Can Gas Detection Really Save You Time and Money?

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Gas detection has come a long way since its inception nearly 60 years ago. Technology has permitted the emergence of a variety of sensing principles and has also enabled devices to become more user-friendly, more functional, easier to maintain and safer. Competition in the market place, born out of the mass commerciality of today's global market, has helped to drive down the cost of gas detection, providing customers with more benefits for their money. But what does this really mean in terms of customer value? Can you really save money by integrating the right type of gas detection and if so, how much?

A device doesn't have to be smart to save you money

"Smart" functionality may mean different things to different people and encompasses much more than just a device's features and in-built intelligence. Devices with firmware are often seen as being "smarter" than traditional analogue systems because they may be able to self-diagnose, improve accuracy, and possibly decrease the amount of time spent calibrating or maintaining the device.

This does not necessarily mean that a device can only save you money if it features in-built intelligence. Products can only be properly evaluated within the context of their subsequent use and where they will be situated; this means that the application itself, environmental factors and additional elements the device could come into contact with all impact upon whether one device is really a "smart" choice after all. In some cases, non intelligent devices may be a better choice for an application. This is highlighted by the divide in the global petrochemical industry with different regions adopting different technologies.

Functionality doesn't necessarily have to be intelligent to make a big impact. The newly launched Sensepoint XCD from Honeywell Analytics features a tri-colour display that clearly indicates the unit's status at a glance – even from a distance; green for normal operation, yellow to indicate a fault status and red to indicate an alarm status. Although there are many models on the market that offer tri-colour LCD indicators, Sensepoint XCD is in fact the only model to provide a full colour-illuminated screen that is easily seen from a distance. An example of the cash saving this functionality could actually translate into can be illustrated by the following example: Consider a plant set up, where a series of devices are monitoring for gas hazards and are feeding back information to a PLC. If a hazard occurs, the maintenance engineer must enter the area, and find the sensor that has gone into warning/fault. If the plant is large with many points of detection, this can take some time. In the case of Sensepoint XCD, the device in warning/fault will be clearly visible by its bright illuminated screen, meaning that the engineer can get straight to the unit and the simplicity of the colour coding means that the device's status is instantly accessible with a simple glance. This can be the difference between an engineer needing to spend 1 hour to locate and access the device or as little time as 10-30 minutes.

Aspects like Sensepoint XCD's unique tri-colour display screen are not necessarily "smart" in their own right, but as the example highlights, the resulting impact they can have in saving time and subsequent costs may well make them a "smarter" choice over a comparable solution. In addition, the device's display also negates the need for additional expense associated with integrating local status lights, providing a cost saving.

Sensepoint XCD's unique tri-colour display screens

Time is money

The most cost-effective systems are those that permit quick and easy use of the device and minimal training. Even a small reduction in the time required on each device – just a few minutes – can quickly translate into big cash savings over time, as the following hypothetical example highlights; consider a site that has 100 catalytic bead driven devices; if each unit takes 10 mins to check and re-calibrate, the labour bill associated with this activity will be just over a day (1.04 days) based on a day consisting of two 8hr shifts / 960 mins. If a day of labour costs 600€ (300€ / shift), and this activity needs to be carried out twice yearly, the total labour cost would be 1,248€. Imagine an identical plant that has 100 catalytic bead driven devices that only require 6 mins per device to check and calibrate; based on the same labour costs and working day, this activity would only take just over half a day (0.62 days), meaning that the same labour bill by the end of the year is reduced to 744€; a saving of 37% by saving 4 minutes per device.

