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**The Improvement of the Quality of the Environmental
Audit by Utilizing IT-based Data Analysis**
- The Case of Audit on Hazard Chemicals Management -

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1. Background and Audit Planning

Toxic and hazard chemicals management has become one of the most important environmental management issues in Korea since September of 2012, when HF gas leak incident in Gumi, Kyungbuk province of Korea left five people dead and more than 2.12 km² of agricultural area contaminated. Toxic and hazard chemicals have been managed by “Toxic Chemicals Control Act” established in 1997 in Korea. The act is a market-based instrument for examination and evaluation of the toxicity, and authorization for commercializing new chemicals. Due to the limit of examination and evaluation for existing chemicals (chemicals excluding new chemicals – by the act, the definition of chemicals is “(a) Chemicals distributed for commercial purposes in the Republic of Korea before February 2, 1991 and announced by the Minister of Environment through consultation with the Minister of Environment and Labor on December 23, 1996; (b) Chemicals which have undergone the examination of toxicity under the former provisions or the provisions of this Act after February 2, 1991 and were announced by the Minister of Environment;”), new chemical management act was established in 2013 and will be enforced in 2015 (so called “K-REACH”). Also, the “Toxic Chemicals Control Act” was amended to “Chemicals Management Act” and will be enforced in 2015.

However, new and amended acts were adopted as the modified laws of EU (European Union), U.S.A. and Japan without elaborate consideration of chemical market and management status of Korea.

Therefore, it was necessary to check up the chemical management status at each stage of the supply chain. BAI audited toxic and hazard chemical substances management status of Ministry of Environment from August to October of 2013. The scope and objectives of the audit were to find problems and complementary measures for legal and institutional systems by analyzing each stage of chemical supply chain before enforcing new acts in 2015 based on data analysis from each managing organizations including Ministry of Environment and National Institute of Environmental Research (NIER).

2. Methodology

In order to evaluate the appropriateness of hazard chemical designation process, BAI analyzed and compared toxic, restricted and prohibited substance list of 677 substances in Korea to IARC(International Agency for Research on Cancer) list of classification from the monographs on the evaluation of carcinogenic risks to humans and EU SVHC(Substances of Very High Concern) list.

For managing toxic and hazard chemicals, several government and non-government organizations took charge of investigations of distributed and discharged chemicals, importation permission of restricted or prohibited substances, annual distribution amount report from the businesses permitted for commercializing poisonous substance, substances under observation, and restricted and prohibited substances from the government by the act. Most of the chemicals management organizations had their own database system to conduct their duties e.g., Pollutant Release and Transfer Register (PRTR) system for chemical substances by NIER and web-based annual report system for companies made by Korea Chemicals Management Association (KCMA).

So, the comparison of the different data provided by the different chemicals management organizations could provide useful information to evaluate the efficiency of market-based instrument for toxic and hazard chemical substances. For example, the comparison of PRTR data and annual report data indicated that there were some illegal toxic chemicals distributions by some businesses.

Newly developed software by BAI Research Institute named 'U-Check', which is based on MS-Access, was used to perform data comparison and analysis. The software provided easy comparison methodology from the large database from the different data sources and made the analysis easy.(efficient/simple)

3. Findings and Recommendations

The audit results indicated that several SVHC and IARC Group I carcinogenic substances were sold without designation of toxic chemicals in Korea and some businesses had not acquired the permission to import and distribute some toxic chemicals. Some major findings from the audit were as follows:

- 8 SVHC substances and 1 IARC Group I carcinogenic substances having more than 100 t/y in Korea were not evaluated properly, not being designated as toxic chemicals.
- There were businesses that distributed toxic chemicals without permission and made fraudulent annual report. (Forty-six companies conducted illegal business activities out of 226 companies investigated)
- Ministry of Environment did not provide the information on 280 poisonous substances and

forty-two restricted and prohibited substances to Korea Customs Service (KCS) that they were imported without checking from the Customs Service.

- The reliability of the data of investigation of distribution of chemicals by KCMA was low due to the inaccurate investigation methodology (about 60% of the reported data contained error).

- Chemical waste might contaminate air and water due to the improper chemical waste management system (a company discharged wastewater including heavy metal solution to the reservoir for waterworks).

For solving the problems, BAI recommended the Ministry of Environment to conduct the examination and evaluation of the nine toxic and hazard chemicals immediately and to provide the regulated chemical information to KCS. Also, it was recommended that the related acts and regulations had to be amended based on the audit results.

4. Impact and Results

The Ministry of Environment would make enforcement decree and regulations which would reflect the audit results for the newly established chemicals management acts. Also, they discussed and installed measures to rectify the recommendations for the audit.

5. Challenges and Barriers

Though the data analysis could provide useful information on illegal business activities, the data did not directly indicate that the company performed illegal business because of the low reliability of the raw data. It was necessary to analyze and check up the data source and correct meaning of it to reduce the uncertainty. For example, according to the report from the investigation of chemicals distribution, a company distributed more than 5,000 t/y of H₂SO₄ without permission, but when BAI checked up the concentration of the H₂SO₄ solution from the business, it was less than 5% (by the act, there should be more than 10% concentration of H₂SO₄ to be considered as toxic chemicals), so it was not illegal.

6. Lessons and Learned

Data mining and analysis by utilizing IT-based tools can provide useful information to analyze the effectiveness and efficiency of the environmental policy, especially for the environmental audit on market-based instrument because environmental audit can be very difficult to deal with and to find problems and right rectification tools against those problems. The key information for the audit on market-based instruments can be the illegal business activities or the outliers from the management system. In order to find the key information for the environmental audit, IT-based data analysis tools can give us key clues.