GSMA Internet of Things Case Study

A NEW PRODUCTION PARADIGM

Ford and Vodafone harness private 5G networks to continually optimise vehicle manufacturing

The Ford Motor Company is using a mobile private network to enable an electric vehicle plant in the UK to enhance production quality in real-time. A combination of 4G and 5G connectivity provided by Vodafone UK enables Ford to analyse and control the new laser welding machines used to manufacture batteries and electric motors for vehicles.

Although automotive plants are highly standardised with repetitive processes for assembling parts to tight tolerances, Ford still sees variations that can impact the efficiency of the plant and the quality of finished products. These can be as subtle as changes in temperature, or even sunlight affecting the cameras used to detect issues on the production line. Low latency connectivity is required to enable the factory to react quickly: if conditions change the factory needs to be able to change the settings on the machines within milliseconds to continuously optimise production quality.

The new private mobile network is enabling Ford to capture a continuous flow of data from sensors installed throughout its electric vehicle factory in Essex. As a result, it can monitor the end-to-end production process and make rapid adjustments automatically in response to changes in the environment, input materials and other factors. These quick configuration changes are designed to maximise the quality of the finished products.

Capturing a huge volume of data

The reliable, high-speed wireless connectivity provided by 5G enables Ford to capture the vast amounts of data generated by its new laser welding machines. As manufacturing the motor and battery of an electric vehicle requires around 1,000 welds, the welding process can generate up to 500,000 pieces of data per minute.

The welding machines generate very “high amounts of heat to fuse pieces of copper together and therefore make a perfect circuit,” explains Chris White, Ford’s 5GEM project lead. “As we do that, we collect data to make sure that we know your car is perfect and won’t have any issues. That data is incredibly important to us and that’s why 5G is critical going forward.”

Ensuring maintenance at the optimal time

Ford also uses the new 5G private network to optimise maintenance, replacing parts before they fail, thereby eliminating unnecessary downtime of the production line. At the same time, the connectivity enables Ford's equipment suppliers to use augmented reality and virtual reality headsets to provide the automaker with remote support and/or test new configurations.

To help it harness the expertise of partners and suppliers, Ford uses the 5G connectivity to create 'digital twins' of its processes that experts can use to develop optimal welding solutions, without stopping the factory.

For example, the 5G network is enabling collaborative working with experts at The Welding Institute (TWI) based in Cambridge. Via 5G, these experts can help Ford's on-site engineers master the new welding technology. To do that, TWI needs access to "many gigabytes of information," notes Chris Allen, Senior Laser Welding Engineer, TWI. "5G enables those kinds of large volumes of data to be moved around with greater ease."

Developing the connected factory of the future

The connectivity solution provided by Vodafone, which uses its mid-range 1GHz – 6GHz spectrum, gives Ford control over provisioning and administration processes, such as activating/deactivating SIM cards.

"Connecting today's shop floor requires significant time and investment," concludes Chris White of Ford. "Present technology can be the limiting factor in reconfiguring and deploying next-gen manufacturing systems. 5G presents the opportunity to transform the speed of launch and flexibility of present manufacturing facilities, moving us towards tomorrow's plants connected to remote expert support and artificial intelligence."

For more information, visit the project website, here: **https://www.5g-em.org/**

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> ***Chris White** - Ford*

About the GSMA

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators and nearly 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

For more information, please visit the GSMA corporate website at www.gsma.com.

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About Vodafone Group

Vodafone Group is one of the world's leading telecoms and technology service providers. We have extensive experience in connectivity, convergence and the Internet of Things, as well as championing mobile financial services and digital transformation in emerging markets.

Vodafone Group has mobile operations in 24 countries, partners with mobile networks in 41 more, and fixed broadband operations in 19 markets. As of 30 September 2019, Vodafone Group had approximately 625 million mobile customers, 27 million fixed broadband customers and 22 million TV customers, including all of the customers in Vodafone's joint ventures and associates.

For more information, please visit: www.vodafone.com.