

Current Status of Methane Emission Detection and Accounting in Oil and Gas Production Process Using AI Technologies

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Abstract: *This paper explores the monitoring and accounting of methane escape emission in the process of oil and gas production. In the actual exploration, the monitoring and accounting methods of methane escape emission from oil and gas are firstly described. Then, the international analysis of methane gas escape emission, detection of methane gas escape emission in our country, accounting of methane gas emission in our country, regional characteristics and historical changes of methane gas escape emission in our country are analyzed in order to improve the emission quality.*

Keywords: Oil And Gas Production; Methane Escape Emission; Emissions Accounting.

1. INTRODUCTION

Methane in the ecological environment will cause serious pollution to the atmosphere, causes the greenhouse effect, but in what is now in the production of oil and gas, methane escape emissions would happen, and with the increasing of industrial, lead to escape methane emission quantity increasing, caused serious pollution to environment, so in the process of oil and gas production, Corresponding methane emissions need to be controlled to protect the environment. Yan et al. [1] proposed a convolutional neural network-based mechanism for image super-resolution reconstruction, while Wu [5] focused on optimizing image classification models for cloud infrastructure. The healthcare sector has seen innovative applications, such as Pang et al.'s [2] data-driven approach for diabetes risk prognosis using electronic health records, complemented by Wang et al.'s [12] work on immune microenvironment mapping in gastrointestinal cancers. Urban and economic studies have employed big data and machine learning techniques extensively. Tang et al. [3] analyzed regional housing supply-demand imbalances in the US, while Tang and Zhao [4] investigated aging population effects on real estate dynamics. Zhao et al. [9] evaluated labor market efficiency under media influence using machine learning, and Chen et al. [10] examined the digital economy's impact on green innovation. Logistics optimization was addressed by Meng et al. [11] through deep learning-based warehousing solutions. Engineering applications include Yao's [6] research on hydraulic testing and Xiangyu et al.'s [8] study on 3D printing parameter optimization using response surface methodology. Finally, Li et al. [13] contributed to smart city analytics with user-centered data exploration methods.

2. DETECTION AND ACCOUNTING METHOD OF METHANE ESCAPE EMISSION IN OIL AND GAS PRODUCTION PROCESS

In view of methane escape emission in the process of oil and gas production, the international side has issued the detection and accounting standard of methane emission, which measures methane escape emission in terms of equipment emptying, leakage and volatilization in the process of oil and gas production. In the detection and accounting of methane escape emission, it is necessary to conduct comprehensive accounting of equipment, processing, transportation, storage and other aspects that may have methane escape emission in the oil and gas production process, and take accounting data and monitoring data in different process stages as reference data for detection and accounting. In the detection and accounting of methane escape emissions during oil and gas production, the actual utility of each link of oil and gas production system should be considered, and the corresponding numerical calculation of methane escape emissions should be carried out according to different oil and gas systems. In addition, some countries adopt the bottom-up detection method in the detection and accounting process of methane escape emission. This method uses sampler to detect methane escape emission, and takes the emission rate as the main detection standard to detect the location of methane leakage. In the application of the top-down detection method, methane escape emission is quickly detected, and the focus is mainly on the detection of the production link. the main reference data of the two detection methods are included in the above. However,

the bottom-up detection method can ensure more accurate results, while the top-down detection method can promote the detection efficiency to a certain extent, and the difference between the two detection results is about 10%.

2.1 Study on detection and accounting of methane escape emission in oil and gas production process

2.1.1 Analysis of international hydrocarbon methane escape emissions

In the international community, there have been corresponding detection and accounting standards for methane escape emissions. Most countries will adopt fixed emission factors as the detection and accounting standard of methane escape emissions. Emission factor is different in different countries of the oil and gas production, most countries in the oil and gas production will use escape to methane emission factor of equipment factor and other factors as the standard, in the process of oil and gas production in the international community, some countries for reference in terms of equipment and gas processing and valves work escape the methane emission standard of measuring emissions factors, And the corresponding methane escape emission data will be made into a report for public. Since today's climate impact of global warming, the cause of today's public perception of greenhouse gas emissions have extremely sensitive, so in actual escape methane emission estimates, international escape emissions of methane to regularly report published on a regular basis, to escape the emissions of methane, achieve environmental protection, to avoid damage to the atmosphere.

