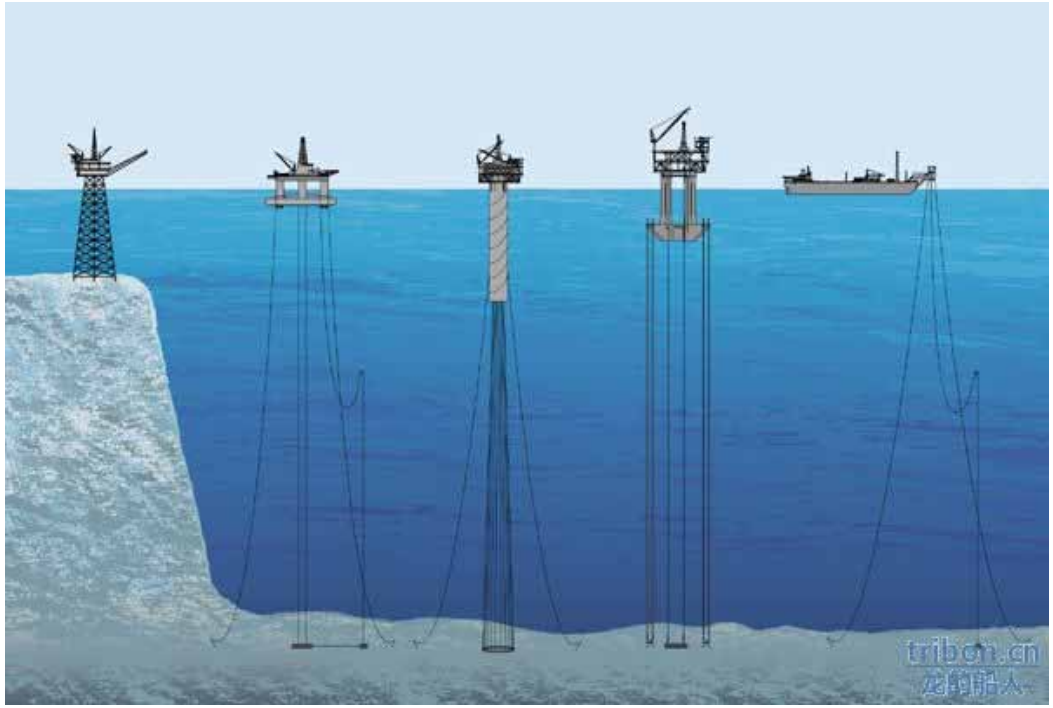


钻机模块吊装
Drilling Rig Lifting

连接调试
Hook up and Commissioning

Platform of Offshore Oil Exploration and Production

海洋石油平台

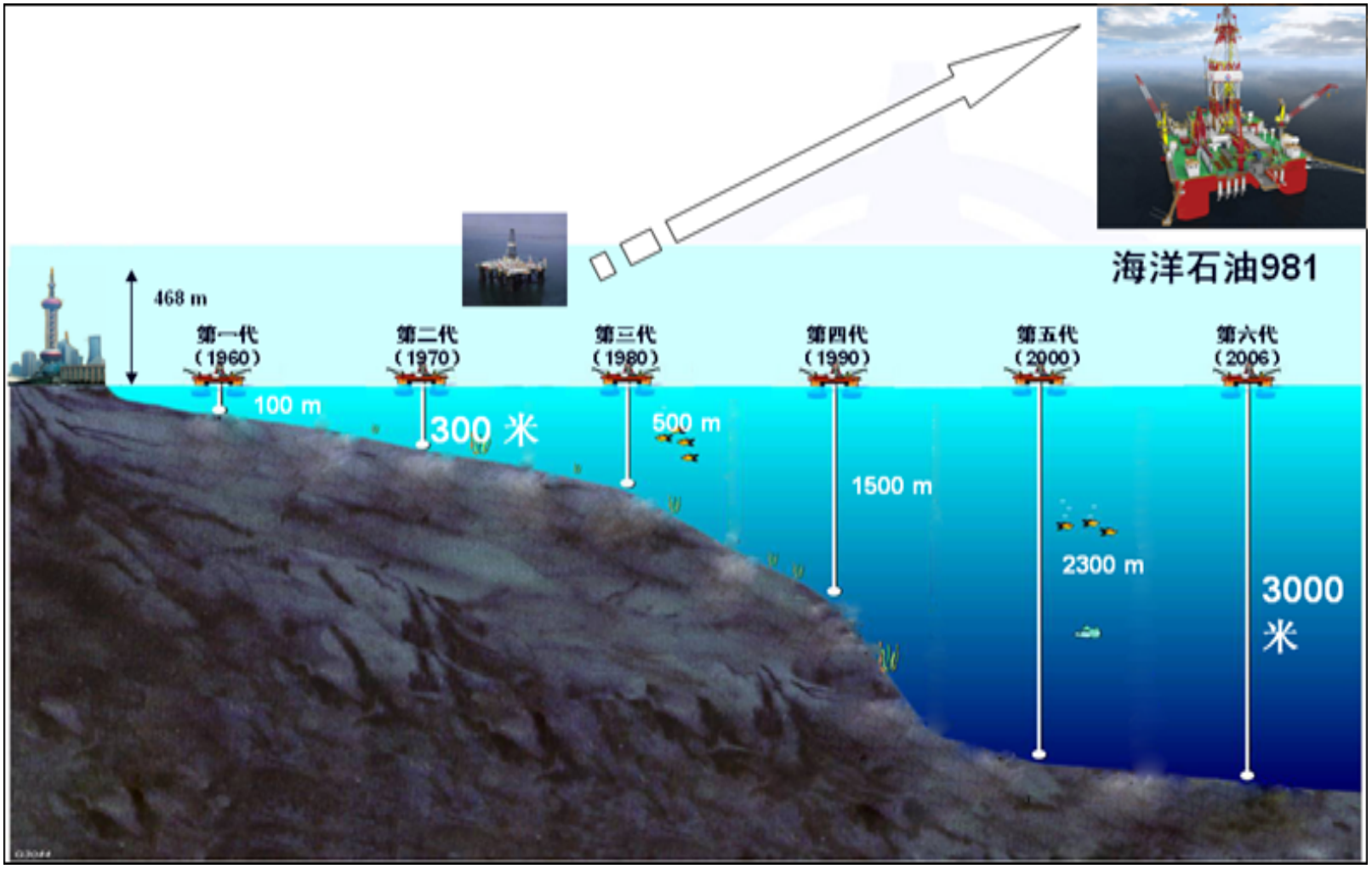


