NAC International Nuclear Transportation Technology and Experience - Success Factors to Support Modern Nuclear Development

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NAC International
1968 – 2008
40 Years of Dedication in Spent Fuel and Nuclear Materials Management
Discussion Points

- NAC Spent Fuel and Nuclear Materials Transport Experience
- NAC Technology
- Key Success Factors
- Cask Loading Sequence
Unique Experience?

A man who carries a cat by the tail learns something he can learn in no other way.

~Mark Twain
**Spent Fuel Shipments Experience**

**Spent Fuel Types**

- Research / Test reactor shipments
  - 3,700 fuel elements (FRR)
  - 2,300 fuel elements (domestic)
  - 2,000 other fuel elements in international programs
- Commercial spent fuel
- Other irradiated materials
NAC U.S. Spent Fuel Shipment Experience

NAC spent fuel transport leadership in the U.S.
Continuously solving the spent fuel transport puzzle in the U.S.
NAC has been a key Spent Fuel Transportation Contractor to the FRR Fuel Return Program since 1996
Transport Technology – The NAC LWT Cask

- Meets all USNRC, DOT and IAEA requirements (-96)
- NRC and DOT licenses
- Versatile cask for use at research and commercial reactor facilities
- Eight casks currently in NAC fleet
- Transported in a standard 20’ ISO container
# NAC-LWT Cask General Parameters

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>inch</th>
<th>mm</th>
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<tbody>
<tr>
<td>Overall length</td>
<td>199.80</td>
<td>5075</td>
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<tr>
<td>Overall diameter</td>
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<td>1120</td>
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<tr>
<td>Cavity length</td>
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<tr>
<td>Cavity diameter</td>
<td>13.37</td>
<td>340</td>
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<table>
<thead>
<tr>
<th>Weight</th>
<th>tons</th>
<th>metric tons</th>
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<tbody>
<tr>
<td>Loaded</td>
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<td>24</td>
</tr>
<tr>
<td>Empty</td>
<td>24</td>
<td>22.4</td>
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</table>
Transport Technology – The NAC STC Cask

- Large Capacity Transport Cask
- Meets all USNRC, DOT and IAEA requirements (-96)
**Equipment and Facility Compatibility**

- Unique cask loading equipment
- Adaptability to facilities with limited site infrastructure (crane capacity, pool dimensions)
- Fuel loading experience in more than 30 facilities
Loading Equipment Options

Direct use of the dry transfer cask with a pool adapter

Intermediate transfer system in addition to dry transfer cask
Elements of Spent Fuel Transport Campaigns

- Cask License
- Routes
- Resources
- Facilities
- Stakeholders
- Fabrication
- Carriers
- Authorities
- Approvals
- Security
- Communications
- Procedures
- Personnel
- Fabrication
- Schedules
- Carriers
- Requirements
- Deliveries
- Certifications
- Training
- Planning
- QA
Foundation of Successful Transportation Campaigns

- Technology
- Licensing Experience
- Qualified Personnel
- Transport Chain Relationships
- Actual “Local” Experience

Abroad

Home – US

NAC
Key Success Factors

• Maintain a Strong Shipping Program Organization
  – Technology
  – Engineering, Licensing and QA Support
  – Project Management
  – Operation Team
  – Training
  – Transport Coordinators
  – Security Specialists
Key Success Factors

- Thrive to Improve Operations and Maintenance Practices
  - Operation and Maintenance Procedures
  - Equipment Preparation prior to shipment
  - Backup Equipment Plan
  - Availability of spare parts
  - “Keep it simple”
Key Success Factors

- Ensure Cask and Facility Interface Compatibility Before Equipment Deployment
- Be Aware of Limitations
  - Floor loading limitations
  - Space limitations
  - Lift / Crane limitations
  - Other facility limitations (doses, water chemistry issues, access)
- Maximize Use of Specialized Dry Transfer Technology and Specialized Tooling
Key Success Factors

- Maintain Clear Communication Interface Between All Parties
  - Identify all stakeholders and define clear responsibilities
  - In particular, make sure you identify the interface points where responsibilities begin and end.
    - Regulatory jurisdiction changes
    - Transportation mode changes
  - Maintain and control active list of point of contacts that can make crucial decisions
Key Success Factors

• Assure completion of all documentation required by all agencies involved
  – Certifications
  – Validations
  – Permits
  – Approvals

• Ensure access, validity and scope meet all the requirements of the shipment
Cask Loading Sequences

Delivery of the NAC-LWT Cask inside a Standard ISO container

Removal of top and front and rear doors
Cask Loading Sequences

ISO container opened
Cask with impact limiters

Cask after removal of the impact limiters
Cask Loading Sequences

Using cask yoke for removal of the cask from the ISO container
Cask Loading Sequences

Cask is raised to vertical prior to placement on a base plate
Cask Loading Sequences

The cask lid is removed

The cask adapter shield gate is unpacked
Cask Loading Sequences

The cask adapter shield gate is installed on top of the cask

The baskets are placed in the pool prior to the fuel loading
Cask Loading Sequences

The pool adapter is installed on top of the pool.
Cask Loading Sequences

The dry transfer cask is placed on top of the pool adapter.
The basket is raised up with a grapple.
Cask Loading Sequences

After transfer of the basket inside the transfer cask, the shield gate is closed and the transfer cask is moved.
The transfer cask is handled and installed on top of the cask.
Cask Loading Sequences

The basket is transferred safely inside the cask by the use of the shielded gates. The fully loaded cask is tested prior to its placement inside the ISO container.
Summary / Conclusions

We identified a number of the key success factors that require special attention to ensure successful implementation of a shipping program. These include:

– a well-defined shipping organization with outlined responsibilities (corporate, federal and state);
– building relationships among the parties; advanced planning, a well-defined maintenance program; and
– creativity in resolving facilities interface issues using appropriate handling equipment and procedures.
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