

Application package “iQ Monozukuri ANDON”

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Manufacturing sites mainly in Japan have introduced ANDON systems, which show the current production quantities against the targets. Now that the Internet of Things (IoT) has recently been applied to factories (manufacturing sites), there is an increasing need for ANDON systems linked to IT systems. In addition, the automation of equipment has further reduced the man-hours required, but the means for quickly detecting equipment errors is an emerging issue.

To satisfy the increasing need for system linkage and to address the emerging issue of error detection, Mitsubishi Electric Corporation has developed the application package “iQ Monozukuri ANDON” to assist management of the manufacturing process at production sites and share information between workers, thus contributing to improved productivity.

The main strengths are listed below.

- (1) Makes it easy to introduce ANDON systems
iQ Monozukuri ANDON provides systems in which graphic operation terminals (GOTs) obtain production data from the sequencer or contact input and display the production status on ANDON monitors and other displays.
- (2) Reduces the man-hours for designing screens thanks to the template screens for ANDON
Provides template screens for checking the production status (progress), detecting equipment errors, notifying the staff of tooling changes, and other tasks.
- (3) Easy to use thanks to the schedule software for ANDON
Provides software that makes it easy to select the screens to be displayed on ANDON and set the time periods.
- (4) Visualization at manufacturing sites and remote offices
Provides support to detect and handle problems quickly, contributing to improved productivity.

1. Introduction

The Graphic Operation Terminal GOT2000 Series products were developed to differentiate Mitsubishi Electric Corporation from other companies under the concept of “Easy & Flexible,” and are rated highly by customers in Japan and around the world.⁽¹⁾ In addition, in response to diversifying customer needs and the demand for higher quality, Mitsubishi Electric

Corporation offers the FA application package “iQ Monozukuri” to help solve issues at manufacturing sites.

Mitsubishi Electric Corporation released the application package “iQ Monozukuri ANDON” in July 2017 to make it easy to establish ANDON systems using GOT2000 terminals.

2. Why the solution was improved

2.1 ANDON

The ANDON system visualizes the production status at manufacturing sites and the equipment operation status to provide information to the maintenance staff and operation supervisors. The use of ANDON to quickly understand problems at the manufacturing site, share information, and consider countermeasures can improve the site’s productivity.

Japanese manufacturers in particular have been introducing ANDON systems. In response to the recent production of diverse product types in various quantities, there is an increasing need for ANDON systems that are linked with IT systems to visualize the production data and equipment status more quickly and specifically. In addition, the need for ANDON systems for new installation may intensify overseas to further visualize manufacturing sites.

2.2 Aim of iQ Monozukuri ANDON

We have been promoting iQ Monozukuri to realize our “e-F@ctory” concept through the linkage of FA and IT. The concept aims at improving the overall efficiency of business operations in the manufacturing industry and reducing the total cost of ownership (TCO).⁽²⁾ iQ Monozukuri optimally combines expertise to assist customers in solving various manufacturing problems, thus making it possible to efficiently introduce, extend, operate, and maintain systems.

The iQ Monozukuri ANDON package displays data obtained from production equipment on the ANDON monitors via GOT2000 terminals, making it possible to share information on the manufacturing site and improve productivity. In addition, iQ Monozukuri ANDON makes it easier to introduce and use the ANDON systems, reducing overall system costs.

3. Characteristics of iQ Monozukuri ANDON

iQ Monozukuri ANDON consists of GOT2000 terminal(s), template screens for ANDON that are used in system design, and schedule software for ANDON to be used during operation after system introduction (Fig. 1). Customers design the screens and items to be displayed based on the specifications of the lines into which the ANDON systems are to be installed, and using iQ Monozukuri ANDON can reduce the man-hours required to design the ANDON screens. Unifying the ANDON monitor and the signage screen can reduce the space and cost and also improve other factors.

The main characteristics of iQ Monozukuri ANDON are described below.

3.1 Easy installation of ANDON systems using the GOT2000

System designers can easily establish systems that connect not only to Mitsubishi's FA equipment but also to other companies' controllers and open networks by selecting from the many communication drivers of the GOT2000. Therefore, by installing the GOT2000 into existing lines and equipment having various types of controllers, various types of data on production equipment can be gathered, making it easier to establish ANDON systems (Fig. 2).

3.2 Reduction of man-hours for designing screens thanks to template screens for ANDON

The multiple template screens provided for ANDON are appropriate for understanding the production status and operation conditions of the manufacturing lines and equipment (Fig. 3).

The use of the GOT screen design software "GT Designer3" allows the template screens to be customized, making it easy to renew the ANDON screens. Therefore, the man-hours required to design screens can be reduced and operators at manufacturing sites can quickly incorporate improvements (Fig. 4).