Drilling of Offshore Oil Exploration

海洋石油钻井

Drilling of Offshore Oil Exploration

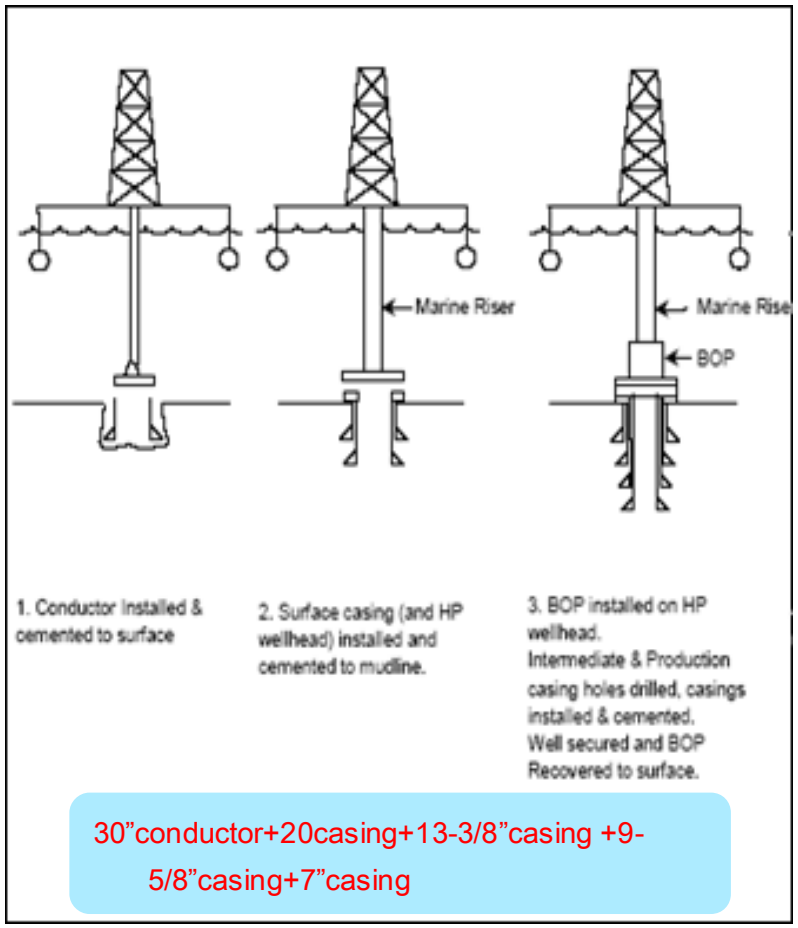
海洋石油钻井



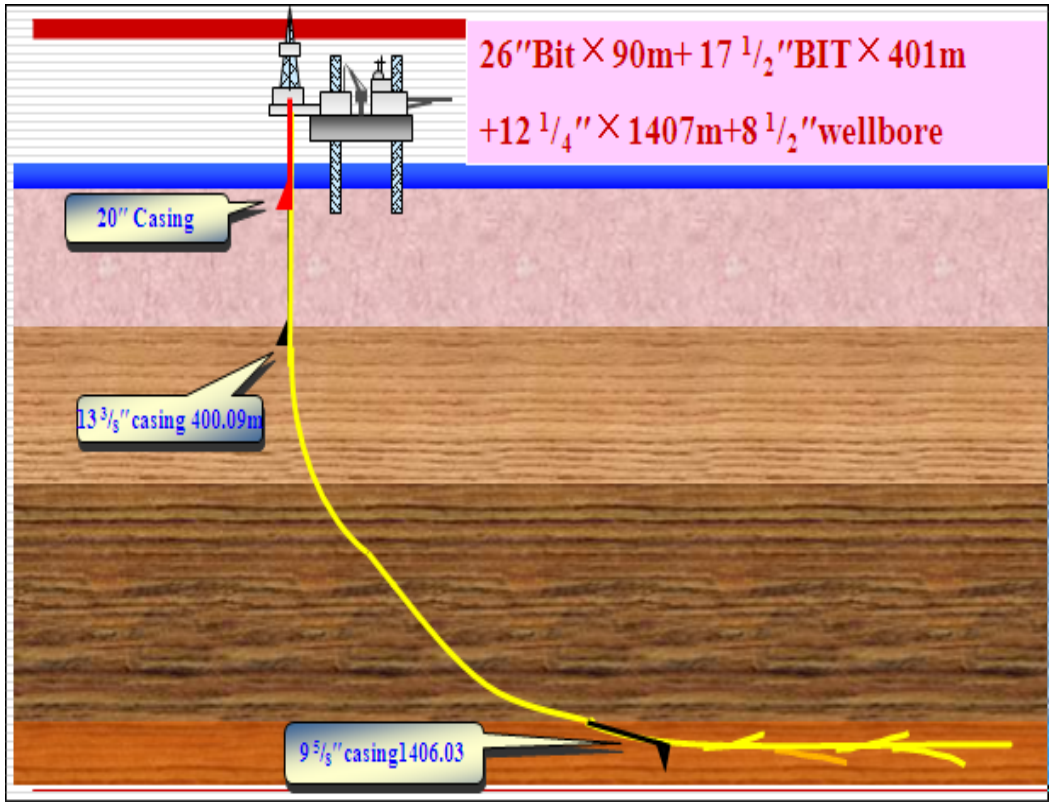
目前，钻井平台已发展到第六代。The latest platform is the 6th generation.

