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AI and ML-based Assessment to Reduce Risk in Oil and Gas Retail Filling Station: A Literature Review

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Abstract

The oil crisis in recent years has pressurized petrol stations and associated service providers to improve efficiency and effectiveness. The accidents caused by human error and other technical incompetence lead to fatalities and environmental pollution. This paper analyses the role of Artificial Intelligence (AI) and Machine Learning (ML) in reducing the risk by various factors at retail oil and gas filling stations. The use of technology can help retail outlets in the oil and gas industry to reduce risks. This survey explores how to reduce workplace hazards at oil and gas filling stations to reduce fatalities, injuries, and other adverse health outcomes, which may be due to inhalation of toxic fumes, fire accidents, electrostatic charges, or any other artificial or natural reasons. Moreover, this review is done on how AI and ML can be used to reduce electrostatic discharges at the nozzles along with the automated replacement of human resources in hazardous situations. Therefore, the purpose includes the exploration of AI and ML technology to enhance safety at petrol and gas stations. This paper is a literature review of the articles published at different times.

Keywords: Oil and gas Industry, artificial intelligence, machine learning, petrol stations, risk assessment, AI and ML

1. Introduction

The oil and gas filling stations experience health hazards due to the inhalation of toxic fumes and gases in the air. Along with this, the filling stations may grapple with fire

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accidents due to electrochemical charges at the nozzle of the filling instruments. Machine Learning (ML) and Artificial Intelligence (AI) based assessment and technology can help, if not eliminate, but reduce fire incidents. The risk-based assessment using new technology can help optimize the conditions. The manual risk-based assessment using traditional methods involves subjectivity, biases, and human errors. Using algorithm-based technology can be a better solution to remove such risks, including fire accidents.

ML and AI present neural-based deep learning that can be used for risk assessment beforehand, significantly reducing casualties [1]. The risk assessment based on AI and ML can present a solution by reducing electrostatic charges development at the nozzle itself. Along with this, ML and AI remove the casual attitude experienced by workers at filling stations. The workers inhaling gas fumes can also be protected by reducing the gas vapours in the air. Thus, the casualties can be prevented at retail filling stations using modern algorithm-based compact loading technology practised through ML and AI.

AI and ML bring rationality and objectivity to decision-making, improving traditional retail filling experiences for customers. The technology can help streamline the filling operations by arranging the queue order as per the time available. Oil and gas are highly combustible gases that can reduce business prospects. The filling operations involve compact air loading, which can be prevented using AI and ML. The use of technology can help prevent fire accidents due to less pressure while filling oil and gas in fossil fuel-based vehicles. Thus using AI and ML technology in filling stations can reduce fire accidents at retail oil and gas filling stations. Risk-based assessment in the oil and gas industry can reduce near misses, accidents, and other hazards.

In the study conducted, three risk parameters were identified, and activities were assessed. It was concluded that risk-based assessment help in the development of strategies that reduce accidents in the natural gas sector. It was identified that one major cause of such hazards is the lack of risk assessment criteria. Therefore, a new risk assessment framework that the industry can utilize to prevent hazards was developed. Every practical project must have a safe working environment. Improved safety outcomes can only be achieved if safety-related priorities are adequately addressed in all phases of projects. At various project stages, the hands-on efforts of owners, builders, consultants and architects are crucial. Mitigation strategies are planned to improve safety conditions and control accidents and injuries on every project due to electrocution, snake bite and fire.

2. Objectives of the Review Paper

The research paper explores AI and ML's role in reducing risks worldwide at oil and gas filling stations. AI and ML technologies are transforming risk management. A general understanding of the technology is discussed with some examples and empirical evidence. The paper reviews the operational risks, thoughts on current limitations and views on implementing technology. A discussion on how ML and AI solutions transform risk management is reviewed. A non-technical overview is first given about ML and AI techniques of benefit.

3. Related Works

The below table describes the details of different types of publications related to petrol station and risk assessment.

