Graphite based Fire Extinguisher for Fire Work Industry

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Abstract-The issue of security and workers safety in fire industries and the surrounding are in high amount. therefore, we intend to aid in security of those industries by bringing some fire extinguishers especially made for fire industries. These fire extinguishers are not just the normal extinguishers, here graphite is used as an inlet for our fire extinguishers, which has 3600ºC of boiling point and the only component which has more possibilities to extinguish the metal fire. These extinguishers specially made for fire industries, it cannot be used for electricity fire because of graphite is an electricity connecting component for pressure of the cylinder nitrogen gas is used the use of graphite, nitrogen gas with 13 bar pressure compositely some other extinguishers contain foam, dry chemical powder,CO_2 and water, we are using graphite for the better performance, change of pressure and gas also helps to improve the quality of our extinguishers. From these projects, we hope to build an alternative safety system for fireworks.

Index Terms: Fire Extinguishers, Graphite, Nitrogen gas, Fireworks, Fire and safety, Metals, Fire

Introduction

An explosion may be defined as a sudden increase in volume and release of energy in a violent manner, usually with the generation of high temperature and release of gas. Explosion is a chemical reaction of any chemical compound /mixture that, when initiated, undergoes a very rapid combustion or decomposition releasing large volume of highly heated gas that exert pressure on the surrounding medium. Thus, the sudden conversion of chemical energy into kinetic energy with the release of heat, light and mechanical shock causes abrupt destruction. An explosion in a building generates four types of loads viz. impact of primary fragments, impact of secondary fragments, overpressure, and reflective pressure. Primary fragments originate from the source of the explosion whereas secondary fragments consist of objects that are picked up and thrown once the explosion radiates. This can include equipment or other objects not properly secured to the ground, bricks from unreinforced walls, or portions of the structure itself. Primary and secondary fragments are both associated with significant casualties, but in certain cases, it also contributes to major structural damage or loss of plant and infrastructure.

Explosives can be broadly classified into two groups viz: Military and civilian or commercial. Military explosives include bombs, mortar shells, bullets, etc. these are designed for a specific form of delivery. They are generally uncased explosives (various plastic explosives used for demolition and other functions) and referred to as high explosives. Low explosives such as propellants are also being used. Examples of commercial explosives are dynamite, TNT (trinitrotoluene) and Ammonium Nitrate construction. Pyrotechnic mixtures are energetic chemical compounds susceptible to explosive degradations on ignition, impact and friction. The Explosives Act, 1884 is a comprehensive law regulating the manufacture, possession, sale, transportation, exportation and importation of explosives in India. Based on this act, Explosives Rules 1983, Gas Cylinders Rules 1981 and Static and Mobile Pressure Vessels Rules 1981 were framed to prevent accidents at various points of handling of explosives in India.

Dos and Don’ts of fireworks

If using fireworks always follow the advice below:

- Never play with fireworks. They are explosives and can hurt you.
- Only buy fireworks marked BS 7114.
- Only adults should light or hold fireworks.
- When you are watching fireworks, stand well back.
- Keep fireworks in a closed box.
- Follow the instructions on each firework.
- Light them at arm's length, using a taper.
- Never go near a firework that has been lit. Even if it hasn't gone off, it could still explode.
- Fireworks will frighten your pets, so keep them safely indoors.
- Never put fireworks in your pocket or throw them.
- Always supervise children around fireworks.
- Light sparklers one at a time, always wear gloves and hold them at arm's length. Never give sparklers to children under five. When your sparkler goes out, DON'T TOUCH IT. It could still burn you, so put it hot end down in a bucket of water made ready for this purpose.
- Do not drink alcohol if setting off fireworks.

Planning Ahead Running a display takes a lot of work, so try to share the load by planning ahead.

- Set up a committee whose members can each take responsibility for a particular task (including one person to be in charge of all safety arrangements).
- Be clear on who will do what and when.
- Be sure each member has a photocopy of this guide and follows its advice.
- If possible, try to recruit at least one person with previous experience of firework displays.
- Remember – fireworks not marked with 'Complies with BS 7114 Part 2 1988' are only suitable for use by professionals. Contacting the Right People
- It is very important to keep the authorities informed of your plans.
- November 5th is always a busy time for them, so please give them plenty of warning about your plans.
- You should contact:
- The Fire Brigade
- The Police

- First Aid Service
- Local Authority

As well as liaising with the Local Authority, Police, Fire Brigade and First Aid organizations, the appropriate team member should:

- Arrange for your fireworks to be delivered and stored securely (and circulate the manufacturer's general instructions to team).
- Animals can be terrified by fireworks. Warn your neighbors and any local farmers in advance so they can keep pets indoors and take other necessary precautions.
- Arrange for you and your team to be trained in the various tasks for the night, including all emergency drills.
- Arrange for first aid posts to be staffed by qualified people. Borrow or hire special clothing (bibs, jackets etc) to identify you and your team on the night.
- Arrange some form of public address system – as a safety measure, not just for commentary. A loud hailer will do as a bare minimum.
- Arrange for fire extinguishers, buckets of water, buckets of sand and metal litter bins to be available on the night.
- Check that plenty of electric torches will be available on the night, with full batteries.
- Publicize the fact that spectators are not allowed to bring their own fireworks (including sparklers) and will not be admitted if they do so.
- Prepare all necessary signs.
- Make absolutely sure that you'll have enough people available to help you on the night (including some cover for illness). Draw up a detailed checklist of tasks and indicate who is to be responsible for each one.

PRESENT WORK

This invention connects to graphite containing fire extinguishing compositions for use only for metal fire like

1. Aluminum
2. Potassium
3. Zirconium
4. Magnesium
5. And it's alloys

More specifically, this invention relates and concerns only on fireworks, this graphite based extinguishing composition which can be stored in the container and expelled from the container by nitrogen gas under pressure.

COMPARISION

Other common Fire Extinguishers	Our invention
Inlet: 1. Foam 2. Dry chemical powder 3. CO2 4. Water **Pressure** 15 psi	**Inlet:** 1. Graphite 10^{-9} nm 2. Nitrogen gas for pressure **Pressure** 13 bar Pressure inside container

The size of the graphite inlet must be in the nano size-10-$^{9}_{m}$. The change in size of graphite particle will change the nature of output (extinguishing capacity) and the character of extinguisher.

By using 10^{-9}nm sized graphite,

1. Slows down fast neutrons and scatters thermal neutrons.
2. It lowers the co efficient of thermal expansion.
3. It will break the fire chain easily.
4. The pressure 13 psi tells the container to maintain the capacity of graphite

Materials

1. Extinguishing Agent-Graphite
2. Valve Assembly
3. Container
4. Nozzle container containing Extinguishing agent and Propellant

Methods

- The graphite has to be crushed with the help of ball mill, the particle size of the graphite must be nano
- After grinding the graphite, structure and size of the particle must be analyzed using sieve analysis
- Changes in particle size will affects the output of extinguisher
- For maintaining the pressure inside the container Nitrogen gas is used
- Pressure has to be maintained in respective amount

Conclusion

After referring the survey, the idea is to get to understand more about accidents and unsafe conditions of fireworks. So it is decided to invent this extinguisher particularly for those industries, there is a hope that this project reduces the accident rates of fire works.

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