The features three variants; a mV input transmitter for use with catalytic sensors for flammable detection or IR sensors for Hydrocarbon and CO_2 detection; an electrochemical cell (EC) transmitter for use with EC sensors (for the detection of CO, H_2S and H_2); and finally an Oxygen transmitter for the detection of O_2 using EC sensors. All three variants feature the same interface and calibration methods, which mean that operators do not to be trained to use each variant separately. This is particularly valuable as plants can evolve and processes can change, meaning additional gas detection solutions are required. Using devices with common design and operation like Sensepoint XCD mean that training can be minimised. And when you consider the training fees, expenses to get personnel to the location where training is situated and also any cost implications resulting from additional personnel cover whilst training of one group is taking place, this can provide thousands of pounds worth of savings. To provide an example, if training fees are 2000€ per day, and the company is sending three engineers from a plant in Germany to a training centre located in the UK, these costs could escalate to 2,540€ (including flights and accommodation for the three engineers). This does not take into account the fact that additional labour cover may be required at the German plant whilst the engineers are attending the single day of training (although they will only be in training for one day, they will require a day either side to travel from Germany to the UK). Based on a labour cost of 300€ per 8 hour shift for each engineer, the cost escalates to 3,440€. Compare this with the costs associated with a device that employs a common interface and design and these costs can be dramatically reduced; at the same plant, one engineer who is already familiar with the interface and technology can train additional engineers on-site. He can also train the engineers individually, reducing the need for additional cover whilst training is taking place. Using this scenario the associated costs could be reduced to 900€ (based on the service engineer conducting the training himself at the labour cost of one 8 hour shift at 300€, the two subsequent engineers each taking half a day to be trained separately at the cost of 150€ each and two half days of additional cover whilst each engineer is being trained at 300€). This alone provides a saving of 2,540€.

Any minimisation of production loss can deliver huge savings. Consider a site that uses Sensepoint XCD to monitor for Methane gas in a potentially explosive environment of a petrochemical plant. The device's ability to provide useful warnings that indicate the need for maintenance can help to reduce nuisance alarms. Sensepoint XCD also offers simple and easy set up via its intuitive user interface, reducing the chance of incorrect set up or calibration, which can also lead to nuisance alarms. Just one nuisance alarm that causes a required process shutdown of 60-90 minute at a site producing 1000 barrels of oil per hour, can equate to 1,500 barrels of lost oil production resulting in lost revenue of 65,100€, based on a barrel price of $70 (47€).

Ease of sensor swapping and calibration can also deliver savings. This can be highlighted by the auto recognition Plug & Play sensor capabilities of Apex from Honeywell Analytics, which use smart pre-calibrated sensors. These types of device can be taken out into the field and changed over in just one minute.

This means that the change out of 100 Apex sensors would take just under two hours (equating to a cost of 75€ based on a day consisting of two 8 hour shifts at an in-house labour cost of 300€ per shift to undertake this work per day) to complete. Conversely, if a site has 100 devices that use standard sensor technology (with each device requiring 20-30 minutes to change those sensors over and re-calibrate), this activity would take approximately 3 ½ days (2,100€ based on the same rate and day duration); which provides a saving of 2,800%. If each sensor has a life of two years, the savings that a

site can make over a 10 year period - just from sensor swapping alone – would be a 10,125€ saving from using a device like Apex that features smart sensors over a solution that only offers standard sensor technology.

Speculate to accumulate

The saying "you get what you pay for" often rings true, meaning that more intelligent devices and those that deliver enhanced functionality tend to have a higher purchase price. But often this money can often be recouped many times over as can be highlighted by the savings that automatic data logging can have on a site's labour cost. For example, a controller that can carry out regular automatic data logging, may cost 500€ more than a controller that cannot offer this functionality. A site that wishes to data log every hour will need an engineer to undertake this work manually, if an automatic facility is not available. If each data log check takes 15 mins to complete, this means that in a 16 hour day, 4 hours will be required to make the relevant checks. If a wage bill of 30€ / hour is attributed to this activity, the cost per week would be 840€. This means the automatic data logging device's additional purchase cost has already been recovered in just one single day's use, plus an addition 340€ from the saved labour bill. By the time the device has been used for a year, the purchaser will have saved nearly 43,680€ in labour just for this activity alone.

The same can be said of aspects like intelligent communications platforms such as MODBUS and LonWorks that facilitate enhanced two-way communication between the device and the control system. This type of functionality has many potential benefits like assisting with planned maintenance activities, allowing operators to plan and schedule maintenance to save money and improve time efficiency as well as ensure maximum equipment uptime. This can also be achieved without the need for additional cabling, and considering that cabling is the single biggest cost for any site, this is attractive indeed.

Field time can also be reduced because devices that have been inhibited so field work can be carried on them, don't need to be manually put back online by a second employee working in a control room; they can be set to automatically go online. This functionality also limits the occurrence of nuisance false alarms that can adversely impact on a plant's production.

