MEASUREMENT & ANALYTICS I WHITE PAPER

Remote indicators in process industries

Introduction

Despite the prevalence of large scale, sophisticated control systems, in many industries and plants a need for local check and visualization of process parameter values remains important. Operators need these local indications to ensure correct and safe operation of production steps, to secure that process parameters such as flow rates, levels, pressures and temperatures are within limits and to ensure calibration is conducted accurately. This is the primary role of field indicators.

Remote field indicators bring a measurement from a data capture device, such as a temperature gauge or flowmeter, to a position more accessible for an inspecting operator. The measuring device may be in a hazardous or hard to reach area and a remote indicator, connected over a 4-20mA loop or Fieldbus network, will give access to the information without the need for the operators to take unnecessary risks.

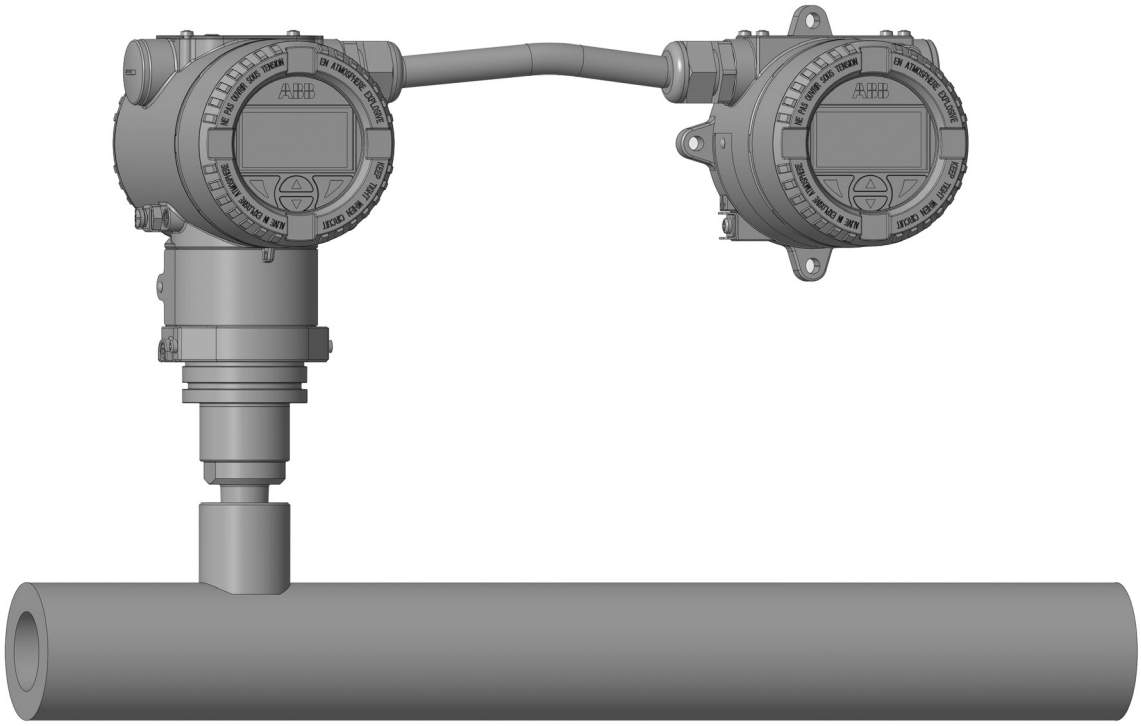
The need for remote indicators

These days, we are accustomed to sophisticated control systems based on transmitters that connect process data to distributed controllers for action and to central computing facilities for analysis and recording.

Systems such as these give companies a real advantage of cost-effective control and offer great possibilities for keeping track of plant performance, costs and how they affect the business as a whole. Yet capable though they are, they are not the whole story.

Very often it is necessary to get a quick, visual indication of a local data point on one part of the process. This is the role of indicators. Simple devices that offer readings of values such as pressure and temperature, they offer a rapid way for process operators to get an idea of how particular values are changing on the part of the process they are responsible for.