Table 1. Review of Publications Related to Risk Assessment

S. No	Authors	Year	Discoveries/Results
1	Al Mahrooqi & Ali [1]	2019	A Machine Intelligence Method for managing lines in gas pipelines in the Sultanates of Oman.
2	Ahmed et al. [2]	2011	Oil stations have improved the new safety risk assessment model. Risk-based assessment and criteria can provide a concise analysis of the accidents at fuelling stations, preventing such incidents in the future. The article explored the risks associated with human behaviour, like casualty and carelessness, increasing the chances at fuelling stations.
3	Shearston & Hilpert [6]	2019	The fuel emissions involve harmful or toxic elements released, which can be curbed by ORVR and stage 2 recovery systems. Most gasoline-filling activities involve the emission of their vapours, leading to compromised results in the context of gasoline-filling stations. Fire incidents at such places can be better managed by AI and ML techniques.
4	Askarova et al. [7]	2018	In the oil industry, incidents at petrol stations should be avoided with the help of a risk analysis framework. Using AI and ML, disasters and related security issues can be effectively addressed.
5	Milana et al. [8]	2019	The technical staff in the oil and gas work is high uncertainty, and the tasks are associated with safety concerns. Using AI for natural language processing in the natural gas resource industry can provide better insights and ideas.

6	Yin et al. [9]	2021	Failure criticality is a part of the oil and gas sector. Therefore, it is vital to develop protective measures. Fuzzy logic inference and machine learning help assess the health or safety risks and ecological effects. Fire incidents in the industry are still rampant due to a lack of safety.
7	Aziz [11]	2018b	The transformation of managing risks by AI and deep learning technology was examined in the study. The paper reviewed the operational risks, thoughts on current limitations and views on implementing technology.
8	Paltrinieri [12]	2019	Risk assessment plays a significant role in safety-critical industries. The oil and gas area faces technological challenges regarding operations and safety from hazards. Ongoing risk identification, better learning from historical data, appropriate information processing methodologies specification, and enough competence to prevent future accidents were required.
9	Guizhi et al. [13]	2021	Managing enormous amounts of data produced by retail outlets, oil and gas production plants, and associated supply chain needs unique techniques and skills. Big Data is the technology suitable for managing and mining thousands of terabytes of data using Hadoop/Spark.
10	Satar et al. [14]	2019	Some of the quickly developing communications technology in the petroleum and gas industry is the Internet of Things (IoT). The deployment of technological advances inside such as in oil and gas industry, including manufacturing, supply chains, and retail service stations, is the subject of extensive research. Opportunities in safety and security monitoring of retail outlets, monitoring and controlling of already occurred hazards using drones were explored.
11	Makka [15]	2018	The study evaluated the environmental impacts and risks of several filling station activities and environmental performance. A comprehensive industrial enterprise tends to comply with appropriate legal standards by applying modern and advanced technologies and different preventive measures to restrict the event of emergency occurrence.
12	Nkansah et al. [16]	2017	The paper assessed the levels of chosen heavy metalloids or metals in filling station dust. Therefore, assessment led to calculate human health risks, potential ecological risks and pollution levels of heavy metalloids or metals in dust throughout the fuel filling station.
13	Magambo [18]	2017	The study was formed to evaluate and examine operational risk management practices in several petroleum filling stations. The research questions, such as operational risk factors for different Petroleum Filling

