

Firecracker Factory Explosions India: Why Firecracker Factory Explosions India Keep Happening

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Firecracker Factory Explosions Latest News

- Recent explosions in firecracker units in southern India have once again highlighted the **recurring safety crisis in the industry**.
 - In Kerala's Thrissur district, blasts at a fireworks unit killed at least 14 people ahead of the Thrissur Pooram, leading to cancellation of the event's fireworks.
 - Days earlier, a major explosion in Tamil Nadu's Virudhunagar—India's main fireworks hub producing about 90% of the country's firecrackers—claimed at least 23 lives.
- While investigations are ongoing, such incidents are not isolated and point to systemic issues.
- Key contributing factors include the highly combustible nature of raw materials, climatic conditions, safety lapses, and weak enforcement of regulations, making firecracker manufacturing a persistently hazardous sector.

How Fireworks Work: Chemistry and Mechanism

- A firework is built from four essential elements: **an oxidiser, fuel, 'stars', and a binder**.
- The **oxidiser** (such as nitrates, chlorates, or perchlorates) supplies oxygen for combustion, while the fuel—typically black powder made of sulfur, charcoal, and potassium nitrate—releases energy when ignited.
- The **'stars'** are small chemical pellets containing metals like barium, strontium, and copper that produce vivid colours, and the **binder** holds the mixture together until ignition.

Ignition and Explosion Process

- When the fuse is lit, heat travels through the firework shell placed inside a mortar.
- It ignites the lift charge, generating gas pressure that propels the shell into the air.
- At a set height, a timed fuse triggers the burst charge, which explodes and ignites the 'stars', creating the familiar bright patterns in the sky.

Risks and Toxic Effects

- The process involves highly reactive chemicals and heavy metals.
- During combustion—or mishandling—these substances can release toxic microscopic particles, making fireworks inherently hazardous in terms of manufacturing, storage, and usage.

Climate and Firecracker Safety: How Weather Increases Explosion Risks

- Firecracker manufacturing is highly sensitive to climatic conditions because it involves volatile chemical mixtures.
- While warm, dry weather is generally preferred for production, extreme summer heat increases instability, making chemicals more prone to ignition.
- **Low humidity** further worsens the situation by preventing the dissipation of static electricity, allowing even minor movements—like mixing powders—to generate sparks capable of triggering explosions.

Role of Moisture and Temperature Fluctuations

- It is not just **dryness** that poses risks. Fluctuations between dry heat and humid conditions can introduce moisture into chemical compounds.
- When such damp chemicals are later exposed to intense heat, they can undergo exothermic reactions or even spontaneous combustion.
- **Improper drying practices**, especially when chemicals are alternately exposed to moisture and sunlight, significantly increase the likelihood of accidents.

Environmental Conditions in Firecracker Hubs

- Regions like Virudhunagar, despite not being extremely low in humidity, experience hot, arid conditions with low rainfall, creating an environment conducive to instability in chemical handling.
- These climatic factors contribute to the frequency of accidents in such manufacturing clusters.

Additional Hazards: Toxic Dust Accumulation

- Apart from explosion risks, stagnant summer heat traps toxic chemical dust near the ground, increasing the oxidative potential of the air inside factories.
- This not only raises fire hazards but also poses serious health risks to workers.

Human Factors Behind Firecracker Accidents: Systemic Risks

- While climatic and chemical risks are well understood, the human factor is often the decisive trigger behind major accidents.
- A key issue is the piece-rate wage system, where workers are paid based on output.
- This creates pressure to prioritise speed over safety, leading to shortcuts in handling highly volatile materials.

Weak Enforcement and Regulatory Gaps

- Despite existing regulations under the Explosives Act, enforcement remains weak.
- Non-compliance is widespread, especially in areas like safe storage, ventilation, and handling protocols, increasing the likelihood of accidents.

Dangerous Storage Practices

- A major risk arises from the stockpiling of raw chemicals and finished fireworks in confined, poorly ventilated spaces, often far exceeding legal limits.
- These unsafe practices turn minor ignition sources into large-scale disasters.
- In such conditions, even a small static spark—common in hot weather—can trigger a chain reaction, rapidly escalating into deadly explosions due to the presence of unregulated and densely packed combustible materials.

Source: IE

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