

“Innovative and Adaptive” Technologies for Decommissioning Some highlights from IAEA TECDOC 1602

IAEA R2D2P Workshop on Decommissioning Technologies
FZK Karlsruhe, July 6-10 2009

Paul J C Dinner (p.dinner@iaea.org)
Consultant, Waste Technology
Scientific Secretary - IDN
IAEA, Vienna



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International Atomic Energy Agency

Innovative and Adaptive Technologies

- Results of an IAEA “Consultative Research Project” on this subject=> TECDOC 1602
- The project, which ended in Dec 2007, involved 13 organizations.
- Wide scope encompassed decision-making tools as well as “hardware” aspects
- Focussed on adapting and applying technologies from larger projects to smaller ones, e.g.
- Simple equipment especially commercial tools

Innovative and Adaptive Technologies

- This presentation focuses on a “subset” of the work reported in TECDOC 1602
- Compilations of simple tools and techniques
- Work of three MS organizations reported
 - Nuclear Research Inst Rez, Czech Republic
 - Danish Decommissioning, Roskilde, Denmark
 - State Enterprise “RADON”, Moscow, RF

For further details of these and the work of other participants in the CRP, see TECDOC (on Disc), or email addresses at the end of the presentation.

Innovative and Adaptive Technologies

- RADON work addresses simple, practical techniques **for decontamination.**
- Examples presented here include
 - A vacuum+ filter assembly with customized “pickups”
 - Commercial High-Pressure Water Jet
 - Dust-suppressing polymers
 - Commercial hydraulic tools for dismantling
 - External (roller) electrode for electro- chemical decontamination of a glove box

Hand-made vacuum/filtering system for concrete dust removal



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RADON Vacuum and filtering system

- Commercial filter and vacuum
- Russian made (Sovplim FS1801)
- HEPA filter, 0.02 m/s, area of 17 m²
- Real capacity 1100 m³/h with filter and pipe
- Own design/construction of air inlets (visible in the picture)

Commercial High-Pressure Water Jet

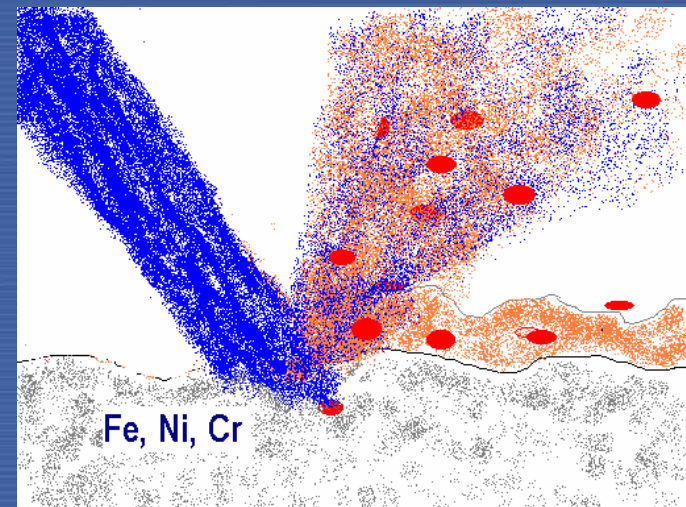
- Familiar brands include Bosh, Karher, Kranzle (commercial professional grade tools)
- Typical high-pressure jet (150-200 Bar, 1-3m³/h)
- Includes water heater (80 – 130°C)
- Chemical additives – acids, alkali, K₂MnO₄
- Abrasives – filter and treat as waste-water (cannot recycle this water thru the nozzle)

Commercial High-Pressure Water Jet

- The hydro jet with chemicals applied for heavy contamination with deep penetration of radionuclides into stainless steel or copper alloys
- The hydro jet with abrasives is very effective for decontamination of external surfaces of buildings and construction with deep penetration of contaminants

Commercial High-Pressure Water Jet

- Hydro jet with abrasive- fine fraction of sand,
- 50-70 kg / hour fine sand



Demolishing of contaminated plaster.

I Application of dust-suppressing polymers



II Removing of the contaminated plaster

Commercial electro gouge mounted with industrial vacuum cleaner



Cotton Re-enforced Polymeric Films

**Polymeric
decontamination films -
reinforced with cotton**



**Removing of polymeric
decontamination films**



Cotton Re-enforced Polymeric Films

- Initial work with commercial films (e.g. “Radez”) had low DF and worked only for loose contamination (e.g. dust)
- Commercial cotton gauze or packing cloth used in additional tests also proved unsuitable.
- Currently developing new generation of these with Moscow State University
- Others around the world have similar products at various stages of commercialization

Commercial hydraulic tools for dismantling: cutting and “un-tightening”



Handheld mechanical cutting equipment for small contaminated pipes (in TRS 463)



Using of polyethylene film for isolation of radioactive wastes before transportation



Using of polymeric foam for isolation of ventilation system before dismantling



Segmented (roller) electrode for electro-chemical decontamination of a glove box



Segmentation and Decontamination used at NRI Rez: (details in the TECDOC)

- Industrial vacuum cleaners and dust extractors
- Hot Water Pressure Washer
- Powered Hydraulic Shears
- Foam decontamination
- Ultrasonic decontamination
- Dry-ice blasting

Decontamination by Dry-Ice Blasting

NRI, Rez

- Clean alt. to bead, grit and sand-blasting
- Uses dry-ice (solid CO₂) in 3mm pellets
- Supersonic accelerations
- High expansion on impact (540x)
- Vapour can be released – needs good vent!
- Contaminated aerosols filtered. (No liquid!)
- Non-abrasive to the impacted surface

Decontamination by Dry-Ice Blasting



(See Table from TECDOC 1602 in the
Hanncluding introductions to
international contacts at trade shows etc
dout)

- Hydraulic Cutter for cutting of Al tubes
- Automatic band-saw for separating radioactive and potentially non-rad parts
- Hydraulic Press for tube volume reduction
- Pneumatic lifting devices (suction pads)
- Plasma cutter with (2m extension)

Lifting Beam with Suction Pads Danish Decommissioning



Plasma cutter with (2m extension) Danish Decommissioning



Sources of D&D Technical Information

- **Main Website on IAEA Decommissioning**
<http://goto.iaea.org/decommissioning/>
- **Main site for downloading D&D reports**
http://www.iaea.org/OurWork/ST/NE/NEFW/wts_d_eCommissioning.html
- **Contributors to this presentation**
 - Sergey V.Mikheykin - SVM958@yandex.ru
 - Josef Podlaha - pod@ujv.cz
 - Kurt Lauridsen - kurt.lauridsen@dekom.dk
 - Michele Laraia – m.laraia@iaea.org
- **The International Decommissioning Network**
idsn@iaea.org

Do not re-invent the wheel !!!!

THANKS FOR YOUR ATTENTION

Join the “Network”

- find help or
- find new friends to help