Database Design for Off-site Dose Calculation

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1. Introduction

KHNP is developing the existing independent network-based PC Version of the off-site dose calculation program (K-DOSE60) as a network version of E-DOSE60. The new software is being developed using SAP platform for atmospheric dispersion factors, and liquid and gas dose calculation programs (ODCP) developed in the Fortran. Various formulas are used for the off-site dose calculation, and various input data are required for this [1]. In this study, input data necessary for the off-site dose calculation were reviewed, and the database for various input factors was established.

2. Input Data Modeling

The database used for the off-site dose calculation consists of a total of 27 information, including the direction and distances from each nuclear power plant of the selected exclusion area boundary and nearest village to calculate the off-site dose due to external exposure and respiration, the point of calculating the internal exposure due to intake of crops and livestock products, the transition coefficient of radioactive nuclides, and the half-life of radioactive nuclides [2,3].

2.1 Design Database Model

Through the analysis of the off-site dose calculation source code, input variables and factors were organized, and the design was carried out to establish a database on SAP platform. As shown in Fig. 1, the database was constructed in order of requirement analysis, conceptual modeling, logical modeling, and physical modeling [4].

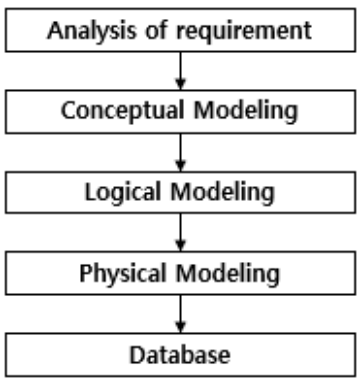

Fig. 1. Process of database modeling for the off-site dose calculation program

Fig. 2 is a logical modeling that embodies conceptual modeling through ERD (Entity Relationship Diagram), and the relationship between each other is visually expressed through ERD. Fig. 3 shows a physical modeling that defines the physical structure for implementation on the SAP platform.

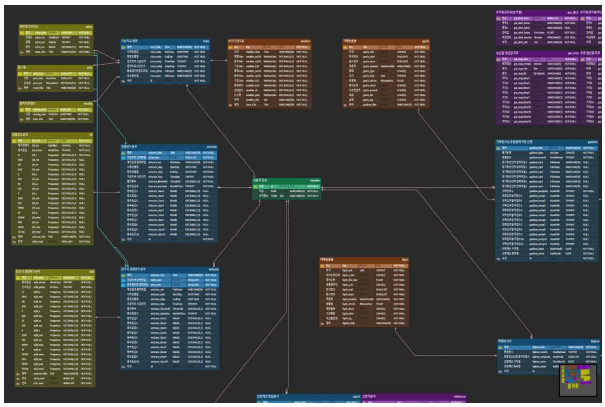

Fig. 2. Logical modeling through ERD of the ODCP

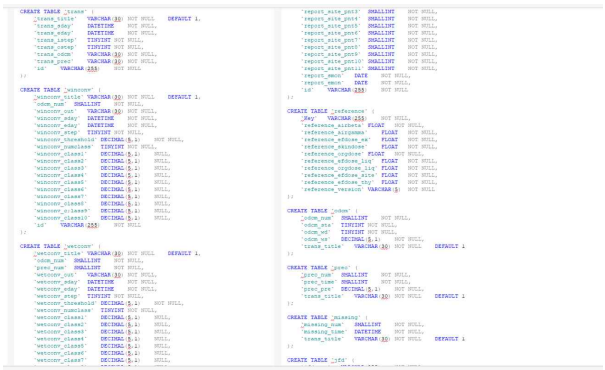

Fig. 3. Physical modeling of the ODCP

2.2 Database related to social environmental factors and site characteristics

Social environmental factors and site characteristic data are classified into data related to gas and liquid effluents. The gas effluent-related data consist of site characteristics of agricultural and livestock products, production of agricultural and livestock products, respiratory volume and intake, transition coefficient, half-life data, and population distribution data. The data related to liquid emissions consist of individual activity hours, seafood intake, total activity hours by branch, marine product production, marine dilution factors, and etc., and were built as a database. Fig. 4 and 5 show the gas and liquid effluent databases.

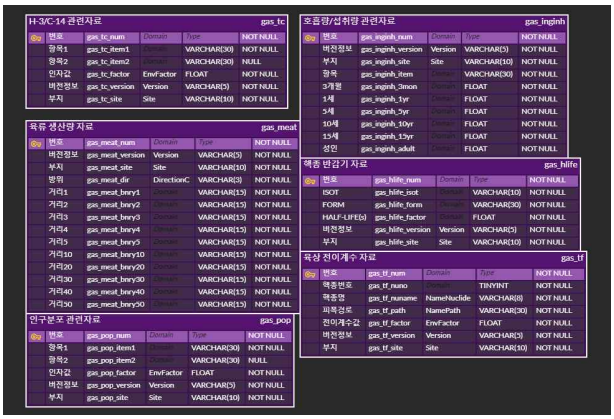

Fig. 4. Gas effluent-related database

Fig. 5. Liquid effluent-related database

2.3 Database related to Site Exposure Environmental Factors

The database of site exposure environmental factors by site was based on ICRP-119 considering ICRP-60 tissue weights for respiratory and internal exposure dose conversion factors. External exposure dose conversion factors were constructed based on FGR-11, 12, and 13. Fig. 6 shows the database of exposure environmental factors by site on the SAP platform.

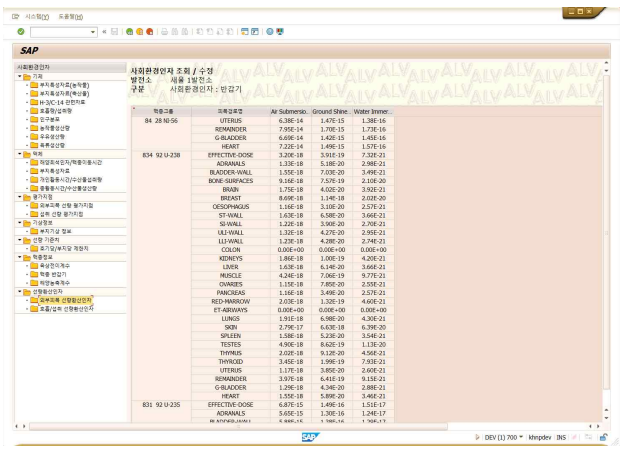

Fig. 6. Database of exposure environmental factors by site

3. Conclusions

The off-site dose calculation program is under development for the off-site dose calculation according to the gas and liquid effluent of nuclear power plants. For this, various input variables are required, and a database for input variables was constructed. The database consists of social environment factors, site characteristic data, and exposure environment factors for each site, and 27 detailed databases were constructed. In the future, a network-based off-site dose calculation program for nuclear power plant will be developed through a database established.

REFERENCES

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