Essentially, field indicators are signal conditioner/converter devices, providing many of the same roles while also including a convenient local display. They are designed to mount on or near a flow or level or other sensor and are usually



— Example of a remote indicator decoupled from the measuring device

supplied in weatherproof enclosures that can also resist harsh environments. Many “smart” field indicators offer additional, more advanced functionality such as sensor linearization.

Such indicators can be used for a number of reasons, such as when a measurement is taken by a transmitter that is difficult to reach - it could be situated at a dangerous height or installed in a small space impossible for a person to access.

The transmitter may also be in a hazardous area, with risks such as high voltages, or a potentially toxic / explosive atmosphere, giving the need to read the data remotely via an indicator.

They are also useful where pressure, temperature and level measurements need to be decoupled from the data acquisition point, or where operators need to set process controls while referring to actual live measurements.

Some indicators incorporate Foundation Fieldbus (FF) communications allowing operators to check more measurement points from a single position. FF indicators, leveraging a more advanced protocol than analog or HART, can be beneficial if process staff need also to perform calculation or operations using raw data from transmitters and if the company operates devices of different brands in the plant. It is also useful when operators need to operate or configure FF devices from the field.

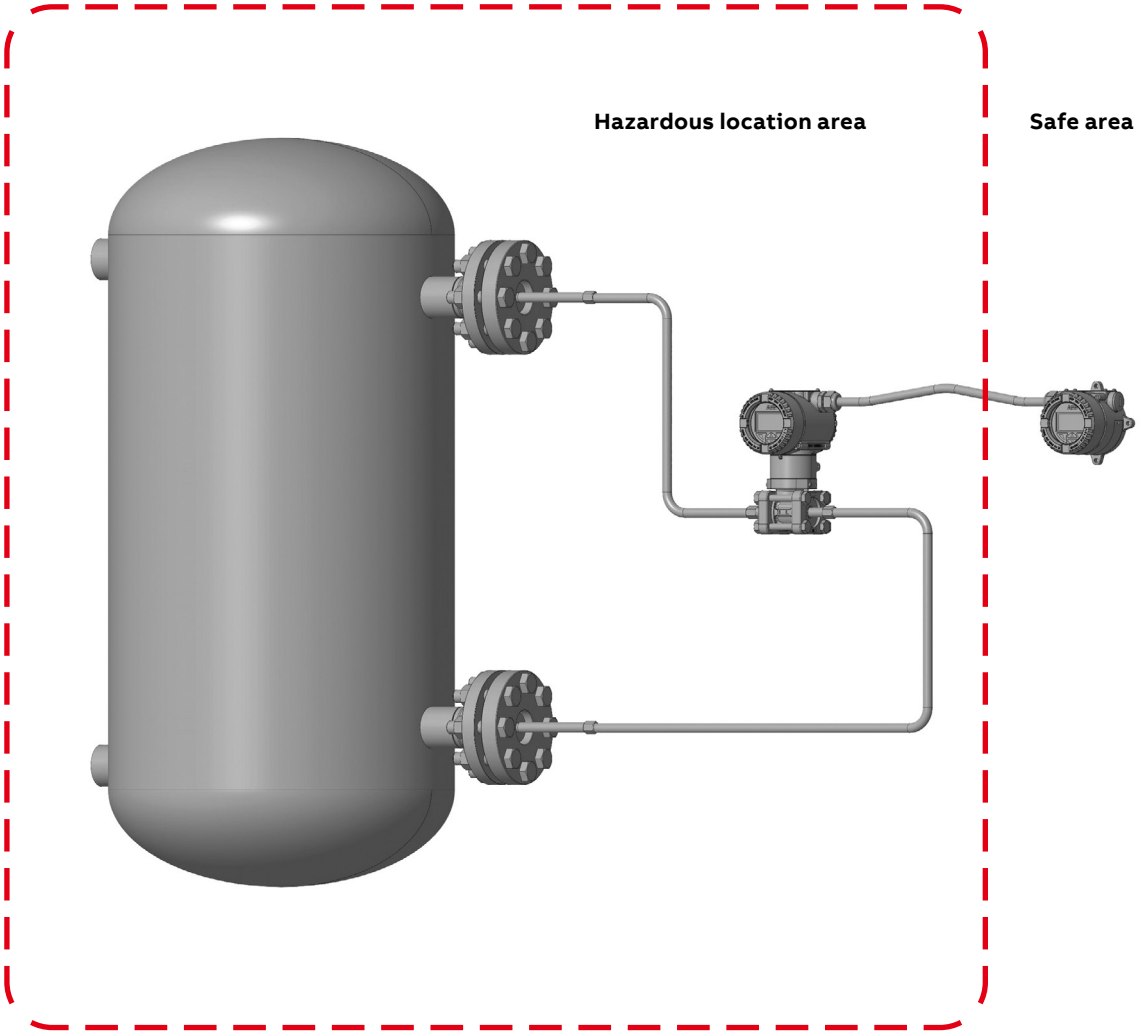
Remote indicators in use

Remote indicators find wide application in industries such as steel plants, oil and gas refining, transportation, storage tank indication and chemical processing. As such, indicators must be designed for all-weather performance and must be vibration and corrosion-resistant, as well as certified for use in hazardous areas.

The type of operations conducted at each plant will determine which indicators on which transmitters need to be read by operators regularly. These transmitters either need to be at a standard height or use a remote indicator wired to the transmitter if process conditions dictate.

