Cleared for public release

INSENSITIVE MUNITION INDUSTRY CONTRIBUTION

How to benefit from IM during manufacturing and storage phases / Review of the current regulation

Paper #24113

- Prepared by Hazard Assessment & Classification IMEMG's Expert Working Group
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Insensitive Munitions
European Manufacturers Group

Summary

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1-INTRODUCTION

Member Companies

A European Organization assembling 23 leading armament groups working with Insensitive Munitions technologies

KNDS
THALES
arianeGROUP
DIEHL Defence
Roxel
MBDA
cea
EURENCO
TDW an MBDA company
RHEINMETALL EXPAL MUNITIONS
JUNGHANS Defence
LEONARDO
RWM ITALIA SPA
Chemring Energetics UK
AWE
BAE SYSTEMS
Nammo
SAAB
hirtenberger Defence Systems
RHEINMETALL

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HA&C Expert Working Group Objectives

Survey NATO and UN regulation

- Standardized mandatory threats
- Maximum response to vulnerability test
- Hazard division assignment procedure

Exchange on various national implementation in European countries

Define common position on document revision and publicize IMEMG position

Taking back IMness benefits

Why?

→ More and more munitions which are stored in manufacturers' workshops or armed Forces storages **are IM**.

→ But regulations **do not efficiently differentiate the IM from the non-IM** for the assessment of danger areas and logistic constraints.

Indeed, even if a HD1.6 exists for very insensitive items, and even if the Storage sub-Division allows effectively to consider the unitary risk (SsD1.2.3), the full potential of "IMness" seems to be not used, by far.

Renewing the approach of explosive safety regulation when considering IM would appear as a major step, especially in the current context of intensity warfare.

→ It would give the opportunity to manufacture and stock more munitions in a better way, knowing exactly the risk.

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Taking back IMness benefits

How?

Taking into account Quantitative Risk Assessment:

→ ***It is not because a warhead is designed to detonate that its detonation can effectively occur during manufacturing or storage:***

- Indeed fully compliant IM or near-IM do not detonate by DDT when exposed to whole accidental events likely to occur during manufacturing or storage.
- When exposed to a detonating charge, IM or near-IM can detonate by SDT but this case can be eliminated by correct hazard management in workshops and storages.

So, for well controlled operations, IM or near-IM detonation should be eliminated from safety distances assessment.

- According to manufacturers, new rules should be extended to civilian regulations.
- The HA&C Expert Working Group suggest some materials to orientate the consideration in order to **promote an evolution of the regulatory framework**.

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2. Hazard Management of a Manufacturing Workshop

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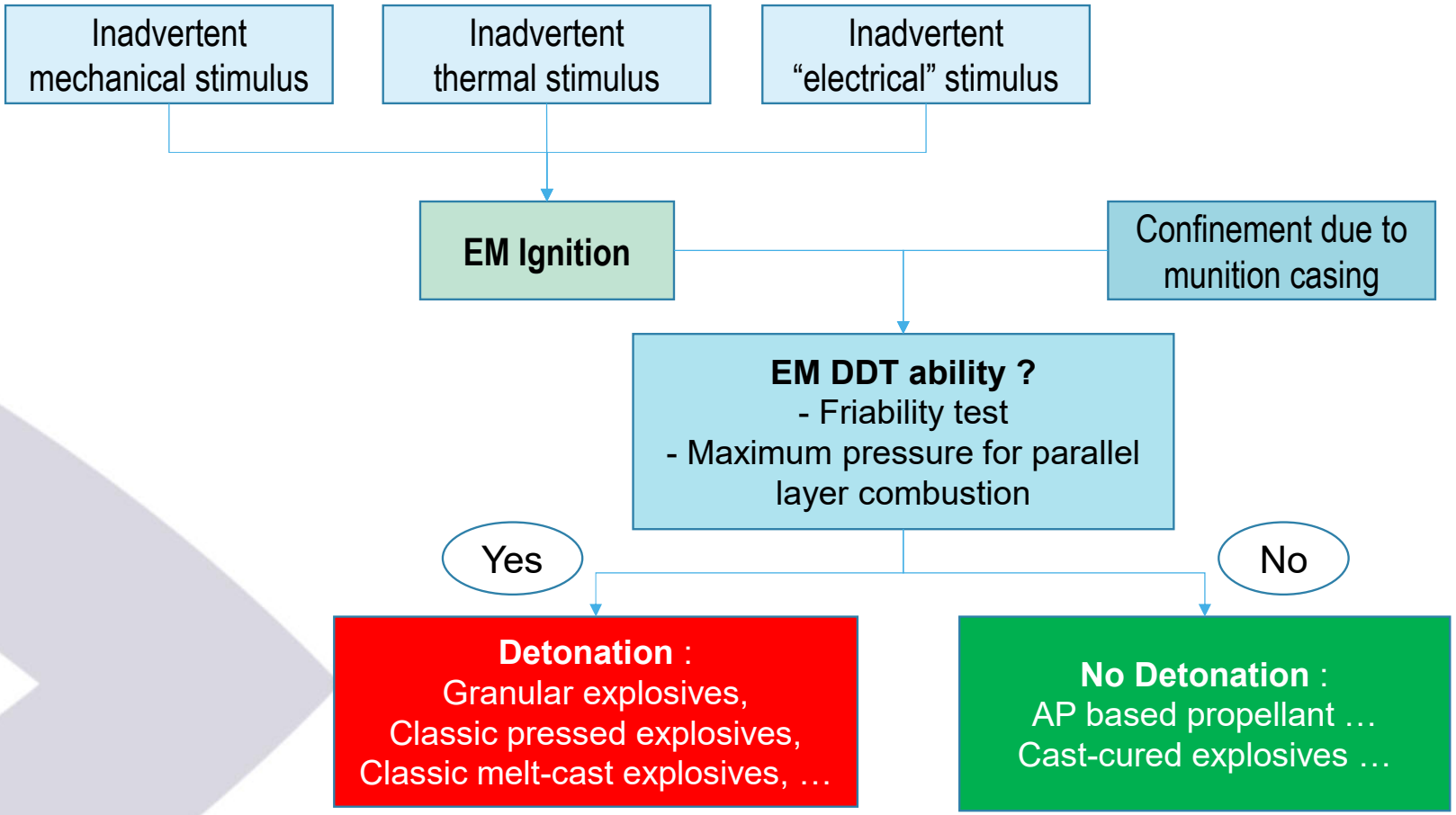
IM Explosives are DDT unable, their reason of being!