Drilling of Offshore Oil Exploration
海洋石油钻井

Typical drilling programmer for drillship and semi-submersible (subsea wellhead system)
钻井船或半潜式平台钻井的典型井身结构



30”conductor+20casing+13-3/8”casing +9-5/8”casing+7”casing



Typical Well structure for jack-up or production platform
自升式或生产平台钻井的典型井身结构

Drilling of Offshore Oil Exploration

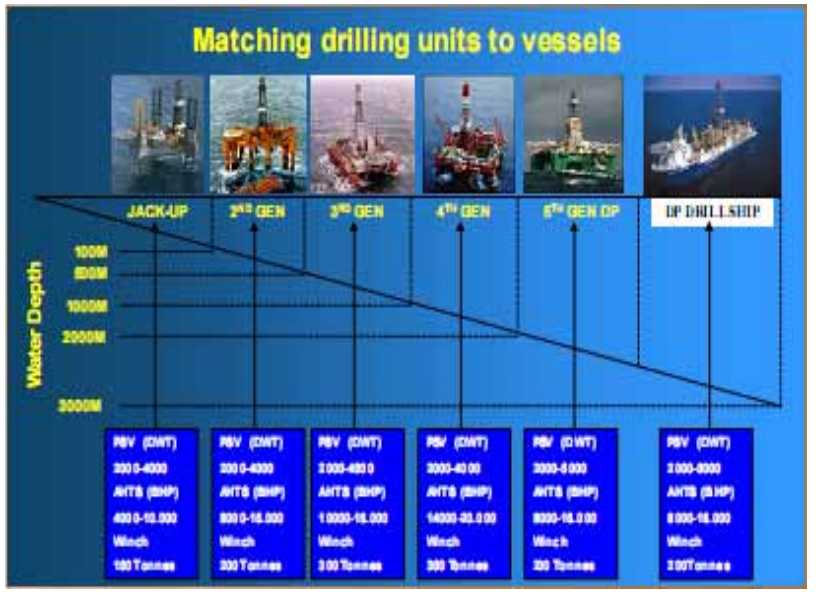
海洋石油钻井

- HIGH INVESTMENT 高投资
- HIGH TECHNOLOGY 高技术
- HIGH RISK 高风险

Drilling of Offshore Oil Exploration

海洋石油钻井

1. The building cost and rent cost are very high
   - # HYSY 981 building cost------6 billion RMB
   - # Jack-up rent cost------1.2-1.5 million RMB/day
   - # Shallow-water semi-submersible rent cost-----1.5-2 million RMB/day
   - # Deepwater drillship or semi-submersible rent cost------3 million RMB /day ….
2. Drilling material cost high
3. High technology brings high cost
4. Logistic services cost high



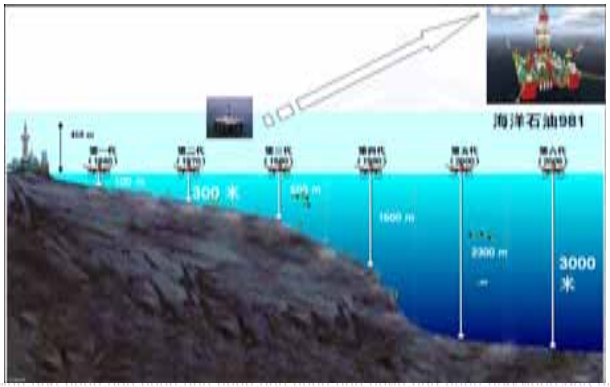
The day rate of an exploration well is about 2.5-3 million RMB/day in shallow water and 5-6 million RMB/day in deepwater.

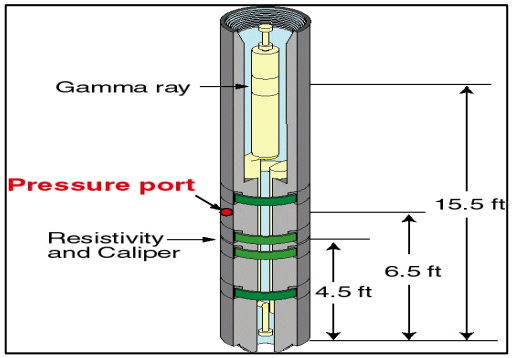
Total cost of drilling to develop a common oil field by platform in shallow water is 1.2-1.5 billion RMB and more than 3 billion RMB in deepwater.

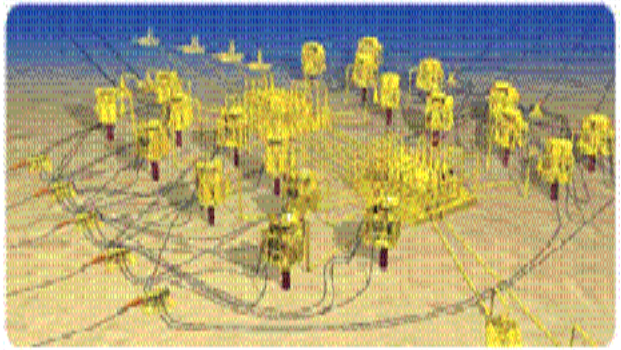
Drilling of Offshore Oil Exploration

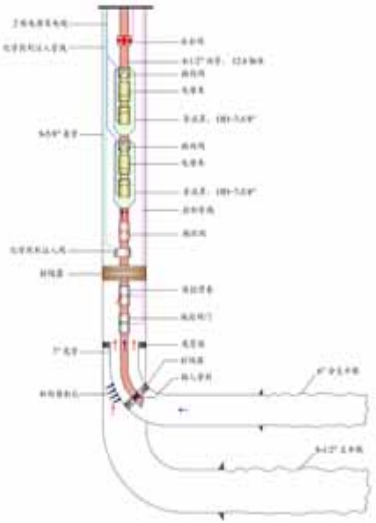
海洋石油钻井

Advanced drilling equipment, drilling and completion technology 先进的设备和技术

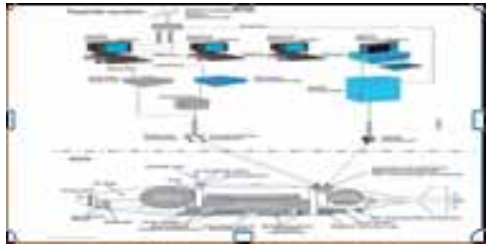


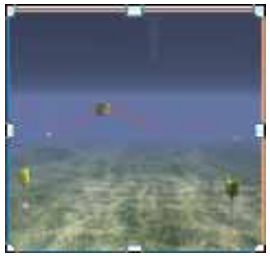






- Subsea technology
  - ROV 水下机器人
  - DP or subsea position 海底定位
  - Subsea wellhead, intelligence Completion and X'TREE 水下井口、智能完井、采油树



