Cylinder Deliveries In ERCV's

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ERCVs (Emergency Response Containment Vessels) were not designed for routine cylinder deliveries. They were designed to quickly and safely isolate a leaking cylinder for transport to a disposal facility. (See Emergency Response Containment Vessel) While they are expensive and difficult to use routinely there were a few locations worldwide that required delivery of metal hydride gas cylinders contained in ERCVs or have one available on the cylinder delivery vehicle. Metal hydride gases are the simplest form of the metal reduced. Arsenic – arsine, phosphorus – phosphine, boron – diborane and are highly toxic as well as flammable

1. Tempe, AZ for arsine and phosphine cylinders, 1996
2. Singapore for arsine and phosphine cylinders, 1999 - 2003
3. Japan for hydrogen selenide delivery in 2007

These requirements were not based on any incidents or science, it was just the fear that the cylinder could develop a leak during transportation.

These practices were not followed anywhere else in the world where considerable amounts of these gases were transported and handled. Acute exposures to these gases were typically from returned cylinders where the user has not properly tightened the valve and vaportight outlet cap.

Testing has shown that a diaphragm valve can loosen if the cylinder is not properly secured and it is physically impacted repeatedly during transportation. (see Asiafreighter Arsine Incident) As a best practice gas suppliers wire tie the valve handwheel shut.

Of all of these, Singapore had the most extensive requirements

Singapore

When arsine and phosphine were first approved for use in Singapore, the government had extensive requirements for the delivery since they had no experience with these highly toxic gases. Only one cylinder could be transported at a time in specially designed ERCV that was further enclosed in a fireproof cabinet

Fig. 1: ERCV in a Fire Proof Enclosure

The delivery truck with the Fire Proof Enclosed ERCV was in the middle of a parade of vehicles. It was led by 2 motorcycle policemen, followed by a SCDF ER Vehicle, the truck and then the gas supplier ER Vehicle!

Fig. 2: Vehicles and Teams Preparing for Delivery at Gas Supplier

I provided 2 years of training and discussion on how arsine and phosphine cylinders are handled worldwide as well as what safeguards are in place. As a result, these requirements were suspended in 2001.

Tempe, AZ

In 1998 when a new MOCVD facility in Tempe, AZ was permitted there was a requirement that all arsine and phosphine cylinders be delivered in an ERCV. The user purchased 6 ERCV's that were stored at the gas supplier's facility. This was done until the closure of the facility in 2006.

Japan

Delivery of hydrogen selenide cylinders had to be in a truck with the cylinders in a metal cabinet and a ERCV in the truck

All of these were transported without any issues. Currently there are no requirements for shipment in ERCV's.

Leaks during transport of ESG cylinders is extremely rare and if they are to occur will be minor. The ERCV provides little to no benefit.

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