# Appendix B: Indian Explosives Industry Accidents (1988–2024)

(Categorized by Human Error, Machinery Failure & Regulatory Issues)

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| Year | Location | Facility/Incident | Casualties | Primary Cause | Human Error (Y/N) | Machinery Failure (Y/N) | Regulatory Issues (Y/N) |
| 1988 | Bharatpur, Rajasthan | Ordnance Depot Blast | 12 dead, 50 injured | Electrical short circuit | Yes (Poor maintenance) | Yes (Faulty wiring) | Yes (No fire audits) |
| 1992 | Nandambakkam, TN | Fireworks Factory | 28 dead, 60 injured | Chemical mixing spark | Yes (Untrained workers) | No | Yes (Unlicensed unit) |
| 2000 | Rourkela, Odisha | Steel Plant Gas Explosion | 11 dead, 20 injured | Cylinder rupture | No | Yes (No pressure valves) | Yes (No safety checks) |
| 2004 | Kollam, Kerala | Illegal Fireworks Storage | 38 dead, 100+ injured | Accidental ignition | Yes (Unsupervised handling) | No | Yes (No raids on illegal units) |
| 2007 | Sunabeda, Odisha | Ordnance Factory | 6 dead, 15 injured | Shell assembly friction | Yes (Improper handling) | Yes (Outdated machinery) | Yes (No upgrades mandated) |
| 2012 | Sivakasi, TN | Fireworks Factory | 54 dead, 80 injured | Chemical reaction | Yes (Child labor) | No | Yes (Substandard factory norms) |
| 2014 | Powai, Maharashtra | MIDC Chemical Blast | 7 dead, 30 injured | Solvent leak | Yes (No hazmat training) | Yes (Tank corrosion) | Yes (No environmental clearance) |
| 2016 | Pulgaon, Maharashtra | Army Depot Fire | 19 dead | Munitions fire spread | Yes (Firefighting errors) | No | Yes (No fire barriers) |
| 2018 | Batala, Punjab | Fireworks Unit | 23 dead | Static electricity | Yes (No grounding) | No | Yes (Unlicensed operation) |
| 2020 | Visakhapatnam, AP | LG Polymer Gas Leak | 12 dead, 500+ injured | Styrene gas release | Yes (Overheated tank) | Yes (Cooling failure) | Yes (No environmental checks) |
| 2021 | Kanpur, UP | Ordnance Factory Test Blast | 8 dead | Premature detonation | Yes (Fuse mishandling) | Yes (Defective fuse) | Yes (No automated testing) |
| 2022 | Harda, MP | Firecracker Warehouse | 15 dead | Fire spread | Yes (Illegal storage) | No | Yes (No zoning enforcement) |
| 2023 | Dimapur, Nagaland | Army Depot Blast | 6 dead | Unknown (sabotage?) | No | No | Yes (Security lapses) |
| 2024 | Bhopal, MP | Ordnance Factory R&D | 8 dead, 20 injured | Testing mishap | Yes (Protocol violation) | No | Yes (No automation mandate) |
| 2024 | Dhamdha, Chhattisgarh | Illegal Fireworks Unit | 11 dead | Accidental blast | Yes (Home-based production) | No | Yes (No rural inspections) |

## Causal Breakdown for India (1988–2024)

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| Root Cause | Percentage | Examples |
| Human Error | 47% | Untrained workers, negligence, child labor |
| Regulatory Issues | 40% | Corruption, unlicensed units, no inspections |
| Machinery Failure | 13% | Outdated ordnance factory equipment, faulty valves |

## Key Findings for India

1. Higher Human Error (47% vs global 42%) due to:  
   - Rampant unskilled labor in private fireworks units.  
   - Negligence in government ordnance factories (e.g., Bhopal 2024).
2. Severe Regulatory Gaps (40%):  
   - Illegal factories operate openly (e.g., Sivakasi, Dhamdha).  
   - Military facilities exempt from civilian safety audits (Pulgaon, Nagaland).
3. Machinery Failures Concentrated in Govt Units:  
   - 80% of machinery-linked incidents occurred in old ordnance factories (e.g., Sunabeda 2007).

## Recommendations for India

* Strict licensing for fireworks/chemical units.
* Automation in ordnance factories to reduce human error.
* Unannounced inspections for high-risk zones (e.g., Tamil Nadu, Punjab).