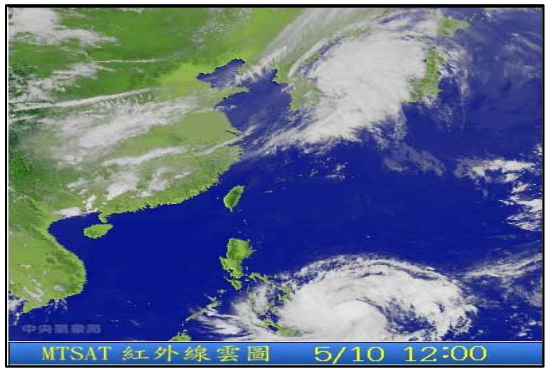


Drilling of Offshore Oil Exploration

海洋石油钻井

Limited space on platform make well control difficult, easy to get a fire or even explosion and cause the serious death accident and oil spill crisis. 主要风险：火灾、爆炸、死亡、溢油等

Tough environment: Typhoon, monsoon and black current and so on. 恶劣环境：台风、季风、黑潮等



Shallow layer geologic hazard
Shallow gas accident
浅层地质灾害、浅层气

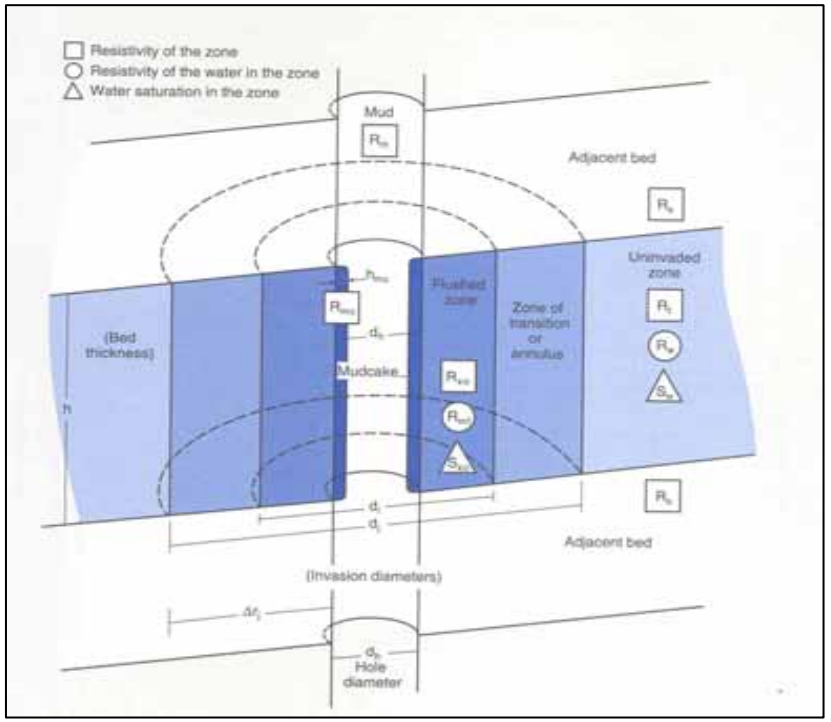
Wireline Logging of Offshore Drilling

电缆测井

Wireline Logging of Offshore Drilling
电缆测井

The Purpose:

岩性	Lithology
物性	Porosity & Permeability
电性	Resistivity
含油气性	Oil Saturation



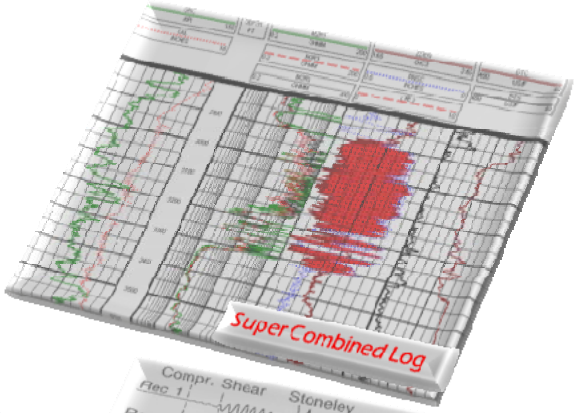
Formation Evaluation:

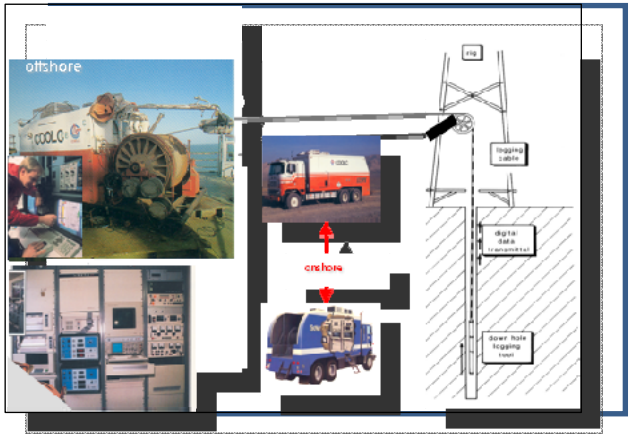
有效孔隙度Φ	Effective Porosity
渗透率K	Permeability
泥质含量 Vsh	Volume of Shal
含水饱和度Sw	Water Saturation
有效厚度H	Thickness

