2009 Insensitive Munitions & Energetic Materials
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Press Technology of IHE Charges
A cost effective economical manufacturing method for IM
Richard Wild, Diehl-BGT-Defence
IM Center - Maasberg

IMC – Maasberg is member of the IMEMG

An association of

European industrial companies

working on the field of Insensitive Munitions.
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More than 40 years in development and production of safe ammunition

- STANAG 4170 qualified PBX compositions
- PBX filled Insensitive Munitions
- Test ranges for IM optimization
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- Melt Cast
- PBX Cast Cure
- Press Fill

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Press fill is Efficient
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Press Fill, Molding Powder

- Water Slurry
  - safe coating process

- Granules
  - homogeneous coating
  - adjustable size
  - no segregation

- Bulk Material
  - no dust
  - free flowing
  - high bulk density

Wild 04/09
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Press Fill, Compacting

- Pressure
  - less than 1 kbar
  - for 5-10 seconds
  - at ambient temperature

- Direct into the shell
  - Compacting from one side

- Final shape
Press fill is

Efficient

- molding powder from a safe and separate water slurry process
- free flowing granules suitable for high speed dosing
- compacting direct into the shell
- final shape compacting
- minor need of cleaning
Press fill is

Efficient

Economic
### IM Center - Maasberg

#### PBX Processing

<table>
<thead>
<tr>
<th>Press Fill</th>
<th>Cast Cure</th>
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<tr>
<td>Dosing of the Granules (Ambient Temperature)</td>
<td>Homogenizing of the Components in a Kneader (Elevated Temperature)</td>
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<tr>
<td>Compacting (Ambient Temperature)</td>
<td>Addition of the Curing Agent (Elevated Temperature)</td>
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<tr>
<td>Ready for Assembly</td>
<td>Cast in Preheated Shells (Elevated Temperature)</td>
</tr>
<tr>
<td></td>
<td>Polymerisation several days (Elevated Temperature)</td>
</tr>
<tr>
<td></td>
<td>Ready for Assembly</td>
</tr>
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</table>
Press Fill, Focal Points

- Higher efficiency for increasing production quantities
  - proportionate costs for the pressing tool
  - no waiting periods (e.g. for curing)
  - no accumulation of IHE-charges
  - quality check immediately possible

- Warhead Diameter smaller than 200 mm
  - moderate press size
  - length:diameter ratio about 3:1 for a one step compaction in a shell

- Warhead mass smaller than 15kg
  - moderate safety distances
  - possible damage (automatic process remote controlled)
Press fill is

Economic

- 3 steps to the final HE charge in the shell
- Ambient temperature process with little waste
- For high quantities
- For moderate WH diameters
- For moderate safety distances
<table>
<thead>
<tr>
<th>Press fill is</th>
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<tbody>
<tr>
<td>Efficient</td>
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<tr>
<td>Economic</td>
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<tr>
<td>Effective</td>
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</table>
Progress in IHE Charge Density and Compacting Pressure

TMD [%]

-10

PBX 92/8 RDX/Bi

Time in Years

0.5 kbar

>99.5

>99

2 kbar

98

1 kbar

>99

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Press Fill, Charge Properties

- Quality
  - no gaps
  - no voids

- Density
  - close to TMD

- Gap Test, no go
  - more than 28 kbar

- Energy content
  - More than 90% solids
Press fill is

Effective

- density nearly 100% TMD
- no voids
- solid HE content > 90%
Press fill is

Efficient

Economic

Effective

Safe
### Progress in Initiation Thresholds

<table>
<thead>
<tr>
<th>Pressure [kbar]</th>
<th>Time in Years</th>
<th>PBX 92/8 RDX/Bi</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kbar</td>
<td>-10</td>
<td>20</td>
</tr>
<tr>
<td>1 kbar</td>
<td>-5</td>
<td>&gt;30</td>
</tr>
<tr>
<td>0.5 kbar</td>
<td>present</td>
<td>&gt;36</td>
</tr>
</tbody>
</table>
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IM TECHNOLOGY

Preparation

Test Setup

Test Result

Press Filled PBX Round 40mm IM

Sympathetic Reaction

No detonation transfer
IM TECHNOLOGY

Test Result

Main Charge

38.7 mm Shaped Charge

Exploder

Press Filled PBX Round 155mm IM

SCJI Impact

Better than Type III Reaction
Press fill is

Safe

- low compacting pressure (< 1kbar)
- high initiation level
- IM compatible
  - SD with 40mm pressed into the thin shell
  - SCJI with 155mm pressed into the confined shell
An economical and effective manufacturing method for Insensitive Munitions is:

- Efficient
- Economic
- Effective
- Safe