



# International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 8.699**

**Volume 14, Issue 3, March 2025**

# Home Safe Gas Monitor: Automated Safety Solution using IOT

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**ABSTRACT:** The HomeSafe Gas Monitor continuously tracks daily gas consumption, estimates remaining usage time, and presents the data on an LCD screen. Designed for safety, it instantly detects gas leaks and takes proactive measures by automatically shutting off the regulator, preventing potential hazards. With its intelligent monitoring system, HomeSafe ensures real-time tracking of gas levels while providing timely alerts to homeowners. Its automated leak detection and shutdown feature enhances household safety, offering a user-friendly, efficient, and dependable solution for managing gas usage securely.

**KEYWORDS:** HomeSafe Gas Monitor, Gas Consumption Tracking, Real-Time Monitoring, LCD Display, Gas Leak Detection, Automatic Regulator Shutdown, Household Safety, Smart Gas Management

## I. INTRODUCTION

Gas leakage and inefficient usage monitoring are critical concerns for households, as they can lead to potential safety hazards and operational inconveniences. Traditional gas monitoring systems depend on manual inspections using mechanical gauges, which often lack precision and require continuous user involvement. Additionally, conventional gas leak sensors function primarily through alarm-based notifications, placing the entire burden of response on the user. This reliance on manual intervention increases the risk of delayed action, potentially worsening hazardous situations. The HomeSafe Gas Monitor revolutionizes gas management by providing real-time tracking and precise monitoring of gas consumption. Instead of relying solely on alarms, the system integrates automated response mechanisms to minimize human error. By delivering timely alerts and actionable insights, HomeSafe ensures proactive gas management, enhancing both safety and efficiency for users. A key advantage of the HomeSafe Gas Monitor is its automated safety shutdown feature, which instantly cuts off the gas supply when a leak is detected, preventing accidents before they escalate. This smart integration of automation and monitoring reduces the chances of gas-related incidents while offering a seamless, user-friendly experience. With its intelligent safety enhancements, HomeSafe is a reliable, convenient, and essential solution for modern households, ensuring peace of mind through continuous monitoring and proactive hazard prevention.

## II. LITERATURE SURVEY

The use of IoT-based gas monitoring systems for home safety has been widely explored in recent years due to the increasing risks associated with gas leaks. Several studies have investigated the effectiveness of gas sensors in detecting combustible gases such as methane, propane, and butane. A study by Patel et al. (2021) demonstrated the efficiency of MQ-series sensors, particularly MQ-2 and MQ-5, in detecting gas leaks and transmitting alerts through IoT platforms. The research emphasized the role of microcontrollers like Arduino and ESP8266 in processing real-time data and notifying users via mobile applications or SMS, thereby improving response time and minimizing hazards. Wireless sensor networks (WSNs) have also been extensively studied for their role in home gas leak detection. Sharma et al. (2020) explored the use of WSNs integrated with IoT to enhance safety measures. The study highlighted the benefits of cloud-based monitoring systems that continuously track gas concentration levels and activate automated safety



responses, such as triggering ventilation systems and shutting off gas supply valves. The ability to access real-time data remotely allows users to monitor home safety from any location, making WSN-based systems more reliable and efficient.

The incorporation of artificial intelligence (AI) and machine learning (ML) techniques in gas leak detection has been another area of interest for researchers. Kumar et al. (2022) proposed an ML-based predictive analysis model to detect potential gas leaks before they become critical. The study trained ML algorithms using historical sensor data, allowing the system to predict hazardous conditions based on detected patterns. This predictive approach enhances safety by reducing false alarms and enabling proactive measures before a dangerous leak occurs. Another study by Reddy et al. (2019) examined the role of smart home automation in gas safety solutions. The research found that integrating IoT gas monitoring systems with smart home devices such as Amazon Alexa and Google Home allows for voice-controlled emergency responses, including automatic gas shut-off mechanisms. Additionally, the study emphasized that smart alarms and multi-device notifications improve household safety by ensuring that residents receive alerts even when they are away from home.

