

Lecture-1
HISTORY OF EXPLORATION

Spring 2024

First Use of Petroleum

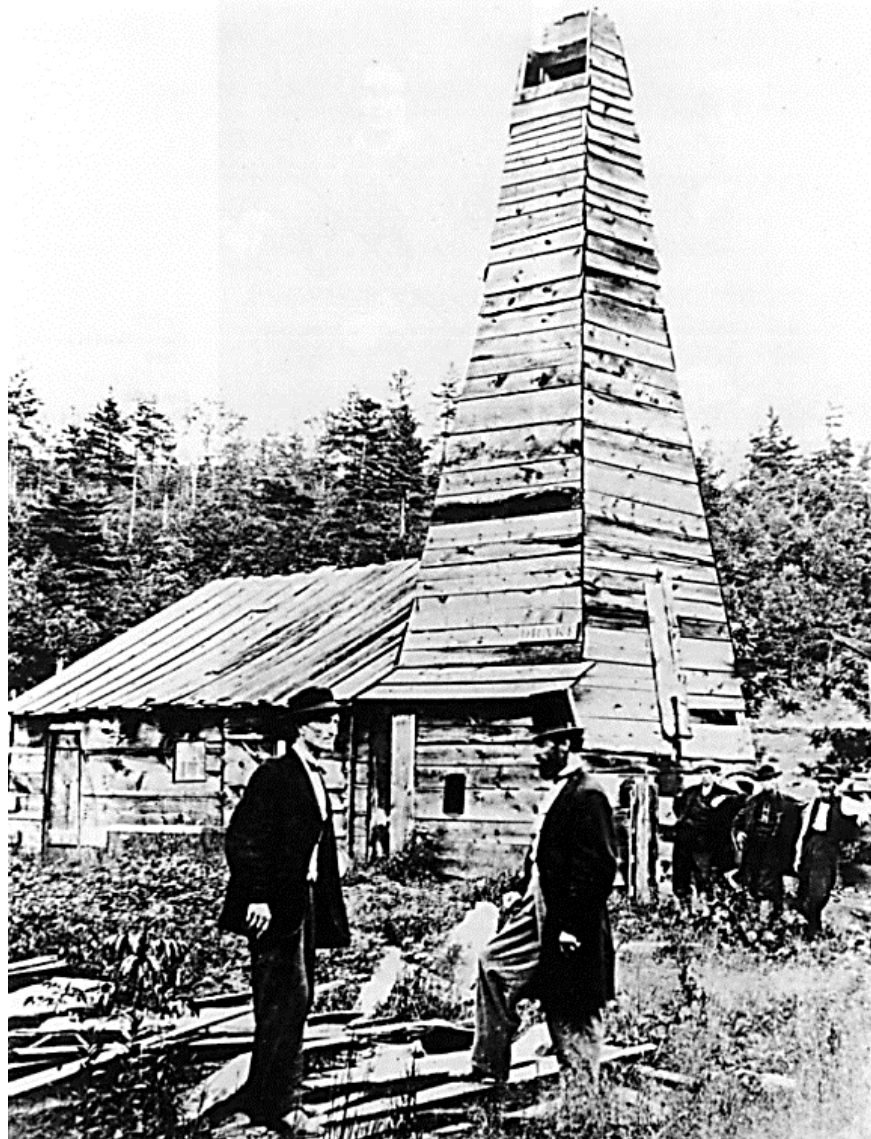
- Pitch was used by Sumerians not only for waterproofing, but as a bonding material in construction.
- Both the ancient Persians and Alexander the Great created incendiary weapons and used them in warfare.
- In Iraq, Sennaharib (704-682 B.C.) used them in the construction of a canal.



