5G-encode

What is 5G-ENCODE?

A pioneering, £9 million project making the benefits of 5G a reality for UK manufacturers.

5G-ENCODE is the UK's largest trial of industrial 5G and one of the UK Government's biggest investments in 5G for manufacturing to date. Part of the Department for Digital, Culture, Media and Sport's 5G Testbed and Trials Programme, it has been set up to establish sustainable business cases and value propositions for the application of 5G technology in manufacturing.

Creating digital passports for any manufactured component to offer real-time accurate Asset Tracking

Using 5G communication to revolutionise in-transit and in-factory Asset Tracking

This case study outlines how businesses can improve productivity and reduce costs by digitally managing assets using a real time asset tracking system and 5G mobile network. 5G-ENCODE has successfully proven that this technology can provide accurate location and condition information of tracked assets. Introducing 5G & asset tracking to the process at the National Composites Centre (NCC) saw a 93% reduction in search time per job. leading to cost savings in operations processes.

The Industry Challenge

Across the manufacturing industry engineers can often waste precious time, locating resources and equipment due to the scale at which most factories work. Certain materials have time limits for use after which they become unusable and must be scrapped. Scrapped material is not only an initial purchase loss but also leads to the business to incurring increased waste disposal costs. Time saving and waste reduction are crucial elements in most industries that need to be managed effectively and not overlooked.

To combat these challenges, many factories use asset tracking systems. Historically tracking devices can be difficult to integrate, sometimes experiencing interoperability and latency issues making for an inefficient and, in some cases dangerous, factory environment. There is an opportunity for innovation through a wireless asset tracking solution that can monitor mobile assets (tools & materials) around a production facility without delay or blind spots to improve process efficiency.

Use case areas

Augmented/Virtual Reality (AR/VR) to support design, manufacturing and training

Monitoring and tracking of time sensitive assets

Wireless real-time in-process monitoring and analytics

Who is involved?

The 5G-ENCODE Project is a £9 million collaborative project aiming to develop clear business cases and value propositions for 5G applications in the manufacturing industry. The project is partially funded by the Department for Digital, Culture, Media and Sport (DCMS), of the UK government as part of their 5G Testbeds and Trials programme.

The project consortium, **led by Zeetta Networks**, brings together leading industrial players (e.g., Siemens, Toshiba, Solvay), a Tier 1 operator (Telefonica), disruptive technology SMEs covering all aspects of network design, deployment, and applications (Zeetta Networks, MatiVision, Plataine), a world-leading 5G network research group (High Performance Networks Group in the University of Bristol) and the NCC representing the high value manufacturing industry.

The key objective of the 5G-ENCODE project is to demonstrate the value of 5G on industrial use cases within the composites manufacturing industry.

About the use case

5G-ENCODE wanted to explore the use of wireless systems to track tools and materials in the production process. For tool tracking, focus was on the location, utilisation and maintenance. Locating tools can take up a large proportion of time while over utilisation and lack of maintenance can lead to poor quality parts. For materials tracking, the focus was on location and asset condition as the materials in question are stored in a freezer. When materials are removed from the freezer, the “out life” must be accurately recorded to prevent the material going off and becoming unusable.

Testing the use case

The 5G-ENCODE project team at the NCC selected an example manufacturing process to equip with RFID tracking technology, relating to a standard AFP workflow. AFP stands for Automated Fibre Placement and involves using a robotic arm to lay down composite fibres in a predefined orientation. The RFID hardware provides data to the management database indicating the location and status of each asset being tracked. The resultant digital passport can improve productivity and reduce costs by providing accurate location and condition information of tracked in-transit and in-factory assets. To execute the use case the following network elements were deployed:

- Six 4G small cells operating on a 5MHz band and one 5G cell with multiple remote radio heads, operating at 100MHz in the 3.6MHz to 3.8MHz range provide coverage for the use case
- Connected to the overlay cellular network are 7 x RFID gateways that track the flow of material, component pre-forms, manufactured parts and tooling around the factory. This means the zonal “last known” location of each asset can be seen in the management centre software, as well as accurate timings of remaining out-life.

Phase 1: 4G baseline

After defining the initial use case it was tested on a private 4G network installed at the NCC to create a baseline understanding of wireless performance. The 4G network testing concluded that follow-on activities were crucial to improve the reliability of the 4G connection. As a result of the initial tests, another 4G router was added in the AFP room to reduce the likelihood of the reader disconnecting from the system and missing an asset movement.

The wireless RFID technology was also found to be effective in communicating within a factory setting but this was to be expected.

Limitations of the 4G connection were identified and centred around sensitivity to interference, resulting in packet loss. While the 4G system may have provided a solution for a factory with less existing electrical infrastructure, when it comes to servicing manufacturers with large metal structure and high-powered Wi-Fi, the higher frequency of a 5G RAN improved coverage when radio units were in areas of high RF interference.

Phase 2: 5G test

In November 2021, the use case was tested using a 5G network with the aim of observing faster data transfer rates in both uplink and downlink, as well as improved response to interference. Testing completed on 5G-ENCODE's private 5G network showed that the 5G performed well when compared to the 4G baseline. This could be because of the higher frequency having less sensitivity to existing interference, or simply that there is less congestion at that frequency range.

Ultimately the asset tracking system installed at the NCC led to a 93% reduction in search time per job, reducing costs and improving process efficiency. The testing showed an improved performance in-factory of 5G over 4G through improved reliability and reduced sensitivity to interference.

Get in touch

If you would like to learn more about 5G-ENCODE and how you could get involved.

visit our website

www.5g-encode.com

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