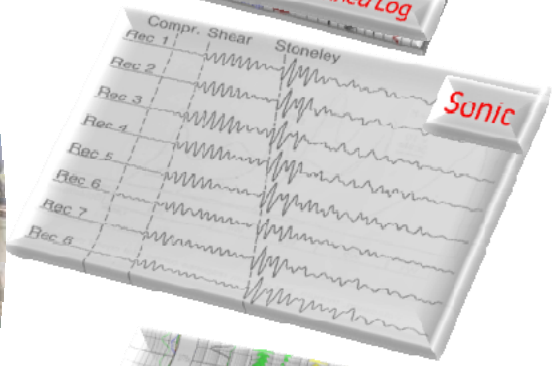
$$S_w = \sqrt[n]{\frac{abR_w}{R_t \phi^m}}$$

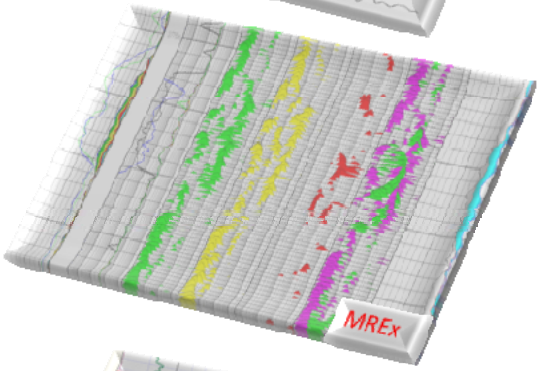
Geophysical Method

- Sonic
- Spectrum
- Electricity
- Magnetic
- Radioactivity
- Mechanic

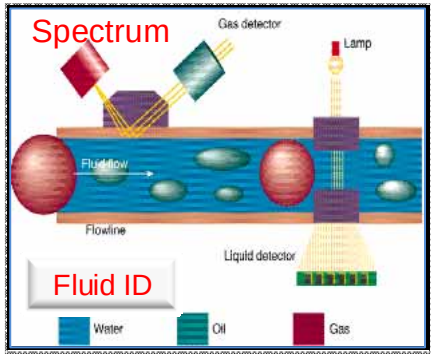


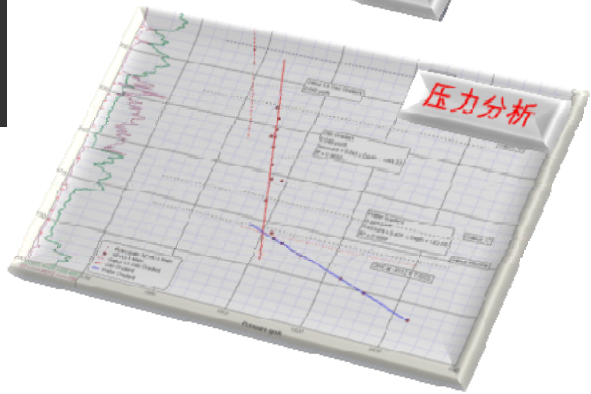