North America

- In 1857 the Canadian Oil Company hand dug to 49 ft in Enniskillen Township, and produced 150 gallons per hour by hand pump.
- In 1858, J.M. Williams dug world's first commercial oil well at Oil Springs, Ontario, Canada.
- By 1862 Canada had its first gusher - 3,000 b/d at Petrolia, Ontario.
- In 1859, Edwin L. Drake's well near Titusville in Pennsylvania, which led to the discovery of the world's first major oilfield is remembered as a pivotal event.

Drake's Well 1859



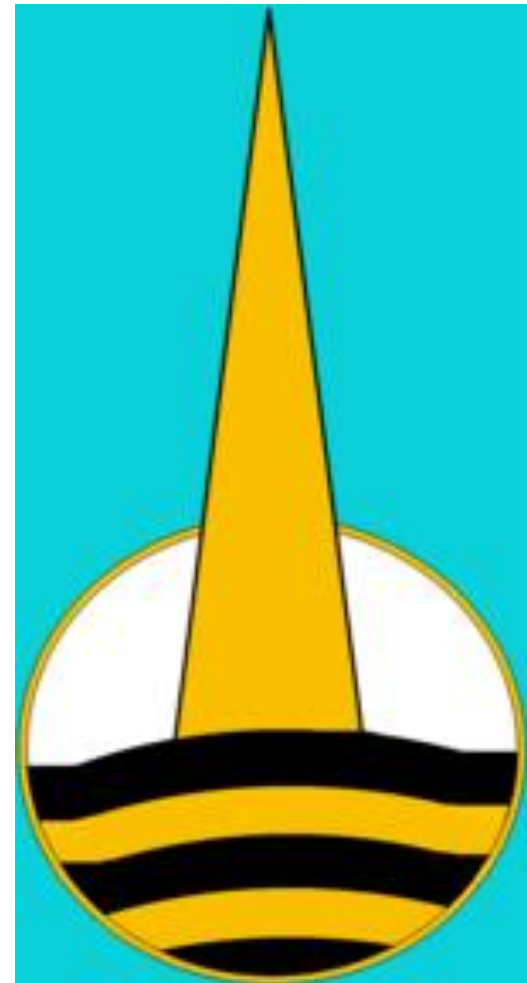
The first exploration well in Iraq

- The first exploration well in Iraq and the Middle East was drilled in 1901 on the Chia Surkh structure close to the present-day border with Iran.
- The well was located on a hill close to an active oil seep and it was abandoned with oil shows after drilling to 710 m in depth.



Iraq Petroleum Company (IPC)

- The first concession was awarded in 1914 to the Turkish Petroleum Company, a British/German group; however, after independence in 1918, the company was renamed the Iraq Petroleum Company (IPC).
- In 1922, the composition of the company changed to include Dutch, French and American interests. The concession agreement was revised in 1931.



Kirkuk Field

- The Kirkuk Field was first discovered in 1927; its reserves were estimated at 4 B.bbl in 1944, but they were upgraded to 7.5 B.bbl three years later.



History

- The Iraq National Oil Company (INOC), formed in 1964, took over exploration rights to the rest of the country outside of the producing fields.
- The Anglo-Persian Oil Company was granted a small concession in which the Neft Khaneh Field was discovered near the Iranian border (that part extending into Iran is called the Naft-i-Shah Field) in 1923.
- The Bai Hassan (1953) and Jambur (1954) fields were discovered.
- In the concession in Southern Iraq awarded to IPC, the Zubair Field was discovered in 1948, and the Rumaila Field was discovered in late 1953.

Qaiyarah heavy-oil

- The company also operated the Qaiyarah heavy-oil accumulation discovered near Mosul by British Oilfield Development in 1927.