			Station challenges against Operation Risk Management for several Petroleum Filling Station and absolute practices for Operation Risk Management in other Petroleum Filling Station supported the study area. Therefore, the research implemented a quantitative and descriptive research design.
14	Oni et al. [19]	2019	A developing range of unfavourable health impacts is accompanied by different air pollution at low concentrations. Some research has evaluated several respiratory parameters among fuel-filling station participants. The study stressed exposure to ambient air pollution and filling station participants' lung function assessment. The paper evaluated total volatile organic compounds, particulate matter (PM10), and air pollutants, focusing at the ascertained level of “peak expiratory flow rate” and “forced expiratory volume in one second” among the attendants of filling station.
15	Online [21]	2008	The study revealed adoption of continual Deep Learning (DL), ML and AI to check if petrol pumps are secure by anticipating dangerous behaviour. An extensive dataset is available in the current internet segment, and DL and ML facilitate the ability to prevent and predict several catastrophically dangerous events.
16	Periyasamy et al. [22]	2017	The rate of the vehicle enhances every year. Due to the increasing needs or demand of the people, the petrol filling stations rate is also increasing. Growth rate possesses a significant role in enhancing the risk of explosion and fire hazards. It can form severe explosion and fire hazards and seems harmful to health. At the same time, fuel is not maintained safely and causes damage to respiratory problems, dizziness, eyes on contact and skill in case of inhaled. Therefore, hazard risks were evaluated using GIS applications in filling stations.
17	Dacherngkhao et al. [23]	2019	Volatile organic compounds tend to pollute ambient air and cause health impacts to the people working at a gasoline station. Cross-sectional study concentrates on health risk assessment to the exposure of BTEX at the segment of a fuel storage tank.
18	O.E. Johnson., and Q.M. Umoren [25]	2018	The research aimed to identify the safety practices, health issues, and work dangers faced by Nigerian gas station workers in Uyo. During working hours, gas station attendants face several risks and health issues. Data were gathered using an investigator's standardized questionnaire, and STATA 12.1 software was used for analysis. Inferential and descriptive statistics were used for the data analysis.
19	John Merrill	2018	Assistant for Understanding Data through Reasoning,

	et al. [28]		Extraction, and Synthesis (AUDREY) was developed in Jet Propulsion Laboratory by NASA. Artificial General Intelligence and AI are used as cutting technologies in multiple applications. To support the emergency responders, event supervisors, and response teams to assure the worker's safety, AUDREY is being trained about fire activity and the threats experienced by the firefighters and police.

The adoption of digital technology into the industries globally is growing at a faster pace with AI and ML technologies. These two technologies are capable and flexible to automate the machinery of any industry, including the petrol and gas sector. AI and ML systems' built-in and customized algorithms can predict fire, send alerts, and detect fire occurrences much faster than humans through integrated sensors. The AI and ML software continuously receive inputs from heat, optical, and photo-electric sensors strategically installed at petrol and gas stations, process the data, enable alerts/alarms, and take actions manually or automatically. Overall, an optimistic picture of the role of ML and AI in risk management is debated. However, there are some practical limitations around suitable data management and automation policies, transparency, investment and lack of necessary skillsets within firms.

The supplementary objective of the paper is to reduce workplace hazards at oil and gas filling stations to reduce fatalities, injuries, and other adverse health outcomes. It may be due to inhalation of toxic fumes, fire accidents, electrostatic charges, or other artificial or natural reasons. The workplace hazards of an oil and gas filling station are caused due to risks associated with the unloading of oil and gas into storage tanks, during storage and while disbursing through the outlets.The risk assessment includes the safety of persons, health hazards, equipment and the environment. The various technological processes in the retail petrol station and associated storage area may produce flammable and explosive gases and vapours which can cause fire and explosion. These activities are the origins of environmental hazards in facilities endangered by flammable and combustible gases and vapours, or toxic products of combustion, heat radiation and shock wave.

The dangers arising in the area are evaluated using computer models using the software ALOHA (Areal Locations of Hazardous Atmospheres). The threat areas are classified into various zones, which would reduce the risk of vulnerability to an acceptable level, and for better monitoring and minimizing hazards [17]. Petroleum vapour emissions vary in severity during refilling depending on the vehicle's make, model and age. The current

network of Onboard Refuelling Vapour Recovery (ORVR) and Level II vapour protection systems require further investigation of the burden and potential health effects of fuel pollution generated during car refuelling [10]. Benzene, toluene, ethyl benzene, xylene and other hazardous compounds are included in US gasoline formulas and may be emitted during car refuelling operations at gas stations. Those pollutants can be significantly reduced with ORVR and Stage II vapour recovery systems; nevertheless, research is being done on AI and ML techniques.