The security aspects of IoT-based gas monitoring systems have also been discussed in the literature. A study by Zhang et al. (2021) analyzed cybersecurity risks, such as unauthorized access to IoT devices and data breaches that could compromise system reliability. The research suggested implementing secure encryption protocols, multi-factor authentication, and blockchain-based data logging to enhance security. Ensuring the confidentiality and integrity of sensor data is crucial for maintaining trust in these automated safety systems. Several studies have explored the impact of power efficiency on IoT gas monitoring systems. According to research by Li et al. (2020), optimizing power consumption in battery-operated sensors is crucial for enhancing system reliability. The study proposed energy-efficient wireless communication protocols and low-power microcontrollers to extend battery life while maintaining accurate gas detection. This is particularly important for deploying IoT-based safety solutions in remote or off-grid locations.

Another important aspect discussed in the literature is the integration of mobile applications for user-friendly gas monitoring. A study by Mehta et al. (2018) evaluated various mobile-based alert systems that provide real-time notifications, emergency instructions, and data analytics for gas leakage trends. The study found that user-friendly interfaces, along with push notifications and SMS alerts, significantly enhance user engagement and responsiveness in emergency situations. Environmental factors influencing gas sensor performance have also been studied. Research by Singh et al. (2017) highlighted how temperature, humidity, and air pressure variations can affect gas sensor readings. The study suggested periodic sensor calibration and advanced filtering algorithms to improve accuracy in different environmental conditions. Ensuring sensor reliability across various home settings remains a key challenge in developing robust IoT-based safety solutions.

A study by Ahmed et al. (2019) focused on cost-effective solutions for gas monitoring in low-income households. The research discussed the development of low-cost, open-source IoT gas monitoring systems using affordable microcontrollers and sensors. The study demonstrated that cost-effective solutions can make gas safety technologies more accessible to a broader population, reducing gas-related accidents in economically disadvantaged areas. Overall, the literature suggests that IoT-based home gas monitoring systems offer significant improvements in safety, real-time monitoring, and automated emergency response. The integration of advanced technologies such as AI, cloud computing, and mobile-based alerts has enhanced the effectiveness of these systems.

### **III. PROPOSED METHODOLOGY**

A modern gas monitoring system is crucial for managing gas usage and maintaining household safety. This innovative device tracks gas consumption continuously and offers precise estimates for how long the supply will last, enabling users to plan refills efficiently. Equipped with an automatic leak detection system, it can quickly identify potential hazards and activate an emergency shutoff feature to minimize risks. A real-time LCD screen displays current gas levels, removing any uncertainty. The monitor integrates a variety of sensors and automated components to ensure maximum accuracy and reliability. In the event of a leak, it detects and responds immediately, significantly lowering the chances of fire or explosion. Its automated shutoff mechanism swiftly halts gas flow to prevent extensive damage. Designed with user convenience in mind, this system simplifies gas monitoring and enhances efficiency in every household. Furthermore, its smart technology improves overall safety and usability. By incorporating real-time

tracking, predictive analysis, and emergency response features, this gas monitor offers a well-rounded solution for modern homes.

The importance of a smart gas monitoring system cannot be overstated when it comes to tracking gas consumption and ensuring household security. This intelligent device continuously measures gas usage, providing users with real-time updates and precise predictions on how long their supply will last. By incorporating automatic leak detection, it promptly identifies gas leaks and activates an emergency shutoff mechanism to eliminate potential dangers. A built-in LCD display enables homeowners to check gas levels instantly, reducing uncertainty and making refills more convenient. The system is enhanced with multiple sensors and automation technology to deliver high accuracy and reliability. In case of a leakage, the monitor swiftly detects the problem and initiates protective measures, mitigating fire and explosion risks. The emergency shutoff function ensures that gas flow ceases before significant damage occurs. With its intuitive design, this device makes gas monitoring effortless for households. Additionally, its seamless smart integration boosts security and ease of use. By merging monitoring, prediction, and safety functions, this system provides a complete solution tailored for modern living spaces.

A reliable gas monitoring system is an indispensable tool for keeping track of gas consumption and ensuring domestic safety. This advanced technology continuously observes gas usage and calculates supply duration with great precision, enabling users to plan refills at the right time. Equipped with an automatic leak detection system, it promptly identifies leaks and triggers an emergency shutoff to prevent potential accidents. A bright LCD screen provides instant gas level updates, removing uncertainty in determining remaining supply. With multiple sensors and automation technologies, the system guarantees enhanced accuracy and dependability. If a leak is detected, the monitor quickly responds, significantly reducing the threat of fires or explosions. The automated shutoff function ensures that gas flow is stopped before any major incidents occur. Featuring a user-friendly interface, the device simplifies gas monitoring, making it accessible to all households. Moreover, its smart capabilities contribute to overall safety and efficiency. By integrating monitoring, forecasting, and emergency response features, this gas monitoring system provides a reliable and effective solution for modern homes.

