

**Developments in Type B Casks activities within EnergySolutions Cask
Division – 16554**

Aleksandr Gelfond, *EnergySolutions*

ABSTRACT

At the end of 2008, the industry experienced sudden shortage of Type B Low Level Radioactive Waste (LLRW) transport casks available for transportation of nuclear waste within the United States of America. Due to retirement of previously certified Type B legacy packages and in order to meet the industry demand requirements, *EnergySolutions* (referred to as the Company) started fabrication of four additional 8-120B packages and added them in a fleet in late 2014, essentially, doubling their fleet of Type B casks. One 3-60B cask was delivered in Spring 2015 to support transportation of irradiated hardware. With growing Type B cask fleet and additional resource demand during maintenance/operations of newer and older casks, the Company had experienced several challenges. This paper will discuss lessons learned from manufacturing of new casks and address, in detail, the current developments associated with operations of Type A and B casks. The topics of discussion will include the Company current cask inventory, major developments associated with user interface and equipment improvements in 2015, issues and challenges the Company maintenance team faces in a daily operations of the casks as well as the latest licensing update for *EnergySolutions* owned Type B packages. Also, the paper will discuss the company strategic direction for improvement of the cask operations culture and user interface experience. This information shall benefit owners of LLRW cask fleet to improve efficiency of operations, customers experience and satisfaction.

INTRODUCTION

Since 2008 the industry has experienced a shortage of Type B LLRW transport casks available to safely transport LLRW in the form of resins, used filters, irradiated hardware and sealed sources. There were multiple events that have occurred in the same timeframe that created this situation. Following the formation of Atlantic Compact, which prohibited transportation of radioactive waste from generators outside Atlantic Compact states (SC, CT and NJ) starting from July 1, 2008, there were no Class B and C LLW disposal facilities available to many US states until 2012 when Waste Control Specialists (WCS) disposal facility was opened. Many generators from those US states outside the compact were forced to safely store Class B and C LLW in interim storage. This event resulted in a dramatic decrease of radioactive waste transportation needs consequently reducing demand

for Type B transport casks. By October 1, 2008 the vast majority of previously certified and used Type B LLRW transport casks, such as 3-55B, 3-82B, FSV-1, 1-13C and 1-13G and 10-142B were retired, because their Certificates of Compliance (CoC's) had expired and could no longer be renewed. In order to fabricate new Type B casks (under effective CoC) and to comply with the latest international regulations for Type B transport packages, all Type B casks that remained in service had to be upgraded to 1996 edition of IAEA Transport Regulations with designation "-96". This upgrade resulted in the loss of radiological payload capacity for some of the Type B packages. In 2011, EnergySolutions and Studsvik partnered to process resins, Semprasafe, which significantly increased the Type B cask transport. In early 2012, when WCS facility opened accepting Class A, B and C LLRW, demand for Type B LLRW transport casks increased tremendously. In response to the Type B cask shortage crisis, the Company added to its fleet two additional 8-120B casks formerly owned by Studsvik and started fabrication of an additional 5 casks (four 8-120B's and one 3-60B) essentially doubling the Type B LLRW transport cask fleet. During the fabrication process of 8-120B casks the Company faced several issues that were captured in lessons learned. Also, due to increased cask fleet there were additional challenges during day to day cask operations which resulted in introduction of continuous improvement efforts in order to increase efficiency of operations and customers satisfaction.

ENERGYSOLUTIONS CASK INVENTORY (IN 2015)

- DOT 7A Type A casks – 80 units including 6-80-2, 8-120A, 10-142A, 14-170, 14-190, 14-195, 14-210, 14-215 and 21-300 casks models
- Type B Packages – 11 units (including 8-120B, 10-160B, 3-60B and PAS-1 cask models)
- IP-1 Packages - 4 units (including 18-450, 27-415 and IP-1 TCT cask models)

CHALLENGES AND LESSONS LEARNED FROM MANUFACTURING OF 8-120B CASKS

In 2012, the Company placed an order for fabrication of four (4) 8-120B casks developed by EnergySolutions predecessor and approved by NRC back in 1980's. Due to multiple issues encountered during fabrication, these casks were not delivered until late 2014. One of the four new 8-120B casks was found to be out of compliance due to the inner cavity height of the cask being shorter than specified in the cask Certificate of Compliance (CofC). As result of this, there were several lessons learned from fabrication process of legacy casks as discussed below.