It is common in specifications covering instrument installation and commissioning to include a requirement that local indicating instruments must be readable at the point where the related equipment is operated. Alternatively, they need to be readable from where the primary instruments need to be tested or calibrated. This means that local indicators are often to be found at points where calibration or some form of periodic testing is required.

Some of the major benefits of using remote indicators include better safety for operators as there is no need to physically access difficult to reach measurement points. With no climbing required and no need to adjust ladders or other specific tools, risk of falls and injuries is greatly reduced. Once they are installed, operators can safely monitor the data from devices while avoiding the need to enter hazardous areas.



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Example of how a remote pressure indicator can be used to provide visualization of data in an explosive area application

Power requirements
Remote indicators most commonly use analog signals, powered by the 4-20mA current loop, or by an internal battery, or by a DC supply voltage, with 24 VDC being the most common. An example is ABB's JDF200 Field Indicator. Compatible with all 4-20 mA, 2-wire systems, it is applicable in all industry sectors where flow, level, density, pressure, temperature and heat transfer rate remote measurements are needed.

Because a loop will also have the same current at all points, a loop powered device can power itself from the 4-20 mA loop without affecting the current levels in that loop. This means that loop-powered instruments such as remote indicators need consume very little power when in operation.

With no need to source additional power beyond the 4-20mA loop, the expense of running further lines is removed. This could be an important factor if the application is in a remote or inaccessible part of the plant where it may not be possible to run more lines.

Because they only need two wires to connect, remote indicators are easy to install. They are normally less expensive than three and four wire systems, which will rely on an external power supply.

Loop powered devices are also usually less expensive than other process control devices, which often have higher power supply requirements. A lot of this cost reduction is due to the absence of expensive components such as