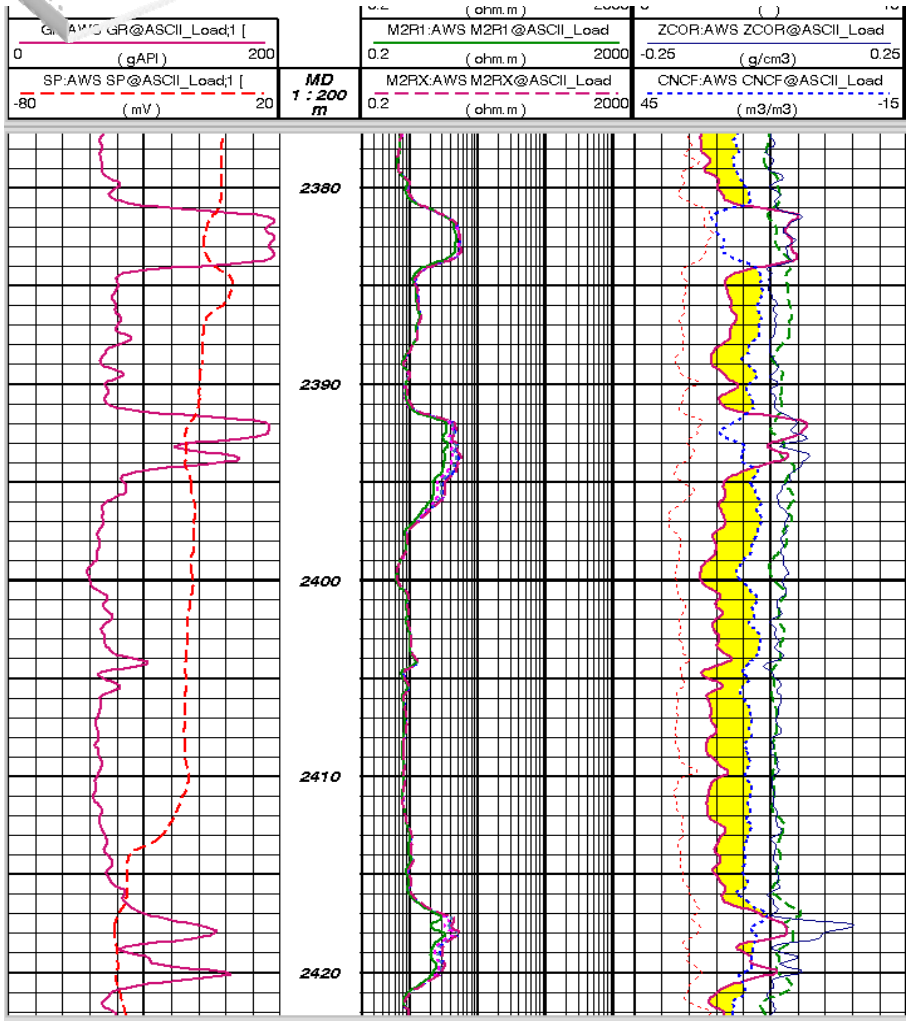
Radioactivity





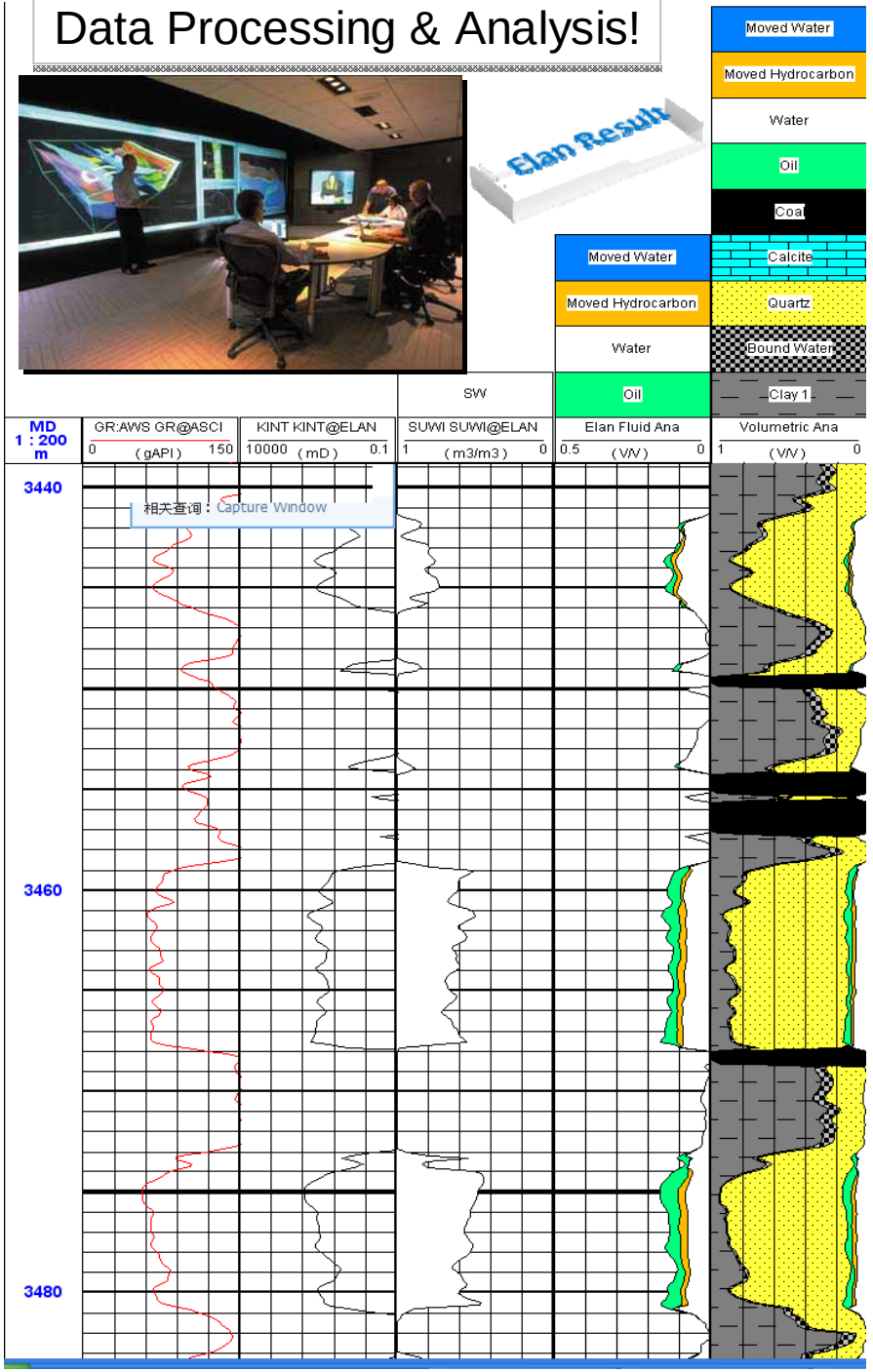
Wire Logging Raw Data

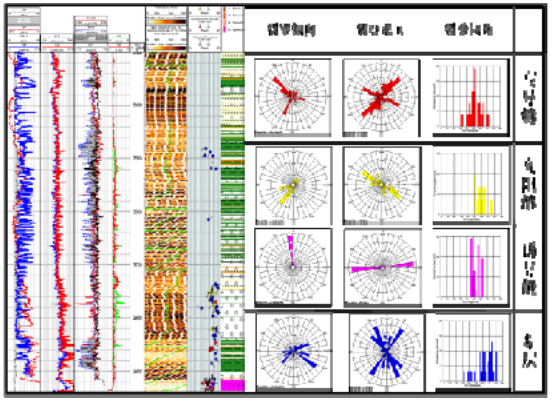
数据采集 Data Acquisition

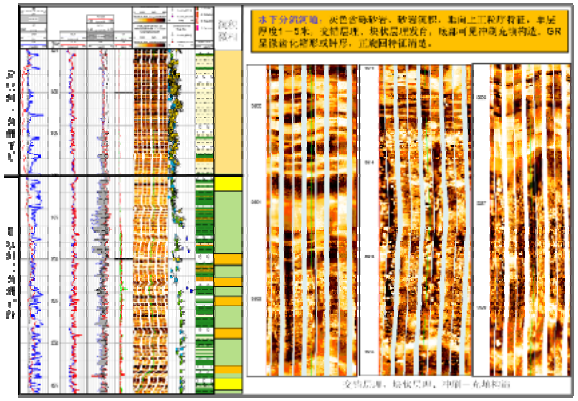


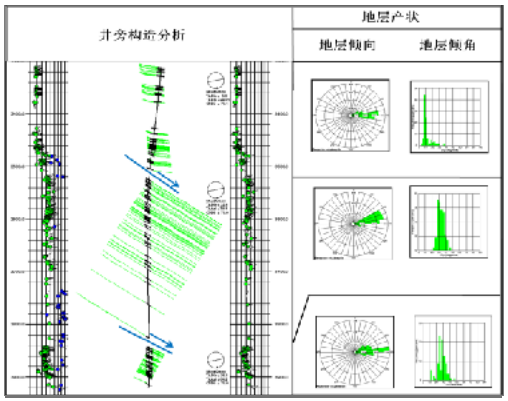
Data Processing & Analysis!