In addition to visualizing the production and operation status, various functions are provided to improve the efficiency of operations at manufacturing sites, for example, the leader call screen (Fig. 5) and the remote control screen to switch ANDON screens from tablet terminals (Fig. 6). Such functions can improve the productivity and equipment operation rate.

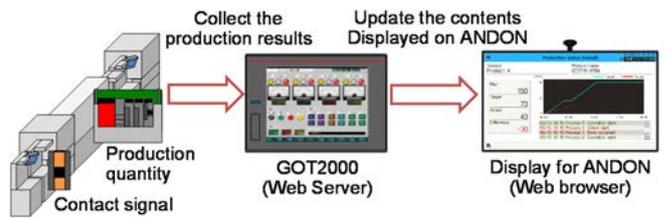


Fig. 2 Easy installation of ANDON system

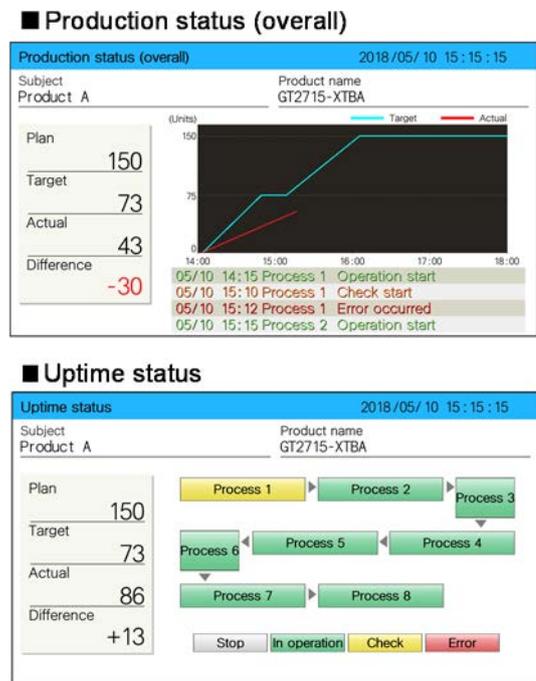


Fig. 3 Template screen examples for ANDON

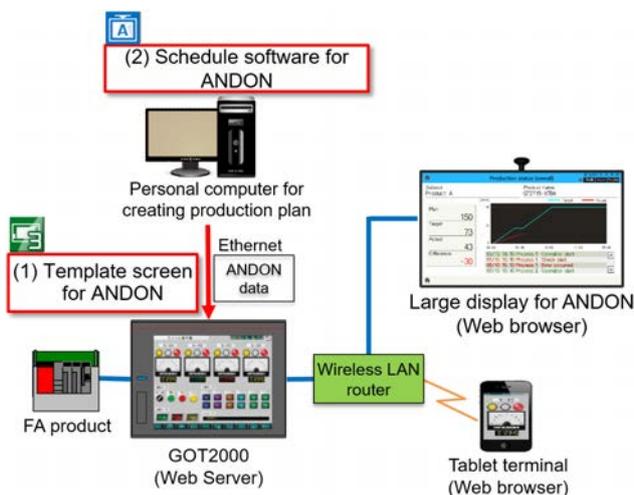


Fig. 1 iQ Monozukuri ANDON system

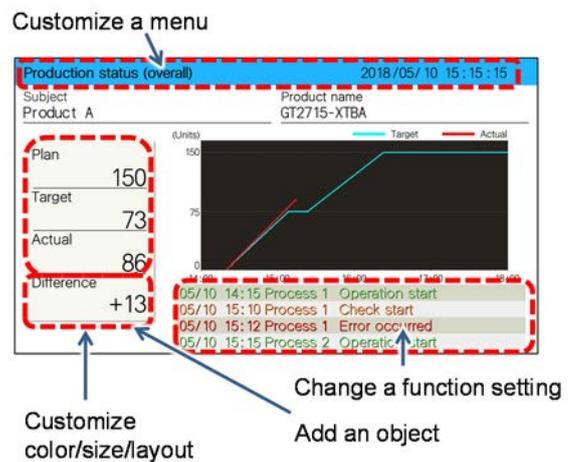


Fig. 4 Customization of ANDON screens

3.3 Easy operation with the schedule software for ANDON

Using the schedule software for ANDON, production plans can be added, deleted, and revised similar to using commercially available schedule software (Fig. 7). In addition to production plans, the software can also set signage, and thus be used to issue notifications at manufacturing sites and view training materials, resulting in more efficient management of manufacturing sites (Fig. 8).

In addition, the schedule software for ANDON can control up to five GOT2000 terminals, enabling comprehensive ANDON management for medium- to large-scale lines and equipment involving multiple GOT2000 terminals (Fig. 9).

