Options for Transportation of Non-Spent Fuel Radioactive Waste/Components

REG-CON 2014

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November 20, 2014

AGENDA

- TN-RAM Package Information
- RAM Cask PLUS
- Low Level Radwaste Disposal Option
- Processing Technology
- Q&A

Package Information

- TN-RAM is currently available in the US for transportation of high activity irradiated hardware.
- U.S. NRC Certificate of Compliance USA/9233/B(U)-96
- Type and Form of Material
  - Dry irradiated and contaminated non-fuel-bearing solid materials contained within a secondary container.
- Maximum quantity of material per package
  - Greater than Type A quantities
    - May include fissile material
    - Does not exceed the mass limits of 10 CFR 71.15
  - Contents ≤ 1,272 times an A2 quantity.
  - Decay heat of the contents ≤ 300 watts.
  - Gross weight of the contents (includes liner and shoring) ≤ 9,500 pounds.
- Typically loaded under water, but can also be loaded dry

Properties

- Cask
  - Length — 178.12 in — 4.52 m
  - Diameter (cask OD) — 52 in — 1.32 m
  - Diameter (cask ID) — 35 in — 0.889 m
  - Cavity length — 111 in — 2.82 m
  - Diameter (impact limiters) — 91.75 in — 2.33 m
  - Internal Volume (cask) — 62 ft^3 — 1.76 m^3
  - Weight (with impact limiters)* — 68,750 lbs — 31,184 kg
  - Material — Stainless Steel
- Liner
  - Length — 104.88 in — 2.66 m
  - Diameter (liner ID) — 33.5 in — 0.85 m
  - Internal Volume (liner) — 52.73 ft^3 — 1.49 m^3
  - Weight* — 2,978 lbs — 1,351 kg
  - Material — Painted Carbon Steel or Stainless Steel

*Empty

Ancillary Equipment

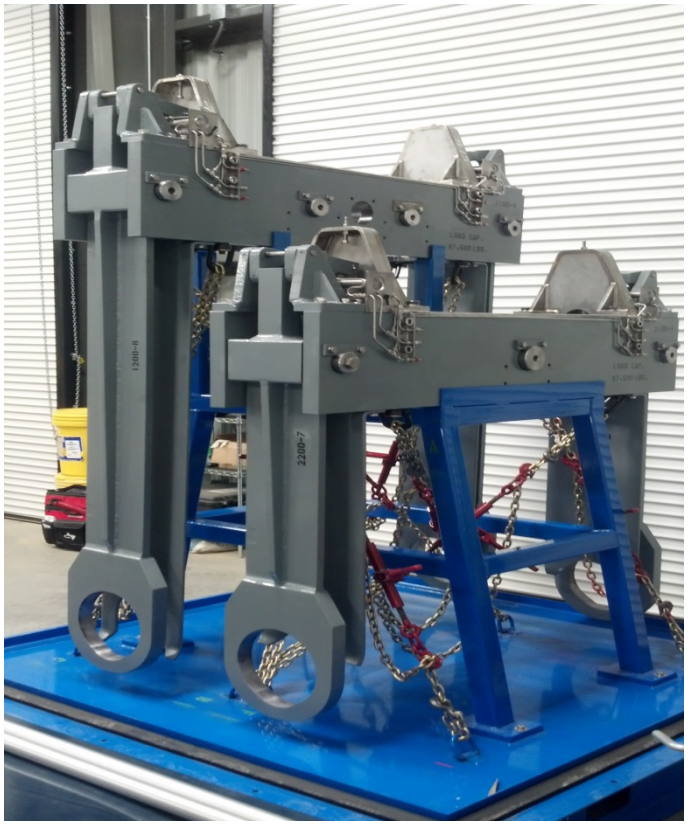
Vacuum Drying System & Backup

Lift Beams

Crane Hook Adapter

Tools

Ancillary Equipment



Lift Beams

Crane Hook Adapter

TN-RAM Delivery

TN-RAM Trailer and Weather Cover

TN-RAM Cask PLUS

- AREVA TN designed and manufactured the TN-RAM cask solely for the transport of highly irradiated reactor components
- Most components require segmentation for shipping in the TN-RAM cask
- AREVA TN teams with established industry leader to process reactor components for full scope service
  - Irradiated Hardware Processing
  - Disposal Liners
  - TN-RAM Utilization
  - Transport to disposal site
- 2nd TN-RAM cask is in fabrication
  - Intended to be used for dry loading
  - Maintains cask contamination free

