

Theater Equipment Operation System (K-compo System)

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1 Introduction

Fig. 1 shows an overview of a theater. Around the time KAYABA SYSTEM MACHINERY entered the market of theater equipment in 1983, control of theater equipment, such as flying equipment and floor equipment, was starting to shift to computer control.

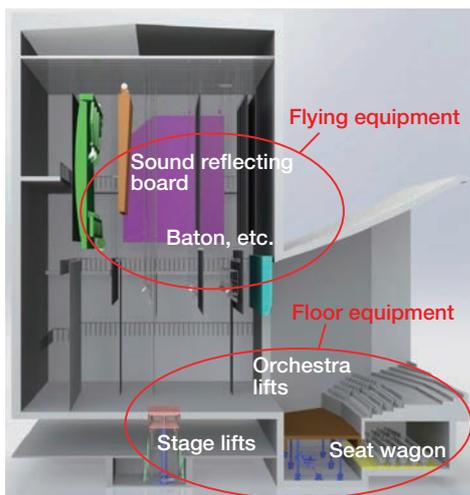


Fig. 1 Theater overview

KAYABA SYSTEM MACHINERY started with the operation system (1st generation), which was developed in 1993 for full-scale theaters, and has since developed the operation system “K-compo System” (Photo 1), which



Photo 1 K-compo System

can be called the 3rd generation system, after the 2nd generation system. In this review, I would like to introduce the overview of this operation system, which was introduced to the market in October 2014 in the Ueda Performing Arts & Cultural Center and has now been well received in three theaters, including Tokai City Arts Theatre (introduced in October 2015) and Nagano City Arts Center (introduced in May 2016).

We chose the registered trademark of “K-compo System”, which is reminiscent of the abbreviation (KSM) of our company name (KAYABA SYSTEM MACHINERY).

We are currently applying to register the exterior design.

2 Shifts in KSM's Theater Equipment Operation Systems and Background of Development

2.1 First generation (1993 – 2006): Dedicated operation system

This was the era in which theater equipment made a drastic leap as computer control was incorporated into theater equipment. Back then, dedicated operation systems were used for the theater equipment specifications of each theater (Photo 2).



Photo 2 First generation operation system (desk type)

2.2 Second generation (2007 – 2013): Mobile operation system

We have moved the reduced-size operation system to the stage side for safe operation of theater equipment and developed a mobile operation system that allows users to operate while checking the movements of theater equipment. In the 1st generation operation system, the

manual operation ^{Note 1)} and program operation (CUE operation) ^{Note 2)} were integrated. In the 2nd generation operation system, we successfully reduced the size by separating the two components. We especially reduced the size of the manual operation component by aggregating the majority of operation equipment into the touch panel, making it portable. We also standardized the form so that the same operation system can be delivered to all theaters (Photo 3).

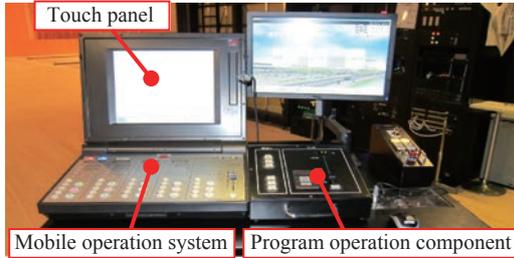


Photo 3 Second generation operation system (mobile operation system)

2.3 Third generation (2014 -): K-compo SystemM

The 2nd generation mobile operation system has the advantage of being compact and portable. However, due to the fact that it was made with molded resin, it could not respond to the needs of enlarging the screen to improve the performance. It also had the issue that it could not respond to customer needs, such as increasing operation features.

Furthermore, screen design and software were made for each theater, presenting the issue that we were unable to reduce the software production fee and inspection/calibration time.

In order to develop K-compo SystemM, we established the following three objectives to overcome the issues while maintaining the small size and form standardization, which were characteristics of the mobile operation system.

- (1) Create a system that easily incorporates control technology advancement (enlarged screen and high-speed process enabled by CPU performance enhancement)
- (2) Enable users to choose different combinations of feature variations for the operation component
- (3) Make the basic software so that it can be standardized for all theaters

Note 1) Operation to select the equipment to move and raise or lower it. You sometimes enter the target position and specify the movement speed before operation.