An intelligent gas monitoring system plays a vital role in ensuring both efficient gas usage and household safety. This innovative device operates continuously, analyzing gas consumption patterns and accurately forecasting the remaining supply duration, thereby allowing homeowners to plan timely refills. One of its most critical features is its built-in automatic leak detection mechanism, which instantly detects any leaks and activates an emergency shutoff to prevent dangerous incidents. With a real-time LCD display, users can conveniently check their gas levels without any guesswork. Advanced sensors and automated components work together to enhance precision and reliability. When a leak is detected, the system acts immediately to lower the risk of fire or explosion. The automatic shutoff feature further safeguards the household by ceasing gas flow before any damage occurs. Its easy-to-use interface ensures that monitoring gas usage is both simple and effective for all users. Additionally, the smart connectivity of this system improves overall safety and convenience. By seamlessly integrating monitoring, predictive analytics, and safety protocols, this gas monitor delivers a comprehensive security solution for modern households.

Ensuring efficient gas usage and household safety requires a smart monitoring system that tracks consumption and detects potential hazards. This sophisticated system constantly analyzes gas usage and generates accurate predictions regarding supply duration, helping users schedule refills without inconvenience. Its automatic leak detection feature identifies leaks as soon as they occur and immediately activates an emergency shutoff to prevent further risks. The LCD display provides instant gas level updates, eliminating guesswork and improving usability. With multiple integrated sensors and automation technology, the system maintains high accuracy and dependability. When a gas leak is detected, it takes immediate action, significantly lowering the possibility of fire or explosion. The built-in shutoff function ensures that gas flow is halted before major damage can occur. Designed for ease of use, the device makes gas monitoring simple and highly efficient. Additionally, its smart technology enhances overall safety and user convenience. By combining real-time tracking, predictive analysis, and emergency response capabilities, this gas monitor is a vital tool for any modern home.

