

The smart future of HVAC

With the UK government's aim for a completely carbon neutral UK by 2050, rethinking industry's approach to HVAC, in light of the internet of things, could be key, as industrial communications device specialist, Brainboxes, explains.

As dire as the environmental costs associated with manufacturing and inefficient HVAC are, (CO₂-emissions from heavy industry are responsible for 14% of the EU total, while heating accounts for the UK's largest proportion of greenhouse gas emissions at 37%), the potential economic cost of realising the 4th industrial revolution – in control panels, production lines, and factory floors – across the country could prove inhibitive to progress.

Thermal Integration, the UK's first manufacturer of electronic heat interface units back in the 1990s, saw the potential offered by the internet of things (IoT) and designed a heat exchange system able to deliver both environmental and cost-saving benefits. Having identified inefficiency in competitor's plant rooms, Thermal Integration went up against large incumbents to win the bid to design and install in a council-owned residential building in a London borough. The existing control panel was described as a '£250,000 on/off switch'. Thermal Integration was able to offer a new £5,000 panel that not only controlled the heating exchange but also allowed remote monitoring via a cloud-based application.

On top of designing a reliable system at a disruptive price point, the challenge was to collect the right big data to be able to monitor and control the system and make sure the heating is available to residents 24/7. Thermal Integration's Technical Manager, Richard Hanson-Graville, found the solution in the IoT, a low-cost computer, and a combination of ethernet switches and I/O modules.

Compared to the PLCs traditionally used when reliable control, ease of programming, and real-time fault diagnosis are required,

Richard discovered that the products made by Brainboxes, alongside Raspberry Pi, allowed for a 70% reduction in his production costs. Describing the Brainboxes modules, he said: "The good thing is they're compact, they're reliable, and you get a lot more in and out. It all works straight out of the box."

Thanks to Brainboxes' compact design, Thermal Integration was able to install a panel that hugely improves on its outdated, bulky predecessor. Critically for a system supplying heat to a residential building, Raspberry Pi sends relevant sensor data, calculates performance, and sounds the alarm when anything goes wrong; ensuring the control panel is every bit as reliable as its expensive alternatives.

Historically, end-users relied on the manufacturer and their engineers to monitor the system. With the introduction of a browser-based dashboard, users are now able to refer to live performance information to confirm for themselves how things are working. The transparency this provides is a game-changer, eliminating the need for expensive engineer callouts. In the case of one elderly resident who complained that the heating in her flat was faulty, remote monitoring meant that it didn't take a visit from an engineer to establish the problem: the heating simply hadn't been switched on.

What about the cost of the hardware for monitoring? Richard used Python script in Node-RED, an open-source system from IBM that pretty much anyone can program. He found that Node-RED's visual



language made it easy to wire together flows. He described how Node-RED provided an end-to-end solution that replaced years of previous research and development.

"I did in about two weeks what we had not achieved in five years of back development," added Richard.

Additionally, open-source software such as Node-RED protects against the perils of becoming locked into a

bespoke system with all the updating and maintenance costs that would bring. All Industry-standard protocols are available, and the flows created in Node-RED are stored using JSON, which can be seamlessly imported and exported.

Thermal Integration plans to roll out its design, with 11 future sites coming through. The company's R&D team is building on the success of this first installation with its latest systems incorporating Brainboxes recently released edge controller. The BB-400 controller combines the power of Raspberry Pi with real-time industrial I/O, a custom heat-sink, UPS and 5-30VDC dual redundant power input.

A smart system that harnesses the power of the IoT and exploits low-cost components allowed Thermal Integration to offer a disruptive price point, improve their profit margins, and achieve the best efficiency figures in the industry.

Could this be a lesson in achieving a zero-carbon, smart future that doesn't cost the earth?

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