SHARS

A Shared Solution for Risky Radioactive Sources

by Jan-Marie Potier and Mohamed Al-Mughrabi

A mobile 'hot cell' helps countries secure and safely store used highly radioactive sources.

The concern over possible malicious use of radioactive material and its associated consequences for the population and the environment has risen significantly over the last few years. Stories relating to nuclear safety and security regularly make the headlines on the world's media, and governments and the public alike have certainly become more receptive to the issue of securing radioactive materials wherever these might be. It is no surprise, then, that this rising concern has been accompanied by a parallel global trend towards increased control, accounting and security of radioactive sources.

However, while securing radioactive sources remains a priority for all of the world's governments, rich or poor, the reality in the field is rather different. The procedure to secure spent sources, or indeed any other radioactive material, often requires the use of highly-expensive, specialised facilities that are only available in developed countries. This is an issue that the IAEA has been looking at for quite sometime now.

Spent High Activity Radioactive Sources (SHARS) are usually cobalt-60 or caesium-137 sources used in teletherapy devices and irradiators and strontium-90 used in radioisotope thermoelectric generators.

The concept of a mobile unit for the conditioning of Spent High Activity Radioactive Sources (SHARS) was conceived by the IAEA Technology Support Unit in 2003. In its essence, this concept consisted of a mobile hot cell and storage container for the recovery, conditioning and packaging of SHARS. The unit would allow engineers and technicians to conduct their work in those countries that lack the facilities to process radioactive sources. This means that sources can be treated in the part of the world where they were last used.

Still on the drawing board only months ago, the mobile hot cell concept has finally become a reality. Funds from the IAEA Nuclear Security Fund were made available to develop and manufacture the mobile unit. The first SHARS unit was manufactured and tested by the Nuclear Energy Corporation of South Africa (Nesca) in March 2007.

Testing the mobile hot cell

The SHARS installation built by Nesca was used for a pilot operation from 12-16 March 2007 in South Africa. The technology's debut was a success, paving the way for fur-

The IAEA's concept for a mobile 'hot cell' was set up and tested in South Africa.

Photo: M. Al-Mughrabi

ther exploratory applications before the end of 2007. In fact, the experiment carried out in South Africa completes phase II and III of the project and allows for the first utilization of the SHARS unit in other African countries.

During the cold demonstration, a dummy source was used to go through the complete process: from recovery, welding and leak testing — through final placement into the long-term storage shield (LTSS). This was followed by the recovery of a source with an activity of 2120 Ci from its working shield, testing the source for any leakage, encapsulation and placement in the LTSS.