TN-RAM Cask PLUS

TN-RAM Cask PLUS Utilization

- 2014 Utilization
  - January – February — Commercial Plant (2 liners)
  - July - August — DOE Facility (1 liner)
  - October – November — DOE Facility (2 liners)
  - December — Commercial Plant (1 liner)
- 2015 – 2017 Utilization Forecast
  - Up to 17 shipments per year

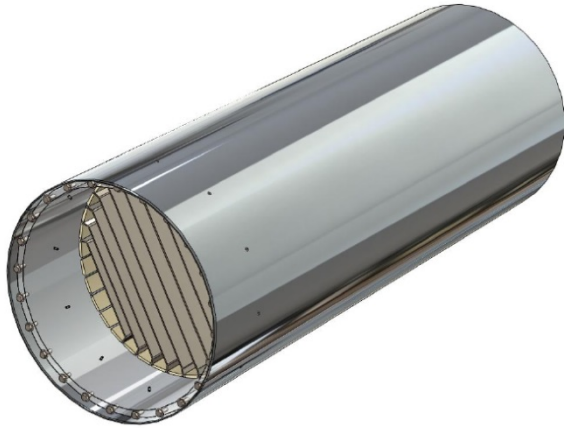
TN-RAM Cask PLUS

- **Irradiated Hardware Processing Requirements**
  - Flatten control rod blades and fuel channels
  - Segmentation via shearing of blades and channels
  - Stellite ball punch
  - Velocity Limiter cutter
  - Misc. material cutters
  - Designed to meet power plant seismic requirements
- **Use TN RAM disposal liners**
  - Facilitates shipping in TN-RAM cask
  - Designed for both Barnwell and WCS

