

### 3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<p>On October 20, 2016 in Tamilnadu a major fire broke out in the huge cracker manufacturing hub in Sivakasi. Many people lost their lives in this accident. In cracker industries the chemicals used for manufacturing fireworks are highly sensitive to friction, impact, heat and static electricity.</p> <p>These friction and impact causes fire accidents. The fire accidents or blasts also occur in godowns either due to sparks from electrical fittings or from the impact stimuli generated during loading and unloading of boxes containing fireworks. These fire accidents cause great loss to the</p>

		<p>industry and also to the lives of the people working in the industries.</p> <p>So, to overcome this problem we have proposed a solution that uses sensors to detect the fire before it causes damage, sprinklers are used to control the fire and a fire alarm is used to alert the workers about the fire breakage. This can also be used in all the other industries like textile industries, mining industries etc.,</p>
2.	Idea / Solution description	<p>In the proposed model, a gas sensor, flame sensor and temperature sensors are used for the detection of fire.</p> <p><b>Gas Sensor</b></p> <p>Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Gas sensors are employed in factories and manufacturing facilities to identify gas leaks, and to detect smoke and carbon monoxide in homes. Gas sensors vary widely in size (portable and fixed), range, and sensing ability. They are often part of a large Embedded systems, such as hazmat and security systems, and they are normally connected to an audible alarm or interface. Because gas sensors are constantly interacting with air and other gasses, they have to be calibrated more often than many other types of sensors. In general gas sensors have the potential to detect all fires because every fire is</p>

		<p>emitting gas and an according fire detector is not dependent from the release of heat or smoke.</p> <p><b>Flame sensor</b></p> <p>The flame sensor detects the presence of fire or flame based on the Infrared (IR) wavelength emitted by the flame. It gives logic 1 as output if a flame is detected, otherwise, it gives logic 0 as output. Arduino Uno checks the logic level on the output pin of the sensor and performs further tasks such as activating the buzzer, sending an alert message.</p> <p><b>Temperature sensor</b></p> <p>A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. The alarm is triggered when the temperature exceeds a particular value.</p> <p><b>Fire alarm</b></p> <p>A fire alarm system warns people when smoke, fire, carbon monoxide or other fire-related emergencies are detected. These alarms may be activated automatically from temperature sensors and gas sensors. If fire is detected by using flame sensors, then the sprinklers will be turned on.</p> <p><b>Sprinklers</b></p> <p>A fire sprinkler system is an active fire protection method, consisting of a water supply system, providing adequate</p>
--	--	---

		<p>pressure and flowrate to a water distribution piping system, onto which fire sprinklers are connected.</p> <p>Fire sprinkler systems are extensively used worldwide, with over 40 million sprinkler heads fitted each year. Even though Fire Sprinkler Systems are a Life Saving System and are not designed to protect the building, 96% of buildings that had fires and were completely protected by fire sprinkler systems were controlled by the fire sprinklers alone.</p> <p><b>Arduino</b></p> <p>Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.</p> <p><b>IoT</b></p> <p>The Internet of Things (IoT) is the ability to have devices communicate with one another via the internet or other networks, remotely tracking information to provide feedback to assist with decision making for commercial, industrial and residential purposes. This is commonly done using sensors connecting to a back-to-base system.</p> <p>The internet of things, or IoT, is a system</p>
--	--	---

		<p>of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to computer interaction.</p> <p><b>How does IoT work?</b></p> <p>An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analysed or analysed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data. In addition, the Cloud Server application supports notification management, i.e., the automated and manual ability to communicate with all occupants connected with the affected property areas to guide them through the event. This communication can occur through App notifications, emails, SMS and PA systems. These communication tools can be</p>
--	--	---

		<p>engaged by the administrators of the application based on how the emergency situation or event evolves.</p> <p><b>Cloudant DB</b></p> <p>Cloudant is an IBM software product, which is primarily delivered as a cloud based service. Cloudant is a non-relational, distributed database service of the same name. Cloudant is based on the Apache backed CouchDB project and the open source BigCouch project.</p> <p>Cloudant's service provides integrated data management, search, and analytics engine designed for web applications.</p>
3.	Novelty / Uniqueness	<p>A fire detection system uses a smoke detector to detect a fire before it actually starts. An effective fire detection system eliminates damage by ensuring that a fire can be prevented before it even starts. A fire detector may also have a direct connection to an alarm monitoring centre. The smart fire management system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the environment. Based on the temperature readings and if any gases are present then the alarm is triggered. If any flame is detected the sprinklers will be switched on automatically. Emergency alerts are notified to the authorities and fire station.</p>
4.	Social Impact / Customer Satisfaction	<p>Fire management system provides an early warning of fire so that people can be evacuated and immediate action can be</p>

		<p>taken to stop or eliminate the fire effect as soon as possible. If fire is detected immediate notification will be sent to authorities and fire stations.</p> <p>The number one reason to install a fire alarm is to make the building safe for your employees, customers, and tenants. A combination of smoke and heat detectors, sirens and bells, and strobe lights detect fires and alert building occupants, giving them ample time to evacuate in an orderly fashion. Using automatic fire sprinklers protects the environment while further verifying that they reduce property damage and protect lives. It reduces financial loss in industries.</p>
5.	Business Model (Revenue Model)	<p><b>Customer segment</b></p> <p>This alarm system is designed for industries. Its purpose is industrial safety, and the primary concern is to avoid the fire hazards that occur to the employees and the properties inside the buildings.</p> <p>Industrial buildings shall include any building in which products or materials of all kinds and properties are fabricated, assembled, manufactured or processed, for example, assembly plants, industrial laboratories, dry cleaning plants, power plants, generating units, pumping stations, laundries, buildings or structures in gas plants, refineries, dairies and saw mills etc.</p> <p><b>Customer relationship</b></p> <p>The industry premises will be inspected</p>

		<p>and after a full assessment, recommendations will be made for the location specifically to ensure maximum safety without excess cost to the business. After installation the following will be provided in the premises.</p> <ul style="list-style-type: none"> <li>• Owner's manual and manufacturer's instructions covering all system equipment.</li> <li>• Operator instructions for basic system operations.</li> <li>• A detailed description of routine maintenance and testing as required and recommended, including: Listing of the individual system components that require periodic testing and maintenance.</li> <li>• Step-by-step instructions detailing the requisite testing and maintenance procedures, and the intervals at which these procedures need to be performed, for each type of device installed.</li> <li>• A testing and maintenance schedule.</li> <li>• Detailed troubleshooting instructions.</li> <li>• A service directory that includes a list of the names and telephone numbers of those who provide service for the system.</li> </ul>
6.	Scalability of the Solution	<p>The proposed model can be used in textile industries, paper industries, automobile industries, mining industries, cracker industries, cement industries etc.</p>