

# SAFETY NOTICE

## IsoVac Report Number R - 4111

### Krypton85 Leak Detection Systems “Training”, Service/Maintenance” & Decommissioning”

It is repeatedly coming to IsoVac attention that there exists a serious deficiency in the use, maintenance, safety credibility, and ultimate decommissioning and disposal of the Krypton85 gas handling systems used for many years for leak detection purposes. IsoVac was founded in 1969, and has continuously engaged only in the fields of design, manufacture, installation & training, maintenance, technical support and disposal of these machines. There have been several other manufacturers enter and leave our specific industry. They have manufactured and sold many pieces of Krypton85 leak detection equipment and then abandoned them, leaving their industry with no support or guidance for the use of that equipment. IsoVac is continuously receiving calls from individuals who have been left without such support. Endless errors are discovered, that went undetected, because of inexperience, lack of training, lack of maintenance, or misdiagnosed equipment malfunctions.

There are three dominant trade names for these machines:

1. The **Radiflo®** Kr85 leak detection systems: Manufactured by **IsoVac Engineering, Inc.**
2. The **TracerFlo** Kr85 leak detection systems: Manufactured by **TrioTech International**
3. The **InterTest** Kr85 leak detection system: Manufactured by **InterTest**

Pieces of Kr85 handling equipment are being shut down and improperly disposed of through lack of understanding on the part of the users, and lack of understanding and policing by the Regulatory Agencies. Once these Kr85 leak detection machines have been in operation for more than a few months, the *internal parts of the machines*, (both plastics and metal parts), *become permanently impregnated with Kr85 gas*. IsoVac brought that problem to the attention of the NRC several years ago. They investigated the problem, witnessed the dismantling and cut-up of one of these machines, and verified that some of the internal parts probably cannot be decontaminated, and must be buried. The NRC issued a report on the investigation, as well as a NOTICE, which was sent out to all licensees. That notice does not seem to have been clearly understood, or, perhaps has not been adhered to.

### **THERE ARE THREE SPECIFIC SUBJECTS TO ADDRESS**

#### **- Equipment maintenance requirements -**

The normal operation of a Krypton85 leak detection system requires the gases to be pumped through vacuum pumps and a compressor, (both of which contain oil). Kr85 gas mixture being pumped through those items carries oil vapors throughout the machine. The gas handling system requires the use of solenoid valves which use o-ring and rubber plunger-seals. In the presence of Kr85, both the oil and rubber materials are decomposed until the rubber surface hardens, and the rubber becomes ‘mushy’ underneath. The hardened rubber surfaces will eventually prevent the valves from

sealing properly, and the hard rubber surface will ultimately break through into the semi-liquefied rubber underneath, thus causing the pressurized Kr85 gas mixture to leak through the valves, or to the outside. The chemical breakdown of the rubber and oils will also release acidic material into the system which is easily detected by the copper-sulfate, (green corrosive buildup), inside the brass valves, which in turn corrodes and destroys the valve seating surfaces, and builds up solids which will eventually plug the plumbing.

Our forty years of research and application of these machines internationally, has established that the rubber valve seals should be changed at least annually, and in high concentration/high usage machines it is proper to replace the rubber seals semi-annually. It has been found that the oils should also be changed annually, as the oil will otherwise become so thick that it will cause the pump and compressor motors to fail. It has also been well established that the higher the Kr85 concentration, the more rapid the deterioration of the organic materials within the system.

It should be noted that the most vulnerable parts of these machines are in the "high-pressure" side of the machine plumbing system. That zone is also classified as the "Hot-side" of the machine, and should never be entered by anyone who has not been well trained and certified to work in that area.

### **- Training -**

The personnel working with these machines are classified as "HAZMAT-WORKERS". Under the DOT Regulations "49 CFR 172.704", all HAZMAT workers must receive 'recurrent-training' at least once every two years. We find that rule to be ignored in most of the companies who call IsoVac for help or guidance, using the excuse that "it is not stated as a requirement in their license", or "they are never inspected for that".

The companies do not address the fact that, for their own protection, they should see that the individuals working with radioactive materials are trained every two years in compliance with DOT regulations.

The result of poor training, or lack of training, is that the individuals handling Kr85 in many of these companies should not be handling the isotope, and they are often not "professionally-trained and certified" in the operation and maintenance of the Kr85 gas handling systems they use. This is known to result in numerous 'detected' mistakes, and certainly others not recognized at all.

Individuals who have not been properly trained in the operation and maintenance of these machines are found to be working in "Hot-zones" of the machines, without recognition of the radiation exposures they likely receive. They often discard the rubber valve seals into the trash after replacement with new ones, and the oils into oil recycle bins after replacement. A single compressor can retain as much as 0.6 to one curie of Kr85 dissolved in the oil. Valve seals from a high concentration Kr85 leak detection system have been seen to contain 10 - 20  $\mu\text{Ci}$ , (after removal), and contain as much as 8  $\mu\text{Ci}$ , ten years later. (After removal, they are now an "unsealed-source").

These leak detection systems are very complex "logic-controlled", "high-pressure", "radioactive-gas handling-systems". They are extremely "model-specific", requiring the

individuals training operators and technicians to be specialists in the technology associated with that specific piece of equipment. The systems are required to satisfy US Boiler-Codes, (with special AEC required deviations), operate under the NRC Codes for safe handling of isotopes, be fully documented and approved by the State or Regulatory Agency where they are manufactured, and follow the format of the "Device Registry" published for each specific model. Training for the use and operation of such a device should be just as specific.

## **- Decommissioning -**

The NRC Rules require "Decommissioning" to be handled properly, and have even required a "Bond" to be set up for the proper decommissioning of radioactive materials, under NRC 10 CFR 30.35, (1990). Additionally, the NRC has investigated the Kr85 problem further, where it was found that improper decommissioning prevailed, and has even witnessed the entire dismantling, seen the maximum limits of deactivation and produced a very comprehensive technical report on the findings of that investigation. That report bears the Report Number 030-05097/96001 (DNMS). Subsequent to the release of that report, an NRC Information Notice 96-51 "RESIDUAL CONTAMINATION REMAINING IN KRYPTON-85 HANDLING SYSTEMS AFTER VENTING, was released.

In spite of the above actions, it has come to the attention of IsoVac, that improper decommissioning is taking place. It is IsoVac intention to attempt to make the regulatory agencies aware that through ignorance on the part of the licensee, and lack of experience on the part of the inspection agencies, Kr85 gas handling devices, (such as the Kr85 leak detectors), are being released into the hands of unlicensed persons, who unknowingly are possessing these devices and either using them or re-selling them to others who are being exposed to Kr85 gas from the operation of those devices.

Since the devices are manufactured by companies who build them to the requirements of the US Boiler Codes for 'Pressure Vessels', as well as the Rules set by the Regulatory Agencies for radioactive material handling equipment, these machines should never be resold by someone not licensed to manufacture them, as that person cannot re-certify them to safety standards. The pressure vessels are imbedded in lead shielding and cannot be x-ray'd to evaluate the welds, or even properly pressure tested.

There are very specific procedures for the proper decommissioning and disposal of these machines. IsoVac engages in that effort on a regular basis. It is extremely labor-intense, and therefore costly. However, it is required to provide public health & safety. It is a rule that anything over 100 $\mu$ Ci of Krypton85 is a "Licensable Quantity" and requires a "Byproduct Materials License" to posses it. IsoVac has dismantled, deactivated and disposed of dozens of these machines, and they all contained from 500-850 millicuries of Kr85 gas residues. It is also illegal to release any 'Licensable Quantity of any radioactive material to an "Unlicensed receiver".