Low Level Rad Waste Disposal Option

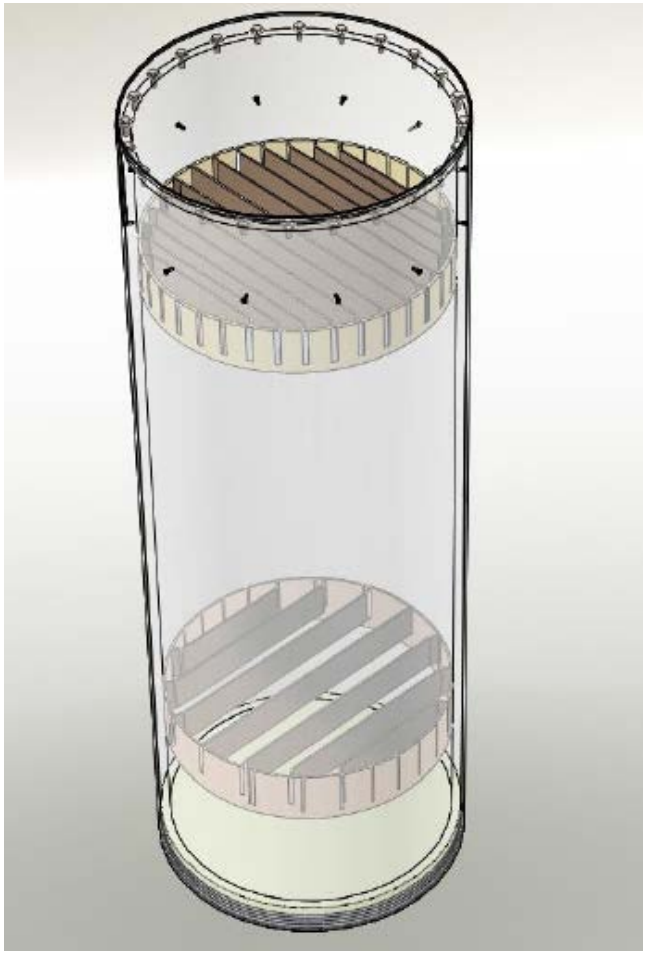
NUHOWS as a disposal option

- **NU**clear **Ho**rizontal **W**aste **S**torage (NUHOWS®) RadWaste Canister (RWC)
- Technology
  - Designed for interim storage
  - Stored in a **H**orizontal **S**torage **M**odule
- Design
  - Accommodates a decade of Rx components
  - Clone of proven NUHOMS®
    - Seismically qualified
- Operations
  - Minimizes size reduction requirements and under water component segmentation
  - Allows for multiple loadings
- Future shipping for disposal in MP197HB cask

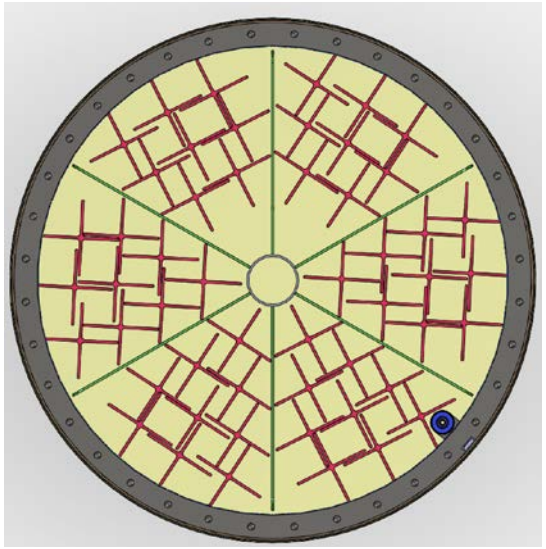


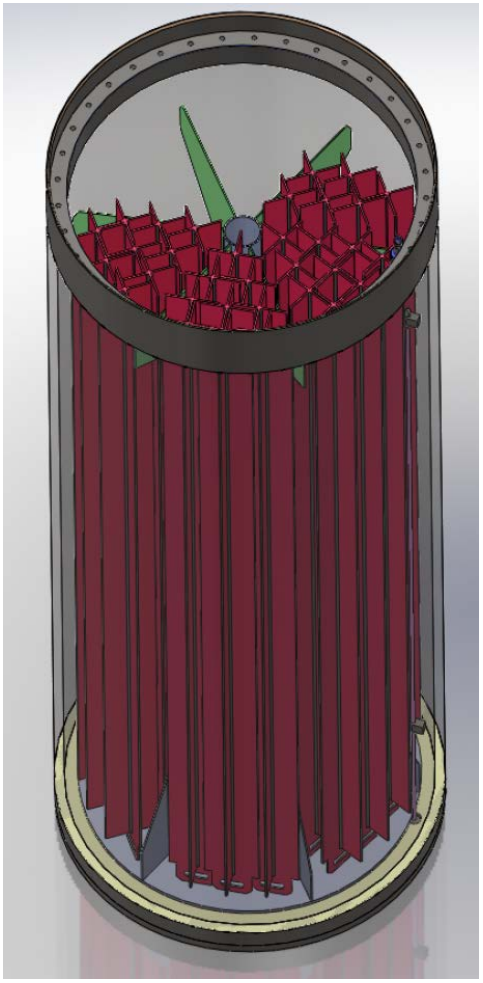
Rad Waste Container (RWC)

Radwaste Canister (RWC) Specifications



- ✓ Stainless Steel Shell
- ✓ Carbon Steel Inner
- ✓ Bolted or welded lid
- ✓ Capacity approx. 300 cu ft.
- ✓ Approximate dimensions
  - 70 inches in diameter
  - 200 inches long
- ✓ 50 Tons max load weight