8-120B cask design is a legacy design which was approved by Nuclear Regulatory Commission (NRC) back in 1980's. The first four 8-120B's were built in late 1980's and 90's. Throughout the early 8-120B cask licensing life, there were several licensing updates made to this legacy package which, in several ways, affected its design and fabricability. Based on the latest 10CFR71 requirements for existing Type B packages; international regulations (1996 edition of IAEA TS-R-01[1]) needed to extend the licensing life of casks in use; and, to allow the fabrication of new packages of the same design, the process for upgrading all Type B casks to the "-96" designation had to be completed. In order to meet these new standards, some of the critical components of the casks in service had to be redesigned. Additional fabrication and acceptance criteria requirements were applied due to new regulations, standards and/or practices associated with these casks. The Company identified the following lessons learned and improvements to the package fabrication process:

- If new cask is fabricated from a legacy cask design, all applicable cask engineering specifications and drawings must be reviewed and modified as necessary based on the latest standards and regulatory requirements, current practices and applicable acceptance criteria. This activity shall be preplanned due to the fact that potential modifications may require submission of an amendment request to the cask CoC, in effect.
- Selected manufacturer shall possess knowledge and expertise associated with fabrication of similar packages. All provided fabrication drawings and specifications shall be thoroughly reviewed by fabricator and cask designer to ensure that all potential gaps related to fabrication of a cask are covered. Fabrication maps (travelers) must be reviewed with special care as well as dimensional tolerance stack up, lead pour process, requirements for gasket sitting surface requirements.
- Build a pilot cask unit and work out all the fabrication issues on this cask unit before fabricating others. Upon successful pilot cask unit factory acceptance tests and lessons learned applied, fabrication of other casks will be smoother.
- Build casks within limited time period while human resource expertise at the fabrication facility is still available.
- Experienced QC support familiar with cask operations shall be available at fabricators facility. Project/Engineering Management shall be closely involved in fabrication to track fabrication progress points. Factory acceptance programs shall be developed and carried out with input from operations.

- Upon completion of fabrication, capture all lessons learned, modify specifications/drawing packages as necessary and ensure that this information is available to successors.

Note: These lessons learned were implemented before/during 3-60B cask fabrication process which resulted in successful fabrication/delivery of this cask.

OPERATIONAL EXPERIENCE

Since LLRW casks are passive systems, required maintenance is essentially limited to the periodic inspections, maintenance of mechanical components, seals changes, load tests and non-destructive testing/examination. Some of casks are refurbished periodically (sanding of external surfaces and painting). There are several typical cask issues that will require removal from service for the repairs. One of the most common issues is backing out of threaded inserts from closure bolt holes due to usage of improper tools during installation and removal of bolts. Degradation of the tack weld holding threaded inserts in place (See Figure 1 below) also leads to the threaded inserts backing out of the closure bolt hole. Even though the cask must return to a shop for the repair, this type of repair is typical and requires minimum cask down time.



Figure 1: Heli-Coil Threaded Insert backed out from closure bolt hole on 8-120B cask

In rare cases, cask components may be severely damaged requiring the preparation of specific plans for repair which may include preparation of repair procedures, ordering of special repair parts and tools and mock up testing. One example of severe damage due to improper use that occurred recently is the damage of the closure bolt holes. This event occurred in 2015, when an 8-120B cask primary lid was lifted with one engaged bolt between the lid and the cask body. Both bolt threads and inserts were stripped, bolt was severely bent and the bolt hole was deformed (see Figure 2)



Figure 2: Damaged closure bolt (left) and deformed bolt hole (right) on a 8-120B cask

In the cask trailer's tool box, the Company provides the equipment to perform pre-shipment leak tests (including the test manifold and gauge). Because casks may travel from one site to another before returning to a maintenance facility for inspection, this equipment maybe subjected to excessive use and often damage requiring unplanned service and/or replacement.

MAINTENANCE FACILITY

The Company cask and cask trailer maintenance work is performed at the Barnwell Logistics Facility (BLF) collocated with Barnwell Disposal Facility (Barnwell, SC). The facility (Figure 3) was recently renovated to accommodate the repair of casks, in addition to the cask trailers that have been repaired in this shop for over 25 years. Full cask maintenance operations started on December 1, 2015. The facility adapted a lot of safety features as a result of internal and external safety audits performed earlier in 2015. In addition, limited cask and trailer maintenance is performed at satellite locations located at the Company Bear Creek (TN) and Clive (UT) facilities.



Figure 3: Barnwell Logistics Facility located in Barnwell, SC

Typical maintenance activities performed at the Barnwell Logistics Facility include (but not limited) to:

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- Maintenance of the cask components (fasteners, ratchet binders, tie-downs)
- Maintenance of trailers (mechanical and electrical work)
- Refurbishment of the cask and trailers (sanding, painting)
- Replacement of cask components with minor and medium weld repairs
- Cask gasket inspection, replacement and annual leak tests
- Load tests of lifting attachment of the casks and components
- Non-destructive testing/examinations

LICENSING UPDATE FOR ENERYSOLUTIONS TYPE (B) PACKAGES IN 2015

Following are licensing developments and updates associated with *EnergySolutions* Type B packages in 2015, including associated notifications to the affected cask users as required by 10CFR71.95.

