"We wanted to implement a solution that would make individual differences in skill levels no obstacle to executing operations in a fast, safe and controlled manner."

Yasuo Aoi
Project Manager
Lake Biwa Development Integrated
Operation & Maintenance Office
Incorporated Administrative Agency Japan Water Agency

Fujitsu IoT Solution UBIQUITOUSWARE enables Lake Biwa's management team to react to emergencies, improve reporting, and make effective use of remote resources.

At a glance
Country: Japan
Industry: Utilities
Website: water.go.jp

Challenge
Lake Biwa Development Integrated Operation & Maintenance Office needed a digital solution to maximize effectiveness of remote resources during emergency flooding by delivering clear instructions and access to off-site expertise.

Solution
Built on a Fujitsu IoT Solution UBIQUITOUSWARE platform, a Head Mounted Display (HMD) was developed for local staff, featuring an easy to read screen, location specific information, and the capability to connect wearers with experienced personnel in real-time.

Benefit
■ Improved flood response with simplified operations

■ Secured connectivity with remote expertise

■ Established a platform for future digital improvements

■ Standardized incident reporting

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Customer

Lake Biwa is the largest freshwater lake in Japan. It provides a source of water for 14 million people in the Shiga region, and is home to more than 1,000 species of plants and animals. The lake is managed by the Lake Biwa Development Integrated Operation & Maintenance Office, a subsidiary of Japan Water Agency.

Products and services

■ Fujitsu IoT Solution UBIQUITOUSWARE

Managing Japan's largest freshwater lake

Some 117 class A rivers flow into Lake Biwa from mountains surrounding its 235km shoreline. Yet there is only one outlet, the Seta River. This makes Japan's largest freshwater lake prone to flooding.

In response, Japan's Water Agency has built a network of drainage pump stations and floodgates to cope with heavy rainfall.

"There are 12 drainage pump stations along the northern lakeshore and two along the south," explains Yasuo Aoi, Project Manager at the Lake Biwa Development Integrated Operation & Maintenance Office. "Drainage pump control panels have a complex system of switches, and operating them proficiently requires advanced expertise."

The agency provides operations manuals at each station in event of an emergency. "In the event of a disaster the response team is comprised of a small number of disaster management experts," says Yuji Iwamatsu, Machinery Division Section Sub-chief. "That's why our manuals aimed to provide instructions that anyone can understand."

However, paper manuals struggle to convey the finer nuances. They are also vulnerable to water damage. "Also, needing to be held in the hand, they don't help with multitasking," adds Iwamatsu.

In May 2015, the Japan Water Agency began a sweeping program of digitization, including a new IoT internal control system. "We also decided to digitalize our operations manuals and introduce a new system for coordinating teams on-site," says Aoi. "We wanted to implement a solution that would make individual differences in skill levels obstacle to executing operations in a fast, safe and controlled manner."

Head Mounted Display with remote connectivity

Central to the digitized solution would be a Head Mounted Display (HMD), allowing wearers to conduct a wide range of tasks. The Agency had several requirements: the HMD must be durable enough to withstand prolonged outdoor use, the screen should be easy to read, yet not obstruct the wearer's view. Also, it should support at least a four-way conversation, allowing personnel on-scene to receive guidance remotely. The Agency wanted to connect local staff in real-time with experienced personnel in the Saitama City Headquarters and branch offices.

"Nobody was more proactive than Fujitsu in working to provide the requested features," Aoi says. "Particularly the four-way call option and suggesting ongoing improvements."

With April 2017 set out as the date for full implementation, one HMD was provided to teams at nine test sites. Each drainage pump station was tagged with an AR marker. The HMD then recognizes the AR local marker to bring up the appropriate operating instructions. Operating instructions are displayed as instruction cards. When instructions on a card have been completed, the next card can be displayed using voice commands.

Iwamatsu explains the process of redesigning the cards: "Besides a team of mechanical professionals, we involved a wide range of divisions, including civil engineering, architecture, and environmental professionals. We wanted the design to consider diverse perspectives from personnel not familiar with the control panels. The aim was to make instructions clear even for new entrants and clerical workers."

Creating a platform for future innovation

At present, the HMD holds around 250 instruction cards. Each AR is managed by the Lake Biwa Development Integrated Operation & Maintenance Office and updated immediately if changes are made to the equipment or instructions. The plan is to add more cards and image data.

"Only Fujitsu designed a device that could both recognize AR markers and display corresponding instructions," Iwamatsu explains. "We hadn't thought to request that, but an AR-enabled HMD has clear benefits."

Being able to switch to receiving remote assistance immediately when irregularities occur helps personnel respond flexibly to the situation. It also allows personnel to share or keep a record of visual and audio input recorded on-site, and receive images with written instructions from support teams. During tests, the HMDs proved successful in assisting clerical workers with no on-field experience with clear and intuitive instructions, enabling operations straight away.

The new approach includes photographing progress, step by step. "Data showing operations on-site can be useful, for example when preparing an after actions report," Aoi continues. "Displaying instructions showing what to photograph and when ensures the report has the same format no matter who was on-site. Ultimately this makes the reports easier to write and more informative."

"In future, we hope to expand the use of the HMD to include general operations," Aoi concludes. "We're looking at inspecting the Agency's waterway facilities or sharing visuals in real-time during procedures such as valve operations."