Improvement of KOMAC's Personal Safety Interlock System (PSIS)

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1. Introduction

Korea Multipurpose Accelerator Complex (KOMAC) has started a trial operation in the second half of 2013, and now one 20MeV beam-line and five 100MeV beam-lines have been installed. Currently one 20MeV beam-line and two 100MeV beam-lines are operated. KOMAC has constructed and operated PSIS in the radiation controlled area to protect workers from undesired accidents in the case of abnormal situation that may occur during the accelerator operation. Personal Safety Interlock System (PSIS) consists of the access control system and personal protection system and is linked with the accelerator operation status, so its durability and continuity should always be guaranteed. The controlled area in the facility consists of several laboratories and target rooms depending on the purpose of the experiment, and the door is controlled independently in each target room. Under the emergency status, the operator should confirm the cause through the control system of PSIS and takes the follow-up action. However, since PSIS has a complex combination of programs and servers functionality, it is difficult to identify the cause immediately. Figure 1 shows the configuration of PSIS for the control room and of the device on shielding in the controlled area at KOMAC.
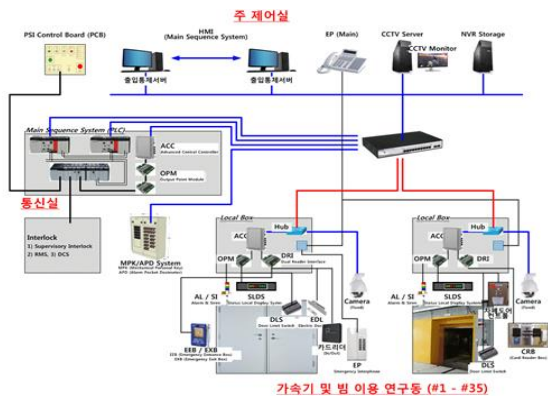

Figure 1.Configration of PSIS

In order to compensate for this difficult identification of the cause, the "Emergency Notification System" was installed in the PSIS so that the operator could quickly identify the cause of the problem in the case of an abnormal situation in the controlled area and take some proper action immediately. Emergency Notification System displays the date, time, place and cause of the emergency situation in the controlled area in the text format on the monitoring screen, so that the operator can easily access the related information. The establishment of this system will improve the efficiency of recognizing the problem.

2. Methods and Results

PSIS consist of the access control system and personal protection system. In the case of an abnormal status such as the radiation abnormality emergency situation, this status is informed to the controlled area and the control room. And each system receives the relevant signals and display, store logs on the emergency. The operator should analyze the logs in order to identify the cause of the emergency situation. For example, if an abnormal condition occurs while the accelerator is in operation, the PSIS send the interlock signal in order to turn off the beam. And PSIS control the shielding door to prevent the radiation leakage.
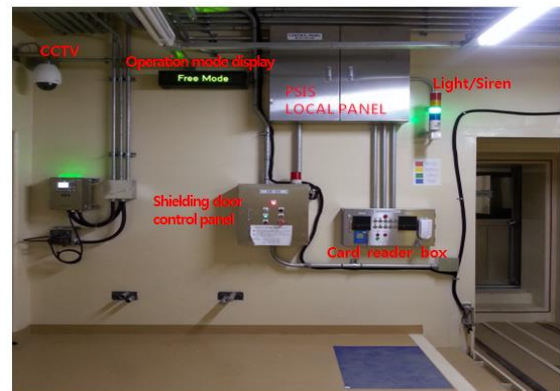

Figure 2. PSIS equipment in controlled area

In the control room, the related information such as the time of the entry and exit for the workers in the controlled area can be checked with the entrance status of the monitoring screen. In the case of an abnormal situation, the Programmable Logic Controller (PLC) generates the related signals and sends them to the device on the shielding in the controlled area and it generated an emergency alarm. Then, a signal is transmitted into the PSIS server of the control room to record the log, and the operator confirms the information about the abnormal situation. In the control room, it is necessary for the user to find and analyze the stored logs through this process that the information on the abnormal situation can be checked. However these

inconveniences in the process of analyzing logs make the time consumable.

In order to improve these inconveniences, Emergency Notification System is established. The Emergency Notification System is connected with the signals receiver from the PLC. The time, location and the cause of the emergency are displayed as the text format at the monitoring screen. Figure 3 shows the before and after improvement of PSIS
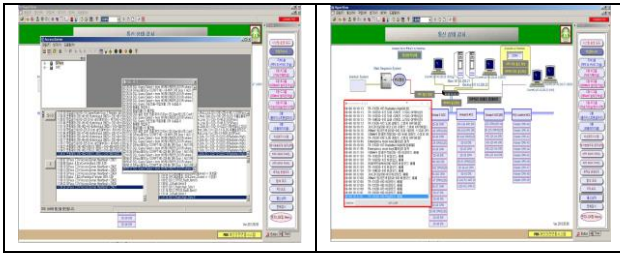

Figure 3.Comparison before (Left) and after PSIS improvement (Right)

Figure 4 shows the Alarm information window and the log storage of the Emergency Notification System and that information is also stored automatically in the log storage.
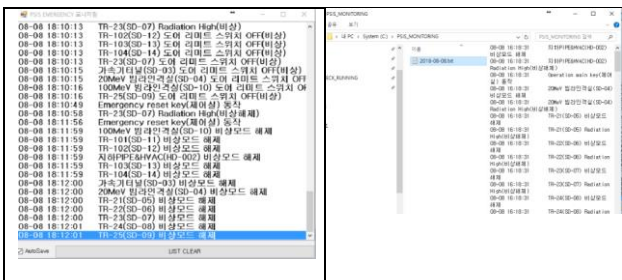

Figure 4.Alarm information window and log storage

Therefore, when the emergency situation occurs, the operator can quickly identify the relevant information and could take an adequate action immediately. In other words, the most important thing is can quickly identify and disseminate the relevant information through this system.

3. Conclusions

Korea Multipurpose Accelerator Complex (KOMAC) operates the Personal Safety Interlock System (PSIS) in the controlled area to ensure the safety of radiation workers from undesired accidents and the handle for any unusual situations that might be occurred during facility operation. In the existing PSIS system, the signal generated from the PLC in the event of an emergency is stored in the logs which make it easy for the operator to immediately check the emergency information such as the location and cause of the emergency. In order to make up for this established Emergency Notification

System, the PSIS emergency situation could be monitored in real time. The emergency signal generated from the PLC is converted into the text format and displayed on the monitoring screen in the control room. In addition, the operator can check the occurrence time and place at once and can immediately take the proper action against the cause of the emergency. Therefore, the establishment of the Emergency Notification System can improve the convenience for the operator.

REFERENCES

[1] Y.S Min, K.J Moon, J.Y. Kim, B.H Kim, Design of the Radiation Protection System in the Conventional Facilites of PEFP, KAPRA , 2002.