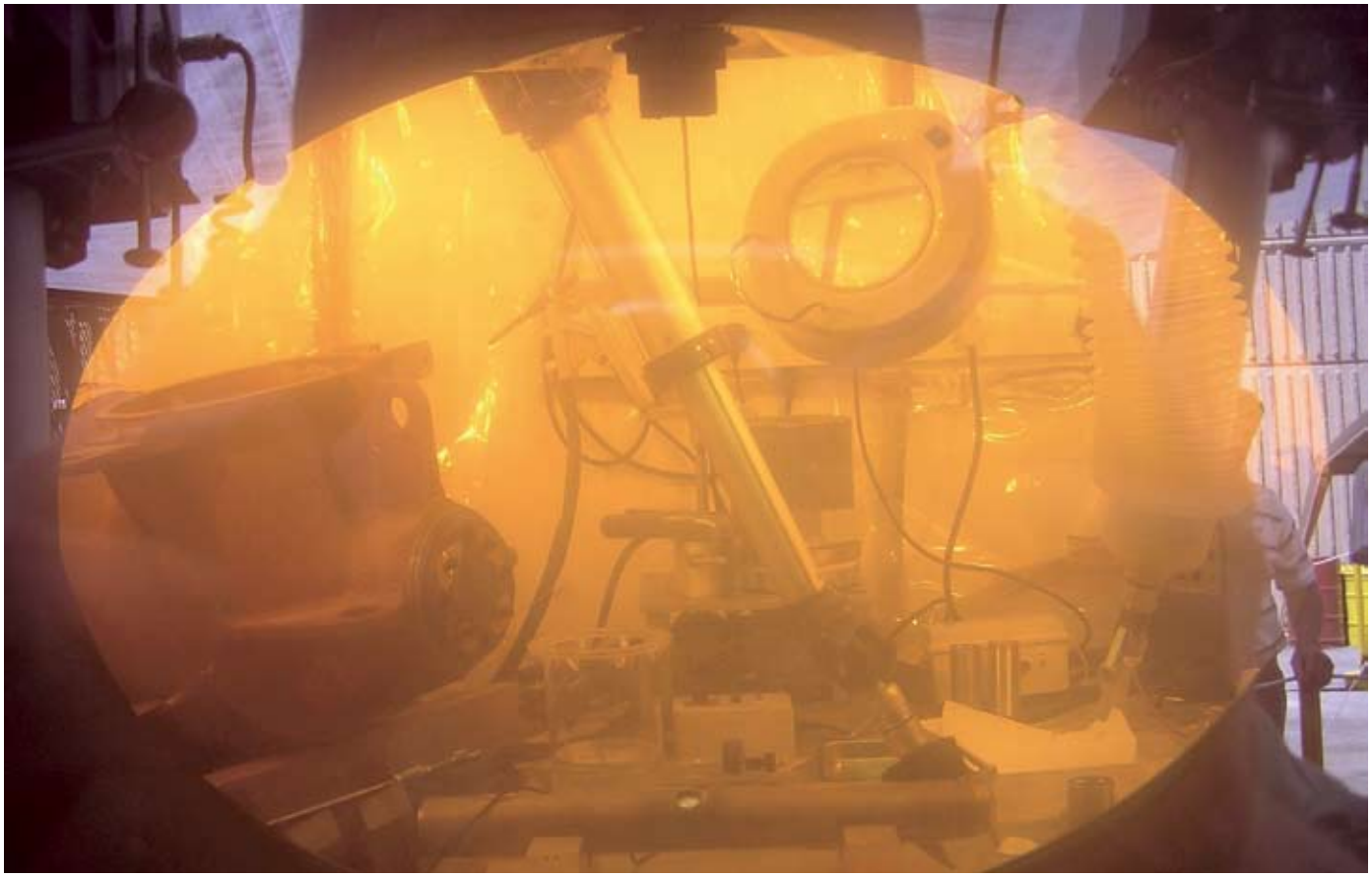
During this demonstration the source was placed against all four walls of the hot cell and dose rate measurements were taken from outside the cell in various positions. The dose rates were found to be within values deemed acceptable according to international norms. In addition, dose rate measurements were taken during the source transfer from the source drawer to the LTSS located outside the hot cell. These also proved to be acceptable and within norms.

The mobile hot cell pilot operation in South Africa was observed by an international peer review team of experts from the UK, the USA, Belgium, Sudan and Tanzania. The peer review report concluded that the design is adequate to recover, handle and condition sealed high activity sources in countries that do not have facilities for such operations.

The technical demonstration also established that the NECSA team is fully qualified to safely perform the required operations with the conditioning SHARS installation. The SHARS unit has been licensed by the Department of Health of the Government of South Africa for the pilot operation.

Some big strides

The technical success achieved with the South African demonstration has made it possible for the inauguration of a new phase in the development of the SHARS unit. Soon, the NECSA team will deploy the hot cell in other African countries to manage disused sources that cannot be repatriated. Over a dozen African countries have already expressed interest in having their sources recovered, conditioned and secured. An expansion of the project in Asia and Latin America is planned for the future.



A close look at some components of the mobile 'hot cell'.

Photos: M. Al-Mughrabi

Several countries have already expressed an interest in the development of a similar regional infrastructure to help solve the problem associated with disused sealed radioactive sources. With international support, most problems associated with high activity sources could be solved within a decade, which would be a major achievement.

The coming fieldwork in Africa represents the initiation of a new phase of source management that allows the processing of radioactive sources in developing countries, in the same way that it is being carried out in developed countries. The South African demonstration has shown for the first time that high activity sources can be treated *in-situ* in a developing country. This is a big stride for the IAEA and its partners and a sign that security and safety in the nuclear field can be achieved by rich and poor countries alike.

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