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EXPLOSIVE RISK MANAGEMENT

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ABSTRACT

An explosive, when heated, intentionally or unintentionally (e.g. fire), can produce a thermal explosion or even a detonation, producing a great deal of damage.
Evaluation of an explosion can involve a description of the initial material physical and chemical states, rate of heating, rate of decomposition kinetics, the changes in the explosive chemical and mechanical properties, rate of burning, transfer of explosive energy into thermal and mechanical energy (hydrodynamics), and, finally, amount of damage (violence).
To analyze the application process, we can first list some of the processes and steps that are involved. The key processes are: risk assessments, threats analyses, characterization of system type, statement of performance and quality requirements, test and evaluation, choice of instrument and calibration.
Subject matter experts on all types of improvised explosive device, including home-made and commercial explosives and their effects. This includes blast analysis, explosive modelling, mitigation procedures, detection equipment and the target effect of different devices.

Keywords: Exsplosives, Risk Management, Emergency Situation, Blast analysis, Explosive modelling

1. INTRODUCTION

Term "explosive" or "explosives" includes any chemical compound or mechanical mixture that, when subjected to heat, impact, friction, detonation, or other suitable initiation, undergoes a very rapid chemical change with the evolution of large volumes of highly heated gases that exert pressures in the surrounding medium. The term applies to materials that either detonate or deflagrate.
A cost-effective risk management process, including policies, procedures, standards, engineering, and resources, that addresses potential probabilities and consequences of mishaps involving DoD military munitions or other encumbering explosives or munitions, to sustain operational capabilities and readiness and to protect people, property, and the environment.
Explosives are substances or mixture of substances which will react rapidly to produces large quantities of gas and heat. That such products of reaction are produced in such a rapid fashion milliseconds or less, provides opportunity for much useful work and makes them essential tools for mining, quarryng or construction industries [1].
In the assessment of the hazard associated with a given situation, the principal effects of the explosive output to be considered are blast pressure, primary and secondary fragments, thermal hazards, and toxicity hazards [2].

Variances are available as an alternative to the Quantity-Distance (QD) requirements published in the QD tables.
Upon approval by the ESO and subsequent review by the, these distance requirements may be reduced if either of the two following conditions are met:

- Engineering risk assessment or testing/analyses of blast, fragment, and thermal hazards show acceptable exposure as defined ; or
- Use of protective construction and/or substantial dividing walls, designed in accordance with TM5-1300 or equivalent approved methods, or protective shields/barricades reduce blast, fragment, and thermal hazards to acceptable levels.

2. RISK MANAGEMENT PROCESS

Explosives safety criteria in Standard specify minimum acceptable standards for explosives safety [3].
Departure from this explosives safety standard shall only result from operational necessity and all risks associated with the departure must be completely understood and accepted by the appropriate approval authority (Requirement). The following principles apply: (1) Accept no unnecessary risk, (2) Make risk decisions at the appropriate level, (3) Accept risk when benefits outweigh the costs, (4) Integrate risk management into planning at all levels.
Methods on eliminating or reducing risk to support the six-step process of Operational Risk Management[4]..
1. Identify the Hazard. A hazard can be defined as any real or potential condition that can cause mission degradation, injury, illness, death to personnel or damage to or loss of equipment or property. Experience, common sense, and specific risk management tools help identify real or potential hazards.
2. Assess the Risk. Risk is the probability and severity of loss from exposure to the hazard. The assessment step is the application of quantitative or qualitative analyses to determine the level of risk associated with a specific hazard. This process defines the probability and severity of a mishap that could result from the hazard based upon the exposure of personnel or assets to that hazard.
3. Analyze Risk Control Measures. Investigate specific strategies and tools that reduce, mitigate, or eliminate the risk. Effective control measures reduce or eliminate one of the three components (probability, exposure, or severity) of risk.
4. Make Control Decisions. Decision makers at the appropriate level choose the best control or combination of controls based on the analysis of overall costs and benefits.
5. Implement Risk Controls. Once control strategies have been selected, an implementation strategy needs to be developed and then applied by management and the work force. Implementation requires commitment of time and resources.
6. Supervise and Review. Risk management is a process that continues throughout the life cycle of the system, mission, or activity. Leaders at every level must fulfill their respective roles in assuring controls are sustained over time. Once controls are in place, the process must be periodically reevaluated to ensure their effectiveness.

3. EXPLOSIVES RISKMANAGEMENT EXPERTISE

- Extensive expertise in identifying the threat to business from improvised explosive devices and the development of procedures to mitigate this threat and ensure resilience.
- Highly qualified bomb disposal instructors having taught at the counter terrorist wing of the Army School of Ammunition, a world renowned training organisation.
- Explosive Device specialists, responsible for the development of tactics, training and procedures for bomb disposal teams within the contemporary operating environment.

- Significant expertise in weapons intelligence and the exploitation of recovered devices including an in-depth knowledge and practical application of forensic and anti-forensic procedures[5].

Hazard Analysis. Logical, systematic examination of an item, process, condition, facility, or system to identify and analyze the probability, causes, and consequences of potential or real hazards.