Note 2) Operation in which you register the equipment to move, target position, and movement speed beforehand and initiate the movement by pressing the “GO” button at the desired timing

3 Overview of K-compo SystemM

3.1 System that allows different combinations of operation features

We have separated the “screen component” and

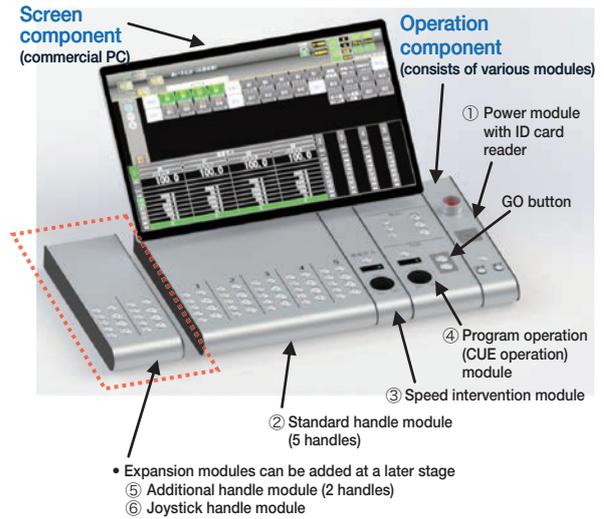


Fig. 2 K-compo SystemM structure

“operation component” so that users can combine/add the operation components (modules) (Fig. 2).

3.2 Screen component

While the screen of the mobile operation system (2nd generation) was 15 inches, we have made the screen 23 – 27 inches in order to improve the operability and visibility. We have enlarged the screen touch switches and used different colors so that each piece of equipment can be easily differentiated. We have also utilized commercial PCs to create a system that enables us to flexibly respond to changes, such as model changes, increased screen size due to technology advancement, and CPU performance enhancement.

Fig. 3 shows an example of the operation screen.



Fig. 3 Operation screen for K-compo SystemM

3.3 Operation component

With the “operation component”, we organized/categorized operation features and turned the below operation features into modules.

- ① Power module (with ID card reader)
- ② Standard handle module (5 handles)
- ③ Speed intervention module
- ④ Program operation (CUE operation) module
- ⑤ Additional handle module (2 handles)
- ⑥ Joystick handle module

The main characteristic is that users can change module configuration or add expansion modules (additional handles/joystick) at a later stage depending on the theater size and customer needs.

Another advantage is that modules alone can be removed in case of failure, meaning that the whole system does not need to be repaired.

Below is an example of an additional handle module (2 handles), which has been added to the standard configuration (Photo 4).

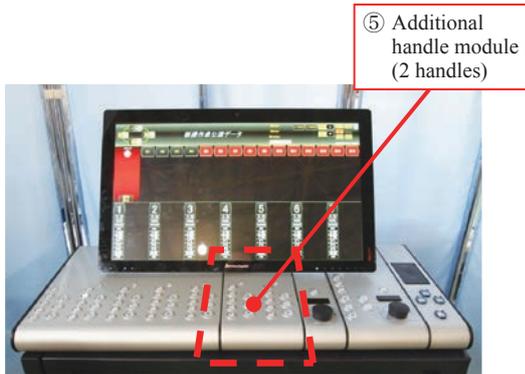


Photo 4 Example of the additional handle module

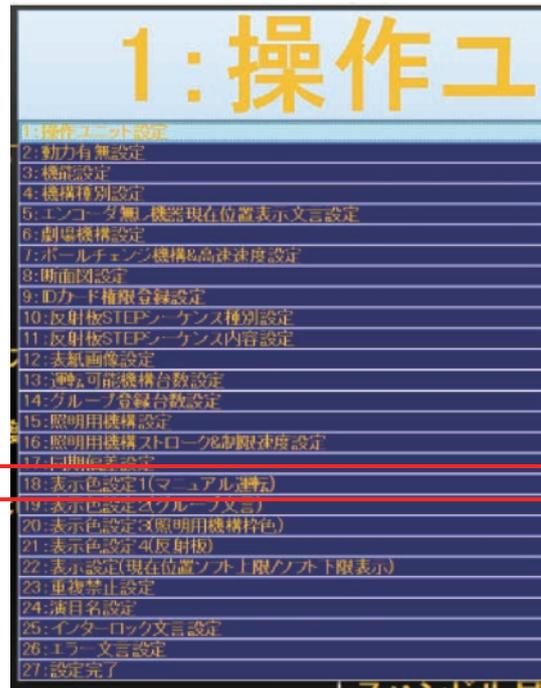


Fig. 4 Screen showing a list of theater settings

4 Standardization of Software

We have reviewed the operation methods and display methods, which used to be made for each theater. By turning the basic specifications and screen display methods into parameters, we have standardized these methods for all theaters.

By using 26 parameters for the number of equipment, specification differences, and type differences, a screen suitable for each theater can be created.

Below are three objectives of software standardization.

- (1) Reduction of software production fee
- (2) Improvement of software reliability
- (3) Flexible setup changes after delivery by turning basic specifications and screen display specifications into parameters

Fig. 4 shows the screen showing a list of theater settings.

Fig. 5 shows the example of display color setting 1 (manual operation) screen for “18: Display color setting 1 (manual operation) screen theater setting”.

