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Explosion-Proof Wireless LAN That Assumes a Large Role in Sensor Network System

1. Introduction

Recently, with extended plant life and aging of operators in the energy, petroleum and petrochemical industries in Japan and other countries, maintaining safe and stable operation has become a critical issue.

In this situation, there have been heightened needs for "visualization of plant operation" to maintain safe, stable operation and support efficient operation in recent years. As one means for realizing this, sensor networks including wireless LAN have attracted attention, and introduction is progressing, particularly in the petrochemical industry.

JFE Engineering has developed and sells wireless LAN devices which can be used in hazardous areas. This report introduces the features of these devices, together with examples of system introduction.

2. Introduction of Explosion-Proof Wireless LAN Products

2.1 Explosion-Proof Access Point (LANEX™-AP0301)

LANEX™-AP0301 (**Photo 1**) is a new type of access point (hereinafter, AP) which has a flame-proof construction and can be used in Zone 1/2 hazardous areas. Its main features are as follows.

(1) System construction with only one channel is possible (single-channel control architecture).

(2) Uses 3×3 multi-input multi-output (hereinafter, MIMO[*1]), and enhances communication quality by multibeam antennas.

(3) Supports IEEE 802.11ac (5 GHz band), realizing high speed.

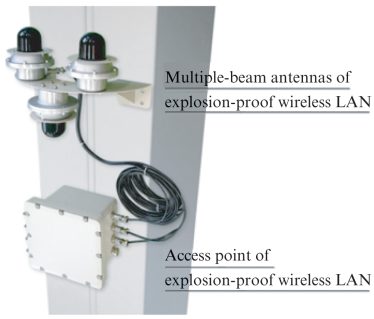

Photo 1 LANEX™-AP0301

Table 1 shows a comparison of the LANEX-AP0301 and two conventional products.

Although 2.4 GHz band wireless LAN has 13 channels (channels 1 to 13), the number of channels that can be used concurrently is generally limited to a maximum of 3 (e.g., channels 1, 6 and 11) in order to prevent radio-wave interference (shared-channel interference) between APs, as shown in **Fig. 1**. For example, when channel 1 is used, interference with channels 2 to 5 occurs.

The single-channel control architecture is a technology that prevents interference by controlling all APs so that the timing of radio transmissions does not mutually overlap, even with only one radio frequency (channel). Normally, when three or more APs are installed, a

Table 1 Comparison of explosion-proof access point

Company	JFE Engineering		Miyaki Electric
AP model	LANEX -AP0301 (New model)	LANEX -AP0200n (On sale)	EAP-50W (End of sale)
Support standard	IEEE802.11b/g IEEE802.11n IEEE802.11a (option) IEEE802.11ac (option)	IEEE802.11b/g IEEE802.11n	IEEE802.11b/g
Explosion-proof grade	Flame-proof construction (Zone1/2)	Flame-proof construction (Zone1/2)	Flame-proof construction (Zone1/2)
Communication distance	Approx.190m	Approx.100m	Approx.70m

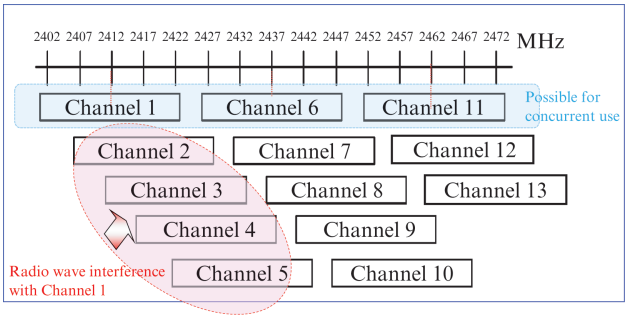

Fig. 1 Channels of wireless LAN

*1: Smart antenna technology for enhanced communication quality.

† Originally published in *JFE GIHO* No. 45 (Feb. 2020), p. 70−72

method in which multiple different radio waves (maximum of 3 frequencies) are transmitted to each AP is adopted to prevent radio-wave interference.

Wireless instrumentation includes systems that use the same frequency band as wireless LAN, but as the number of channels being used increases, the possibility of radio-wave interference between the wireless LAN and wireless instruments also becomes higher. The single-channel control architecture is an effective means for preventing radio-wave interference, not only during use of only the wireless LAN, but also during mixed use of the wireless LAN and wireless instruments.

