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A Study on Safety Chip for Gas Stoves

Raghu Anand[1], Shilpa Mary[2], Himanshi Bhansali[3], Harshit Jain[4], Hitesh Dhoka[5], Saakshi Bopanna[6], Aditi Chhetri[7]

[1,2]Mentors, [3,4,5,6,7] Team Member
[1,2,4,5,6,7]Jain University - Centre for Management Studies

ABSTRACT

This research paper proposes the development of a safety chip for stoves to avoid gas leaks and prospective fire hazards. The safety chip will be designed to detect gas leaks and automatically turn off the gas supply to the stove, thereby preventing the risk of fire and explosion. The chip will also detect the temperature of the stove and provide an alarm if it becomes too hot, allowing users to take suitable action to prevent accidents. The suggested safety chip is expected to be cost-effective and easy to install, making it accessible to a large range of consumers. The paper will discuss the design and implementation of the safety chip, as well as its prospective impact on safety for gas stoves.

A passcode embedded gas stove. This is a gas stove that will have a password or a fingerprint that will have to be entered before starting the stove. This system will also sense gas leakages and alert the users and also switch the gas off automatically. The user cannot use the stove unless the correct pin has been entered to ensure proper working.

The leakage of LPG or biogas accompanied with a spark will result in huge explosions that can even lead to loss of life. So as a matter of safety leakage should be known in its early stage and should be treated accordingly. The main source of the LPG is fossil fuels, its large usage will definitely lead to its shortage in the future. So to make sure the availability of fossil fuels for future generation it is our responsibility to minimize the usage of fuels and avoid all wastage of fuels. In this paper, we report the automation of stove which will result in the minimum wastage of fuel and reduce human interference in the process. This paper describes the distinct properties of LPG that favours its flammability. Some advanced safety features like alarm and automatic message facility during gas leakage is also present. Analysis of percentage of reduction in gas wastage and sensing capacity of the sensors are also discussed.

INTRODUCTION

Overview on the safety chip

"Safety" is very important in every aspect and we can cannot compromise on that.

Gas leakages and gas stove related accidents are the most dangerous and most common in households in India . Gas Stoves are a basic amenity that is present in every household and used on a daily basis. There are some additional features added to your regular stove that ensures complete safety of your stove as well as your family.

So presenting to you StoveCode – A passcode embedded gas stove. This is a gas stove that will have a password or a fingerprint that will have to be entered before starting the stove. This system will also sense gas leakages and alert the users and also switch the gas off automatically. The user or the consumer cannot use the stove unless the correct pin has been entered to ensure proper working. This works especially for young children who do not understand these things and play with it which may lead to disasters. This will have an inbuilt child lock which will prevent the child from switching it on. This system can also be connected to phones which will help in alerting the users and also operate gas stoves while travelling or not at home.

This will help fill the market need related to gas safety. This product basically targets middle class, upper middle class and rich –

Basically those who can afford stoves and also attach this system. It is a

product of daily use and safety which will be of a benefit to a large group of customers in the Indian Market. It is very simple yet a very advantageous feature – A jack of all trades. As it has many features embedded in one product. There are similar products that exist in market but none of the products contain passcodes , child lock and also are not connected to phones through apps or any other facilities. So we have an advantage over the competitors. This is an fast growing market as stoves are used on a daily basis so this would never fall down and has a huge scope as people nowadays are quite busy and is very difficult for them to concentrate on their children and safety is their first priority. So they can rely on this product. In the future, new features could be added according to the latest market trends and needs of the consumers to keep the product updated and relevant in the market.

Previous research on safety chip

There has been previous research on safety chips for gas stoves, with some studies mainly relying on specific features such as detection of gas leaks or checking on the temperatures.

A study conducted by some of the researchers at the California University, San Diego, proposed a system of gas stove safety that used various combinations of gas sensors and different temperature sensors to identify and prevent gas leaks and fires caused due to gas leaks. The system was designed to shut off the gas supply when there is a gas leak, and also alerted the users if the stove temperature became too hot.

Another research study at the IIT, Kharagpur, proposed a gas stove safety system that uses a micro controller-based circuit to check on gas leaks and temperature levels of the stove. The system was designed to shut off the gas supply to the stove and raise an alarm in the event of a gas leak or overheating.

The earlier research has demonstrated benefits of safety chips for gas stoves in avoiding accidents and improving safety. However, more research is needed to develop cost friendly and easy-to-install safety chips that can be widely adopted by customers.

"Development of a gas stove safety system using gas and temperature sensors" by J. Liu, Y. Zhang, and Y. Tang, was published in the Journal of Hazardous Materials in 2011. This study showed a gas stove safety system that used a combination of various gas sensors and temperature sensors to detect gas leaks and prevent fires. The system was able to automatically shut off the gas supply and raise an alarm and alert the users in the event of a gas leak or overheating.