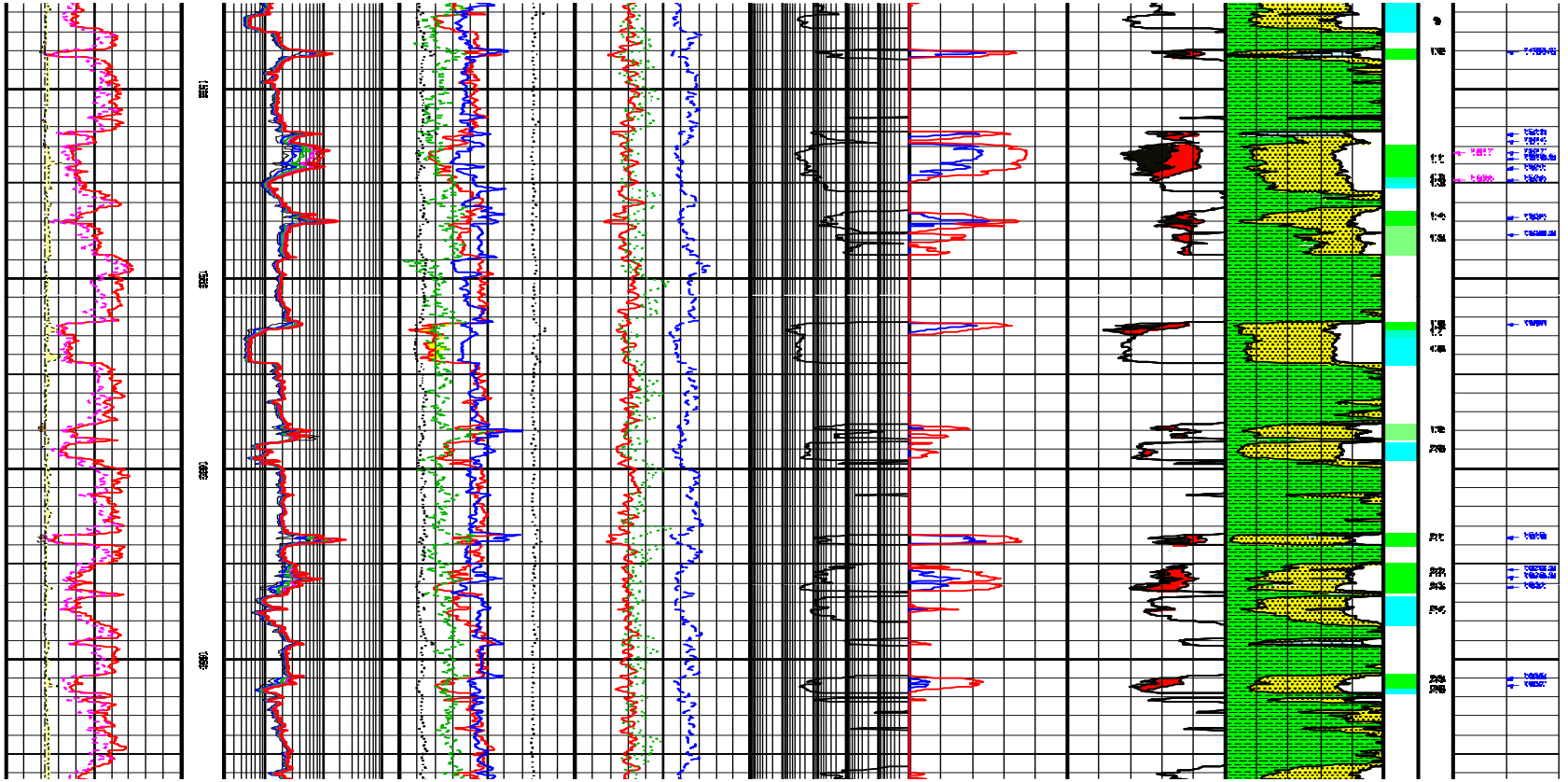
Elan Result











综合测井图　Composite logging map

Testing of Offshore Drilling

测试

Testing of Offshore Oil Exploration

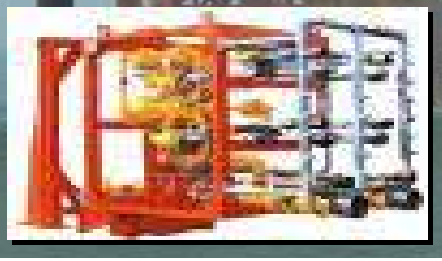
测试

The Concept of Testing

测试的概念

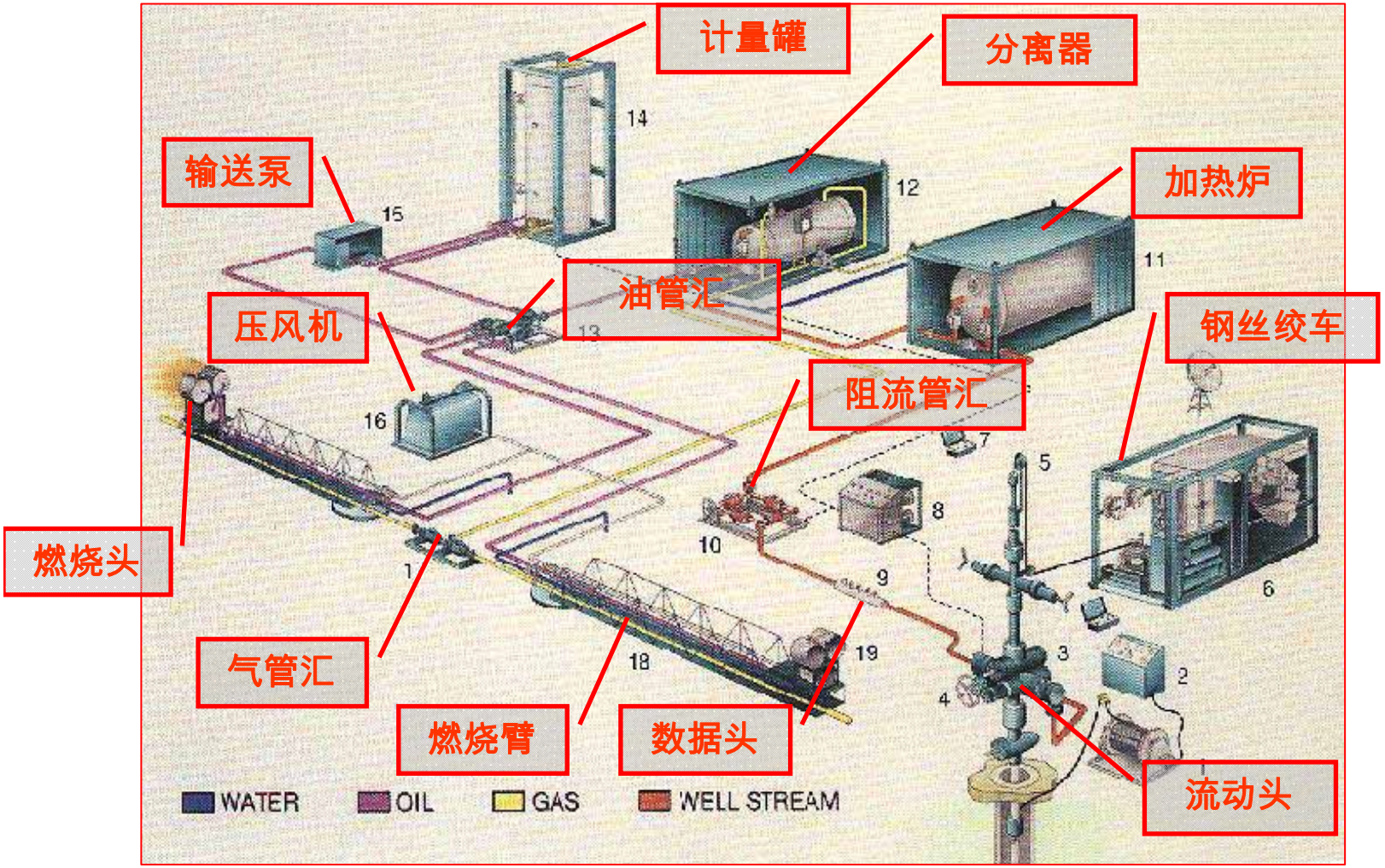
Formation testing is established in drilling engineering formation channel-hole through certain measures after the formation fluid into the wellbore out, and even the fluid and production through a series of homework, understand of fluid properties, capacity and to obtain all kinds of formation parameters of the data such as whole process called formation testing.

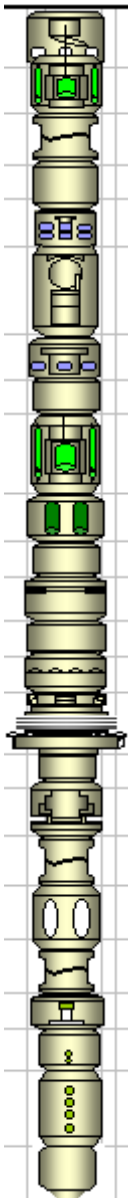
地层测试是在钻井工程建立起地层通道---井眼之后，通过一定的措施使地层流体流入井筒甚至喷出地面，并对流体和产层通过一系列作业，搞清流体性质、产能及取得各种地层特性参数等资料的整个工艺过程称为地层测试。

Testing of Offshore Oil Exploration

测试





井上设备和井下工具　Surface Equipment and Downhole Equipment

Testing of Offshore Oil Exploration

测试

The Purpose of Testing

测试的目的

1. Ascertain formation fluid property and output capacity;

   确定地层流体性质及产出能力

2. Determine the effective thickness of production and the effective permeability;

   确定产层有效厚度及有效渗透率

3. Ascertain pressure-P and temperature-T in Produce layer ;

   确定产层压力P和温度T

4. Find out the extent of damage of the strata;