3.4 Visualization at manufacturing sites and remote offices

iQ Monozukuri ANDON can manage the contents to be displayed on up to five ANDON systems using the "GOT Mobile" function regardless of the display size of the ANDON.

Therefore, the contents to be displayed on ANDON can be set specifically for the relevant persons and location. This makes it possible to check the operation status in detail and handle problems quickly, thus further improving the equipment operation rate (Fig. 10).

4. Technologies to realize the characteristics

The production plan and signage data (e.g., notice board) to be displayed on ANDON are updated daily based on the production status and schedule. To minimize the impact from such high updating frequency on the processing by GOT2000 terminals and controllers, the screens to be displayed on the ANDON monitors, the production plans for products, and the signage data are separate from each other to allow them to be individually managed.

As shown in Fig. 11, data on the template screens for ANDON is stored in the GOT2000's internal memory as is done with the data on the screens displayed on other GOT2000 terminals. However, the schedule data to be displayed on the ANDON monitors, such as the production plan and signage, is stored on an SD card. The processing section for ANDON compiles this data to configure the screens to be displayed on the ANDON monitors.

This mechanism allows system designers to freely design and customize ANDON screens using GT Designer3 (GOT screen design software). Meanwhile, operators at manufacturing sites and ANDON system users do not require experience in screen design on GOT2000; they can use ANDON systems by setting the production plans and signage data with the schedule