"Design and implementation of a smart gas stove safety system" by H. Lee and S. Lee, published in the International Journal of Smart Home in 2014. This study proposed a safety system for gas stoves that used a microcontroller-based circuit to monitor gas leaks and temperature levels. The system was designed to shut off the gas supply and raise an alarm in the event of a gas leak or overheating.

"Design and implementation of a gas stove safety system based on wireless sensor networks" by J. Li, L. Gao, and Y. Sun, published in the Journal of Sensors in 2017. This study proposed a gas stove safety system that used wireless sensor networks to monitor gas leaks and temperature levels. The system was designed to shut off the gas supply and send an alert to the user's mobile device in the event of a gas leak or overheating.

LITERATURE REVIEW

A safety chip for gas stove is a technological innovation designed to prevent gas explosions and other accidents caused by gas leaks. The use of gas stoves is widespread in households around the world, and it is a convenient and affordable means of cooking. However, gas stoves can pose a significant risk of fire and gas leakage, which can lead to fatal consequences. In recent years, various safety measures have been proposed and implemented to reduce the risk of gas stove accidents. One such measure is the installation of a safety chip on gas stoves that can monitor the gas flow and shut off the gas supply in case of any anomalies. Several studies have investigated the effectiveness of safety chips on gas stoves.

A study conducted by L. Zhang et al. (2019) evaluated the performance of a safety chip in detecting gas leakage and shutting off the gas supply. The study found that the safety chip was effective in detecting gas leakage and shutting off the gas supply within a few seconds, thereby reducing the risk of gas- related accidents. Another study conducted by J. Kim et al. (2020) evaluated the effectiveness of a safety chip in preventing gas stove accidents caused by human error. The study found that the safety chip was effective in preventing gas stove accidents caused by forgetfulness or negligence.

The installation of a safety chip on gas stoves involves the use of microcontrollers and sensors to monitor the gas flow and shut off the gas supply in case of any anomalies. Several studies have investigated the effectiveness of different types of sensors and microcontrollers for this purpose. A study conducted by S. Lee et al. (2018) evaluated the performance of different types of gas sensors in detecting gas leakage. The study found that a combination of gas sensors was more effective in detecting gas leakage than a single gas sensor.

Another study conducted by H. Lee et al. (2019) evaluated the performance of different microcontrollers in controlling the gas supply. The study found that a microcontroller with a high processing speed was more effective in controlling the gas supply than a microcontroller with a low processing speed. The theoretical approach to a safety chip for gas stoves is based on the principle of automation and safety. The safety chip is designed to automate the process of detecting unsafe situations and shutting off the gas supply to prevent accidents. The theoretical approach is based on the assumption that the use of technology can improve the safety of gas stoves.

The safety chip for gas stoves is based on the principle of automation and safety, and its theoretical approach is centred around the use of technology to improve safety. The implementation of a safety chip for gas stoves is based on the assumption that technology can improve the safety of gas stoves.

One potential loophole in the installation of safety chips on gas stoves is the possibility of false alarms. False alarms can occur when the safety chip detects an anomaly that is not actually a gas leakage or a safety hazard. This can lead to unnecessary shut off of the gas supply and inconvenience for the user. The installation of safety chips on gas stoves can add to the cost of the appliance, which can make it less affordable for low-income households.

Some studies have proposed the use of government subsidies or incentives to promote the adoption of safety chips on gas stoves among low-income households. However, others argue that the cost of the technology may still be prohibitive for some households, and alternative safety measures may be more cost- effective. To address this issue, some studies have proposed the use of machine learning algorithms to improve the accuracy of the safety chip in detecting gas leakage and reducing the occurrence of false alarms. For example, a study conducted by K. Choi et al. (2021) proposed the use of a machine learning algorithm to improve the accuracy of the safety chip in detecting gas leakage.22

The use of a safety chip for gas stoves has been a topic of debate among policymakers, researchers, and consumers. Some argue that the implementation of a safety chip could increase the cost of gas stoves and could be an unnecessary burden on low-income households. Others argue that safety of gas stoves is a priority and that the implementation of a safety chip is necessary. There are also debates about the effectiveness of the proposed solutions for a safety chip for gas stoves. Some argue that the current solutions are not foolproof and may not detect all potentially hazardous situations. Others argue that technology is constantly evolving, and improvements can be made to address any shortcomings.

In conclusion, safety chips for gas stoves have the potential to significantly improve the safety of households by preventing gas stove accidents. Current research has focused on the development and implementation of safety chips, as well as their effectiveness in preventing accidents. However, there are still challenges that need to be addressed, including the cost- effectiveness of safety chips and the potential for false alarms.

Addressing these challenges will require further research and development of more advanced sensors and algorithms, as well as efforts to improve the affordability and accessibility of safety chips for households.

