From what I have seen, this is predicting oil output rate which is a discharge q and as oil comes out perhaps during drilling, gas also comes out so in the current gilbert’s formula available, there’s something called gas-oil ratio and this seems to be determined naively at the surface drilling or something.

My major question was if the parameters provided were related to gas or oil or water but it might not be a necessary question because if there’s a constant ratio between gas and oil, it mean same relationship with the features will be found.

I see so basically, a well is dug and then sensors are used to determine where is rich in hydrocarbon and once that is found using sensors, some gun is fired and holes are made and the hydrocarbons flow up. Now what I think is that after this hole is drilled, a well head which seems to be an equipment to control the extraction is mounted there. The well head pressure seems to be a good feature together with the choke size of the amount of oil that will be obtainable but these seems to be surface level parameters like If the oil well has no potential to produce good amount of oil, the upstream won’t have a good output.

Video1. Good video explaining the drilling process - <https://youtu.be/wjm5k6Kf-RU>

Important points

* Gas-Oil ratio helps us determine the economic limit of a well. There seem to be something about bubble point and stuff.
* Bubble point: It seems to be a pressure point where liquid turns to gas like in soda, it’s usually all liquid from the bottle but once we open it, some gas escaped

Video2. <https://youtu.be/pe71rV92GY8>

Explaining Features as per my understanding (the plan is to get an understanding of these features and know which to use for EDA)

WellBore Name - Name of bore - I think this is a useful parameter. I think in maybe similar regions there are multiple bores, and towards my thoughts, the date range is same for different wells like there’s say 1st may 2013 till 1st June 2013 for all wells.

I can check the oil and gas output overtime across these wells like is one underperforming while the other is performing well? That could be a good feature.

FLOW\_KIND – It’s same for every day, it says Production, perhaps there’s some drilling for test or so. We don’t want to use this as a feature for EDA or anything

WELL\_TYPE - It’s same for every day, it says [OP](https://www.google.com/search?q=whatts+an+OP+oil+well&oq=whatts+an+OP+oil+well&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIJCAEQIRgKGKABMgkIAhAhGAoYoAEyCQgDECEYChigAdIBCTEyNDIyajBqN6gCCLACAQ&sourceid=chrome&ie=UTF-8#:~:text=OP%3A%20A%20well%20used%20to%20produce%20oil%20from%20a%20reservoir.). From google, OP: A well used to produce oil from a reservoir.

Downhole pressure – Oil pressure at the bottom of the reservoir

Downhole Temperature (Kelvin) – Oil Temperature at the bottom of the reservoir

Average Tubing Pressure – It seems to be the pressure of the oil in the tube

Annulus Pressure – Pressure between two concentric pipes this seems to not be a very relevant feature but just something the pipe should be able to hold.

AVG WHP (PSI) – It seems it’s the flow pressure on the well head. This is a relevant feature for oil and Gas production

Choke Size - The choke is typically installed at the wellhead, where it controls the flow of fluids as they come up from the reservoir. It seems an adjustable choke was used in this production system.

<https://otg.ca/what-is-a-choke-in-oil-and-gas-operations-2/#:~:text=The%20choke%20is%20typically%20installed%20at%20the%20wellhead%2C%20where%20it%20controls%20the%20flow%20of%20fluids%20as%20they%20come%20up%20from%20the%20reservoir>.

Oil Production (stb/day)

Gas Volume (scf/day)

Water Production (stb/day)

ML Approach

1. EDA – Check Gas-oil ratio rate overtime. Is it increasing? Is it stable? Is it dependent on the well bore (there’s a wellbore variable) I believe the different wells might behave differently so that will be a good feature to one hot encode.

**Answer**

The GOR itself is mostly the same for the different oil wells but the individual oil outputs overtime might differ

1. It seems water rate is the only thing that doesn’t flow with the rest. Basically, anytime there’s gas, there’s oil but it’s not the same for water. In video2 it seems there’s some analysis of how we have water, oil and gas in the earth and how there’s some particular pressure where water will flow. Maybe some pressure is directly related to water and then water can be used to predict oil and gas.

Pressure vs Oil (x is date, y is pressure and then oil in same plot) I can apply min-max scaling for better plotting.

Pressure vs Gas

Pressure vs Water

Feature Engineering – Interact 2 features and then three features by multiplication -

Absolute Difference in Forward lag by 2 and 3 of all features, I can add this in terms of percentage

Like for a particular lower feature, we want to know the percentage drop wrt the other feature –

Point of change in wellhead pressure affects oil output, we can just attach a feature of 1 and 0 where

there’s change in well head pressure and choke size, I’ll have two new cols, pressure rise or drop in

whp and choke size rise or drop -

Evaluation