

Al-Ayen University
Petroleum Engineering Faculty

Drilling Engineering II

Fourth Year

**اندفاع الآبار النفطية والغازية وطرائق
معالجتها والسيطرة عليها**

**Oil and Gas wells Blow out
Control and treatment**

الأستاذ المساعد الدكتور: ناجح يوسف العلي

Lecture - 4

الاندفاع Blow out:

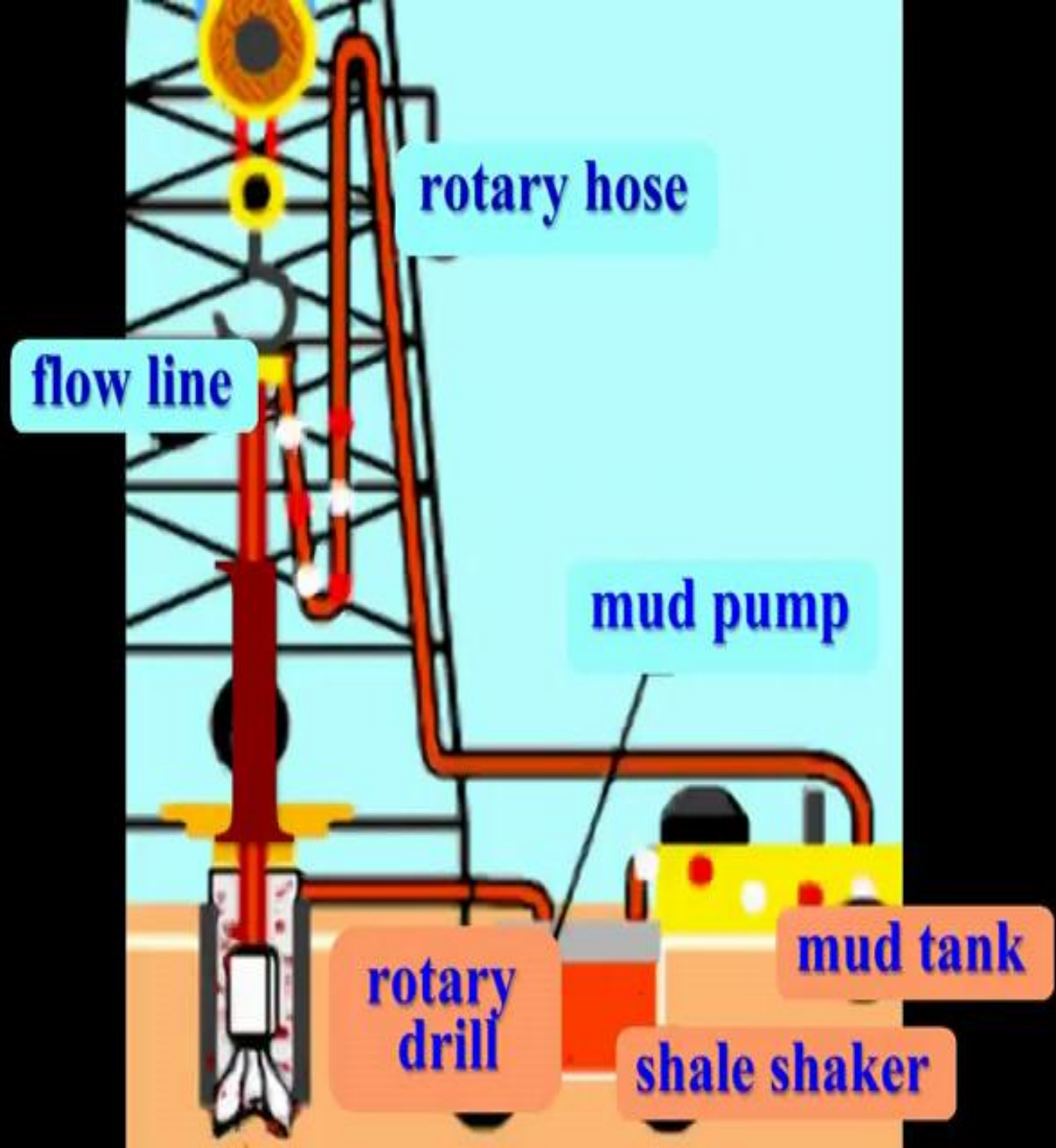
هو تدفق الموائع الطبقيّة (نفت، غاز، مياه) من فوهة البئر بشكل حر.

