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# Safety Management – Explosives Industry In India

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# List Of Contents

# Introduction

To understand the magnitude and difficulty in ensuring adequate safety in the manufacture / usage of civil explosives in our country it is necessary to have an idea of its size and diversity.

# History of Explosives in India

- During colonial rule, explosives for mining were imported
- First manufacture in India started in a NG explosives factory in 1958
- First detonator/DF plant in 1962

Last 30 years, there has been a remarkable growth in the explosives industry in India and every type of product is now being made in the country

# Industry Status

- All types of explosives for varied civil applications are manufactured with raw materials available in the country
- Practically no imports
- Regular exports to middle east / south east Asia
- Distribution covers entire Indian subcontinent of 7.5 million square miles = 12 million square KM
- 63 explosives manufacturing companies in the country out of which 29 are bigger units coming under the purview of licensing by the department of explosives, government of India
- 34 are as small scale industry licensed by state government
- Mixture of all sizes and types of ownership

# Production

| **Explosives** | **2002/03** | **2003/04** |
|---|---|---|
| **Class 2** | | |
| Gunpowder | 123 | 295 |
| Permitted (Small dia) | 19103 | 25511 |
| Non Permitted (Small dia) | 15034 | 29787 |
| Large dia | 106249 | 108664 |
| Site mixed(Bulk) | 215645 | 217120 |
| ANFO | 14051 | 14315 |
| **Total** | **370205** | **395692** |

# Production…

| **Class 3** | | |
|---|---|---|
| **Explosives** | **2002/03** | **2003/04** |
| Nitro Compound Permitted (SD) | 3992 | 2984 |
| Non Permitted (SD) | 23943 | 20023 |
| LD | 2515 | 299 |
| **Total** | **31639** | **24179** |

# Production…

| **Explosives** | **2002/03** | **2003/04** |
|---|---|---|
| Safety Fuse | 99 | 155 |
| Detonating fuse | 135 | 164 |
| Shock tube | 20 | 26 |
| Detonators all types | 451 | 419 |
| PETN | 1800T | 2000T |

# End User Profile

- Coal sector consumes 70% of LD , 85% of bulk explosive , 40% of detonators and 60% of detonating fuse and 90 % of shock tube
- Unorganized sector consumes 80% of instantaneous electric and ordinary detonators and 70% of non permitted (SD) explosives
- Other consumers in organized sector are tunnel projects , roads, iron ore , cement , copper, zinc , uranium. Unorganized sectors mostly use explosives for quarrying , well digging

# Accident Statistics 2002-03

| | No of accidents | Dead | Injured | Probable cause |
|---|---|---|---|---|
| Unauthorized transport | 3 | 19 | 31 | NG explosives / detonators/SF transported together in tractor trailer near habitation |
| Magazines | 3 | 0 | 0 | Detonators mishandling old NG explosives |
| Detonators (crimping , Filling, pressing, dipping etc) | 6 | 0 | 10 | One involves copper shells (copper azide), mishandling ,sensitive ASA |
| Raw materials (NC,AN,PETN etc) | 1 | 0 | 0 | NC fire |
| While blasting | 2 | 6 | 4 | Untrained and bad blast practices , stray current |
| Any other | 1<br>1 | 0<br>0 | 8<br>2 | In planetary mixer NG based composition<br>Fire in delay element mfr |
| Total | 17 | 25 | 55 | |

# Accident Statistics 2003-04

| | No of accidents | Dead | Injured | Probable cause |
|---|---|---|---|---|
| Unauthorized transport | 1 | 3 | 2 | Gelatin / detonator transported in tractor/trailer |
| Magazines | 1 | 0 | 3 | Explosion due to falling of detonator boxes |
| Detonators (crimping ,Filling Pressing, dipping etc) | 4<br>1 | 1<br>0 | 4<br>1 | Mishandling ASA<br>Fire in dipping shop |
| Authorized Transport | 1 | 5 | 2 | Ammonia tanker transfer |
| Any other | 1<br>1 | 0<br>1 | 1<br>0 | Fuel oil tank<br>Fire/.Dipping shop waste fire |
| Detonating fuse manufacture | 1 | 9 | 4 | While extruding ,Sensitive PETN ? |
| Total | 11 | 19 | 17 | |

# Problems Associated With Safety Management

- Inadequate trained labour
- Experienced personal going into retirement – industry unable to attract qualified younger personnel
- Use of temporary labour to meet sudden demand and on economic grounds
- Distribution , storage and use in unorganized sector does not conform to safety rules
- Paucity of information on accidents even in organized sector – ‘ Visfotak’ being organized to act as information bank
- Inadequate expenditure on safety issues

# Problems Associated With Safety Management…

A study revealed explosives related accidents in the organized mining industry ranged on an average of 5% of total accidents ( fatal and serious injuries). The main causes include:

- Manmade causes
- Natural causes such as lightning ,geological factors leading to premature initiation
- Malfunction of explosives / accessories
- Due to impact, friction, fire stimuli arising during pre and post blast mining operations such as fly rock.Etc
- Accident arising during movement of bulk trucks while loading etc

# Recent Measures

A significant achievement recently is prohibition of possession , sale and use of NG based explosives throughout the country with effect from 01/04/2004. Consequent to the implementation of this order ,manufacture of NG based explosives have been discontinued

# Accident Statistics 2003-04

| Operation / Material | No of accidents | Dead | Injured | Probable cause |
|---|---|---|---|---|
| Unauthorized transport | 1 | 3 | 2 | Gelatine / detonator ttransported in tractor/trailer |
| Magazines | 1 | 0 | 3 | Explosion due to falling of detonator boxes |
| Detonators (crimping ,Filling Pressing, dipping etc) | 4<br>1 | 1<br>0 | 4<br>1 | Mishandling ASA<br>Fire in dipping shop |
| Authorized Transport | 1 | 5 | 2 | Ammonia tanker transfer |
| Any other | 1<br><br>1 | 0<br><br>1 | 1<br><br>0 | Fuel oil tank Fire/.Dipping shop waste fire |
| Detonating fuse manufacture | 1 | 9 | 4 | While extruding ,Sensitive PETN ? |
| **Total** | **11** | **19** | **17** | |

# Future Trends

- ✓ Replacement of ASA being used as primary explosives in detonators with something less sensitive to impact and friction
- ✓ Use of less fire prone dipping and delay compositions
- ✓ Use of lower processing temperature s and less pumping in production of SD emulsions
- ✓ More use of shock tubes as initiating systems
- ✓ A greater role of independent organizations like VISFOTAK

I Thank Safex for giving opportunity
to present this paper