8-120B Cask (CoC USA/9168/B (U)-96)

a) CoC Rev.21

In order to envelop the as-built internal cavity length of recently fabricated 8-120B cask found out of compliance, the Company submitted an Amendment request for relaxing the negative tolerance of the 8-120B cask internal cavity height dimension. The Amendment request was submitted on February 19, 2015 and NRC granted CoC, Rev.21 on April 8, 2015.

b) CoC Rev. 22

The Company submitted CoC, Rev. 21 amendment request on September 16, 2015 to include cladding tubes in 8-120B the secondary lids as part of authorized configuration. CoC, Rev. 22 was granted by NRC on September 23, 2015. This revision of the CoC allows 8-120B cask units with the secondary lid test port cladding tube to be used for Type B shipments. This event required submission of notifications to affected users based on the requirements 10CFR 71.95.

c) Planned Amendments (short and long term).

Short term: Make minor Safety Analysis Report (SAR) revisions based on internal and external comments, add and define gross dewatered resins as one of authorized payloads. Provide clarification in the pre-shipment leak test

requirements section. This amendment request is expected to be submitted in Spring 2016.

Long Term: Based on comments received from NRC for the *EnergySolutions* Amendment Request for CofC, Rev. 21 (application was later temporarily withdrawn by the Company), the Company is planning to submit a new amendment request to authorize additional payload specifications by introducing a family of shielded inserts for 8-120B cask for Type B shipments. This amendment request is expected to be submitted in 2016.

10-160B cask (USA/9204/B(U)F-96)

Rev. 22 of CofC was authorized via timely renewal process on August 14, 2015 with expiration date of October 31, 2020. No planned Amendment request for this CofC is expected at this time.

3-60B cask (USA/9321/B(U)-96)

Rev. 2 of CofC USA/9321/B(U)-96 was authorized via timely renewal process on September 30, 2015 with expiration date of September 30, 2020. No planned Amendment request for this CofC is expected at this time.

10 CFR 71.95 notifications made to the cask users for 8-120B cask in 2015

- a) Failure to Observe Certificate of Compliance Conditions for the 8-120B Vent Port Pre-Shipment Leak Test

During the vent port seal pre-shipment leak rate test, a neoprene gasket that was added under the test manifold may have reduced the test sensitivity below the required value. The leak test manifold and gasket are not licensed packaging components. The gasket was added to the leak test manifold on some or all shipments to more reliably seal the manifold, saving test time and reducing personnel exposures. The amount of reduction of the test sensitivity could not be established, therefore, conservatively, the Company made notifications to the affected users on June 24, 2015.

- b) Failure to Observe Certificate of Compliance Conditions for the 8-120B Secondary Lid Test Port Configuration

It was identified that four of the 8-120B casks did not comply with the approved SAR drawings referenced by the effective revision of the Certificate of Compliance 9168 (CofC). The secondary lids on the subject casks were fabricated with a

cladding tube inside the test port hole, but the tube was not shown on the SAR drawing referenced by the CofC. The purpose of the secondary lid test port tube is to isolate the pre-shipment test volume from the interspace between the two 3 1/4" thick plates that make up the secondary lid. The Company made associated notifications to affected users on September 21, 2015.

STRATEGIC DIRECTION FOR IMPROVEMENT OF THE CASK OPERATIONS

Starting in 2014, the Company identified several strategic directions for improvement of cask logistics operations and user experience. The following activities are continuously evaluated, improved and/or performed to ensure the effectiveness of operations and customer satisfaction:

- Purchase of new trailers for Type (A) and Type (B) casks or complete refurbishment of the existing trailers (body, mechanical and electrical components)
- Introduction of new casks into fleet and refurbishment of the existing casks in the fleet
- Improve Quality Control inspection for outgoing casks from BLF
- Purchase new cask ancillary components and ensure existing inventory is readily available (ratchet binders, gauges, manifolds, fasteners)
- Continuously evaluate and improve of procedure based on the latest regulatory/standards requirements, industry practices and customer's comments
- Improve user-friendliness of Type B cask pre-shipment leak tests in accordance with new revision of ANSI N 14.5
- Establish EnergySolutions Web based Customer Portal which provides access to the following essential documentations:
 - Cask Manuals which includes cask related procedures
 - Safety Analysis Reports and Certificates of Compliance
 - Technical Bulletins
 - Position Papers
 - Newsletters on significant developments/events distributed to the cask users.

- Provide users with Payload Qualification Verification Support for Type B packages

CONCLUSION

EnergySolutions is in the process of continuous improvement of their cask operations associated with growing needs for the transportation of LLRW. There were several lessons learned from the fabrication of new casks (8-120B cask) which were introduced to the fleet in late 2014. Lessons learned captured the need to perform a detail engineering review of legacy package designs to ensure compliance with the latest regulations, standards and practices. Specific attention shall be given to the review of fabrication drawings and manufacturing processes. Also, availability of qualified/experienced fabricators is essential part of successful fabrication. These lessons learned were successfully implemented during fabrication of 3-60B cask delivered in Spring 2015. The Company is proactively implementing strategic direction improvements which will translate into improved user satisfaction and effectiveness of cask operations.

REFERENCES

1. 'IAEA Safety Standards Series: Regulations for the Safe Transport of Radioactive Material,' 1996 Edition, No. TS-R-1.