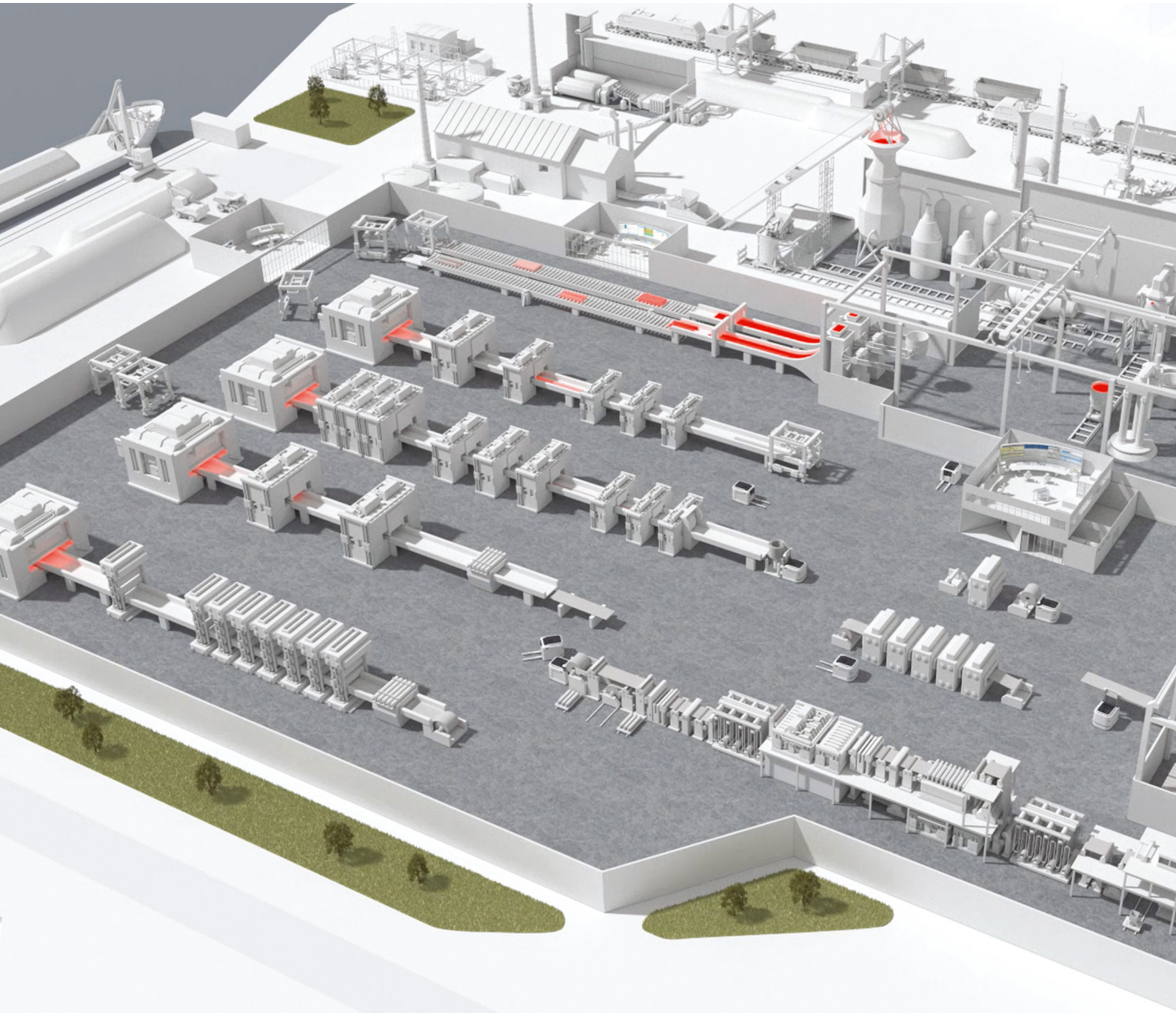
mechanical relays and advanced digital or analog signal output components that can be found in three and four-wire powered devices.

