Case study

MEASURING DANGEROUS DUST LEVELS REMOTELY

Bringing *life* to technology.

Measure

Dust from construction sites and quarries can be a nuisance for neighbours and dangerous for workers, so it must be closely monitored. Our client already had the technology in place to measure dust particles, but we evolved it – and connected it to the internet.

The challenge

Our client was already measuring the concentration of dust particles in the air with ES-642 Remote Dust Monitors. The particles they are most interested in are PM10 and PM2.5, as they're small enough to lodge in the lungs and increase the risk of cancers and respiratory diseases. PM10 is particles between 2.5 and 10 microns (micrometres) in diameter (a human hair is about 60 microns), and PM2.5 is particles smaller than 2.5 microns.

These Remote Dust Monitors were doing a good job, but the data was physically stored on them, so a technician would have to visit each one to collect it. That meant that they only found out about a spike of dust levels – or a fault in the equipment – days or weeks too late.

Our client turned to us for a smarter solution.

The brief

Our client wanted a more intelligent system that would tell them about dust levels in real-time, so they could respond immediately if there was ever a rise in dust levels – or a fault with the Dust Monitors.

In addition, they wanted to better understand where the dust was coming from, as a spike could be caused by somethiing enironmental, like a gust of wind.

Our response

Our solution was inspired by the Internet of Things (IoT), which is the bringing together of items embedded with electronics, software or connectivity to form a network between objects. But we didn't just want to connect the Dust Monitors to the internet. We also wanted to measure the weather, as wind and rain both affect how much dust is in the air (wind creates more and rain creates less).

We first built a computer system to communicate with the existing ES-642 Remote Dust Monitors over a multi-drop RS-485 network. It works by pulling off data and pushing it through a 4G router, every minute, to a secure storage unit in The Cloud, where it can be viewed remotely. The computer also stores the data to send later if the signal ever drops.

We then added a Lufft WS-600 weather station, with an ultrasonic 'chirp' to measure wind speed and an upward-facing radar to count raindrops. It's smart enough

The Lufft WS-600 Weather station

to differentiate between rain and snow, because it can measure how fast they're falling.

Together, these devices can distinguish between dust that has come from the construction site of quarry – and dust that has come naturally from the environment. That's because the computer can make intelligent judgements based on the layout of the Dust Monitors and the combination of data results.

The result

Now our client – and neighbours of the construction site or quarry – can log into a secure website, anywhere, to view real-time data on dust levels in the air.

It's also easy to know that the Dust Monitors are online and measuring, as they're programmed to send data via 4G to the website, every minute. So if data stops coming in for a prolonged period, our client can assume that the equipment has developed a fault or been damaged, and can send out a technician to fix it. What's more, we can also send data the other way to update the software and reboot it.

Most importantly, though, whenever dust levels rise too high, the website now fires off a warning email or text. Some Dust Monitors even have a horn, flashing beacon – or screen displaying data – to alert site workers and neighbours of the risk.

The weather station is particularly helpful, too, as it tells our client whether or not the dust was created on-site or off-site – and if they can do anything about it. This can be useful as evidence if a case was ever taken to court.

Final words

This is a classic example of Digital Transformation. The data was available but only intermittently and obtained through an expensive person visiting each site in turn. We replaced this system with a computer that works constantly and tirelessly, has no real overheads and provides immediate results.

This transforms the thinking behind the system because now it is a reactive system, capable of providing instant feedback and alerts. The person is now available for deeper analysis of the data, over a number of sites.

Jeff Graham