



CONCEPTUAL DESIGN OF THE MOBILE TOOL KIT FACILITY FOR CONDITIONING OF DISUSED SEALED RADIOACTIVE SOURCES CATEGORY 3-5 IN THAILAND

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1. Background

The use of nuclear and radiation technology is currently widespread in Thailand, particularly in the fields of industry, research, and agriculture. Most of the applications for nuclear and radiation technology often involve the use of sealed radioactive sources (SRSs). SRS contains radioactive material that is permanently sealed in a capsule or closely bound and in a solid form. When SRSs are no longer in use, they are declared disused and managed as radioactive waste. The Radioactive Waste Management Center (RWMC) is responsible for the centralized collection, transport, conditioning, and storage of Disused Sealed Radioactive Sources (DSRS) in Thailand. The objective of conditioning DSRS is to ensure safe and separate from the environment and to prevent general public exposure for a specified period. Besides, it is recognized that conditioning DSRS will minimize the risk associated with them. The innovation of waste packages is more suitable for handling, transport, storage, and/or disposal. In 2022, RWMC designed and developed the Mobile Tool Kit Facility for Conditioning of Thailand (MTKF-TH-01) to perform conditioning of DSRS categories 3–5. The basic idea was (i) to establish a workplace area for conditioning DSRS for categories 3–5, (ii) to build a flexible and movable workplace for moving to another building in the future, and (iii) to perform DSRS conditioning for new operators training. The MTKF-TH-01 is designed to consist of two containers (2.25 m x 3.20 m x 2.40 m) and is divided into three main areas: (i) reception and technical area; (ii) working and dispatch area; and (iii) dress change and contamination control area.



Fig. 4 Inside top view layout of the MTKF-TH-01



Fig. 5 Front side view layout of the MTKF-TH-01

2. Inventory of DSRS category 1-5 in the storage facility

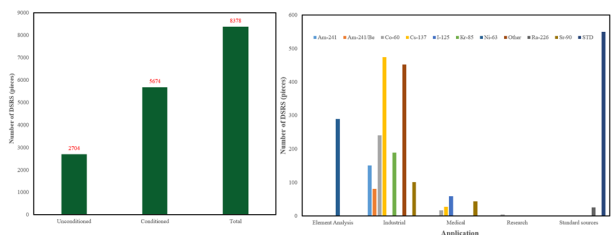


Fig. 1 The total amount of DSRS stored in the radioactive waste storage buildings, (a) number of DSRS unconditioned and conditioned, (b) number of DSRS unconditioned divided by application and nuclides.

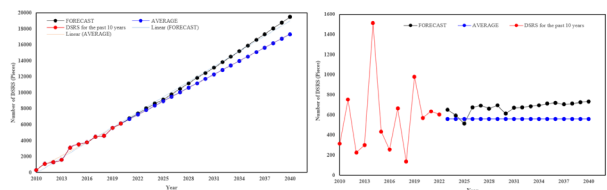


Fig. 2 (a) cumulative number of DSRS for the past 10 years and future number of DSRS prediction, (b) number of DSRS for the past 10 years and future number of DSRS prediction.

3. The basic design of the Mobile Tool Kit Facility (MTKF-TH-01) for Conditioning of DSRS category 3-5 in Thailand

The design of the MTKF-TH-01 is designed to consist of two containers (2.25 m x 3.20 m x 2.40 m) and is divided into three main areas: (i) reception and technical area; (ii) working and dispatch area (Hot Lab working area), and (iii) dress change and contamination control area.

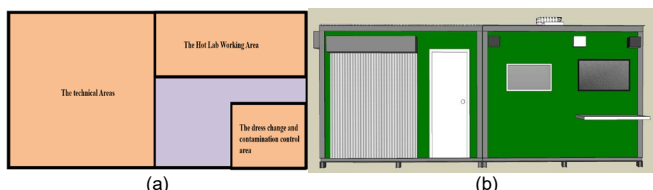


Fig. 3 (a) Basic layout, (b) Appearance of the MTKF-TH-01

4. Assessment of the radiation dose rate received by operators from conditioning DSRS category 3-5 by using the MTKF-TH-01

Application	Radiation worker	Public
Effective dose (whole body), Hp (10)	- 20 mSv per year, on average during 5 consecutive years - 50 mSv each year - 100 mSv for 5 consecutive years.	1 mSv per year
Annual equivalent dose to lens of the eye, Hp (3)	-20 mSv per year, on average during 5 consecutive years -50 mSv each year -100 mSv for 5 consecutive years.	15 mSv per year
Annual equivalent dose to the skin, Hp (0.07)	500 mSv per year	50 mSv per year
Annual equivalent dose to hand and feet	500 mSv per year	50 mSv per year

The radiation workers receive a total radiation dose of 12.86 mSv per person from the conditioning DSRS category 3-5 activities from assessment. According to the Ministerial regulation on radiation safety, B.E. 2561, dose limits for radiation workers and the public in Thailand shown in TABLE 1, The radiation worker received a minimum radiation dose not exceeding the dose limits of the effective dose (20 mSv/year) which followed the legal

5. Conclusions and Acknowledgements

The paper aims to present the design and development of the Mobile Tool Kit Facility for Conditioning of Thailand (MTKF-TH-01) to perform conditioning of DSRS categories 3–5 from the industry. In 2022-2023, Thailand Science Research and Innovation (TSRI) supported the budget to operate the project of the design and prototyping of the Mobile Tool Kit conditioning Facility for the management of radioactive waste in Thailand of RWMC. The design of the MTKF-TH-01 is designed to consist of two containers (2.25 m x 3.20 m x 2.40 m) and is divided into three main areas: (i) Technical area; (ii) Hot Lab working area, and (iii) Dress change and contamination control area. In addition, radiation safety assessment of conditioning DSRS category 3-5 by using MTKF-TH-01. There is a risk of exposure to radiation in operations calculated by using the Rad Pro Calculator program. The radiation workers receive a total radiation dose of 12.86 mSv per person. The radiation worker received a minimum radiation dose not exceeding the dose limits of the effective dose (20 mSv/year) which followed the legal.

The authors would like to gratefully extend sincere thanks to Thailand Science Research and Innovation (TSRI) for their support budget for the project of the design and prototyping of the Mobile Tool Kit conditioning Facility for the management of radioactive waste in Thailand and wish to thank RWMC teams for their contribution to this project.