السبب:

ضغط الطبقة أكبر من ضغط عمود سائل الحفر

النتيجة:

تحريض النفط الغاز على الحركة باتجاه البئر
(خروج البئر عن السيطرة)



rotary hose

flow line

mud pump

rotary drill

mud tank

shale shaker

حل مشكلة الاندفاع تتطلب مايلي:

١- التدخل السريع (لا وقت للانتظار)

بسبب تطور و تفاقم المشكلة بسرعة

٢- السرعة في العمل ومراعاة عامل الزمن

لما يترتب عليها من خسائر مادية أكيدة وقد

تتجر بخسائر بشرية

عند الشك بوجود اندفاع

١- إذا كان البئر في حالة حفر:

١- يحرر الدقاق عن القاع

٢- تثبت تشكيلة الحفر على السلييس

٣- التأكد من جاهزية موانع الاندفاع ويبقى

مساعد الحفار عندها

٤- يتم إعلام ال Company man بوجود

تدفق حجمي ويوضحه على جدول

ال Volumetric

٥- يتم إطفاء مضخات سائل الحفر Pumps

٦- مراقبة التدفق على ال Shale shaker
مع قياس دوري لحجوم التنكات

٧- إعداد جداول لتطبيق الطريقة المناسبة
في قتل البئر اعتمادا على المعطيات السابقة

٢- إذا كان البئر في حالة رفع وإنزال

نفس الخطوات السابقة ما عدا الخطوتين ١ و ٢

pressure control system

blowout preventer (BOP)

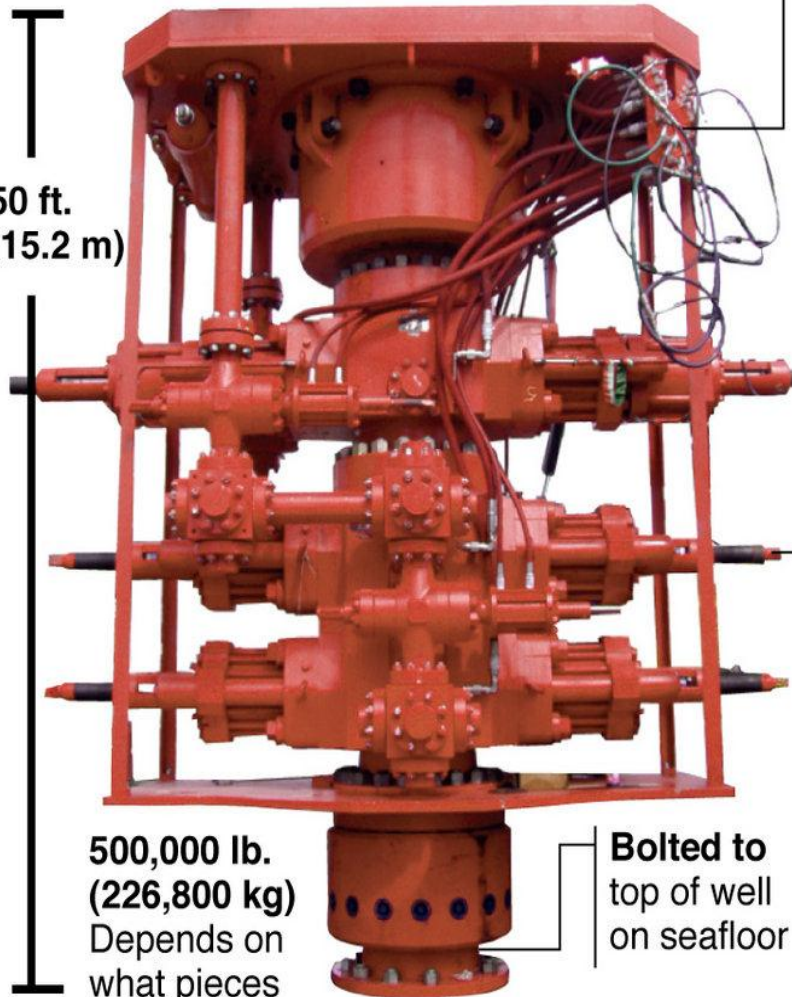


Blowout preventer

Investigators are trying to determine why the Deepwater Horizon blowout preventer failed.