The benefits of common design to your bottom line

Today's devices are being built with not only functionality in mind but also a smarter approach to product design; aspects such as common device and spare parts design enable businesses to carry less spares. As an industry average, 2-5% of the total order is required as additional spares stock. The savings that this can deliver can be illustrated by the following example, using a hypothetical device that utilizes common design across three transmitter model variants; if a site is monitoring for a variety of hazards, including toxic,

Sensepoint XCD from Honeywell Analytics

flammable and O_2 depletion with 300 points in total (based on 100 of each type with 2 sets of sensors per transmitter), the spares required using this type of device would be 15 transmitters, and 10 of each sensor variant. For arguments sake, if the transmitter cost was 500€ and each sensor cost 30€, the spares value would represent 8,400€. Conversely, if the same site was using an uncommon transmitter designed, they would require 45 transmitters in total (15 per variant) and 90 sensors (to cover 2 spares per variant device). Using the same example pricing, the spares stock value suddenly increases to 25,200€. This highlights the massive savings that common design can yield; equating to a 33.3% saving in spares alone.

Maintenance: Prevent issues, don't react to them

Ongoing equipment maintenance has been talked about throughout this article, but a special mention should be made to the positive impact that adopting the right maintenance philosophy can have. Preventative maintenance is preferable to reactive and a big factor in facilitating preventative maintenance is the implementation of solutions that can self diagnose, warn of potential issues and feedback various status indicators to control. A device that has no detectible failure modes (also known as a fail-to-safety device), offers not only enhanced protection but large potential cash savings via its ability to forewarn of a developing issue.

An Open Path optical device such as Searchline Excel from Honeywell Analytics operates with no detectible failure modes. This type of device uses a transmitter and receiver set-up where a beam of IR light is sent over a range. Hydrocarbon gases absorb IR light at different wavelengths (depending on the gas itself), so a difference in signal strength at the receiver indicates a gas cloud in the range. If this signal drops below a certain level, the device will warn that its beam is becoming blocked. Equally if the signal sent from the transmitter falls below a certain level, the device will interpret this as possible dirty optics and warn of the fact that work will need to be carried out in due course, thus minimising unforeseen failures by its design.

Conversely, a catalytic bead device has undetected failure modes. For example, if someone has accidentally painted over a catalytic bead device and blocked its sinter, or a poison such as silicone kills the sensor, the detector will not indicate a fault and will appear to be capable of detecting gas; it will just show a 0 reading as if no gas is present. Not only does this compromise potential safety, it means that more frequent checks need to be made.

Using devices that can minimise unforeseen failures does not only improve the safety case at a site, they can extend the period of time between service intervals. This can be highlighted comparing an Open Path IR device to a catalytic bead device in terms of ongoing maintenance required. An Open Path device can warn of a need for maintenance, such as dirty optics requiring cleaning and the scheduled maintenance period interval can be as long as one a year. Conversely, a catalytic bead driven devices being used in a poison-free environment are typically challenged twice yearly (please note, this period can be extended with site/user experience). In a petrochemical plant where known catalytic bead poisons such as Propylene Oxide and Ethylene Oxide are present, this bump testing might need to be as frequent as every 3 months, equating to an increased maintenance labour requirement of 400% when compared to an Open Path IR device's ongoing requirements; and this does not account for additional savings that can be made from a reduction in points needed (one Open Path device can typically replace five points of detection), and the subsequent reduction in cabling. These additional dimensions make the migration from point to Open Path one that can potentially deliver huge savings.

It is important to clarify that many factors impact upon whether a fail-to-safety device is more applicable than a solution with undetected failures. For example, many petrochemical applications choose to fit catalytic bead devices because they are unlikely to be affected by the potential failure modes.

When considering the impact of maintenance, an individual site's philosophy should be considered, including the available resource to undertake this work, and also any additional process equipment in the area where gas detection is situated that also requires ongoing maintenance.

A Case by Case approach

Local factors and individual plant set up will have a massive impact on whether one device is more suitable than another in terms of providing a cash saving. In reality there is a plethora of factors that can impact upon the selection of gas detection solutions capable of reducing the ongoing cost of gas detection. It's important to work with a supplier who can provide multiple technologies and specification variance, as this will enable them to give impartial guidance on choosing the right solution that is truly fit for purpose, based on your individual variables.