Welcome to ... Natural Gas 101 Overview of Oil and Gas Industry by Michael Rozic ECI







from Well Head to Burner Tip or as they say in the industry ... Upstream Midstream Downstream



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- What do Hydrocarbons Look Like? NGL'S and Crude Oil
- How were Oil & Gas Deposits Formed and Where are they located?
- How are Hydrocarbons Extracted from the Earth?
- *Production Separation, Treatment, Compression & Pipelines*
- Oil and Gas Storage
- Gas Processing and Fractionation
- Oil Refining and Distillation
- Oil and Gas Distribution



What do Hydrocarbons Look Like? (Natural Gas Liguids)









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What do Hydrocarbons Look Like? (Crude Oil)









What Products are made from Crude Oil and Natural Gas Liquids?





What do Hydrocarbons Look Like? NGL'S









What do Hydrocarbons Look Like? NGL'S





What do Hydrocarbons Look Like? NGL'S





Propane C3



What do Hydrocarbons Look Like? NGL'S



What do Hydrocarbons Look Like? NGL'S









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What do Hydrocarbons Look Like? Crude Oil



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How were Oil & Gas Deposits Formed and Where are they located?



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How were Oil & Gas Deposits Formed and Where are they located?

Figure 1. Map of basins with assessed shale oil and shale gas formations, as of May 2013



Source: United States basins from U.S. Energy Information Administration and United States Geological Survey; other basins from ARI based on data from various published studies.



How were Oil & Gas Deposits Formed and Where are they located?



How were Oil & Gas Deposits Formed and Where are they located?

Marcellus Shale – Natural Gas (95,000 sq. miles)



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How were Oil & Gas Deposits Formed and Where are they located? What is the Marcellus Shale?

- 5000 to 9,000 feet below the surface!
- The Marcellus Shale, also known as the Marcellus Formation, is a unit of marine sedimentary rock believed to have been formed around 400 million years ago under inland seas throughout much of the Appalachian basin. Microscopic plants and organisms were incorporated as the materials were deposited. The organisms were trapped in the bottom of the sea without oxygen. The organisms are still bound within the rock formation.







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How are Hydrocarbons Extracted from the Earth?

Natural Gas Development Stages: A Regulated and Safe Process



EMERSON

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- 1. Drilling
- 2. Hydraulic Fracturing
- 3. Production
- 4. Gas treatment and transportation



How are Hydrocarbons Extracted from the Earth? Drilling





How are Hydrocarbons Extracted from the Earth? Drilling



How are Hydrocarbons Extracted from the Earth?







How are Hydrocarbons Extracted from the Earth? Casing







GAS WELL PROTECTION

INTERMEDIATE CASING

CONDUCTOR CASING

SURFACE CASING

Production – Separation, Treatment, Compression & Pipelines



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How are Hydrocarbons Extracted from the Earth?





How are Hydrocarbons Extracted from the Earth?





Production Unit / Seperator



How are Hydrocarbons Extracted from the Earth?





Production – Pipelines



Midstream

- Shipping and storage of oil and gas
- Provide a pipeline and system that will transport and process the gas and oil so it can be delivered to downstream (Transmission)
 - Gas Transmission large pipelines delivering dry gas
 - Provide LNG
 - Fractionation Plant
 - Ethane, Propane and Butane
 - Petroleum Transmission pipelines or trucking

Link Upstream and Downstream!





Oil and Gas Storage



Oil and Gas Storage

Storage

Traditional Uses

- Winter = high demand, low deliverability
 - · "Peaking" supply
- Summer = low demand, low prices
 - Pressure relief
 - Price opportunity
- Emergency deliverability
 - Harsh winters
 - Hurricanes(supply disruption)

Oil and Gas Storage





Oil and Gas Storage – Underground Storage



Remote Automation Solutions Critice Oil (2.20)

Oil and Gas Storage



Oil and Gas Storage

Compressed Natural Gas (CNG) & Liquefied Natural Gas (LNG)







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Gas Processing and Fractionation

NGLs

- Hydrocarbon liquids derived from natural gas
 - Ethane = C2H6
 - Propane = C3H8
 - Butane = C4H10
 - iso-Butane = "IC4" "isomer" of Butane
 - Pentanes = C5H12 ("C5+")
 - Natural gasolines (C5 and some C6 C9)
 - Condensate (C6+)

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Mark West Fractionation Plant in Houston Pa.



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Production – Separation, Treatment, Compression & Pipelines



Gas Processing and Fractionation

Fractionation Processing



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Oil Refining, Distillation & Cracking



Remote Automation Solutions Drilling and



Oil Refining, Distillation & Cracking



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Gas Distribution System

- Deliver natural gas to consumers in a geographic area from transmissions pipelines
- Typically owned by investors or a public gas system owned by local governments
- Delivery system involves
 - Gate station reduce pressure in the transmission lines from high pressure (200-1500) to distribution levels that can be .5 psi or 200 psi
 - Odorant injection (make the gas smell)
 - Measure flow rate of gas Custody transfer
 - Measure quality of gas Gas Chromatograph, Moisture and Sulphur Analyzer



Gas Distribution System

- Control and adjust pressure based on temperatures and demands of the local community
 - Regulators control the flow from higher to lower pressure (open and close valve to maintain pressure)
 - Relief values are used to vent gas if a line becomes overpressured and regulators malfunction
- Ensure gas customers receive enough gas or pressures above the levels required for their company operations or appliances



Natural Gas Gate Station





Natural Gas Gate Station



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Questions