2.2 Explosion-Proof Smartphone (LANEX™-Phone)

LANEX-Phone (**Photo 2**(a)) is a smartphone with a special protection construction and can be used in Zone 2 hazardous areas. iPhones *2 can be installed in LANEX-Phone. Use of an iPhone *2 as the internal unit of the explosion-proof smartphone makes it possible to use the device as an ordinary mobile phone and also enables use of applications that run on iOS *2. Because the mobile phone circuit can be used in hazardous areas without installing a special telecommunication infrastructure, it is possible to use LANEX-Phone as a mobile terminal that contributes to high work efficiency, for example, by improving communications inside/outside of hazardous areas and distributing live images of the site.

2.3 Explosion-Proof Tablet (LANEX™-Tablet/m)

LANEX-Tablet/m (Photo 2(b)) is a tablet with a special protection construction that can be used in Zone 2 hazardous areas, and can be configured with an iPad *2 mini. Like the above-mentioned explosion-proof smartphone, it is possible to use applications that run on iOS *2, supporting paperless maintenance and inspection work. LANEX-Tablet/m can also be used was a mobile terminal for technology transfer tools when handing down technologies and skills to the next generation of workers.

(a) LANEX™-Phone (b) LANEX™-Tablet/m

Photo 2 Explosion-proof smart phone/tablet

*2: Trademark or registered trademark of Apple Inc. in the United States and other countries.

3. Examples of System Introduction

3.1 Plant Maintenance Support System

Digitization of various types of control logs which had conventionally been managed in paper form and applications for linkage with the control log system make it possible to collect logs that show the dates when work was performed (implementation record) and to digitize work procedures (display of manuals, work guidance, etc.).

Figure 2 shows the image of system introduction.

Work is normally carried out while communicating online with a server. Under environments where communication is difficult, it is possible to continue work by switching to offline and upload the input results in an area where communication is possible.

The methods adopted for operation of tablet terminals include both direct manual input of the necessary information by touching the screen, and information input by reading barcodes or QR codes.

3.2 Plant Operation Support System

This is system for realizing higher efficiency in plant operation by enabling plant monitoring at the site, checking alarms during site work, etc. Although use of

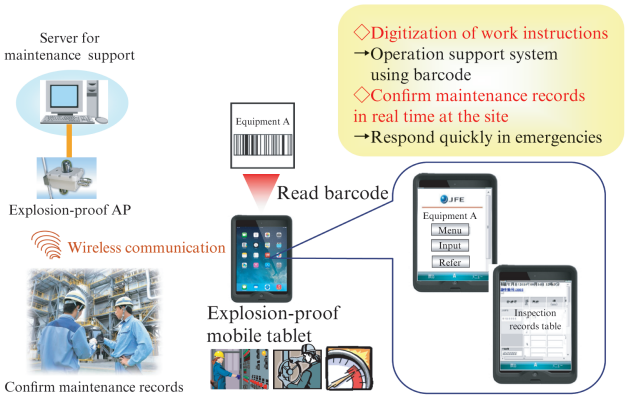

Fig. 2 Plant maintenance support system

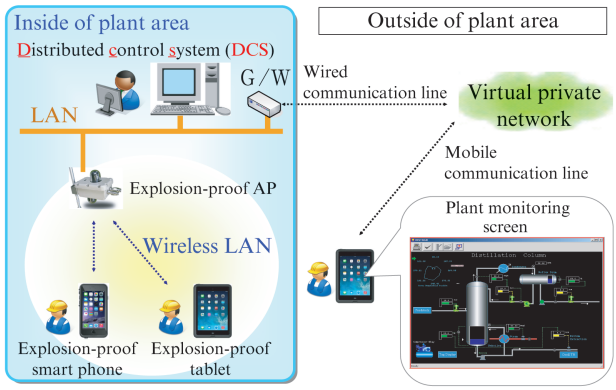

Fig. 3 Plant operation support system

this system is frequently limited to inside the plant area, persons in charge can monitor the plant from other locations (office, business trip destinations, home) and at any time (including holidays and nighttime).

Figure 3 shows an image of system introduction.

4. Conclusion

In the future, needs for wireless LAN solutions are predicted to expand while also becoming increasingly diverse. For example, in the case of camera images, since transmission of images with high resolution which cannot be satisfied by the conventional resolution is frequently expected, communication at a high transmission rate is inevitably necessary. Achieving higher transmission rates will expand the range of applications that can be used and will further expand the market.

By continuing to develop and market explosion-proof products that support new devices in the future, beginning with explosion-proof smartphones and explosion-proof tablets that are compatible with new Apple products, JFE Engineering hopes to contribute to safe, stable work in plants and a higher level of technology transfer.

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