The research's third primary objective is to explore how AI and ML can be used to reduce electrostatic discharges at the nozzles along with the automated replacement of human resources in hazardous situations. Several factors were examined that increase the fire risk at gas stations, which are the most prominent cause of fire hazards at gas filling stations. It arises from the dispenser's nozzle, where electrostatic charges are accumulated. And discharge occurs when the person who is also charged comes in contact. Thermal imaging cameras can send the data to AI systems for assessing the risk. Predictive algorithms can process the input parameters to decide when a hazard is likely to happen by sending alerts, alarms or auto-shutting pumps. Some European countries have set up robotic gas stations on an experimental basis to overcome the limitations of manual and semi-automatic pumps. These automated dispensers would rely upon AI, ML and DL technologies. The study assessed how external factors, corrosion, and pipeline materials harm the natural gas pipeline in the organization. Therefore, the study is indirectly related to fire accidents caused due to faulty pipeline systems.

Hu et al. [3] examined how the new method involving entropy weight and grey clustering can help assess the identified hazards in natural gas resources. The new method’s effectiveness was judged based on numerical values gathered in the process. Thus, the study can provide theatrical explanations for various measures associated with planning in the petroleum and gas sector. Moreno-Garcia &Elyan (2019) [4] examined how automated processing in the industry has tremendous opportunities and challenges. The status of the IoT as a modern technology was examined in the petroleum industry. Digital transformation can better streamline data and information, leading to better analysis. The technique will also benefit operating and capital effectiveness, protective measures, sustainability considerations, and health risks. The sector is under pressure from the low price of crude oil to increase performance and adopt cutting-edge technologies to lower input costs [5].

Despite all these advantages, there can be particular challenges in implementing IoT and potential cyberattacks. The research carried out by the authors provides various opportunities and challenges associated with embracing technology in the petroleum and gas sector. Non-cancerous diseases are also rampant among workers at petrol filling stations. The threshold level for cancerous elements was significantly higher in workers who inhale toxic compounds at petrol filling stations. Thus, the natural gas resources sector is directly and indirectly related to health hazards. The electric sparks can occur at the nozzle of the equipment filling petrol in vehicles. Such sparks can cause extensive damage due to handling inflammable fuels and gases in the vicinity. Thus, how the electrostatic spark at the fuel station may lead to severe loss was examined. Fuel losses and leakage from underground fuel storage systems are common issues in gas and oil stations. ML techniques were evaluated for detecting fuel loss at service stations to solve the issue [24].

Literature reveals that retail oil and gas filling stations are highly susceptible to fire damage. Fire accidents can be caused by compaction, electrostatic charges development at the nozzle, filling pressure, workers, casual behaviour, or other natural or artificial reasons. To prevent fire accidents, AI and ML can be used by reducing the electrochemical and electrostatic charge perception at the nozzle. It reduces the fire damage criticality along with removing human-based errors. Machines also reduce human's contact with flammable gases, leading to less vulnerability for humans and other living beings. The technology can bring objectivity and development of technical superiority, leading to less release of explosive fumes in the environment. Therefore the technology has positive ecological effects as well, which indirectly affect fire accidents and the health of human beings. Technology can help reduce compaction leading to less pressure. The reduced pressure also prevents petrochemical charge precipitation, and reduced vulnerability and sphere of influence are associated with fire expansion. Thus, the technology can reduce the incidents occurring due to manual filling at oil and gas stations at the retail level.

4. Information Technology System at Petrol Stations

The petrol or gasoline retail industry is moving toward a new digital transformation for the future. The primary goal of these intelligent stations is to drive a new and improved customer experience. Using intelligent devices and sensors integrated with new-age technologies like AI, ML and DL would boost routine operations with insights gathered from the data. It also provides safety and security for petrol stations through innovative

surveillance systems which prevent hazards. AI and ML are the foundation for implementing intelligent sensors, drones and robots replacing humans. The predictive, prescriptive and cognitive analytic algorithms of AI/ML receives data continuously from infrared cameras, optical beam smoke detector, and aspiration smoke detector. These sensors monitor temperature change, detect heat signatures, smoke and fire, accumulation of petrol vapour, and sparks caused by electrical systems and send alerts.