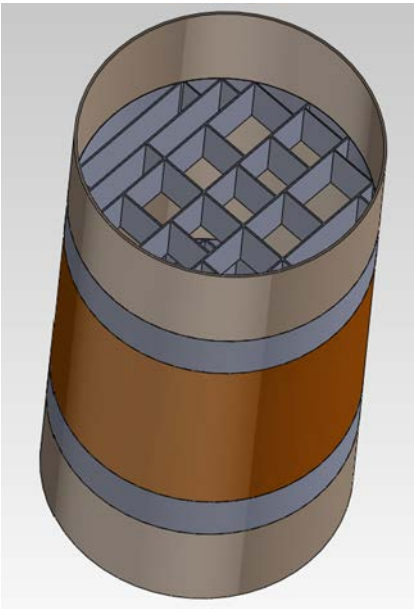




Estimate 50+ CRBs whole or 100+ CRBs flattened RWC

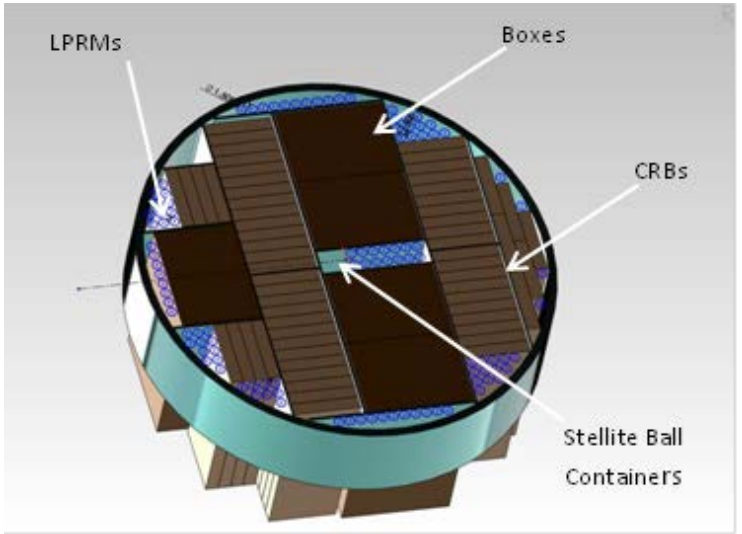
Radwaste Canister

- NUHOWS RWC designed for long term interim storage
- Internal designs refined
- Recently used at Nine Mile Point



RWC Basket

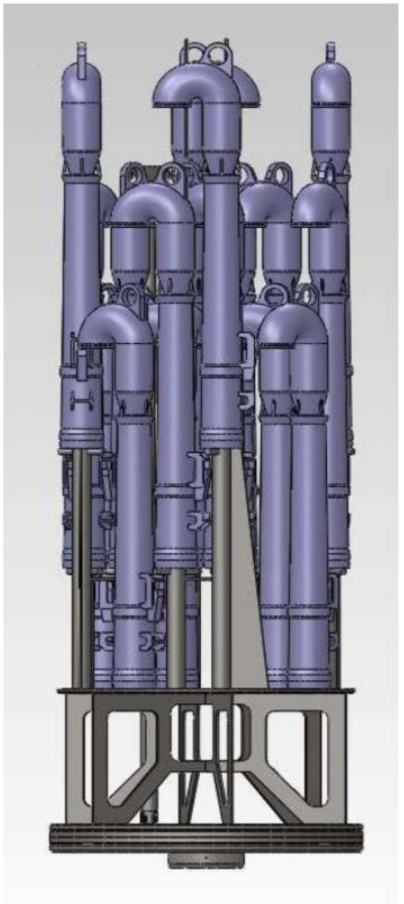
Flattened CRBs in Boxes



Mixture of Flattened CRBs and Boxes

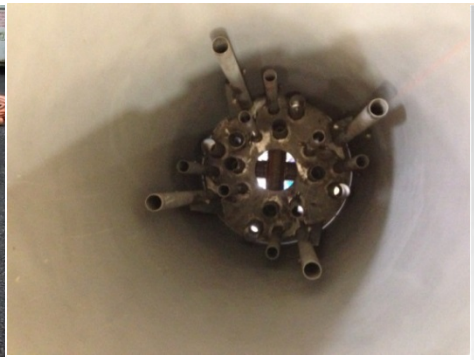
NUHOWS® Storage Technology
Jet Pumps

- Challenge – package of 20 Jet Pumps Mixers
- Did not have all specific dimensions
- Desired to house all 20 jet pumps in one RWC
- Mock up used to test packaging scheme
- Welded lid
- Vacuum dried
- Project considered a success