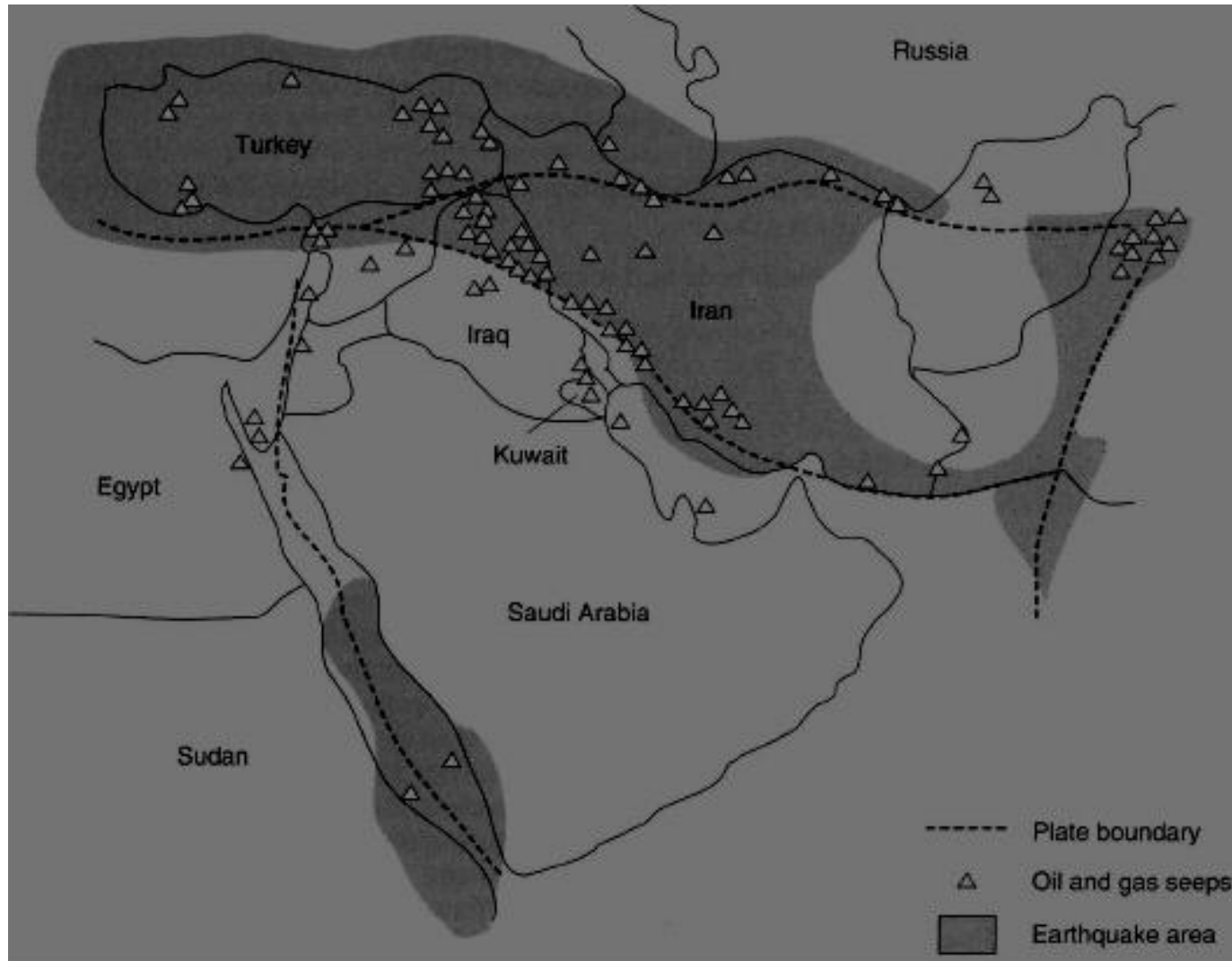
History (Continued)

- INOC entered into a service agreement with the French Company Elf-ERAP, and the Siba Field near Basra was discovered in 1969, with Jabal Fanqi in 1970 and Abu Ghurab in 1971.
- Buzurgan (1969) also was found in the former Basra Petroleum Company exploration area. Following agreements reached with the Indian Oil and Natural Gas Commission and Braspetro, the Ma'jnoon Field was discovered by the latter in 1976. INOC became the sole exploration and production agent in Iraq.