50 ft.
(15.2 m)



Controlled by electrical, fiber-optic and hydraulic networks; can be activated manually with switches on rig floor and automatically when well pipe or rig is badly damaged

Massive pistons slam together to stop the flow of oil or natural gas; some pistons are fitted with cutting edges to shear through drill pipe and well casing if necessary

Bolted to top of well on seafloor

500,000 lb.
(226,800 kg)
Depends on what pieces are included

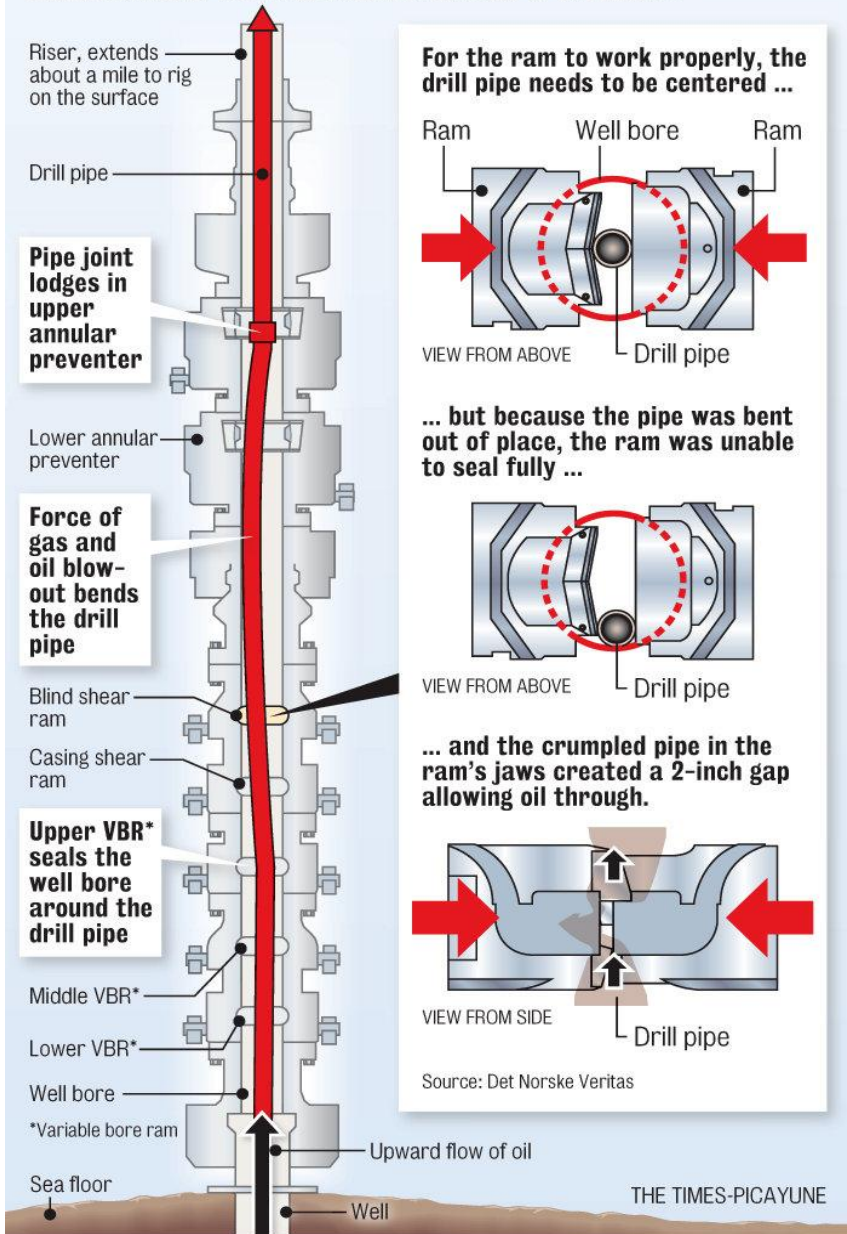


BLOWOUT PREVENTER CONTROL SYSTEMS

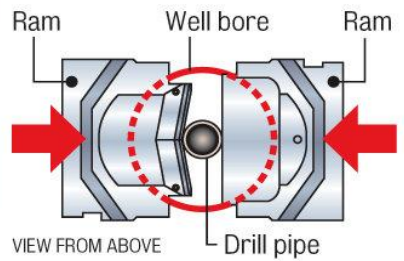


BOP FOILED BY BOWED PIPE

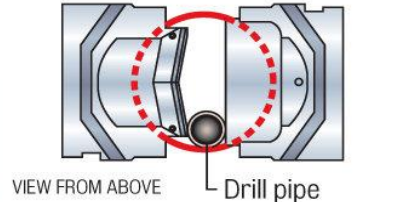