   弄清地层的损害程度

5. Ascertain formation during test no failure phenomenon;

   确认地层在测试过程中无衰竭现象

6. Sure in the stratum oil--water interface position or oil--gas or air-water interface;

   确定地层中的油-水界面位置或油-气或气-水界面

7. Sure test radius, boundary display and single well control geological reserves, etc.

   确定测试半径、边界显示及单井控制地质储量等

Testing of Offshore Oil Exploration

测试

Process Technology

测试方法

1. Conventional test 常规油气测试
2. Low permeability and low porosity reservoirs test 低孔低渗油气层测试
3. The sand formation testing of heavy oil 稠油出砂地层测试
4. Open hole test 裸眼测试
5. Fracturing test 压裂测试
6. Semi-submersible test 半潜测试
7. Acidification test 酸化测试
8. Screw pumps test 螺杆泵泵抽测试








Testing of Offshore Oil Exploration

测试

Meaning of the Testing

测试的意义

1. for oil and gas reservoir/drill evaluation to provide information;

   为油气藏/油气田的钻后评价提供资料

2. for reserve calculation to provide direct parameters (such as: including hydrocarbon area, the effective thickness, formation of crude oil, the original volume coefficient Boi dissolved gas oil than Rsi, original reservoir pressure);

   为储量计算提供直接参数（诸如：含烃面积、有效厚度、地层原油体积系数Boi、原始溶解气油比Rsi、原始储层压力）

3. further for the writing of the test report to provide information .

   进一步为测试报告的编写提供资料

Thank You !