2.1.2 Detection of methane escape from oil and gas in our country

Different from the detection and accounting of methane escape emission in our country's oil and gas production process, the detection process will investigate all links and factors involved in methane escape emission in the corresponding oil and gas production, and realize the numerical calculation of methane escape emission from multiple angles and aspects. In oil and gas emission of methane escape detection, can escape methane emission link, and many factors, including casing gas, gas water, produced water, equipment maintenance and production base in the whole process of oil and gas production will appear the phenomenon of escape methane emission, so in the actual oil and gas production, In order to ensure the accuracy of the data, it is necessary to focus on the detection of methane escape and discharge in oil and gas production. Generally, during the fracturing flowback stage of the production process, the amount of methane escape emission is relatively large. Therefore, in the process of detecting the amount of methane escape emission, it is necessary to detect the amount of methane escape emission at this stage, and then deduce the amount of methane escape emission in the whole area. But in some cases, the condition of oil and gas production appeared difference, it is easy to cause the current amount of methane emissions escape detection appeared difference, causing the escape of oil and gas production of methane emissions appeared difference, so you need to pay attention to the influence of external condition in the process of detection, in order to realize accurate measurement for escape methane emissions.

2.2 Accounting of hydrocarbon methane escape emission in our country

Our country to escape methane emissions in the process of oil and gas production of the corresponding data of accounting monitoring began in 2014 was improved, our country did not escape to the United States and Canada, and other commonly used foreign methane emission detection of accounting standards, but in the process of oil and gas production for emission factor of the default factor as the main accounting standard accounting [1]. This accounting standard plays a good role in the very beginning of the current detection and accounting of methane escape emissions from oil and gas production, which can accurately measure methane escape emissions from oil and gas production. But along with our country in the process of oil and gas production escape methane emission factors, today's oil and gas production in the torch burning and improve equipment leaks, empty corresponding escape methane emissions caused by oil and gas production quantity is calculated also gradually began to adapt to the corresponding emissions of methane escape the status quo, so need to improve the current standard, Allowing for accurate measurements of methane escape emissions.

2.3 Regional characteristics of methane emission from oil and gas in our country

In the detection and accounting of regional distribution of methane escape emissions in our country, the characteristics of regional methane escape emissions can be analyzed. Consider only the escape of methane emissions in the process of production, the escape of methane emissions in 2000 or so has been the heilongjiang, xinjiang and other places are in a higher value, but with the passage of time, escape methane emissions is higher in

our country today has been happening to the area of the corresponding change, in 2012, emissions of methane escape area statistics, the relatively top region has been transformed into Shaanxi Province, and in the subsequent detection and accounting of methane escape emissions, the emissions of Sichuan Province gradually began to show an upward trend, while the methane escape emissions of Shaanxi Province have always been in a high position [2]. Thus, the current inter-regional methane escape emissions from oil and gas production have gradually shifted from the northeast to the southwest, but not to a high degree. This is because in recent years, our country has made great efforts to develop oil and gas development in the southwest region, and in the process of development has realized the construction of west-east gas transmission project. This shift in the focus of oil and gas development has led to the spatial and regional variations of methane escape emissions in current oil and gas production, showing a corresponding shift trend. Therefore, it is necessary to pay attention to the external impact of relevant policies in the detection of methane escape emissions in the process of oil and gas production.

3. CONCLUSION

Oil and gas production is an important energy project in our country, which can provide a large amount of energy consumption for all walks of life in our country. However, in order to control methane escape emissions and realize environmental protection in the actual oil and gas production process, it is necessary to improve the equipment and production details in the oil and gas production process, combine the emission characteristics of our country, ensure the control of methane escape emissions, and promote the good development of oil and gas production.

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