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Transport of Small Quantities of Irradiated Materials: Flying Pig Concept Update

Vanessa LALOY

AREVA TN, Saint Quentin en Yvelines, FR

Fabien HUE

AREVA TN, Saint Quentin en Yvelines, FR

Abstract

Over the past years, the demand for a cost-effective and flexible solution to transport small quantities of irradiated material for research purposes has been continuously increasing. However, there was no small and low cost transport solution available on the market to carry out this task.

In this context, a specific Working Group through the organization HOTLAB(1) with different international laboratories, was created to investigate such transport challenges and to develop specifications for a new transport cask. Taking into account prior experiences and feedback of existing casks on the market, the Working Group was able to define the main principles of a new cask optimized for hot lab needs.

Hence, the Flying Pig project was initiated by some of the HOTLAB members and AREVA TN.

The purpose of this article is to share the work accomplished since 2009 by AREVA TN on a new air type B(U) cask: the "Flying Pig." The main goal of this cask is to transport small quantities of irradiated material between hot labs all over the world.

The article will focus on the most important characteristics of this B(U) cask such as transport means allowed, operability, contents allowed, dimensions and mass... The main milestones to come will be presented.

Introduction

In order to optimize cooperation between worldwide hot labs, collaboration on the international transfer of radioactive research material was started few years ago by some hot labs assisted by industrial companies, authorities, and transport organizations. During the last 3 years, the main principles of a new cask optimized for HOTLAB specifications have

been determined, taking into account prior experiences and feedback of existing casks on the market. AREVA TN was selected by HOTLAB members to design, license and manufacture this new cask.

1. Presentation of the Project

A few years ago, HOTLAB issued a call for proposal for a cost-effective and flexible solution to transport small quantities of irradiated material throughout the world.

AREVA TN was selected by HOTLAB to design, license and manufacture a new air B(U) cask, the Flying Pig.

Why this curious name? The transfer casks used by the labs are called “Pigs” because the front of the package looks like a pig head with a cylindrical body and 3 holes. HOTLAB added “Flying” as they needed a cask able to be shipped by air!

AREVA TN is developing the following activities for the cask, which will be proposed for leasing to the lab customers, in close cooperation with HOTLAB members:

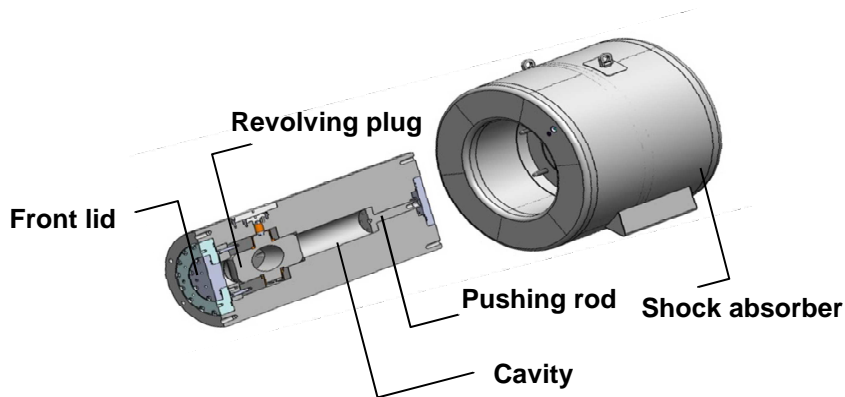
- Design of the cask
- Manufacturing
- Certifications:
 - French Competent Authority (FCA)
 - ADR (Accord for dangerous goods by road) signatory countries
 - United States Competent Authority
- Fleet management including maintenance and storage

2. Technical Aspects of Cask

In order to propose a cost-effective solution, several improvements were studied, the most interesting of which are the following:

- Body welding-free (to improve manufacturing and maintenance process)
- Manufacturing procedure of the revolving plug in the cavity fully redefined
- Types of wood for the shock-absorbers reduced to only one (to improve manufacturing procedure)

These improvements in manufacturing are to have no impact on the operability or safety of the cask.



