Methane Emissions Resulting From Oil & Gas Sector in Turkey

(April 2017)

Emre Özgür, Ph.D.
Petroleum & Natural Gas Engineer
emreozgur@gmail.com
Republic of Turkey Ministry of Energy and Natural Resources
Global Methane Initiative - Oil & Gas Subcommittee Member of Turkey

1) Background of Upstream Petroleum Sector of Turkey

There are about 120 producing crude oil fields in the southeast region of Turkey (Figure-1). The typical characteristic of the oil fields in Turkey is that they are black-oil type which has low dissolved gas content. The weighted average of Gas-Oil Ratio (GOR) amount is nearly "2 sm^3 (standard cubic meter) / stb (stock tank barrel)" for the Turkish oil fields. GOR is a commonly used term in the petroleum sector, which is the ratio of volumetric flow of produced gas to the volumetric flow of crude oil for crude oil and gas mixture sample at standard temperature and pressure conditions. The associated petroleum gas released during the production of crude oil is vented at the storage tanks through the venting valves. Some of the emitted gas is flared instead of venting process. These are the main sources for the methane emission in Turkish upstream petroleum sector. The crude oil production is about 18 million barrels in 2016.

There are 70 producing natural gas fields in the northwestern part, also called Thrace Basin, of Turkey. The annual gas production is very low and has decreasing trend. The natural gas production is about 0,4 billion m^3 in 2016 and negligible methane emission is expected during the natural gas production (Figure-1).

Figure-1, Crude Oil Production and Natural Gas Production Regions in Turkey

2) Calculation of Emitted Methane in Turkish Upstream Petroleum Sector

During the crude oil production, the gas is released at the surface storage tanks as a result of pressure reductions (Figure-2). The gas is vented via valves at the storage tanks due to technical and safety reasons. The amount of emitted methane is based on the Gas Oil Ratio (the parameter showing the dissolved gas amount in crude oil) of the crude oil. Every oil field has specific GOR value. To calculate the possible methane emission in 2016 for Turkey, the GOR of each Turkish crude oil field is multiplied by annual crude oil production of the related field; then they are summed up. The general equation is given below.

$$Amount\ of\ \ Methane\ Emission = \sum_{n=1}^{120} Annual\ crude\ oil\ \ production\ \ \ of\ \ \ field_n\ \ x\ Gas\ Oil\ \ Ratio\ \ (GOR)\ of\ \ \ field_n$$

After multiplying the each GOR values by the production of each crude oil field, the numerical result is calculated as:

Estimated Emitted Methane for the Oil & Gas Sector in Turkey (2016) ≈ 36 million sm^3

Although in most of the fields gas is processed through venting, gas is also flared at few fields with high gas content. In terms of volume quantity, about half of the estimated emitted methane amount given above is vented and the other half is flared at the production sites in Turkey.

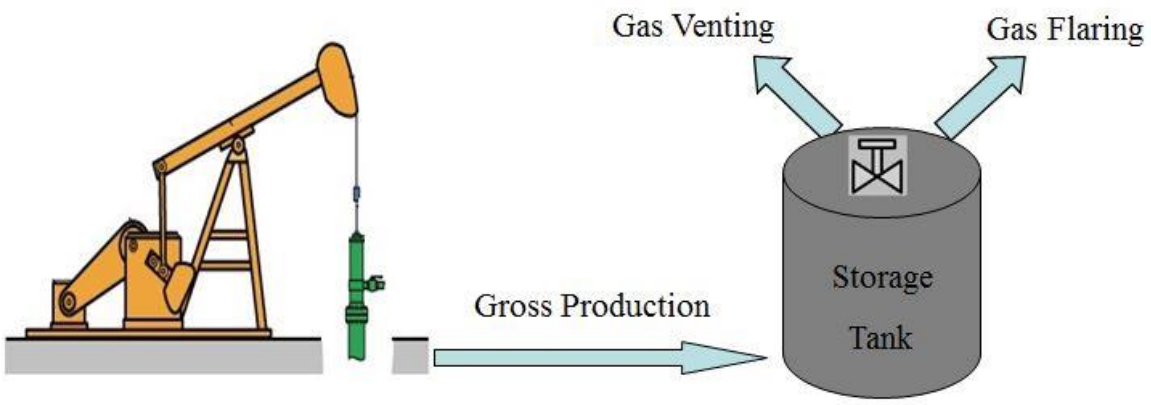

Figure-2, Example of Methane Emission during Crude Oil Production