Can blowout preventers avoid this pitfall in the future?



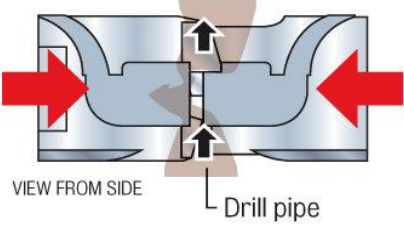
For the ram to work properly, the drill pipe needs to be centered ...



... but because the pipe was bent out of place, the ram was unable to seal fully ...



... and the crumpled pipe in the ram's jaws created a 2-inch gap allowing oil through.



Source: Det Norske Veritas

3 THE BLOWOUT PREVENTER FAILS

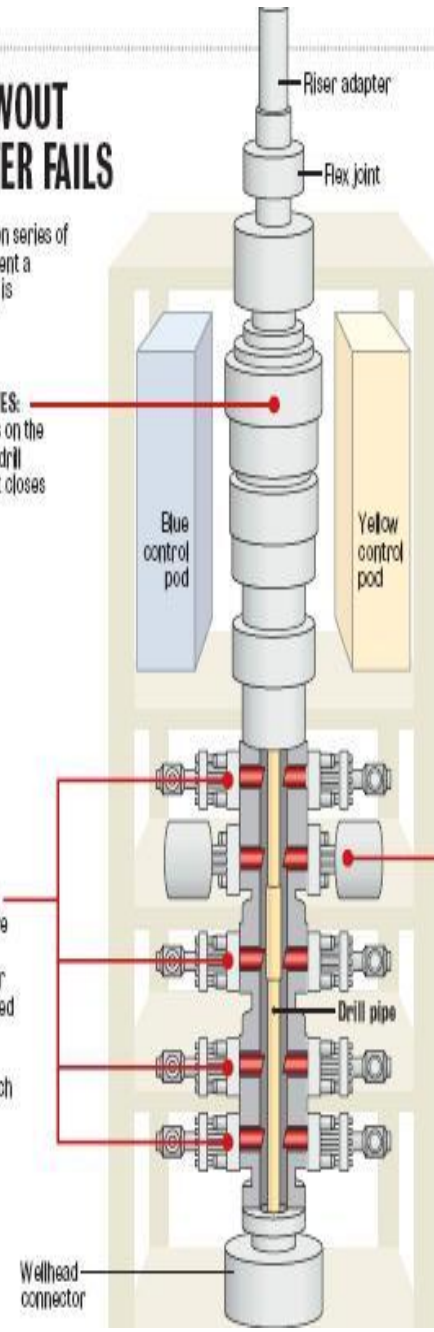
The BOP stack is a 450-ton series of valves developed to prevent a gusher if the mud control is overwhelmed.

TWO ANNULAR VALVES: Closes in and seals on the drill pipe. Or if the drill pipe is not in use, it closes the open hole.