To analyze the application process, we can first list some of the processes and steps that are involved [6]. The key processes are: risk assessments, threats analyses, characterization of system type, statement of performance and quality requirements, test and evaluation, choice of instrument and calibration.

A well-organized procurement and commissioning process might consist of the following steps:

1. Identify the threat.
2. Select the sensitive place /process.
3. Evaluate the data (throughput, size, etc.).
4. Find the right technology.
5. Decide the technical requirements (sensitivity, minimum detection level, etc.).
6. Choose one or more EDS meeting the requirements and obtain samples for evaluation.
7. Evaluate, test and accept or reject the EDS.
8. Operation, calibrate and maintain the EDS.

4. RISK CONTROL

There are a number of measures which can be employed to controlrisk and these can be listed in order of preference as follows[7] :

1. Elimination. While it may be argued that in certain instances this is an option, eg underground coal, mining, secondary blasting, there is currently no practical alternativeto the efficiency of work produced by explosives int he mayority of mines and quarries.
2. Substitution. Replacing the hazard with one of lesser risk has, to some extent, occurred over the past twenty years with the move away from the more sensitive explosives to the slightly more forgiving emulsion and watergel types.
3. Engineering Controls. These controls are employed to a limited extent in lessening the high risk posed by explosives by either reducing the probability o fan event or by reducing the consequences.
4. Examples include: the design specifications for explosives transport and manufacturing vehicles aimed at reducing the probability of an initiation, the design specification for a barrier on explosives transport vehicles between detonators and high explosives aimed at minimising the consequences o fan initiation, the design of explosives magazines aimed at reducing the probability of your explosives presenting a high risk to the general public and the designed location of explosives magazines at recognised safe distances to minimase the consequences of an event. It is necessary to track the explosives on site from point of receipt to point use or disposal, and to determine where it would be appropriate to institute procedures to control or minimise the high risk. Administrative (procedural) Controls. In the use and handling of blasting explosives on mine, and quarry sites, it is, int he main , this measure which is called upon to effectively control the high risk posed by the explosives.
5. Personal Protective Equipment (PPE). This type of control measure can be effective with certain explosives eg flame retardant clothing for people working with firework compositions, safety glasses for people manufacturing or packaging detonators.

5. SCOPE OF ADMINISTRATIVE CONTROLS

From the moment explosives arrive at a particular site there exist a high risk requiring effective controls and there exist a responsibility or obligation, presumably on the mine or quarry manager, but also on those both above and below these people to varying extents, to ensure those effective controls are in place to protect both the employees and the general publick from the hazards associated with those explosives.

While these will vary from site to site, the following are some areas of concern which would need to be considered:

- Receipt of exsplosives: who receives, where temporarily located,stock check,time/exposure of personnel and expolosives competency of driver.
- Transport of exsplosives: what models, suitability of vehicles, routes and emergency response.
- Storage of Eksplosives: design of magazine, lacation of magazine, exsplosives competence of keeper, issue from magazine, inspections, emergency response and legislative requirements.
- Manufacture of explosives: types of explosives, approved methods, explosive competence of operators, equipment and records.
- Use of explosives: blast design (Who?), explosives competence of operators, technical data available, misfires, environmental factors and reactive ground.
- Disposal of explosives: who, how, where and control of site.
- Decontamination of explosives equipment: hot work system, where and how.
- Assessing Explosives Suppliers: explosives types, quality and material safety dana sheets (MSDS).
- Blasting Contractors: safety system, competence (explosives) and equipment.

As a significant high risk, explosives should be controlled at all stages of their life on a mine or quarry site. Administrative (procedural) measures should reflect this accordingly.

6. CONCLUSION

Emergency management can be defined as "a process to reduce loss of life and property and to protect assets from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery." An Emergency Plan documents the elements of the process.

Subject matter experts on all types of improvised explosive device, including home-made and commercial explosives and their effects. This includes blast analysis, explosive modelling, mitigation procedures, detection equipment and the target effect of different devices.

- Electronic Counter Measures and Radio Controlled Improvised Explosive Device experts.
- Specialists in the Tactics Training and Procedures (TTPs) employed by groups utilising suicide devices, with considerable operational experience in dealing with this type of attack.
- Experienced and qualified ammunition and explosives professionals with extensive knowledge of all ammunition natures including the design and target effects of different natures, render safe procedures, disposal, demilitarisation of UXO and obsolete stocks and the safe storage and transport of all ammunition.

Emergency management begins with an emergency plan which encompasses all hazards and all related planning areas, including emergency planning preparedness and hazard identification and mitigation, emergency response, use of the Incident Command System, disaster recovery and related areas.

Any emergency management initiative must start with an inventory of risks and an assessment of the exposure from these risks with the desired outcome of creating a workable emergency management program. Infrastructure issues will likely be seen as presenting the most risk. The key steps in emergency management are:

- Context
- Hazard, Risk and Vulnerability Analysis (HRVA)
- Mitigation
- Preparedness
- Response
- Recovery

The risk posed by exsplosives are high and need to be managed.
Effective risk control measures are few and heavy emphasis is placed on the administrative – procedural controls. It is essential therefore that these are comprehensive in coverage, competent in content, implemented with commitment and enforced.

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