Overall dimensions

- Diameter 900 mm
- Length 1,500 mm

Cavity (inner dimensions)

- Diameter 150 mm
- Length 300 mm

Weight

- ~2.6t

3. Operability and Interface

The Flying Pig will have operability very similar to that of the AREVA TN TN®106, which is well known to laboratories users:

- More than 200 shipments since 2001
- Easy operability
- Revolving plug easy to use during loading and unloading procedures
- Similar to TN®106: direct contact with the hot cell
- Loading and unloading in vertical and horizontal position

The Flying Pig will be equipped with a specific transport and handling frame (cylindrical body without base plate) and 4 screwed lifting lugs for handling operations.

4. Contents Allowed

A large range of materials will be allowed:

- Irradiated pellets
- Fuel rod sections
- Fuel plates sections
- Metal samples
- Sources (sealed and non sealed)
- Radiolyzable material
- Etc.

Various chemical forms for the radioactive materials and for the non-radioactive materials will also be allowed:

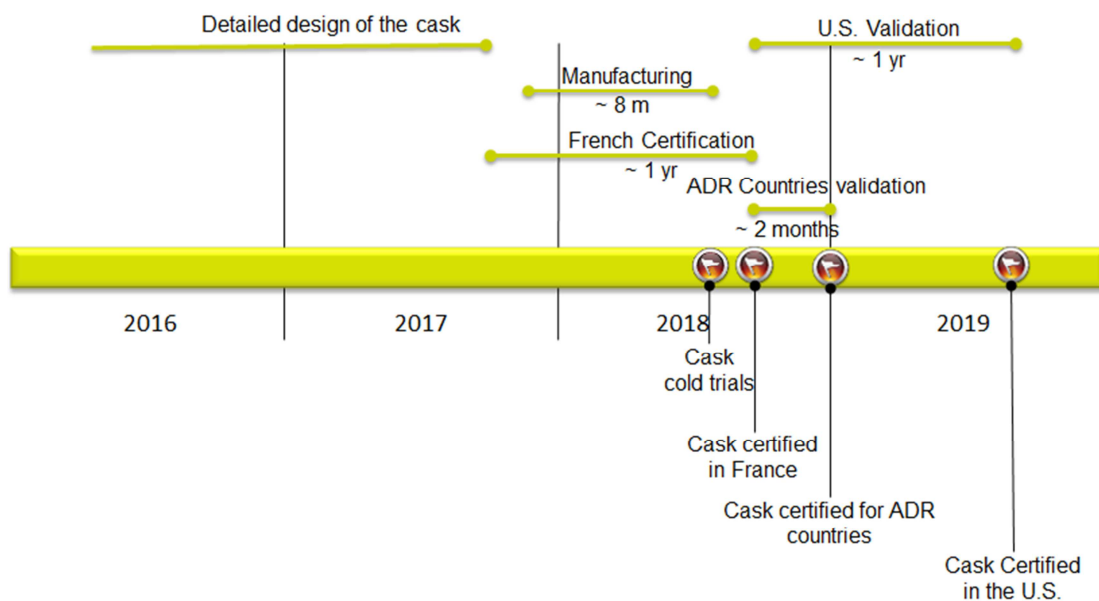
- Metal, oxide, carbide, nitride form or mixtures with Si, Yr, Al...
- Mass of fissile material in conformity with materials listed in IAEA SSR-6 2012 Edition §417 e) (fissile excepted) and 674 a) to c) (fissile)

The limits for the radioactive content and its conditioning are to be:

- Gross weight: 10 kilograms
- Internal dimensions: (width) 150 millimeters x (length) 300 millimeters
- Thermal power: 10 Watts

AREVA TN will use an inequality system of loading for the Flying Pig certificate of approval. The user will then have the possibility of evaluating what can be transported or not according to the isotopes or energy spectrum of the contents.

5. Schedule



This schedule includes road, rail, maritime and air certifications.

6. Conclusions

The “so called” Flying Pig is an innovative transport cask solution: flexible, versatile, and the first one which will be authorized for air transport for such material.

The design process of the Flying Pig is currently scheduled to be completed in 2017. In parallel, the manufacturing of the cask and receipt of the French Competent Authority approval will be completed by the end of 2018.

After that, we can let the “Pig” fly!!!!

7. References

(1) HOTLABS website, <http://hotlab.sckcen.be/en>