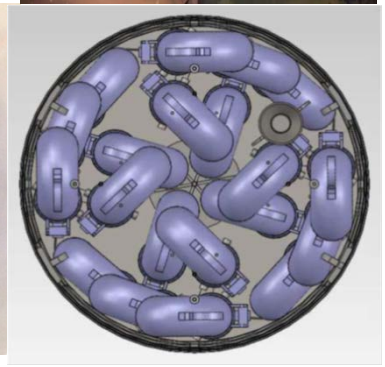


RWC Packaging Scheme

Jet Pumps to be Packaged
AREVA TN



RWC Internals Bottom



RWC Top View

Transfer and Storage

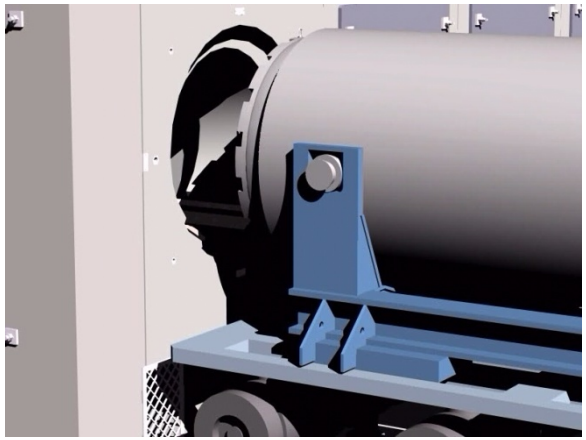
- Transfer cask to storage location
  - RWC transfer cask/trailer available for use
  - Special haul paths not required
  - Horizontal transfer relatively quick
  - HSMs easy to install on waste storage pad

Transfer Cask on Transfer Trailer

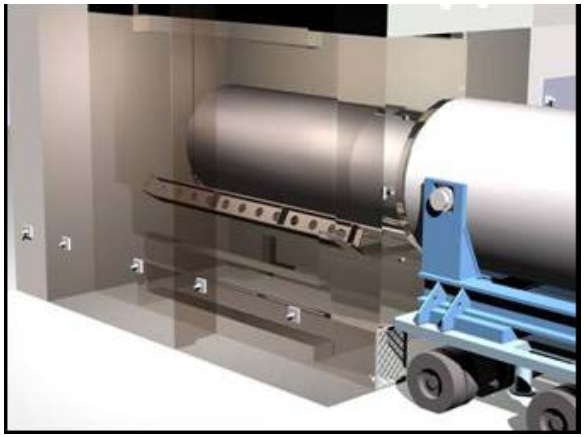
HSM Array

Storage Process

- Transfer RWC to NUHOWS Horizontal Storage Module
  - Simple and low dose insertion into HSM
  - Concrete HSM provides robust radiation shielding
  - Transfer cask can remove RWC from HSM for repeated loadings
  - Reverse process for retrieval
  - Contamination free HSM



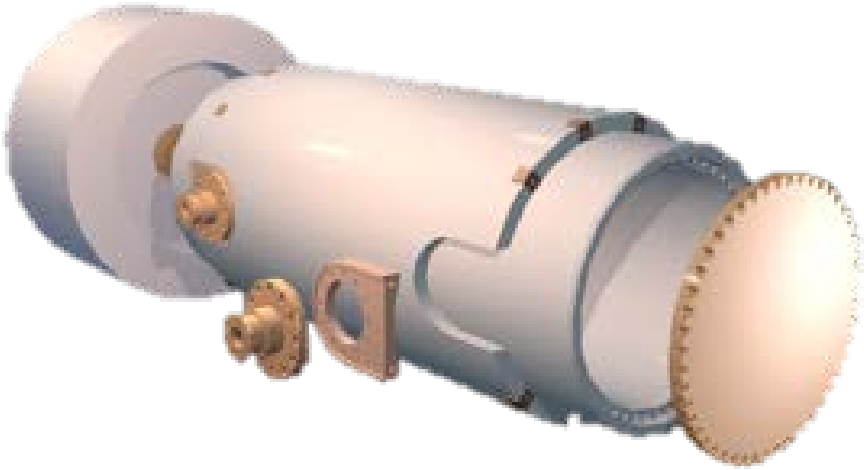
RWC being Inserted into HSM



RWC Positioned in HSM

Transport and Disposal

- RWC utilizes existing NUHOMS® Used Fuel Transport Cask
  - MP197HB Cask (CoC 9302)
  - Incorporated irradiated hardware into license
  - Accepts larger canister
  - Minimizes transports
  - Minimizes handling