Intelligent surveillance can identify customers who use phones or light a match. The collaboration of sensors and AI/ML helps monitor the causes of various hazards and helps take preventive measures for disaster management. The real-time data is used to mitigate the risks by the processes of Prevention, Detection and Communication, Occupant Protection, Containment and Extinguishment followed globally. Fuelsuite can forecast future events for petrol station owners. Predicting future adverse events before they occur will help efficiency in decision-making and prevent any undesirable events. As Fuelsuite is integrated into one platform, it gives owners the access to more excellent information about their sites, operations, raw materials, sales, services, and all they need.

5. Artificial Intelligence, Machine Learning and Deep Learning in Filling stations

AI/ML and DL are used in improving customer interaction and safety in petrol pumps. The AI-enabled systems will empower traditional video surveillance. It is achieved by creating relationships between the objects in the video, forming the basis for the logical analysis of video data. AI-powered video content analysis algorithms enhance the security of petrol pumps, enforcing several safety protocols and avoiding fire accidents. The AI/ML algorithms calculate the fire risk in a petrol station based on various data feeds from smart sensors strategically fixed across the petrol station. They receive inputs from infrared cameras to monitor temperature rise, aspiration smoke detectors or optical beam smoke detectors to detect high-intensity smoke in storage zones, next to fuel pumps, or in any electrical equipment, cables, or switch boxes.

Thermal imaging and surveillance cameras would identify a tiny fire from a cigarette lighter or a match. AI-enabled surveillance systems can quickly identify persons trying to use mobile phones or light a cigarette and alert staff before such events occur. To address and minimize fire-related dangers and threats, smoke detectors, heat detectors, flame detectors, vapour detectors, gas sensors, and automated suppression systems are employed. The fire detection boxes and indication appliances have all been designed and integrated with AI/ML-

based systems. Machines and robots using ML and AI can enter dangerous areas where firefighters cannot process. Whenever the pumping lever leaks or the connections leak, the individuals are blasted because the cut-off mechanisms are damaged, and the people could get significant diesel and gasoline injuries. Sometimes consumers could be subjected to harmful concentrations of carbon monoxide or other gaseous pollutants whenever the petrol pump space is improperly maintained, which can result in vaporized exposure burns.

Automated artificial intelligence-based drones and robots can enter unsafe and harmful locations that people cannot process. Robots and drones can give aerial images that improve tactical awareness, recognize and identify objects, and view through fires. In domestic fire accidents and situations, firefighting robots effectively control the fire. Robotic firefighting systems currently use thermal sensors to recognize fire accidents. The drawback of using sensors is that they cannot detect fires farther away than a particular range. Fire detection is currently processed positively over a wider area because of artificial intelligence technologies.

The AI and ML-integrated tools also help to identify the physical and mental health of the human struck by fire [29]. Some countries in the EU operate robotic fuel stations on an experimental basis. Robotic fuelling stations are being tested in a few European Union countries. The implementation of AI and ML techniques at petrol stations is currently unexplored. At this time, digital technology at the retail stage does not employ technologies such as the Web of Things, automation, computer vision, AI, supervised learning, IoT devices, machine learning and robotics. AI and ML are still unknown territories or spheres of technology at most oil and gas filling stations worldwide. The new related issues range from external factors warranting judicious use of technology, cyber security concerns, and automated information processing [4]. Though the technology can bring tremendous benefits in reducing fire accidents by applying a safety valve at the nozzle of a pipe, it also has specific challenges. Cyber security is one of the most potent challenges and can be used at the international level in case of rivalry. AI and ML can also be used when a fire accident has been caused. For example, technology can help evacuate from remote areas where humans cannot move without suffering injuries. Thus, the technology of still to be used at a rampant level.