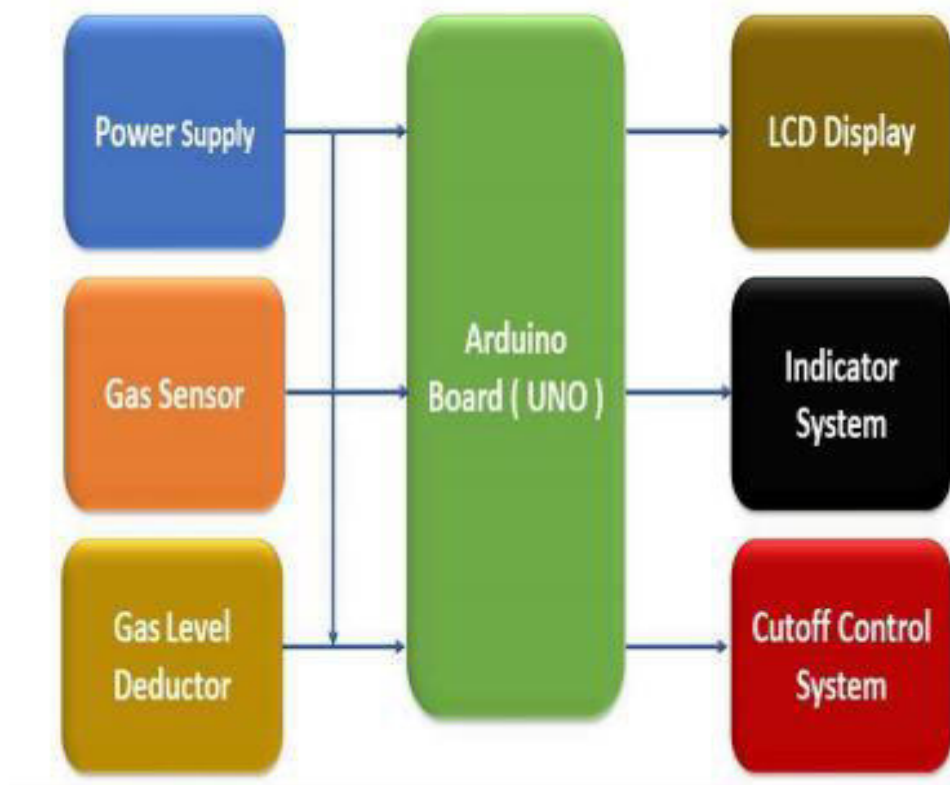


Fig1: Architecture Diagram

A technologically advanced gas monitoring system is essential for managing gas consumption and guaranteeing home safety. This intelligent system functions by continuously observing gas usage and delivering precise predictions regarding supply longevity, ensuring users can schedule refills without worry. Its automatic leak detection mechanism is highly efficient, identifying leaks immediately and triggering an emergency shutoff to eliminate threats. A real-time LCD display offers instant updates on gas levels, simplifying the monitoring process. The inclusion of multiple sensors and automation technologies significantly enhances accuracy and reliability. If a gas leak is detected, the monitor reacts instantly, reducing the probability of fire or explosion. The emergency shutoff system promptly stops gas flow before any hazardous situation escalates. With a user-friendly design, this device ensures gas tracking is both easy and effective. Furthermore, its intelligent integration strengthens security and operational efficiency. By combining real-time data analysis, forecasting, and emergency measures, this smart gas monitor is an indispensable asset for contemporary households.

A modern home requires an intelligent gas monitoring system to track usage and enhance safety. This system works by continuously evaluating gas consumption, offering real-time insights and precise supply duration estimates, which helps homeowners plan refills efficiently. One of its key safety features is the automatic leak detection mechanism, which detects leaks and instantly initiates an emergency shutoff to prevent hazardous situations. The system is equipped with an LCD display, allowing users to check gas levels without guesswork. Advanced automation components and sensors ensure high reliability and accuracy. When a leak is identified, the system acts immediately to neutralize potential dangers, reducing the risk of fire or explosion. The automated shutoff function further ensures that gas flow is discontinued before any substantial damage occurs. With its simple yet efficient design, the device simplifies gas monitoring for households. Moreover, the integration of smart technology enhances safety and

convenience. By merging monitoring, forecasting, and emergency interventions, this gas monitor provides a holistic safety solution for modern homes.

A highly efficient gas monitoring system is indispensable for keeping track of gas consumption while ensuring household security. This advanced solution continuously evaluates gas usage, making precise predictions about the remaining supply to help users manage refills effectively. Its automatic leak detection system promptly senses gas leaks and activates an emergency shutoff mechanism, preventing any hazardous situations. The LCD display delivers real-time gas level updates, eliminating uncertainties for users. Integrated with smart sensors and automation features, the system is designed for superior accuracy and reliability. In case of a gas leak, it acts immediately to lower the chances of fire or explosion. The built-in emergency shutoff halts the gas supply before serious damage can occur. With an intuitive interface, this device makes gas monitoring simple and effective for all households. Additionally, the incorporation of smart technology ensures overall safety and ease of use. By combining gas consumption tracking, predictive analytics, and security measures, this system serves as a robust safety solution for modern homes.

