DAVINCH operations updates 2017

Ryusuke Kitamura
Ayumu Kuriyama*

Nuclear & CWD Division
Kobe Steel, Ltd.
Outline of the presentation

1. Introduction

2. Destruction of ACWs in China

3. Destruction of OCWs in Poelkapelle, Belgium

4. Other Updates
Chemical Weapons Destruction by Kobe Steel in JAPAN

Lake Kussharo (2000)
- 26 of 50kg-Yellow bombs (Lewisite/Mustard)
  - Disassembly + Neutralization + Detonation

Samukawa (2003)
- 806 CWM filled bottles
  - Neutralization
- Approx. 8,000m$^3$ of contaminated soil
  - Heat treatment

Kanda (2004-)
- 2,968 Sea-dumped OCWs
  - Destruction by DAVINCH
DAVINCH®

• DAVINCH® = Detonation of Ammunition in a Vacuum INtegrated CHamber

A controlled detonation system developed by Kobe Steel to destroy chemical and a variety of conventional Ammunition
How does DAVINCH work?

Munitions
(chemical agent, energetic material)

Donor charge

Evacuation
Minimum oxygen supply

All valves are closed to isolate the chamber

DAVINCH detonation chamber

Detonation

Detonation off-gas
(CO, H2, etc.)

Solid wastes
(fragments, dust)

Destructed!
How does DAVINCH work?

DAVINCH detonation chamber

Detonation off-gas (CO, H₂, etc.)

Valve is opened

Solid waste

Cold Plasma Oxidizer

Off-gas treatment system

Clean off-gas (CO₂, H₂O, etc.)
DAVINCH systems applied all over the world

- Poelkapelle (Belgium, 2008 - )
- SECOIA (France, under test operation)
- Tooele (US)
- Nanjing (China, 2010 – 2012)
- Wuhan (China, 2014 – 2015)
- Shijiazhuang (China, 2012 - 2016)
- Haerbaling (China, 2014 - )
- Kanda (Japan, 2004 – 2014)
Outline of the presentation

1. Introduction

2. Destruction of ACWs in China

3. Destruction of OCWs in Poelkapelle, Belgium

4. Other Updates
Overview of DAVINCH system in China

- **Shijiazhuang**
  - 2016
  - Destruction completed

- **Nanjing**
  - Overhaul and Modification are Completed

- **Wuhan**
  - Overhaul and Modification are Completed

- **Haerbaling**
  - In Construction (Foundation)

- **Harbin**
  - In Construction (Foundation)
ACW destruction facility in Nanjing

- 35,681 ACWs were destroyed from 2010 to 2012.
- After completion of destruction, the facility was decontaminated, dismantled and transported to Wuhan.

Dismantlement at Nanjing

Nanjing Site (January, 2015)
ACW destruction facility in Wuhan

- DAVINCH system was installed in 2013.
- 264 ACWs were destroyed from December 2014 to May 2015.
- After completion of destruction, the facility was decontaminated, dismantled and transported to Japan.

DAVINCH

Wuhan Site After Dismantlement
Facility is waiting for shipment in Japan

- DAVINCH system returned from Wuhan was overhauled and modified for Harbin in 2015-2016.
- It is stored at some warehouses in Japan and waiting for next deployment.

New Chamber for Harbin

Off-gas Treatment system
ACW destruction facility in Shijiazhuang

- Transportable DAVINCH system was installed in 2012.
- Severe winter season suspend operation, however, ACW destruction completed in December 2016. 2,567 ACWs were destroyed.
ACW destruction facility in Shijiazhuang

- In 2016, 4 Drums filled with Yellow Agent (HD/L) were destroyed.

Setting Drum in Boring Equipment and extraction operation in Glove Box.
ACW destruction facility in Haerbaling

- The Largest burial site of ACWs in China.
- DAVINCH system was installed in 2014.
- DAVINCH has been operating since December 2014.
- Severe winter season suspend operation, however, 1,639 ACWs have been destroyed (May 1st 2017).
### Destruction record of ACWs in China

The Table below shows the quantity of ACWs destroyed by DAVINCH in China.

<table>
<thead>
<tr>
<th>Projectiles</th>
<th>Nanjing</th>
<th>Wuhan</th>
<th>Shijiazhuang</th>
<th>Haerbaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow shells (L/HD)</td>
<td>14</td>
<td>22</td>
<td>408</td>
<td>886</td>
</tr>
<tr>
<td>Red shells (DA/DC)</td>
<td>58</td>
<td>145</td>
<td>627</td>
<td>692</td>
</tr>
<tr>
<td>Blue-white shells</td>
<td>1</td>
<td>57</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>(CG/trichloroarsin)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>14</td>
<td>17</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Aerial bombs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15kg Red Bomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50kg Yellow Bomb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canisters (toxic smoke pots)</td>
<td>35,601</td>
<td>79</td>
<td>1,285</td>
<td></td>
</tr>
<tr>
<td>Drum can containing yellow agent (L/HD)</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (as of)</td>
<td>1</td>
<td>3</td>
<td>164</td>
<td>10</td>
</tr>
<tr>
<td>Complete</td>
<td>Complete</td>
<td>Complete</td>
<td>Complete</td>
<td>May 1st 2017</td>
</tr>
</tbody>
</table>

(Pictures from [http://wwwa.cao.go.jp/acw/heiki.html#sec1](http://wwwa.cao.go.jp/acw/heiki.html#sec1))

Red canister

90mm Yellow shell

150mm Yellow shell
Outline of the presentation

1. Introduction

2. Destruction of ACWs in China

3. Destruction of OCWs in Poelkapelle, Belgium

4. Other Updates
Overview of DAVINCH System in Belgium

- Constructed in 2007 in military site in Poelkapelle
- Owned and operated by Ministry of Defense Belgium since 2008
- **11,187** munitions have been destroyed by DAVINCH (as of December 2016).
  - **4216** OCWs and **6971** Conventional munitions
  - In 2016, **1733** munitions were destroyed.

Map showing Poelkapelle, Belgium.
Examples of Ammunition Destroyed by DAVINCH in Poelkapelle

- Chemical munitions
  - (3 x 10.5cm Clark shells) x 1 packages/shot

- Conventional munitions
  - (7 x 7.7cm shells) x 1 packages/shot
Outline of the presentation

1. Introduction

2. Destruction of ACWs in China

3. Destruction of OCWs in Poelkapelle, Belgium

4. Other Updates
Other Updates

SECOIA Project in France

- SECOIA
  - Site d’Elimination des Chargements d’Objets Identifies Anciens
- Site is located at Mailly-le-Camp, France
- Currently, the new DAVINCH is under test operation.
Other Updates

New facility at Haerbaling in China

- To expedite the completion of the disposal of ACWs
  - Operation will start in 2020
  - Multiple 4 Chambers
  - The biggest DAVINCH system
Summary

- DAVINCH facilities have been operated safely in Japan, China and Belgium, with proper operation and maintenance.

- More than **55,000** items (chemical and conventional weapons) have been destroyed by DAVINCH world wide.

- Decontamination, Dismantlement and Transportation were successfully operated at transportable DAVINCH.

- New concept DAVINCH and Biggest DAVINCH will contribute to OCW destruction.

- Kobe Steel will keep on operating, maintaining and improving DAVINCH systems to destroy chemical and other munitions and to support the efforts to make cleaner the world.
Our Technology make it Achievable

- Risk must be Acceptable
- Cost must be Agreeable

But these two points are always trade-off.

- Kobe Steel bring solutions for the problems with achievable technology in many cases.
Thank you for your attention.

Any questions?