An effective fire detection system needs precise and responsive operations to make the most appropriate decision in a fire emergency and accidents. Because many commercialized fire detection techniques only use a single essential sensor, the sensor's

detecting capabilities constrain its ability to identify fires accurately. According to its static features, the current approaches that use image-based and rule-based machine learning algorithms find it challenging to react to changes in the surrounding environment. The need for responsiveness is not satisfied because the existing fire detection techniques and communications networks do not provide faster data transfer latencies. For the security and sustainability of intelligent buildings from fire accidents, a novel system for fire detection with a multimodal artificial intelligence structure was suggested. And a faster data transmission delay in the reduction system for an adaptive fuzzy approach is one of architecture's critical machine learning algorithms. They address the issues with standard MQTT's traffic intensity, and Direct-MQTT using SDN was used. Approximately 95% accuracy in detection systems was found by researchers who tested the effectiveness of the suggested technique in terms of delay time and accuracy. The decision and transfer latencies are decreased by approximately 72%, together with the end-to-end latency [26].

The application of cameras to monitor artificial accidents, including fire accidents, has become a prevalent issue in research and is essential to the advancing intelligent devices. Fire disasters generate significant economic and societal harm. Using vision-based approaches like CNN, RNN, and ANN algorithms, fire can quickly be identified and realized due to recent advancements in integrated technology. A machine learning algorithm-based technique for visual monitoring during fire accidents and situations was suggested in [27].

One of the research explored the key risks and events of occurrence of possibility of explosion and fire accidents in Compressed Natural Gas (CNG) filling stations. The posterior probability of critical events of explosion accidents and CNG filling stations was calculated and evaluated by implementing GeNIe software [20]. As per the current status, the use of AI and ML at fuelling stations is a relatively new concept. The integration of the technology at retail stations needs skills along with the refinement of the stations to accommodate new requirements. The resistance against technology due to the false myth of losing jobs can also bring negative results [5]. Using the technology requires social, political, and administrative support to reach every station at the retail level. Moreover, the modern shift of attention to electricity-based vehicles can reduce the business prospects in this regard. The technical developments are still at a nascent stage due to high sophistication. The workers will have to be trained to adapt to changing operational needs associated with the use of technology. The implementation on the ground level requires government support, which will take time to

implement on the ground. ML and AI are still the only ideas in the modern world though they can be used in myriad applications and economic sectors. The research and development on technology is an additional new gap that needs to be filled before the advent of the technology at fuel filling stations at retail levels.

Research gap 1 is ML and AI technology that can cause concerns associated with cyber security. The online hacking of the system can derail the entire process of digitally charming retail petrol and gas stations. The cyber-attacks also include privacy concerns as they generate big data that can compromise the personal information of customers and other stakeholders.

Research gap 2 is the need for financial capital and a skilled workforce to transform petrol and gas filling stations digitally. The highly sophisticated technology makes it revered but also limited development that unskilled people cannot use.

Research gap 3 is the rising economic inequality due to technical automation has widened the differences between the people divided as haves and have-nots. The top 90% of the technical services and associated economic developments are controlled by the top 10% of people in the economic hierarchy. The technology will further make the services inaccessible for those who have been left behind in the race of a dynamic society.

6. Research Agendas based on Research Gap

Prevent manufactured fire disasters

- How can AI and ML help to reduce artificial fire hazards in public and professional places?

The significant risk associated with a fuel station is a fire hazard. The presence of gasoline vapours near fuel dispensing pumps, nozzles and storage tanks are the potential places where fire accidents can occur. The static electric charges developed near nozzles which generate sparks while discharging is the most common cause of the fire. The other reasons include improper wiring or faulty electric equipment, overheating, overloaded conductors, and a lightning strike to the pump or vicinity of the pump can quickly generate a spark leading to ignition of the vapours.

The best way to handle fire hazards is to prevent them from occurring. A safety and security audit should identify all fire-causing substances, equipment, and processes that cause the risk. The AI/ML-enabled systems would continuously monitor the parameters from

intelligent sensors and surveillance cameras and process data. The customized algorithms use this data to predict the occurrence of fire hazards. The necessary actions would be initiated when threshold limits are crossed automatically, or an emergency procedure would be explicitly initiated at a gas station.