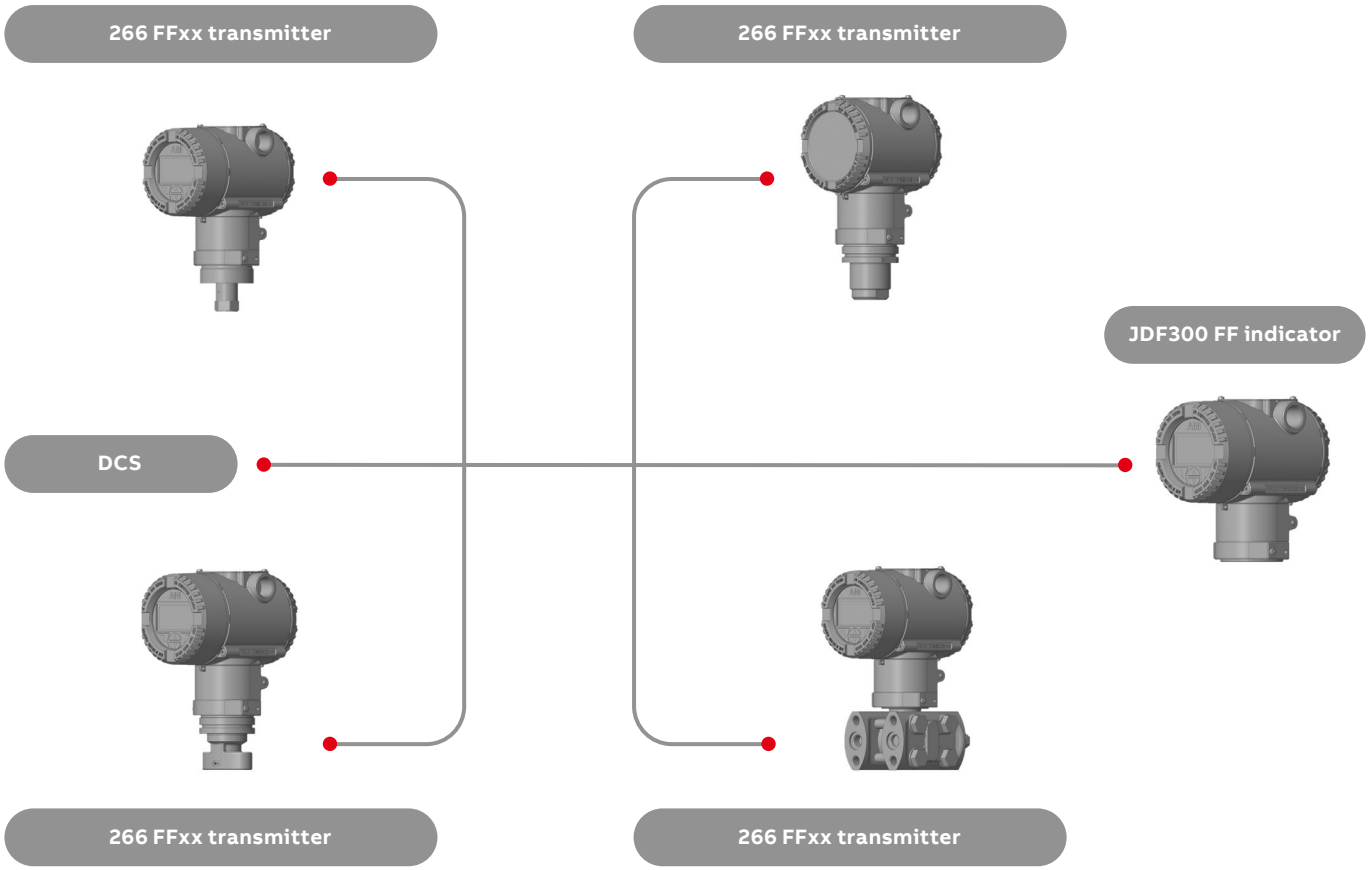
The low power demand of loop-powered devices also means that remote indicators are generally approved for use in hazardous areas and can be classed as intrinsically safe or non-incendive. Approval for these classes of operation requires the device to consume so little power that it is incapable of causing combustion events during normal operation or fault conditions. With their low current draw, remote indicators easily meet this requirement, making them an ideal solution for hazardous area applications.

Typical products

An example of a typical advanced indicator is the ABB JDF300 Foundation Fieldbus indicator. This device has been designed to withstand high vibrations as well as the destructive effects of highly corrosive areas. The JDF300 is available in an aluminum or stainless-steel housing, making it suitable for harsh ambient conditions. This makes the device an ideal fit for steel, oil & gas and chemical processing plants, storage stations and transportation.

The JDF300 can display up to eight different variables, including pressure, temperature, level, flow or any other element, making it a good solution to the challenge of remote viewing of process data while avoiding the need to install a separate indicator for each process value.





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Example of FOUNDATION Fieldbus network with remote indicator

The device is certified to ATEX, FM and IECEx, allowing it to be used across industrial environments and particularly in high-hazard situations. This results in easier and safer measurements for operators.

It is compatible with any existing Foundation Fieldbus networks and can be configured for local or remote use. The JDF300 has an intuitive and user-friendly set up menu allowing operators in the field to interact with the device without the need for extensive training.

The unit is also easy to install both on walls and pipes due to its multipurpose bracket system. The modular construction also makes replacing selected parts easier when maintenance is required.

ABB remote indicators such as the JDF300 and the similar JDF200 analog indicator, have seen particular success in the South Korean oil and gas industry. Some JDF200 indicators have also been used in various projects in Middle Eastern countries, in combination with temperature transmitters on refinery gas exhaust applications.

ABB Measurement & Analytics

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