Surface Oil and Gas Seeps

- Shows have been reported from most countries in the Middle East.
- Many of the fields in southwestern Iran (Naftkhaneh and Masjid-i-Sulaiman) and Iraq (Kirkuk and Qaiyarah) were discovered through their proximity to surface oil seeps.

The Relationship between Plate Boundaries and Seepage



(Hunt, 1996)

Oil Leakage Time

- In excellent review, Beydoun et al. (1992) point out that not all losses are to be attributed to Miocene tectonics; some are due to earlier events such as the Late Cretaceous to (locally) Early Palaeocene collision event associated with ophiolite obduction.
- The Upper Cretaceous impregnation with bitumen of the outcropping reef limestone in the Kurdish Mountain in northern Iraq is one example for a pre-Zagros Basin hydrocarbon loss.
- The presence of water-born, bituminous pebbles in Palaeocene-Lower Eocene conglomerates in northern Iraq, the impregnation of Lower Fars sediments deposited on top of the Lower Miocene Jeribe and Euphrates limestone.

Oil Leakage Time (Continued)

- Presence in the Pliocene Bakhtiari beds of detrital bitumen provide ample evidence of the loss of hydrocarbon over a protracted period of time.
- As the following review will emphasize, no simple generalization concerning the source of the oil seeps can be made. While most are related to late Mesozoic or Cenozoic sources, the source of the oil may be derived from Palaeozoic rocks in some areas.
- Structurally, the greatest number of shows are in the Zagros Fold Belt, in the mountains and Foothill Belt, where the Cenozoic folds and faults provide easy migration paths.
- These shows, consequently, are not necessarily good indicators of the location of the structures from which the hydrocarbons are escaping. In contrast, in regions where deformation is less intense, a more direct relation between seep and structure is possible, as in the Burgan Field in Kuwait.

Oil Seeps in Iraq

- In the Naft Khana Field, oil and gas escaping through fractures in the cap rock of the field migrate along a thrust fault to the surface.
- In the Hit area in Western Iraq, there are extensive seeps of heavy sulfurous oil.
- A well drilled at Awasil found heavy oil (10 API) in sands at the base of the Middle Cretaceous and in limestone streaks in probable Upper Jurassic anhydrites.

Oil seepage in Tawke





**Typical large-scale onshore oil seep,
Qaiyarah, Iraq**

(Fugro NPA Ltd, 2009)

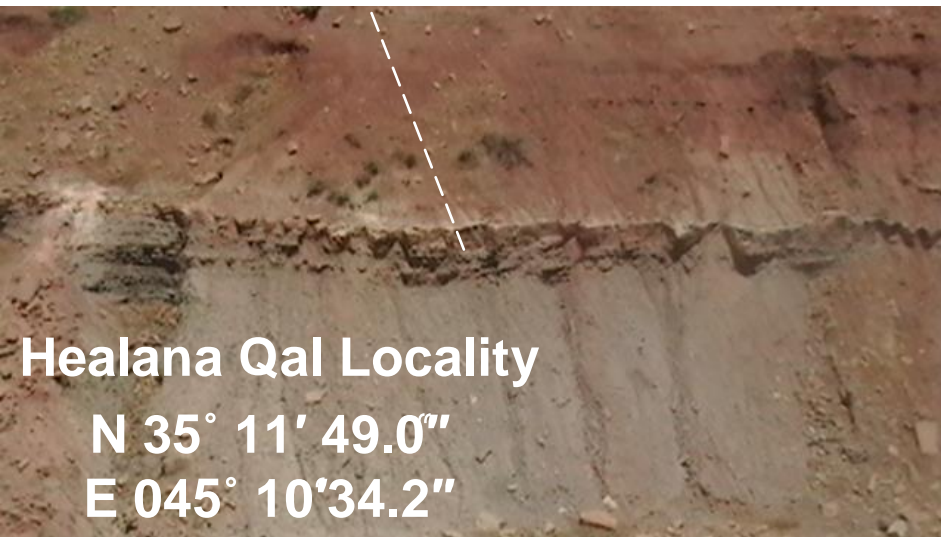


Konaqeer, Iraqi Kurdistan

(www.sterlingenergyuk.com/Kurdistan.aspx)



Rock Sample from Upper part of Lower Fars Fm.



