

## Life Cycle Assessment of Carbon Emission from Natural Gas

Seyed Ali\*

Department of Chemical Engineering, Faculty of Engineering, University of Kashan, Postal Code: 87317-53153, Kashan, Iran

### Abstract

With the deterioration of world climate and surroundings, the carbon emission of the oil and gas trade has been a crucial issue of world concern. At present, there's an absence of systematic analysis on carbon emission calculation of fossil fuel pipeline from construction to disposal we have a tendency to propose a life cycle assessment technique for fossil fuel pipeline so as to quantify the carbon emissions from construction to disposal. The carbon emissions of fossil fuel pipeline square measure divided into four elements during this model: producing, construction, operation, and exercise. For every of the four stages, carbon emissions from material production and construction, facility construction and instrumentation operation square measure all detailed calculated additionally, methane, the most element of fossil fuel, features a non-negligible impact on the atmosphere. Therefore, gas run from the pipeline system is additionally thought-about during this paper. And knowledge from actual pipelines square measure utilised within the case study. The results show that the carbon emissions of those pipelines square measure within the vary of 26 power emission issue, and mechanical device operation standing end up to be the most factors poignant carbon emission. With the institution of this model, potential carbon emission of planned pipelines may be calculable, that has guiding significance for future pipeline construction.

**Keywords:** Life cycle assessment; Natural gas pipeline; Carbon dioxide emission; Methane emission

### Introduction

In recent years, severe environmental issues have emerged because the trade develops quickly, and climate problems have drawn wide attention round the world. In step with the info printed by International Energy Agency, the share of renewable energy has not exceeded 11 November within the energy market though it's exaggerated worldwide year by year since 1990. Generally, fossil fuel is thought to be a clean energy supply in terms of its in depth application eventualities, hot price it provides, or its combustion merchandise. At a similar time, the world demand for fossil fuel has exaggerated dramatically within the past twenty years, leading to a lot of frequent transportation of fossil fuel across completely different regions to satisfy the growing demand and therefore the consumption of fossil fuel within the field of power generation has step by step surpassing coal in some areas, indicating a fast increase in carbon emissions from fossil fuel. Therefore, the importance, also because the urgency of emission reduction within the oil and gas trade can't be overemphasized. Moreover, some students calculable the emission intensity of fossil fuel as comparatively clean energy to match the GHG effects with completely different energy sources comprehensively. The complete life cycle of fossil fuel from production to final consumption, the environmental advantage of fossil fuel compared with different fossil fuels is more highlighted [1]. LCA technique to search out that emission from sedimentary rock gas was 6 June 1944 less than typical gas, twenty three nothing less than gas, and thirty three nothing less than coal. LCA technique to match and analyze the impact of coal, oil, natural gas, and electricity on the surroundings and located out that the use of coal has the best impact on the surroundings, and therefore the impact of oil and fossil fuel is increasing annually. Given the various blessings of fossil fuel, it'll play a crucial role within the future energy consumption market [2]. Pipeline transportation is that the main mode of fossil fuel transportation, and there's no elaborate technique to calculate its carbon emission. Therefore, it's necessary to propose a calculation technique to quantify the emissions from fossil fuel pipelines. Moreover, learning the carbon emission from the fossil fuel pipeline system makes contribution to manage GHG emission because the causes of emissions may be known, therefore on propose reduction suggestions that is additionally the

need of long development of the oil and gas trade. Due to the increasing refined fossil fuel pipeline network, the dimensions of kit concerned is consistently enlarged, resulting in the rise in energy consumption and thanks to pipeline materials, long transportation distance, complicated regional surroundings and poor operation management, the potential CH<sub>4</sub> run rate within the transportation method is high, that brings challenges to GHG emission reduction. Quantification of carbon emissions from fossil fuel pipelines is tough as a result of the operation of the mechanical device in stations is variational. Moreover, the turnout of long-distance pipelines changes oft thanks to the fluctuations in client demand on the pipeline. When the fossil fuel pipeline is place into use, its operation state also as numerous processes of maintenance is additionally necessary to be thought-about, that square measure tough to calculate within the LCA model. There's no correct calculation technique for carbon emission of long-distance fossil fuel pipelines [3-4].

