Upgrading Equipment Lifecycle Information Management System at KOMAC

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1. Introduction

A 100-MeV proton linac installed at KOMAC (Multi-propose Accelerator Complex) has been operated and provided accelerated proton beams to users from various fields since 2013 [1]. The stability of accelerated beam depends on and is affected by various factors including, for example, RF power stability, ion source stability, magnet system stability and cavity resonance stability [2]. Therefore, equipment management is important part for operation accelerator.

To provide more stable operation and beam to users, we need more accurate information of equipment lifecycle, maintenance cycle and equipment condition. Therefore, the maintenance and lifecycle can be determined without checking the equipment directly, so the equipment can be provided with a corrective measure before the heavy failures due to a phenomenon of aging.

The Equipment Lifecycle Information Management System - KOMAC has been developed for efficient accelerator operation and managed the system since 2014. And we were able to use this system to help with stable accelerator operation.

But, we have been operating this program for several years and have found some problems. So, we have improved the existing shortcomings and updated the program more efficiently and conveniently.

This study describes our Equipment Lifecycle Information Management System and how the program was updated for more efficient accelerator operation.

2. Function and Feature

The overview of Equipment Lifecycle Information Management System is shown in Figure 1

Fig. 1. Equipment Lifecycle Information Management System schema

In this section some of features are described in the Equipment Lifecycle Information Management System – KOMAC.

2.1 Offline system

Generally, many of plant or industry managing their product and equipment by Internet (online-network).

But, the online system and any wireless method is prohibited at KOMAC due to the top security facility. So this system uses off-line method by using secure digital (SD) card for equipment registration and updates. The top priority of this system is to provide the security by ensuring the offline system.

2.2 QR Code label

The conventional equipment management method was checking the serial number on equipment and finding the related document. The disadvantages of this method are time delay for searching the expected information and human errors. Also, the equipment information is hard to be checked immediately on the site.

In this system, user enter their equipment history and information in to the program, then program creates the dedicated QR code of the equipment. After that users can print the QR code label and attach it to the equipment so that the equipment information can be conveniently searched on the site. In addition, the equipment with accessible location can be provided with large size QR code (shown in Fig. 2. Lift side) which can help to check equipment history information from a distance.

Fig. 2. QR code label on a Banding Magnet and Turbo Molecular Pump.

2.3 Smart Pad

The traditional method of searching equipment information was to find paper document or on the computer in the office. By using this system, Smart Pad can assist to read QR code by a camera attached on the Smart Pad and the equipment information is immediately shown on the site (shown in Fig. 3.). Therefore, user can save time and effort for managing equipment.

Fig. 3. QR code scan with a Smart-Pad, Equipment Information on Smart Pad.

2.4 Management of Equipment location and documentation

The Equipment Lifecycle Information Management System records and indicates the purchase date, location and maintenance history of the equipment. In addition, more efficient management is possible because the equipment can be grouped according to location, type, and purpose refer to Figure 4.
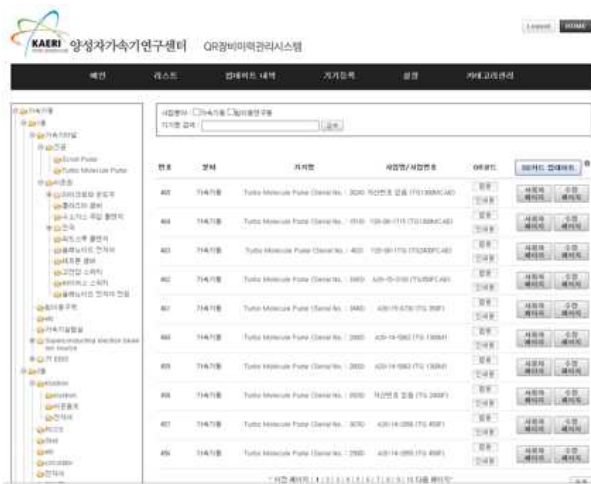

Fig. 4. Screenshot of Equipment Lifecycle Information Management Program.

3. Upgraded Features

3.1 Imputable Tablet

The tablet of previous system could only be check for equipment information. But the latest version is not only readable but also writable, so user can enter equipment information regardless location. Also, it is more convenient and faster to use the smart pen connected to the tablet when inputting information.

3.2 Efficient Data Management Function

3.2.1 Search

Existing grouping functions were difficult to change once specified. Updated function can be grouped in a variety of ways, and additional groups can be created depending on the circumstances. In addition, it is possible to search by keyword, regardless of the group and current location designated when user searching equipment information.

3.2.2 Data Management

An updated version of the program can display the equipment information directly in various graphs. In addition, it can make document immediately according to the prescribed format, then user do not have to process the data again to make the document.
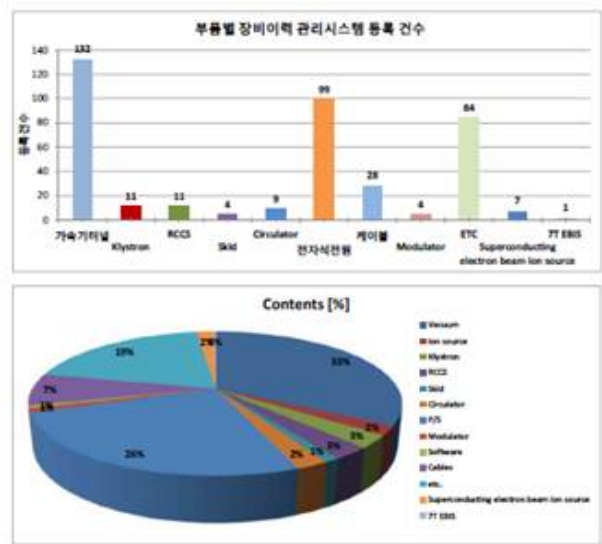

Fig. 5. Graphs of equipment information.

4. Conclusion and Plans

We manage accelerator equipment by Equipment Lifecycle Information Management System. Key points of this system are reduce to find equipment information time through QR code scan, enhance security with offline system, and increase the stability of operating the accelerator by establishing a systematic system.

We also updated system such as tablet upgrades, search enhancements, and data management features.

These are reduced the time spent on equipment management.

From now on, we have additional plan to operate more stable accelerator through real-time device status pin-boards and enhanced search equipment information function.

ACKNOWLEDGMENT

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