Healana Qal Locality

N 35° 11' 49.0"

E 045° 10' 34.2"

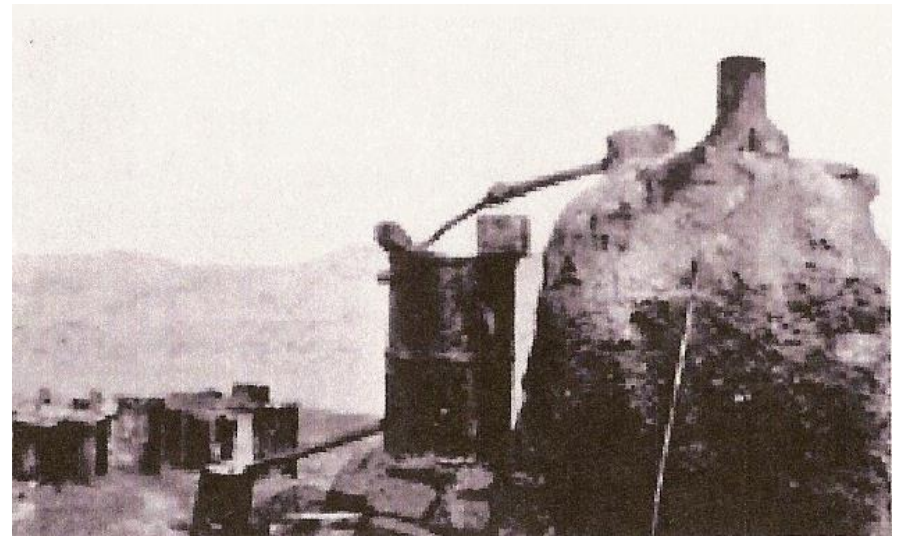


Gas Seep

Old asphalt production method



A primitive well baling device for raising oil from seeps. Once raised the oil was run into a small settling tank (dark oblong, right foreground)



