

Development of logic model for bulk facility national inspection program

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Abstract

In this study, specific requirements for the development of a regulatory verification support program for supporting the implementation of the national inspection of bulk facilities were established and a conceptual design was derived. Since the system to be built has a strong character of a database system that stores and manages data and provides information when necessary, it is desirable to first identify the database to be managed within the system, and configure the data output method of the regulatory body and other interface functions.

In order to design a regulatory verification support program to support the implementation of the national inspection of bulk facilities, first of all, a database must be created by reconstructing various information from the List of Inventory Items (LII) of bulk facilities to create a small and well-organized relationships.

The user group of the regulatory verification support program to support the implementation of the national inspection of bulk facilities is the government and regulatory agencies. Next, key entities must be selected through identified tasks, data types, uses, processing types, flows and restrictions, requirement collection, and input/output data analysis. Analysis of requirements for system design is based on user groups.

Objects and properties were organized to structure the data related to the national inspection of bulk facilities, and a system screen configuration plan was configured and detailed menus were configured.

Government and regulatory agencies are supposed to input data provided by business operators, but they may have to enter values directly due to unexpected errors, so it is necessary to define the shape and size of data. In addition, it can be designed to find errors by computerizing the nuclear material inventory variation and total inventory verification work by inputting the data provided by the operator. This is expected to prevent human errors and prevent data errors.

When building a system, institutional constraints such as operational policies and security regulations must be considered. In particular, requirements such as user authentication, authority,

and personal information protection must be reviewed in advance to clarify the requirements for system development and to create a stable development environment.

1. Database of List of Inventory Items (LII) for bulk handling facilities

In order to design a regulatory verification support program for the implementation of the national inspection of bulk handling facilities, first of all, various information of LII of bulk handling facilities should be reconstructed to create a small and well-organized relationship (Figure 1).

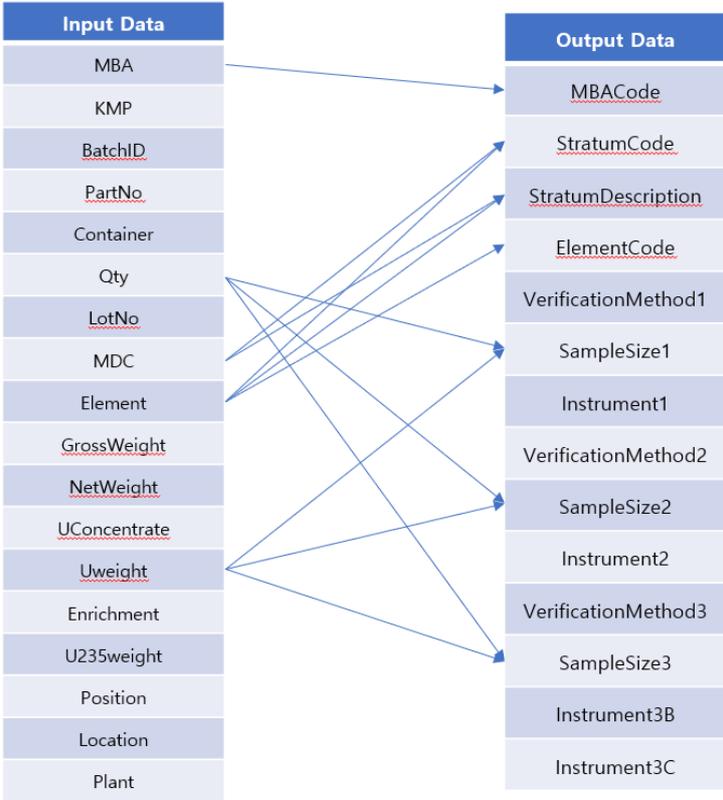


Fig 1. Input items and output items of the regulatory verification program to support the implementation of the national inspection of bulk handling facilities

2. Establish program requirements

The user group of the regulatory verification program to support the implementation of the national inspection of bulk handling facilities is the government and regulatory agencies. The government and regulatory agencies are KINAC and the Nuclear Safety and Security Commission, and all users accessing the system must be authorized personnel. It should be designed so that the

information can be updated through application for amendment or change of the person in charge, considering the possibility that the person in charge will change. For program design, a requirement statement was prepared as shown in Table 1.

