Application of Automation in Demilitarization Processes

GLOBAL DEMILITARIZATION SYMPOSIUM

“ENERGIZING THE DEMILITARIZATION ENTERPRISE THROUGH TEAMWORK, INNOVATION, AND EFFICIENCY”

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Outline of Presentation

- Automation in Demil Processes
- Disassembly equipment
- Engineering phase
- Summary
- Questions
Definition of AUTOMATION

The automatically controlled operation of an apparatus, process or system by mechanical or electronic devices that take the place of human labor.

Source: www.merriam-webster.com
Why Automation?

Operator related

• Increase operator safety
• Reduce hard physical and monotonous work
• Reduce human factor
• Reduce labor cost
Why Automation?

Process related

- Increase throughput
- Better use of existing infrastructure
- Reduce production cost
- Better production planning
- Better process control and monitoring
- Process with high reliability
- 24/7 operation
Automation in Demil Processes

- Machine operation in safety cell
- High throughput
- Environmental friendly
Automation in Demil Processes

- Demil was not part of grenade design
- Risk for detonation during demil operation

→ Grenade disassembly only inside safety cell

→ Modular machine design
## CBU Disassembly Line

<table>
<thead>
<tr>
<th></th>
<th>BLU 61 A/B</th>
<th>BLU 63 A/B</th>
<th>BLU 86 B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity / CBU</td>
<td>220</td>
<td>650</td>
<td>650</td>
</tr>
<tr>
<td>NEW / bomblet</td>
<td>0.61 lbs</td>
<td>0.28 lbs</td>
<td>0.26 lbs</td>
</tr>
</tbody>
</table>
• Grenade type: BLU 61 A/B, BLU 63 A/B, BLU 86 B
• Automatic fuze removal
• Automatic detection and separation of reject grenades
• Machine performance: 720 bomblets / hour
MLRS Thermal Treatment Process

<table>
<thead>
<tr>
<th>Rocket Pod</th>
<th>M26 Rocket</th>
<th>Rocket motor</th>
<th>Warhead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>13.85 ft</td>
<td>12.92 ft</td>
<td>6.34 ft</td>
</tr>
<tr>
<td>Weight</td>
<td>5,236 lbs</td>
<td>674.6 lbs</td>
<td>324.1 lbs</td>
</tr>
<tr>
<td>Diameter</td>
<td>8.94 in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td>6 x M26</td>
<td>644 x M77</td>
<td></td>
</tr>
</tbody>
</table>
MLRS Thermal Treatment Process

- Rocket type: M26
- Underwater sled for rocket motor transport
- Underwater band-saw cutting process
- Water circulation with band filter unit
- Segment transport to ignition unit by transfer crane
- Process rooms separated by sluice gates
- Machine performance 3 rocket motors / hr
# Disassembly Line for ICM / MLRS Grenades

<table>
<thead>
<tr>
<th></th>
<th>M42</th>
<th>M77</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>1.5 in</td>
<td>1.5 in</td>
</tr>
<tr>
<td>Length</td>
<td>3.24 in</td>
<td>3.3 in</td>
</tr>
<tr>
<td>Weight</td>
<td>7.33 oz</td>
<td>7.5 oz</td>
</tr>
<tr>
<td>NEW/ grenade</td>
<td>1.1 oz</td>
<td>1.09 oz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ICM projectile</th>
<th>MLRS rocket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>6.1 in</td>
<td>8.94 in</td>
</tr>
<tr>
<td>Length</td>
<td>31.69 in</td>
<td>12.93 ft</td>
</tr>
<tr>
<td>Weight</td>
<td>102.5 lbs</td>
<td>677 lbs</td>
</tr>
<tr>
<td>Grenades per projectile / rocket</td>
<td>88 M42/M46</td>
<td>644 M77</td>
</tr>
</tbody>
</table>
Disassembly Line for ICM / MLRS Grenades

- Grenade type: M42 / M46 / M77
- Removal of ribbon, fuze and copper cone
- Thermal treatment of grenades by ignition of explosive
- Explosives detection station at end of process
- Static kiln for fuze thermal treatment
- Machine performance 900 grenades / hour
Grenades Processed

Demil capacity of SAB equipment

>130,000,000 ICM/MLRS grenades processed to date

Demil capacity

150,000 ICM/MLRS grenades / day*

31 tons / day

*Based on 24 hour operation
Process Performance

Demil of ICM/MLRS grenades by SAB equipment

150,000 grenades / day

1 Football field / 22 days

Approx. 16 Football fields / year

286 yd² / day

120 yards

53.3 yards
Process Performance

Demil of ICM/MLRS grenades by SAB equipment

150,000 grenades / day
= Length of 4.19 miles / day
= 1,529 miles / year

Distance 1,416 miles
Engineering Process

**Concept**
- Evaluation of Requirements
- Analysis of Infrastructure

**Basic Engineering**
- Layout drawing
- Process description

**Detailed Engineering**
- Detailed drawings
- Detailed process development
- Design reviews
From Design to Production

Equipment Manufacturing
- Equipment assembly
- Dry runs at SAB
- FAT
- Shipment

On-site Installation
- Equipment installation
- Operator training
- Service personnel training

Production
- Start-up assistance
- Low rate ➔ Full rate production
- SAT
Process Scalability

Process performance

Grenades per cycle

1 3 5 9
Product Tracking

- Tracking of entire disassembly process
- Check points throughout the process
- Tracking software evaluates current status
- Process stops if any inconsistency is detected
- Detailed error message
- Database interface
Product Tracking

Process Control Unit

ENTRY
Grenades

Disassembly process

EXIT
Disassembled and demiled components

RFID
Sensors
Motors
Cylinder
Process Control

- Product tracking
- Process dashboard
- Detailed status information
- Online performance data
- Defined process interlocks
- Different access level according to operator qualification
Level of Automation

- Safety
- Analyze type of munition
- Process performance
- Infrastructure
- Investment cost

→ Right balance between automation and manual labor
Does 100% Automation always make sense?

Cost-effectiveness-analysis

Level of Automation

Investment Cost
Longtime partnership

Co-operation between engineering and production
Summary

- Full process control
- Product tracking
- High throughput
- Reduce human factor
- Operator safety
Thank you for attending our presentation:

Application of Automation in Demilitarization Processes

Questions?
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