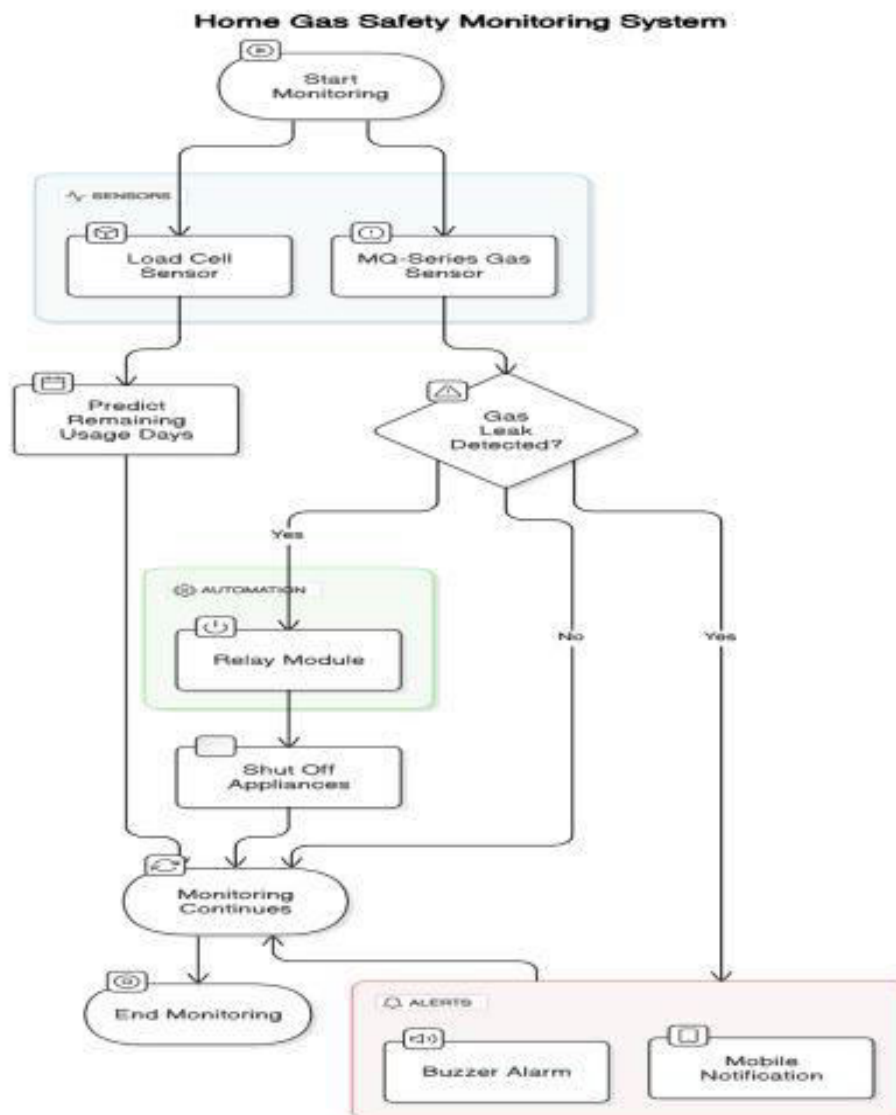


Fig2: Flow Diagram



#### IV. RESULT AND DISCUSSION

**Gas Detection Module:** This module utilizes an MQ-series gas sensor to continuously monitor the surrounding air for combustible gases like LPG and methane. When a leak is detected beyond a predefined threshold, the system triggers an alarm and sends alerts to the mobile application.

**Gas Consumption Monitoring Module:** A load cell sensor is integrated to measure the weight of the gas cylinder. The system tracks gas consumption over time and estimates the remaining usage days, notifying the user when a refill is required.

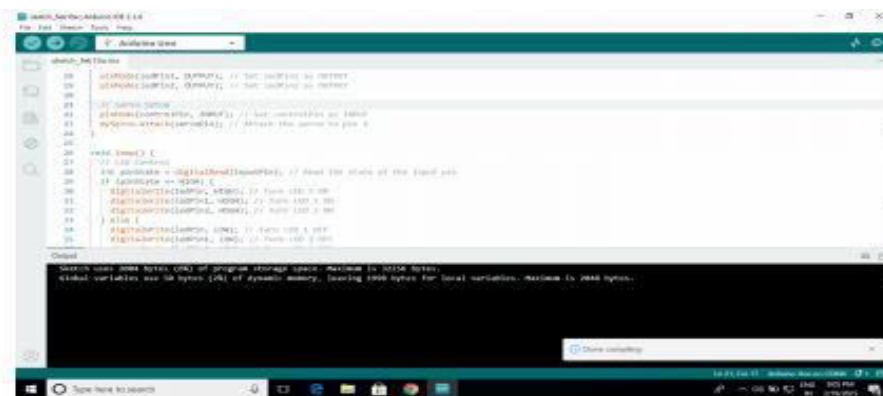


Fig3: Output

**Safety and Automation Module:** A relay module is connected to gas appliances, allowing automatic shut off in case of a leak. When a high gas concentration is detected, the microcontroller activates the relay to prevent further gas flow, reducing the risk of fire hazards.

**IoT Communication Module:** The system is equipped with Wi-Fi or Bluetooth connectivity for real-time communication. The microcontroller (ESP8266/ESP32), ensuring remote access via a mobile application. Users receive push notifications in case of gas leaks or low gas levels.