On this screen, you can change the color setting of buttons and characters on the screen.



Fig. 5 18: Display color setting 1 (manual operation) screen

login feature to the ID card to enable the management of “who used the system when”. Furthermore, we have made improvements to the ID card so that operation can be restricted according to the operator’s skills, such as “restriction of operable equipment”, “restriction of displayed screens”, and “restriction of operation of acoustic reflection boards”. (Fig. 6)

5 Other Operation Features

5.1 Adding the operator recognition feature

The safety manager used to turn the power on/off for conventional operation systems by using a key. We have changed the key to an ID card and enhanced the security function by restricting the access. We have also added the

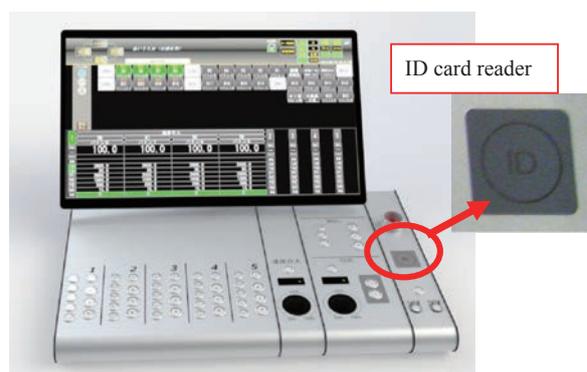


Fig. 6 ID card reader

5.2 Reviewing the sound reflection board operation method

Setup/storing operation of sound reflection boards needs to be done based on thorough understanding of their movements, as they are large pieces of equipment that move above the stage.

The steps of the operation of sound reflection boards from setup to storing are displayed, and the movements in each step are displayed in 3D images. We strived to make the operation safe and easy for operators (Fig. 7).

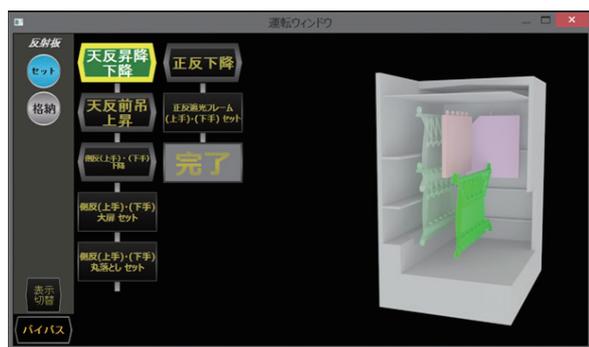


Fig. 7 Acoustic reflection board operation screen

5.3 Standard installation of program operation (CUE operation)

Program operation (CUE operation) was installed as a standard feature in order to smoothly carry out performances.

By registering performance data and operating the “GO” button, you can move the equipment, which you want to move in the particular scene, to the target position at the specified speed. The screen automatically switches to the next scene according to the progress of the performance. By repeating this operation, you can accurately move the equipment at the registered position/speed. “Cued operation ^{Note 3)}”, in anticipation for rehearsals, is also installed as a standard feature.

5.4 Adding expansion monitors

In order to be able to see various types of information at once, many customers have the needs to enlarge the

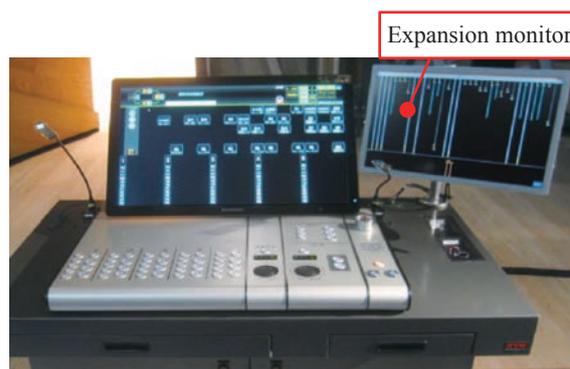


Photo 5 Example of an additional expansion monitor

display screens. Due to this, we have decided to employ the system that enables people to add monitors (Photo 5).

Expansion monitors can display the current position, cross-section, failure history, interlock, etc.

Note 3) Operation to move the equipment to the target position in the previous scene when you specify from which scene to start the rehearsal in preparation for a performance

6 In Closing

The idea to build the operation component by combining operation function modules was unprecedented not only in Japan but also overseas. We take pride in the fact that our theater equipment operation system became a unique system.

We hope to be able to offer detailed services in the future by increasing module types and improving the operability by upgrading software.

We hope that the K-compo System will be utilized in a number of theaters and become a standard operation system in this industry.

Finally, I would like to mention that many theater-related people have given us valuable advice and cooperation when developing this K-compo System, and I would like to take this opportunity to express my deepest gratitude to everyone.

Author



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Joined the company in 1989.
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Engaged in designing electrical
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