MP197HB Transport Cask

- Transport for disposal
  - Cask loading
    - Reverse of loading procedure
    - Similar to on-site transfer cask
  - Acceptable for future disposal at WCS
  - Currently licensed (CoC 9302) and being fabricated

Disposal Options

WCS
THE TEXAS SOLUTION

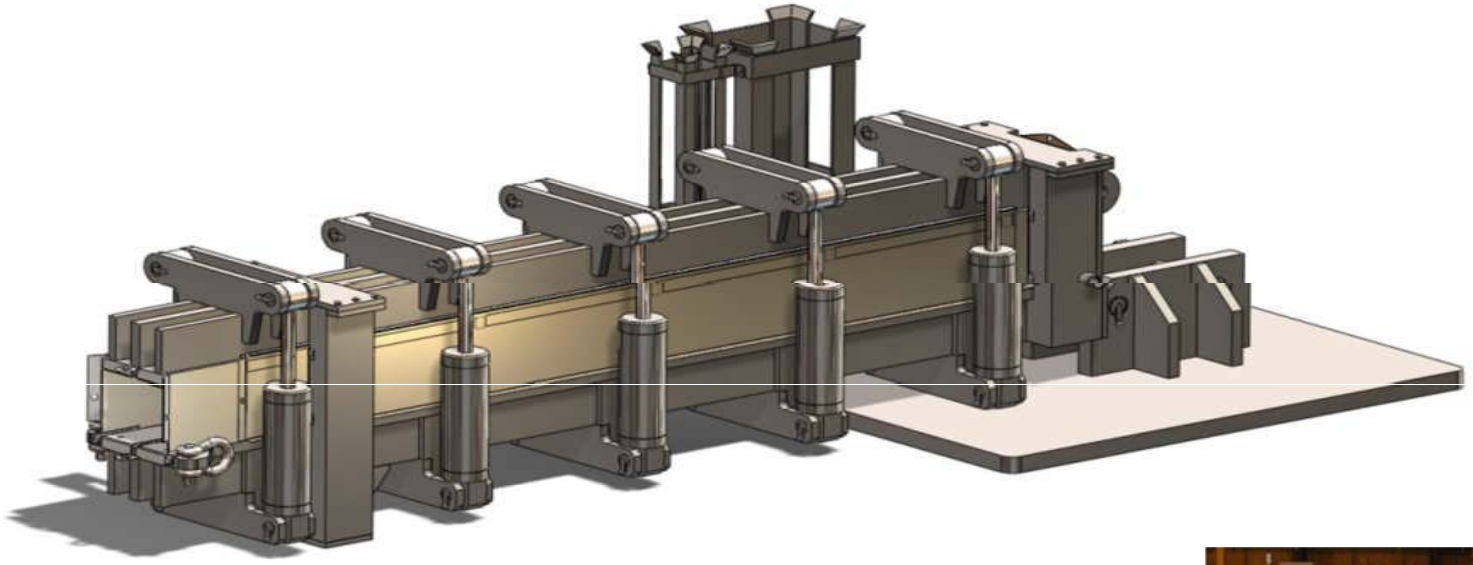
NNSA
National Nuclear Security Administration

CHEM-NUCLEAR SYSTEMS

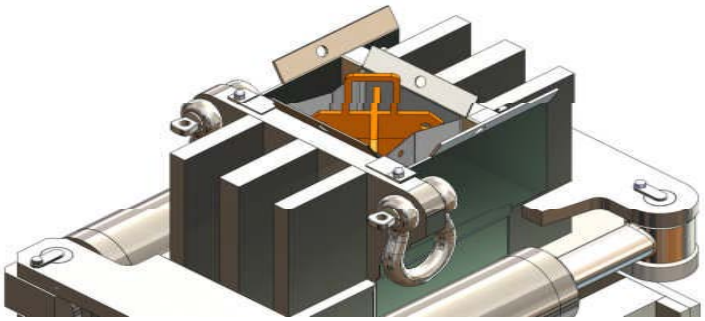
USEcology, Inc.