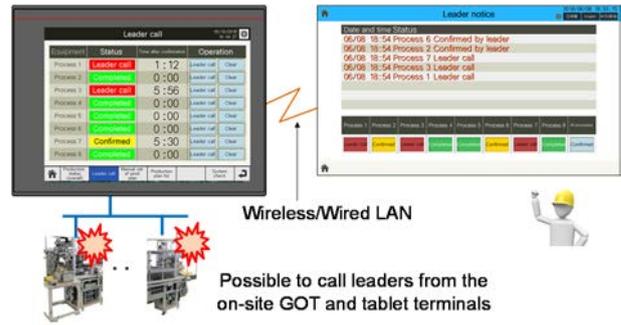


Fig. 5 Leader call screen

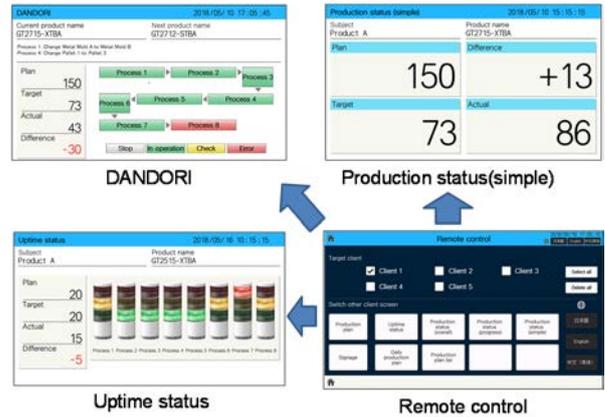


Fig. 6 Switching ANDON screens with remote control screen

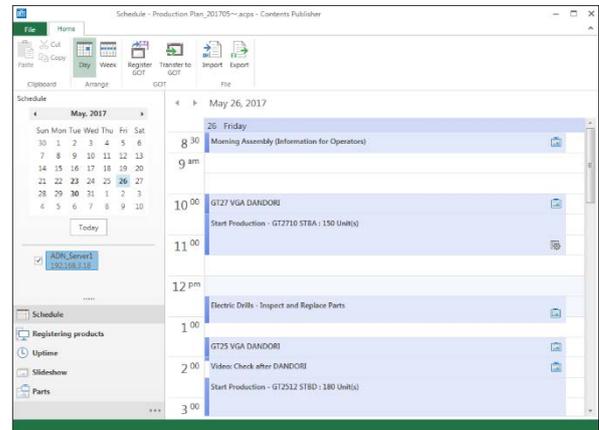


Fig. 7 Schedule software for ANDON

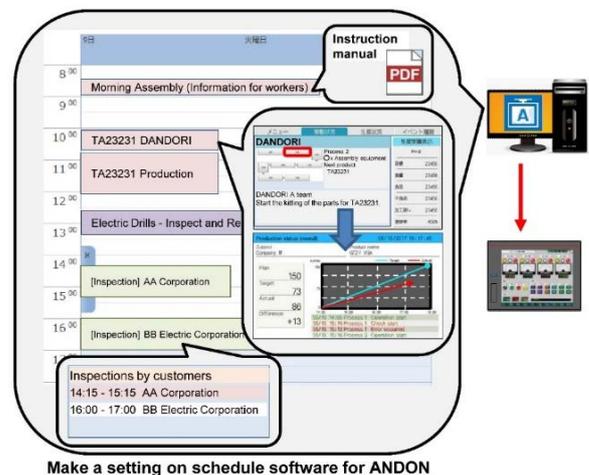


Fig. 8 Easy operation at production site

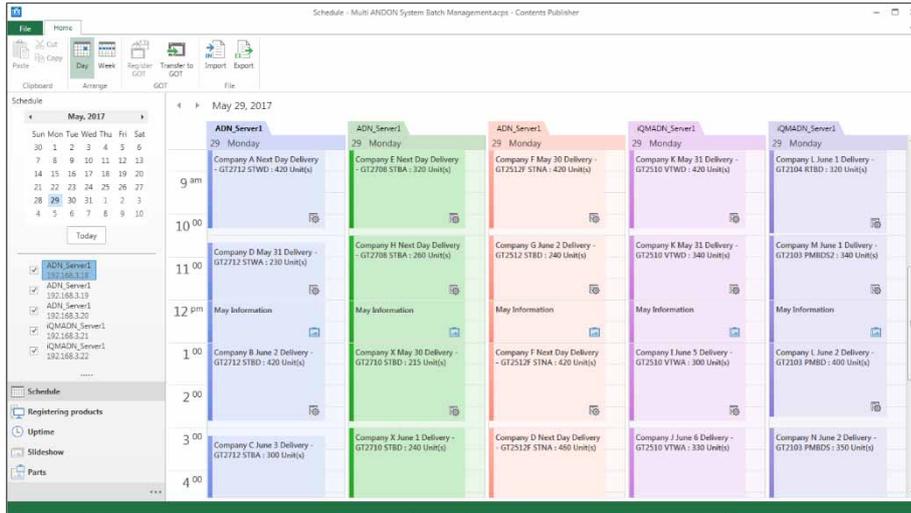


Fig. 9 Multiple schedule management settings

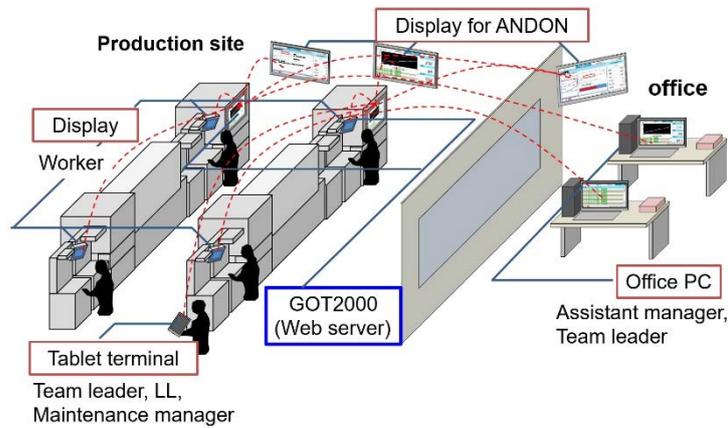


Fig. 10 Visualization of production site from remote location

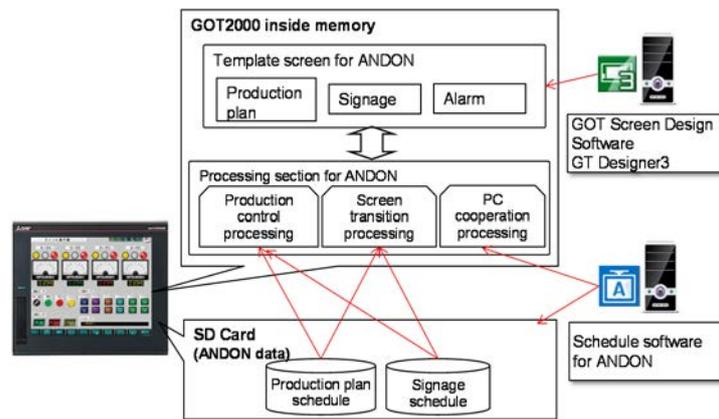


Fig. 11 Relationship between ANDON data and ANDON process

software for ANDON. These techniques make the system user-friendly with minimum effect on GOT2000.

5. Conclusion

This paper described the application package iQ Monozukuri ANDON that makes it easy to establish ANDON systems through the linkage of FA and IT. We will continue to expand the application package and develop solutions to problems at manufacturing sites,

offering added value to our customers.

6. References

- (1) Deguchi Y., et al.: Troubleshooting Solutions for Graphic Operation Terminal "GOT2000 Series", Mitsubishi Denki Giho, 89, No. 4, 235–238 (2015)
- (2) Sumisaki R., et al.: Application Package "iQ Monozukuri" for Factory Automation, Mitsubishi Denki Giho, 91, No. 4, 209–212 (2017)