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IM Explosives are DDT unable, their reason of being!

Hazard management during manufacturing operations:

Always possible inadvertent ignition: friction, impact, drop, punching, excessive heating, fire …

→ Extremely Insensitive Substance (EIS) pass UN tests : Bullet Impact, Susan Test, Friability Test, Fast & Slow Heating …

→ IM pass (or near pass = type IV) UN tests : Bullet Impact, Fragment Impact, Fast & Slow Heating …

None detonation possible through DDT mechanism for IM explosives

DDT possible for granular explosives, classic pressed or melt-cast explosives (i.e. Comp B)

➡ ***Why are IM explosives still considered like classic explosives in manufacturer workshops & storages with a HD1.1 mass explosion ?!***

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IM Explosives exposed to potential detonation

Hazard management during manufacturing operations:

IM are designed to pass sympathetic reaction (with identical munitions only)

→ So IM explosives **may be able to detonate** by SDT if exposed to a various detonating charge

Detonation source elimination management is achievable during many industrial phases :

- ***X-Ray control,***
- ***finishing,***
- ***packaging,***
- ***Storage,***
- ***…***

Through that way, accidental IM detonation can be eliminated with desired accuracy level

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3. Hazard Management of all-up round Munitions Peacetime Storages

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Why HD1.6 considers single item detonation ?

Hazard management for all-up round munitions peacetime storage:

For HD1.6 IM storage: it is currently mandatory to take into account **a single item detonation:**

- It is not explained why. It appears to be only an additional precaution.
  - → Is it due to initiation device failure?
  - → Not relevant because these devices are compliant to STANAG 4187 relative to fuses safety design,
- This constraint prevent from storage of different IM together (because absence of sympathetic detonation is only demonstrated between identical munitions)

⇒ If the consideration of the single item detonation was not mandatory:

- Mixing storage for various IM types would be effectively possible

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4. Dissemination of NATO Rules in Civilian Regulation

Manufacturers are managed by civilian regulations

NATO rules should be disseminated in civilian regulations:

SsD1.2.3 (unitary risk): exists only in AASTP (Military NATO rules) and applies only for storage

➡ The HA&C EWG suggests to:

- Extend to **logistic and transport operations**
- Extend to **manufacturers (civilian regulation)**

Near-IM are currently considered as classical munitions:

- Because type V responses are mandatory for Fast & Slow Heating, bullet & fragment impact, …
- While, a type **IVp** or **IVf** (light effect of propulsion or projection) is often obtained
- Which is very far from a detonation!

➡ The HA&C EWG suggests to:

- **Create a new HD for Near-IM**,
- Or: **relax responses levels from type V to type IV for FH, SH, BI and FI**

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5. What would be the Benefits for Manufacturers?

Benefits for manufacturers

Increasing production capabilities:

Because, if the feared event is only the combustion of IM and not their detonation:

- it becomes possible:
  - → to **increase the storage quantity** in workshops, in storehouses, etc.
  - → to **produce cast-cured explosives** in workshops **dedicated to solid rocket propellants**

- It also becomes possible to design more compact and more automated workshops:
  - → i.e. **EURENCO POGS workshop since 2006**
  - → This workshop remains **unfortunately an exception** (DDESB Seminar - 2006 - “How to fill Artillery Shells under 1.3 Hazard Division using Cast Cured PBX”).

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6. What would be the Benefits for National Authorities?

Benefits for National Authorities

Increasing production capabilities:

Increasing production capability is currently an **important need and wish for National Authorities**:

- One improvement axis consists in taking benefits of IMness of new munitions
  - Can be done through **regulation improvement**,
  - **None additional funding necessary.**

→ Can be done **without safety** concerns because IM are intrinsically safer.

Of course, the related manufacturer responsibility is:

- to **produce compliant IM** (or near-IM),
- to **manage efficiently pyrotechnic safety**.

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7. Conclusions & Perspectives

Conclusions and perspectives

Currently, it is desirable to consider IM benefits in order to increase production capabilities.

→ Manufacturers are convinced that **regulation improvements can do this**!

- SsD1.2.3 should be extended:
  - to transportation phases, at least in peacetime conditions for armed forces,
  - to civilian national regulations, and in parallel introduced in UN Orange Book.

- In IM workshops and dedicated storages:
  - When it is justified that none accidental detonation (DDT and SDT mechanisms) can occur then only accidental combustion must be considered for safety distances.

- Currently, for HD1.6, single article detonation has to be considered.
  - **It seems to be especially excessive.**
  - In addition, it prevent from the opportunity to manage storages with various IM types.

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THANK YOU FOR YOUR ATTENTION
ANY QUESTIONS ?

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