AREVA TN

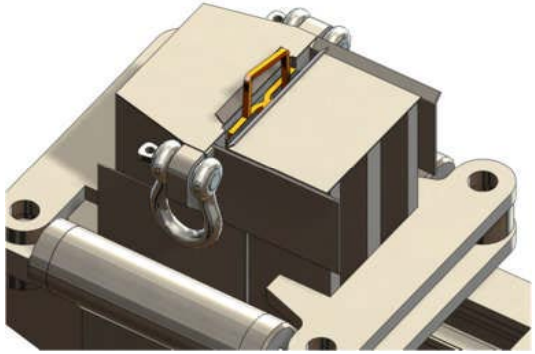
Compactor



Compactor Horizontal View



CRB Positioned for Flattening

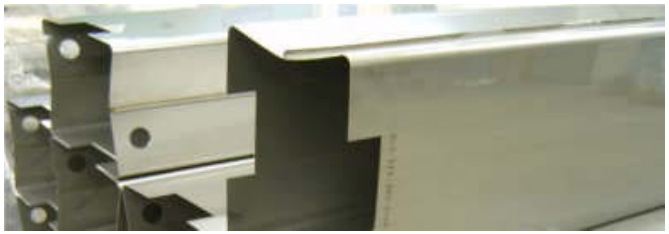


CRB Flattened

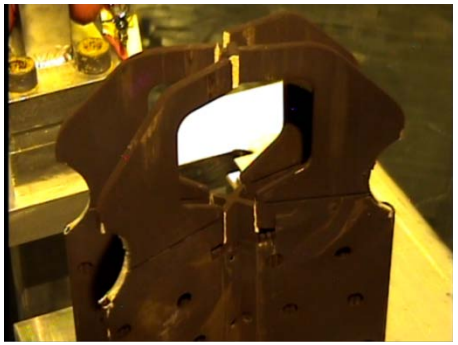
HPU

Processing Technology

- Control Rod Blade/Channel Flattener
  - Remotely operated
  - Compaction force 280,000 pounds
  - Proven at Cooper, Dresden, LaSalle, Nine Mile Point, Peach Bottom
  - Over 350 CRB flattened (2011 – 2014)
  - Compacted CRB thickness = 1.5 – 2.0 inches
  - ALARA compliant
- Uses aluminum sheaths to mitigate spring back
- Controlled high volume direction water flow
- Allows for single or multiple cuts
  - Single cut provides
    - Enhanced packaging efficiency
    - Reduced FME risks



Aluminum Sheaths



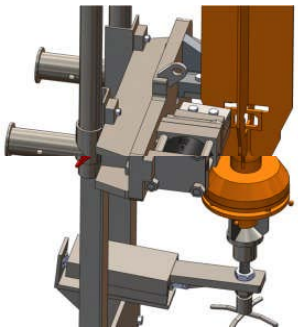
Flattened CRB Handle

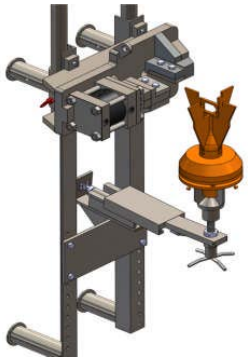
Compactor

AREVA TN

Processing Equipment

- Control Rod Punch (CRP)
  - Demin water hydraulics
  - Designed to prevent crud traps
  - Reduces chip/shard generation
- Velocity Limiter Shear (VLS)
  - Demin water hydraulics
  - Four cut process
  - Curb mounted





VLS

CRP

AREVA TN

TN-RAM Cask PLUS

Questions?

Thank You

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