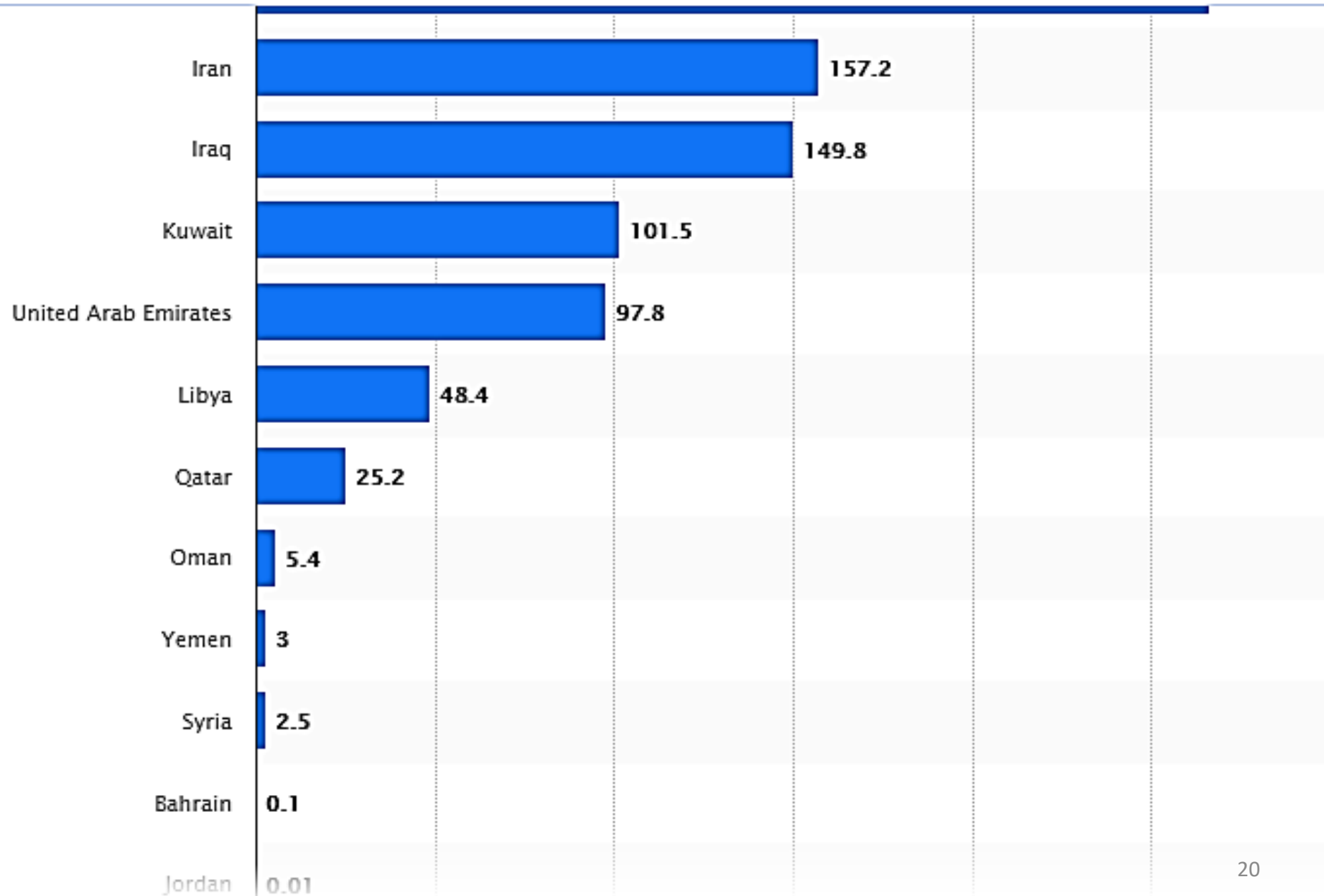
An oil still with a pipe from the top leading to a cylindrical condenser



Another example of early oil and gas processing

(Google, 2009)

Volume of oil reserves in the Middle East in 2018, by country (*in billion barrels*)



The hydrocarbon richness of the Middle East

- The combination of a number of factors, such as the accumulation of thick sequence of sediments; the presence of excellent reservoir rocks; the wide, regional distribution of seals; the close association of reservoirs with the intrashelf, basinal source rocks; and the excellent, large anticlinal traps with extraordinary wide closure all have contributed to the hydrocarbon richness of the Middle East.

Steps to Drill A Gas/Oil Well

1. Complete or obtain seismic, log, scouting information or other data.
2. Lease the land or obtain concession.
3. Calculate reserves or estimate from best data available.
4. If reserve estimates show payout, proceed with well.
5. Obtain permits from conservation/national authority.

Steps to Drill A Well, con't

6. Prepare drilling and completion program.
7. Ask for bids on footage, day work, or combination from selected drilling contractors based on drilling program.
8. If necessary, modify program to fit selected contractor equipment.

Steps to Drill A Well, con't

9. Construct road, location/platforms and other marine equipment necessary for access to site.
10. Gather all personnel concerned for meeting prior to commencing drilling (pre-spud meeting)
11. If necessary, further modify program.
12. Drill well.

Steps to Drill A Well, con't

13. Move off contractor if workover unit is to complete the well.
14. Complete well.
15. Install surface facilities.
16. Analysis of operations with concerned personnel.