Previous studies on fossil fuel emissions have planned completely different approaches to check carbon emissions from production, transportation, final utilization, and different processes from completely different views. Moreover, several researchers adopt the LCA technique to produce comparable emission results of fossil fuel. Took processes together with extraction, transportation, and therefore the power generation within the life cycle of fossil fuel into consideration and all over that the extraction and delivery of fossil fuel generated nearly thirty two nothing CH<sub>4</sub> emissions and three nothing GHG within the U.S. Shun calculated the carbon emissions of oil and gas gathering

\*Corresponding author: Seyed Ali, Department of Chemical Engineering, Faculty of Engineering, University of Kashan, Postal Code: 87317-53153, Kashan, Iran, E-mail: Ali@gmail.com

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and transportation systems throughout the exploitation method, and analyzed the connection between transportation capability and carbon emission. GHG intensities of gas provides from 10 thousand fields at intervals the scope from wellhead to town gate station that lined ninety six you look after China's gas production. Results show that the GHG intensities within the researched fields vary from 6.2 to 43.3, LCA model for Liquefied fossil fuel (LNG) with regards to the technologies together with liquefaction, shipping, and regasification, and provides suggestions for the method in step with the results that solely 6.5 g CO<sub>2</sub>eq generated whereas per mega joule of energy delivered to the market [5-6].

Previous studies have analyzed a part of the whole construction method of a fossil fuel pipeline or enclosed the impact of mistreatment fossil fuel within the discussion, however didn't thought-about the whole life cycle analysis of a fossil fuel pipeline system from getting down to finish. Development of essential infrastructures and instrumentation, exercise that reduces the carbon emission of the pipeline system features a substantial potential to some extent. Therefore, integrated with the enlightenment of previous researches, this paper takes the development of basic infrastructure, instrumentation operation, and disposal of fossil fuel pipeline installation into thought to fill within the current analysis gaps [7]. To accomplish the goal of estimating the carbon footprint of fossil fuel pipeline system, this paper carries out a of carbon emission by establishing an LCA model from its production to disposal in step with ISO 14044 customary. knowledge free by the United States Environmental Protection Agency show that energy offer chains square measure the foremost outstanding emission supply of gas (CH<sub>4</sub>) within the us, and therefore the dominant emission supply of CO<sub>2</sub> equivalent (CO<sub>2</sub>eq) in residential, commercial, and industrial sectors. Since CO<sub>2</sub> and CH<sub>4</sub> account for the biggest portion of total GHG, this paper focuses on the emission of those 2 gases. At a similar time, the pertinency of the planned model for various pipe diameters and construction conditions are thought-about. A case study with specific knowledge from an actual pipeline and construction for emission reduction is provided [8]. The results of the model show that CH<sub>4</sub> has the best impact on the atmosphere within the greenhouse emissions caused by fossil fuel pipeline engineering. CH<sub>4</sub> emission is especially comes from the run of the fossil fuel pipelines and therefore the compressors within the station. Among all the stages that inflicting CO<sub>2</sub> emissions, the primary stage accounts for the biggest proportion, accounting for concerning eighty you look after the whole CO<sub>2</sub> emissions. It may be seen that there square measure nice variations in carbon emissions in every stage, that accounts for an oversized proportion within the initial and third stages (i.e. construction and operation stages) of the complete life cycle of fossil fuel pipeline construction. The bulk of carbon emissions square measure caused by pipeline construction within the initial stage. Because the carbon emission free by the pressurization station is caused by energy consumption [9-10], the carbon emission within the pressurization station is additionally associated with the carbon emission issue of the regional facility within the region. There square measure several pipeline branches just in case one and Case three, and therefore the proportion of carbon emission is additionally considerably completely different from that just in case a pair of. For case a pair of with fewer feeders, the proportion of carbon emissions within the third stage is less than the opposite 2 cases, thanks to the lower volume of carbon emissions just in case a pair of and therefore the lower energy consumption of the mechanical device operative, leading to fewer carbon emissions. Second, as Case a pair of passes through densely inhabited areas with thicker pipe thicknesses than different cases, a lot of steel is needed when the corresponding calculation, that results in a

rise in carbon emissions within the initial stage. In general, there's very little distinction within the composition of carbon emissions within the 3 cases, which might result in a lot of representative conclusions [11-13].

## Conclusion

Based on the study of the complete life cycle assessment of the fossil fuel pipeline system, the LCA model of CO<sub>2</sub> and CH<sub>4</sub> emissions within the whole life cycle of the fossil fuel pipeline is established. During this model, the carbon emissions of pipeline and instrumentation production, construction, operation, leakage, and recovery method of pipeline and instrumentation square measure comprehensively thought-about. After that, this paper uses the planned model to calculate the carbon emissions of 3 actual fossil fuel pipelines Associate in Nursing makes an in-depth analysis. In the pipeline and instrumentation production stage, the carbon emission of the complete life cycle of the pipeline production method is taken into account and enclosed within the total carbon emission, whereas within the construction stage [14-15], the carbon emission caused by the development machinery thanks to the pipeline buried underground is taken into account within the construction stage. Finally, when the pipeline is out of service life, the recyclability of steel is taken into account, and therefore the carbon emission of this half is additionally thought-about within the model, that makes the complete method a lot of in line with the construct of property development.

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