

Methane and Hydrocarbon Emission Rates from Oil and Gas Production in the Province of Basra, South of Iraq

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Abstract. Petroleum deposits typically contain a gaseous component known as "associated gas". If associated gas is not collected or used on-site, it may be flared or vented as a byproduct of oil production. Flaring is preferential to venting in terms of global warming. Flaring oxidizes carbon and produces CO₂, but by destroying methane and other hydrocarbons, it decreases the overall risk of global warming emissions. On a 100-year time scale, fossil methane is 36 times more potent than CO₂. The measurements were taken at six oil fields (AITuba, Allhais, Artawi, North Rumaila, Nahran Omar, and Majnoon) and two power plants (Alnajebia power plant and Shatt Al-Basra). To measure the concentrations of hydrocarbons, a direct measurement was taken for six months. ANOVA test was used to analyze the results at $p \leq 0.05$ and a correlation between hydrocarbon concentrations, wind speed, and temperature was done. The result showed that the hydrocarbons were found in all stations, in all measurements with different concentrations except in Alnajebia and Shatt Al -Basra power plant at first measurements, the device did not detect hydrocarbons concentration. The highest average of hydrocarbon concentrations was at Allhais which was recorded as 995, 598.15, 418.7, 358.89 and 279.13 ppm for methane, ethane, propane, butane and pentane respectively. The lowest average was found at the majnoon oil field for methane, ethane, propane, butane and pentane 395, 238.8, 167.16, 142.2 and 111.4 ppm respectively. The relationship between the average hydrocarbon concentrations with the average monthly wind speed and with average monthly temperature was positive.

Keywords. Power plant, Flaring gas, Hydrocarbons, Basra, Air pollution, Oil industries.

1. Introduction

Natural gas is regarded as one of the most efficient fuels. It is one of the non-renewable energy sources whose quantities diminish over time due to their widespread use [1]. The main Composition of natural gas is methane, Over one-third of all methane emissions resulting from human activity are produced by fossil fuel operations. Nearly 5% more methane was released into the atmosphere in 2021 as a result of the burning of fossil fuels, totaling approximately 120 Mt [2]. Natural gas contains a large quantity of methane with other hydrocarbons such as ethane, propane, etc and other non-hydrocarbons such as Carbon dioxide, Nitrogen, Hydrogen sulfide, Helium and some compound found in trace amounts [3]. In 2020, Iraq was ranked 11th among the countries in the world's natural gas reserves [4]. The total proved reserves of natural gas in Iraq is 3.5 trillion cubic meters, with the