**User Authentication Module:** To ensure secure access, a login authentication system is implemented. Users register on the platform and log in to monitor their home gas system. The authentication process utilizes encrypted credentials and cloud-based authentication services to protect user data.

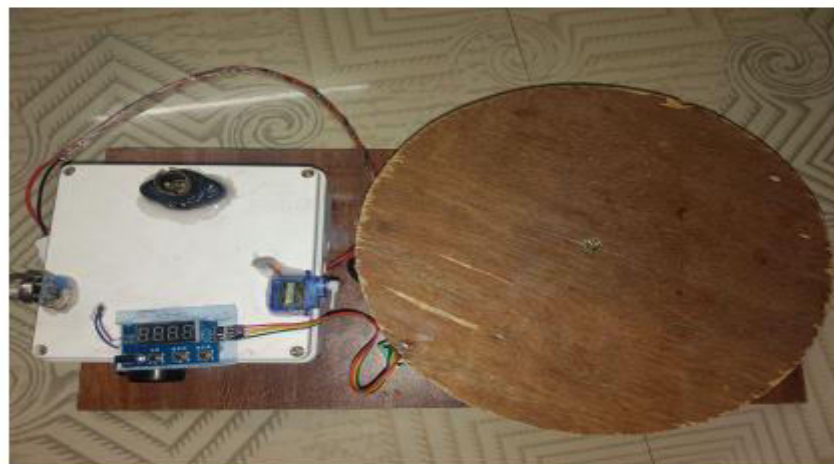


Fig2:

### **V.CONCLUSION**

The HomeSafe Gas Monitor presents a smart, efficient, and automated solution for gas usage tracking and safety. By integrating real-time monitoring, predictive analysis, and automatic shutoff mechanisms, it significantly reduces the risks associated with gas leaks and inefficient consumption. Unlike traditional manual methods, this system enhances accuracy, reliability, and convenience through IoT-based remote tracking and AI-driven analytics. While initially designed for household applications, its potential for commercial and industrial use can be expanded with necessary modifications. The cost-benefit analysis demonstrates that the system not only improves safety and efficiency but also leads to long-term savings by minimizing gas wastage and maintenance costs. With its scalable and innovative design, the HomeSafe Gas Monitor stands as a comprehensive and future-ready solution, ensuring enhanced safety, energy efficiency, and convenience for modern gas monitoring needs.

### **REFERENCES**

1. Punch newspaper 2021, Panic as gas leakage occurs in Ikeja. A available at <https://punchng.com/breaking-panic-as-gas-leakage-occurs-in-ikeja> retrived January 17, 2021.
2. A., L. (2017). Wireless gas leak detection improves employee protection, environs, and production value.
3. Arpitha, T . K. (2016). FPGA-GSM-based gas leakage detection system. Bangalore. IEEE Annual India Conference (INDICON), 1-4.
4. Chengjun, D. X. (2011). Development of gas leak detection and location system based on wireless sensor networks. Shanghai. Third International Conference on Measuring Technology and Mechatronics Automation, 1067–1070.
5. Kareem, H. (2019). Embedded real-time system for detecting leakage of the gas used in Iraqi kitchens. Indonesia J. Elect Eng Comp Sci .vol 14, 1 171-1 176.
6. Loth, J. M. (2003). Technology Assessment of online Acoustic monitoring Leak In fragment in the underground, natural gas Transmission Lines. USA: W est V irginia University .
7. Manohar , R. a.(2018). Android Introduction to Detection. Hindu: Nwebweze, O. (December 2015) vanguard News .com .
8. Murvaya, P.(201 1). A survey in Gas leak Detection and localization technology. Journal of loss prevention in the Process Industries, 1 1-25.
9. Park, G. L. (2013). Development of gas safety management system for smart-home services. Distributor Sensor Network, 9-10.
10. Sonkar, B. S. (2015). Microcontroller-based LPG Leakage Detector using GSM Module. International Journal of Electrical and Electronics Research, V ol.1 1 1, 264-269.
11. Sperl, J. (2005). System pinpoints Leak s on point Arguello Offshore Lines. Oil and Gas Journal. vol .99, no 36, 47-55.





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