GLOVEBOX WITHDRAWALS TO HERMETICALLY SEALED CANISTERS (U)

by
J. A. Purcell
Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

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JUNE, 1993

by

J. A. Purcell

Westinghouse Savannah River Company
Aiken, SC 29802

ABSTRACT

Since the advent of gloveboxes, bagouts have been used to maintain complete containment of materials removed from the gloveboxes. In this operation, materials are pushed from within the box into a plastic bag attached to a bagport and the bag is then sealed and cut away from the bag stub which is left on the port.

Another system uses canisters which are sealed to a transfer port on the glovebox. In this system, the canister body is sealed to the fixed port while the canister cover is sealed to an inward swinging door on the glovebox in a manner that avoids contaminating outer surfaces of either closure.

The systems above use plastic or elastomer seals to provide short term high integrity containment. For long term containment (over 50 years) of certain materials, use of plastic and elastomer seals is unsatisfactory. These highly toxic and radioactive materials must be transferred directly from inert gloveboxes to metal canisters which must be sealed before separation from glovebox containment. This paper reviews several concepts which are under development. These concepts utilize a sphincter for mating the canister to the glovebox and various plans are used to seal a closure on the canister while sealed to the glovebox.
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MAGNEFORMED CLOSURE

In an early application of magneforming, an aluminum can was taped in the end of a glovebox bag; the can was loaded with powder inside the box and closure accomplished by magneforming a two-piece plug in the can. By cutting through the can wall at the adhesive-bonded interface between parts of the two-piece plug, the can, with outer surfaces kept clean, was separated from the glovebox. In this procedure the plastic bag served the same function as the sphincter shown in Figure 1.
MAGNEFORMED CLOSURE (Cont'd)

A proposal has been considered for enhancing glovebox withdrawals into magneformed cans by use of a sphincter to seal cans to the box. This method is described in Figure 1. Note that the upper section of the can is left with the top section of the plug in the sphincter to be displaced inward when another can is inserted. Magneforming works much better for aluminum than for stainless steel. A "driver", consisting of an outer aluminum sleeve, is recommended for use with stainless steel parts.

A magneformed closure leaves contamination at the interface between can wall and plug and does not provide a hermetic seal. It does, however, provide an adequate seal to permit canister separation from the glovebox and allows for subsequent welding to fix any loose contamination. Contamination at the weld can be reduced as required by decontamination and/or machining a V-groove at the plug-to-can interface.

TAPERED PLUG CLOSURE

A variation in tightly fitted 2-piece closures as described previously has been tested with a tapered 2-piece plug. In this plan, the closure area of the can and the 2-piece plug are formed with a Morse taper. While still in the sphincter, the plug is pressed into the loaded can for a very tight fit. A one-piece hollow plug may be used instead of the 2-piece adhesive bonded plug. This requires cutting through walls of both can and plug to separate can from glovebox.

As in the magneformed closure, contamination remains in the plug-to-can interface. Again, this may be cleaned and fixed by welding to provide a hermetic seal as for the magneformed closure.

IN-PLACE WELDED CLOSURES

Hermetically sealed closures may be achieved before separating cans from the glovebox by in-place welding to fuse the can wall to a hollow plug. See Figure 2. A retractable automatic TIG welder as used for pipe fuses the metal interfaces in the area to be cut. For stainless steel closures, very careful control of current and rotational speed is required to achieve a 360° closure. By grooving the outer can wall in the weld bead area, current level can be reduced to minimize heat distortion of the stainless steel can. Heat distortion will result in incomplete closure and excessive heat can cause blowout through the can wall.
IN-PLACE LASER WELDED CLOSURES

A can closure system has been developed for the Thorp Plant in England using a laser to fuse the metal interface between can and hollow plug. This procedure is very similar to methods described in foregoing sections. See Figure 3.

RETROFITTING EXISTING GLOVEBOXES

For retrofitting existing gloveboxes with any of these systems, the best approach appears to attach a "blister" at an existing enclosure panel.

Accurately placed positioning stops must be provided in designs to assure proper fit-up, sealing and cutting of components.

SHIPPING GRADE RADIOACTIVE CONTAINERS

To date, no effort has been made to qualify the containers discussed here as the primary container for Type B radioactive shipments. The following enhancements are suggested to meet DOT requirements for a Spec. 2R type container.

• Use schedule 40, 5 in. diameter pipe with welded pipe cap for container body.

• Machine groove in outer body of container at area of fusion weld.

• Weld a secondary cap on the container after parting from glovebox to meet ASME weld specifications.

• Provide cooling method to prevent overheating sphincter during welding of pipe.

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1. CAN IN RECEIVING POSITION

2. CAN WITH PLUG READY FOR MAGNEFORMING

3. MAGNEFORMED CAN IN PLUG SHEARING POSITION

4. LOADED CAN SEPARATED FROM GLOVEBOX

DIRECT GLOVEBOX WITHDRAWAL TO MAGNEFORMED CANS

FIGURE 1
Figure 2

GLOVEBOX WITHDRAWAL TO WELDED CAN
1 Intermediate package in place in sphincter

2 Inner package inserted

3 Hollow bung inserted

4 Intermediate package parted in cut and seal operation

THORP PLUTONIUM PACKAGING SYSTEM

Figure 3