Table 1. Requirement Statement for national inspection DB program

Requirement statement		
1		The history information DB is used only for domestic bulk handling facilities.
2		The user of the history information DB is the KINAC National Inspector.
3		The history information DB must be independently operable in the personal laptop of the National Inspector.
4		In the history information DB, the history of the national inspection of the existing bulk handling facilities and the nuclear material information of the bulk handling facilities should be managed.
5	National inspection history	National inspection history should include inspection date, inspection period, type of inspection, inspection facilities, inspection contents, etc.
6		Completed national inspection records must match KSIS ¹ information.
7		National inspectors are identified by name.
8		National inspection history inquiry must be able to search conditions by inspection year, inspection type, and inspection facility.
9		When the results calculated by the sample size program are output, the latest inspection results for the facility must be shown.
10		The user must be able to add or change other than the batch of inspection objects, which is the result calculated by the sample size program.
11		The result of the national inspection performed must be able to be uploaded to KSIS.
12		Bulk handling facility nuclear material information
13	Nuclear material is identified by batch ID.	
14	Based on the uploaded excel file, it should be able to organize and show the disappeared nuclear material information and the new nuclear material information compared with last year's data.	
15	MBA, KMP, Batch ID, Lot No, MD code, Stratum, Element, U weight, U235 weight, Enrichment, Qty, etc. must be entered in the Excel file managed by the bulk handling facility.	

3. ERD(Entity Related Diagram) Structural Design

¹ KSIS is the Korea Safeguards Information System (KSIS) which is KINAC internal information system.[1]

Next, core entities must be selected through identified tasks, data types, uses, processing types, flows and restrictions, requirement collection, and input/output data analysis. Analysis of requirements for system design is based on user groups. Figure 2 shows objects and properties are arranged to structure the data related to the national inspection of bulk handling facilities.