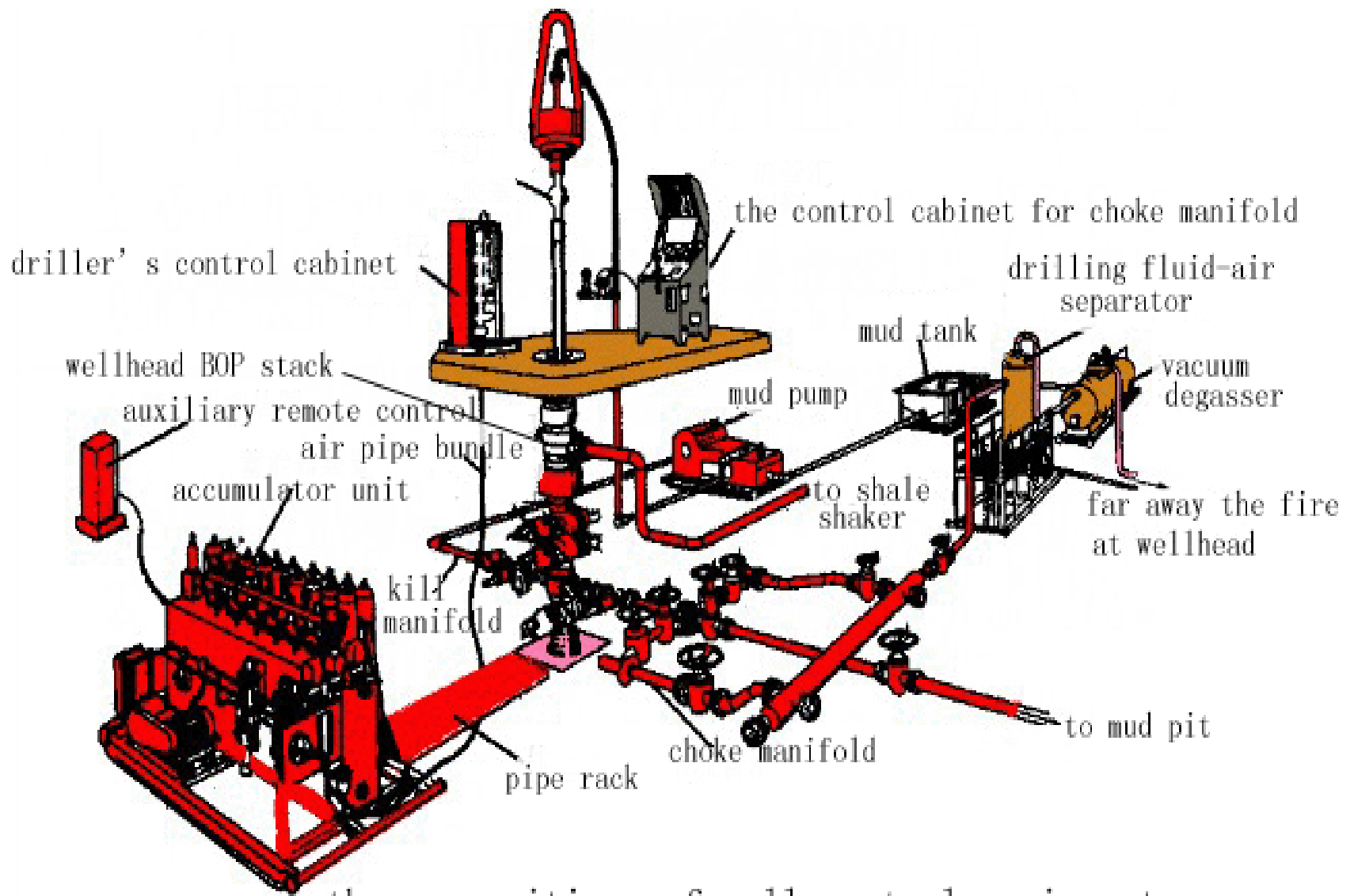
FOUR BLIND RAMS: Can withstand more pressure than annular valves over open holes. Not used with a drill pipe in place. Two metal blocks close on each other, sealing the well.

PROBLEM: With only seconds to react, rig operators fired off the shear ram, but it only partially sheared the drill pipe. A joint may have been in the way, or the ram was fouled by pieces of casing or cement from the blowout. For days, remotely operated robots tried to fire off the ram manually, but failed.

SHEAR RAM: The final fail safe, it is designed to close the well by cutting through and sealing the drill pipe. But they are not designed to cut through joints where two drill pipe sections connect.



Note: Man shown for scale. BOP is located on the sea floor 5,000 feet below the



driller's control cabinet

the control cabinet for choke manifold

drilling fluid-air separator

wellhead BOP stack

mud tank

vacuum degasser

auxiliary remote control

mud pump

air pipe bundle

to shale shaker

accumulator unit

far away the fire at wellhead

kill manifold

choke manifold

to mud pit

pipe rack

the compositions of well control equipment