- How ML and AI technology can help bridge economic inequality in the context of skill development through training?

Firefighters need more than just physical strength and conditioning. Firefighters also have to make quick decisions under extreme stress conditions. Some significant training costs are prohibitive, logistically challenging, and potentially dangerous to train applicants in typical firefighting activities, including hose drag, maze searching, equipment carrying, forced entry, victims drag, ladders rise and expansion, and roof breaching and drag. The two essential and cost-effective training systems managed by AI and ML-based technologies are Virtual Reality (VR) and Augmented Reality (AR). The affordability of aspirant candidates will discourage them from undergoing training, leading to economic inequality in the context of skill development through training. The skill development will be much more comprehensive. The steep decrease in training costs would bridge the barrier of economic inequality.

- How fire accidents already caused due to specific reasons can be better managed by AI and ML technology?

ML and AI-based techniques gain more features from the existing data using iterative and intelligent processing algorithms. The ML & AI-based methods identify every individual data in the system and continuously learn and test with the standard results. The system can evaluate the current fire accident data and give total insight into the type of fire, category, location and navigation guidance, and drone coordination to the team involved in fire containment and extinguishment to make decisions.

7. Analysis of Research Agendas

The research agendas help fill the research gap by training people who cannot gain technical services and education. If they have more technical knowledge, fire accidents can be better managed at oil and gas petrol stations. Technology implementation also needs digital transformation associated with local competence among a large population. The analysis focuses on employing ML and AI to defend against fire damage, health hazardas and disasters at commercial gas and oil charging stations. The scope of the research is limited to

fire and health hazards only for better research that involves a systematic review of articles based on chosen inclusion and exclusion criteria.

Table 2. SWOC Analysis

Strength	**Weaknesses**
• High demand for ML and AI due to the tech-savvy modern population • Reduction of fire accidents, leading to fewer fatalities • Governmental support due to administrative benefits	• Lack of public awareness • False misunderstandings or myths related to the use of technology • Lack of economic growth due to the after-effects of the COVID-19 pandemic
Opportunities	**Challenges**
• Scientific vigour in market • Modern thoughts and beliefs in liberalized society • Changing social dynamics	• Need further exploration through research and development . • Difficult to gain workers' and labour unions' support due to job automation

8. Suggestions to Implement Research Activities according to the Proposal

The suggestion to implement future research activities is to narrow the topic to a particular country. Different geopolitical and diplomatic conditions make each nation different from others. Therefore, one research solution may not be helpful for all countries worldwide. Once the research is narrowed down to a particular topic, the findings can be optimized for all similarly placed countries. Another recommendation for conducting research operations is to develop exclusion and inclusion standards related to the original study. Considering that ML and AI are still relatively new ideas, the inclusion criteria must account for the most recent market advancements. The research done in the first five years can help assess research conditions. This research proposal is a systematic review involving secondary data analysis, and future studies are recommended to generate primary data using relevant tools and techniques. Thus, the study may be refined for future research activities differently.

9. Conclusion

This paper has analysed the role of Artificial Intelligence (AI) and Machine Learning (ML) in reducing various hazards at oil and gas filling stations. The objectives mentioned in

the previous parts have been fulfilled, keeping in mind the wide-scale use of AI and ML technology warranted at the international level. The chosen technical developments can better manage fire accidents if they occur and, at the same time, reduce the instances of fires at a petrol station by reducing electrostatic charge precipitation at the nozzle. The research involves carefully deliberating the research methodology, including a systematic review of articles narrowed down based on inclusion and exclusion criteria. The identified problem is the increased fire accident at retail oil and gas filling stations due to manual errors in traditional use. The vulnerability to fire hazards can be reduced by developing risk-brisk-basement methods. The above findings show that the research involves meticulous planning and hard work due to the lack of available literature on the same topic as a new market idea and technology. Originality of the study is that all previous works related to the topic have been cited. Therefore, this research can help policymakers consider associated social underpinnings and technical impediments while planning the use of AI and ML technology at retail oil and gas filling stations.

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