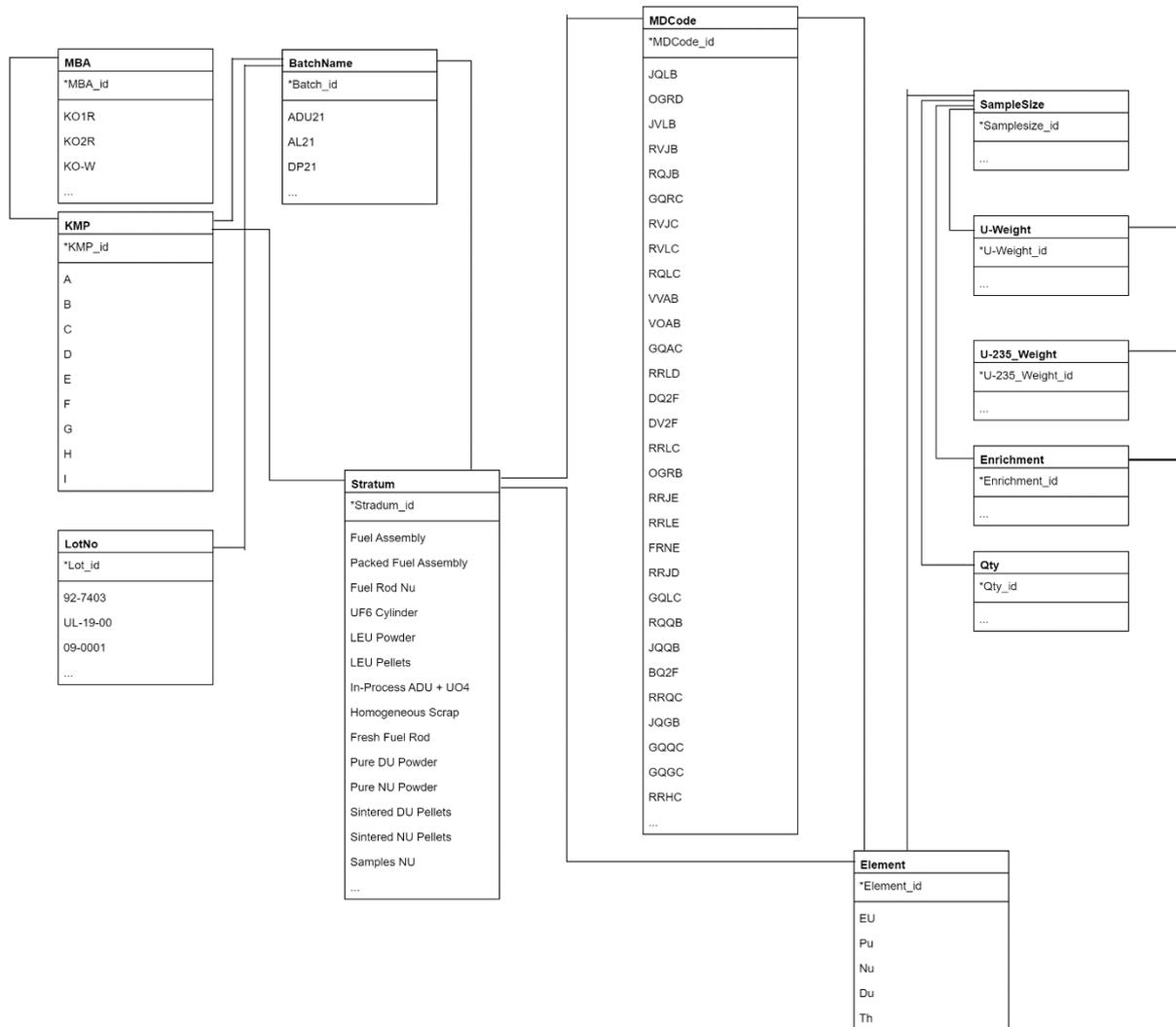


Fig 2. ERD Diagram for National Inspection of Bulk Facilities

4. History DB system prototype development

Government and regulatory agencies are supposed to input the data provided by operators, but they may have to input values directly due to unexpected errors, so it is necessary to define the shape and size of the data (e.g. nuclear material amount (number), Batch name (English), quantity (number), etc.). In addition, it can be designed to find errors by computerizing the nuclear material inventory change and total inventory verification work by inputting the data provided by

the operator. This is expected to prevent human errors and prevent data errors. Institutional constraints such as operational policies and security regulations must be considered when building the system . In particular, requirements such as user authentication, authority, and personal information protection must be reviewed in advance to clarify the requirements for system development and to create a stable development environment. Figure 3 is the screen configuration of the program to be developed as a prototype.

National Inspection DB Program for Bulk Facility			
Menu 1 : Select User Information	Menu 2 : Mailbox System Configuration	Menu 3 : National Inspection History Inquiry	Menu 4 : System Settings
Menu 1-1 : Select User Information SSAC NSSC KINAC	Menu 2-1 : Input Mailbox System File Input IAEA file Input Facility file(If there is empty period)	Menu 3-1 : Search Inspection Type Period Facility	Menu 4-1 : Register User Information
Menu 1-2 : Select Operator Information KNF KAERI	Menu 2-2 : Output NM Inventory by KMP	Menu 3-2 : Print the report Output test result data (KSIS format)	Menu 4-2 : User Affiliation NSSC KINAC KNF KAERI
Menu 1-3 : Input Operator Data Input LII(Excel File) Direct entry and correction			Menu 4-3 : Enter User Information Name Birth Date
Menu 1-4 : Verification Plan Output			
Menu 1-5 : Correction the verification plan			
Menu 1-6 : Output test result data(KSIS format)			

Figure 3. National Inspection DB Prototype Program Screen Layout

5. Conclusion

The IAEA utilizes CIOSP when inspecting domestic bulk-handling facilities. The IAEA conducts a review of the consistency of the accumulated mailbox declaration, general ledger, inventory change reports and physical inventory list submitted by facility. [2] In developing a national inspection program for bulk handling facilities, I would like to refer to the CIOSP mentioned above. In developing this program, the most difficult part is to derive a sampling plan through accurate stratification with input data (LII). Other than that, it seems that it is not difficult to implement the functions of saving, classifying, and retrieving records of inspections. The program is currently under development, and it is hoped that national inspections for bulk facilities

will be made easier after development is complete.

Reference

[1] Son, Jung Hee, H. E. O. Chul, and Seung Ho Ahn. "Development of on-line reporting system for nuclear material." (2017).

[2] Choia, Jinha, et al. "The Status of IAEA Safeguards on Domestic Bulk-handling Facility." (2021)