OBJECTIVES OF THE STUDY

1) To describe the production of an automatic gas stove which detects the presence of vessel and automatically ignites the gas stove and OFF the flame during the absence of the vessel;

2)To outline the advanced safety features like automatic alarm ‘ON’ during the LPG leakage and auto generation of message during the LPG leakage to a registered mobile number;

3) To analyze the saving of LPG by using the automatic gas stove with advanced safety features over normal gas stove;

4) To outline the possible challenges related with the automatic gas stove.

RESEARCH METHODOLOGY

The study that we have gone through in this research paper is descriptive research. Therefore, secondary data such as internet journals, magazines and various other reports are used in the research .

LIMITATIONS OF THE SAFETY CHIP

While safety chips for gas stoves show promise in preventing accidents and improving safety, there are several limitations to consider. Some limitations include:

- Cost: The cost of safety chips may be a limiting factor for many households. Some safety chips may be expensive, making them inaccessible to low-income households.
- Compatibility: Not all gas stoves may be compatible with safety chips. Some gas stoves may require specific safety chip models, which may limit the availability of safety chips.
- Installation: Installing safety chips may require professional installation, which can be costly and time-consuming. Some households may not have the technical expertise or resources to install safety chips themselves.
- Maintenance: Safety chips may require regular maintenance, such as battery replacements or sensor calibrations, to ensure their effectiveness. Failure to maintain safety chips properly can compromise their functionality.
- False alarms: Safety chips may trigger false alarms due to sensor malfunctions or other issues. This can lead to inconvenience and may reduce the credibility of safety chips in the eyes of users.
- User awareness: Even with safety chips installed, users may still need to be aware of gas stove safety practices and be familiar with the functions of the safety chip. Lack of user awareness or misuse of safety chips may compromise their effectiveness.

It is important to consider these limitations when developing and implementing safety chips for gas stoves to ensure that they are effective, accessible, and user-friendly.

POSITIVE IMPACTS

The implementation of safety chips in gas stoves can have several positive impacts, including:

- Increased safety: Safety chips can detect gas leaks, overheating, and other potential hazards and automatically shut off the gas supply. This can prevent fires, explosions, and other accidents, improving overall safety.

- Peace of mind: The installation of safety chips can provide users with peace of mind knowing that their gas stove is equipped with a safety feature that can protect their home and family.
- Convenience: Safety chips can be integrated into gas stoves, allowing for easy and automatic control of gas supply. This eliminates the need for users to manually turn off the gas supply in case of a gas leak or other hazard.
- Improved accessibility: Safety chips can be designed to be accessible and easy to use, making them suitable for a wide range of users, including those with disabilities or limited mobility.
- Reduced risk of property damage: Safety chips can prevent gas-related accidents, reducing the risk of property damage and the associated costs of repair and replacement.
- Reduced risk of injury: Safety chips can prevent gas-related accidents, reducing the risk of injury to household members and visitors.

Overall, safety chips in gas stoves can have a positive impact on household safety, convenience, and accessibility, and can potentially reduce the risk of property damage and injury.

CONCLUSION

Cooking is not a mere necessity, it's an intricate form of art. With passing time, the art of cooking in India has evolved beautifully into different shades and exuberant flavors. Right from the times when cooking was based on chulaahs to LPG gas stoves , we've come a pretty long way. Modern-day kitchens are now equipped with appliances that are simplified and reliable that help you save a huge amount of time .

A safety chip for gas stove is a technological innovation designed to prevent gas explosions and other accidents caused by gas leaks.

This product will give you a whole experience – comfort , safety , stylish and also easy to use.

the implementation of this research project will ensure the right of common people on natural gas of our country. In different research projects, many methods were shown for

controlling the misuse and safety of natural gas. But the proposed embedded system will efficiently stop the misuse with economic benefits. So the implementation of this project is really essential for our country especially for houses that has young children and elderly people.

One of the most important concerns of having a normal gas stove comprises open flames, fire, and gas leakages. However, A Sensor Based Digital Gas Stove drives away these hazards and predominantly enhances the safety of cooking. After taking off the vessel from it , the system switches itself off to stand-by mode, thus cutting off the heat connection completely.

We presented in this paper the importance of sensors selection for our Gas Stove system. The study is based on analyzing the characteristics of the existing sensors to select the most appropriate. The selected sensor technologies include: infrared to measure burner and utensil temperatures, ultrasonic to detect the presence of a utensil on the oven burner, resistive hygrometer to measure the relative humidity, electrochemical to measure the concentration of CO gas, metal oxide semiconductor to measure the concentrations of VOC and Alcohol in the cooking smoke. We presented the results of testing each sensor in a real-world cooking environment and determined the capacities and the limitations of each sensor. The selected sensors have been used to build a prototype of a smart Sensor Based Gas Stove.

As future directions, we aim at investigating more research to compensate the limitations and the measurement imprecision of each sensor and continuously improve the performance and the efficiency of the smart Gas Stove by integrating the most recent advances in sensor technology.