Ultra-Reliable 5G Can
Drive Digital Transformation

A dual-layer 5G network is enhancing the productivity, efficiency and safety of WISCO's steel production

Highlights

- ZTE and China Unicom use 5G to enable a massive steel plant to remotely operate heavy machinery
- Two independent communications paths connect cameras and PLC systems on the site's unmanned cranes, vehicles, locomotives, wagons and containers.
- ZTE says the dual-layer network delivers 99.99% availability and a latency of just 15 ms.
- The plant's revenue per capita is up by 19%, labour costs are down by 23% and 750,000 tonnes of carbon emissions are saved each year.
- Supported by AI, the connectivity could enable self-driving cranes to be deployed in 2024
- Dual-layer 5G could be used to provide ultra-reliable connectivity in many economic sectors

Like many industrial businesses, Wuhan Iron and Steel Corporation (WISCO) can find it difficult to recruit employees to work in its hot and dusty plants. Potential applicants can be deterred by safety risks, such as those presented by falling objects and burns.

One solution is greater digitisation and automation, which requires ultra-reliable and ultra-responsive connectivity. To that end, WISCO has deployed a dual frequency, dual layer 5G network to dramatically improve efficiency and safety at its vast industrial campus in Wuhan, China.

Supplied by ZTE and China Unicom, the 5G network uses both the 2.1 GHz and 3.5 GHz frequency bands to provide two independent communications paths to cameras and PLC (programmable logic controller) systems on the site's unmanned cranes, vehicles, locomotives, wagons and containers, which are used to transport iron-ore over a distance of 10 km within the complex, which spans 47 square kilometres.

Encompassing 85 public and 100 private indoor and outdoor 5G sites, the dual-layer solution is designed to

ensure that low latency connectivity (15ms response times) is available throughout the plant at least 99.99% of the time. The network also supports an uplink throughput of around 500 Mbps to enable live video streaming from the equipment (see graphic). China Unicom's public cell sites use network slicing to provide the necessary quality of service to WISCO.

The entire WISCO plant in Wuhan is covered by two overlapping radio layers, consisting of two independent radio heads, base stations, transport lines and core networks. "From access, transport and core, everything is replicated," explains Hans Neff, Senior Director, CTO Group of ZTE. "The command centre has control over those two independent paths, which have seamless independencies. In cases, where both paths are active, they are used in a load-sharing mode. In case, where just one is there, just one is used."

of the supply chain are now synchronised and are now served together, helping this whole process to be running smoothly," explains Hans Neff. That has led to major improvements in the efficiency of loading and unloading processes across the plant.

Crucially, the connectivity also removes the need to have people physically onboard the machinery. Instead, they can remotely operate the equipment from the safety and relative comfort of the control room. In aggregate, the solution has increased the plant's revenue per capita by 19%, while cutting labour costs by 23% and saving 750,000 tonnes of carbon emissions per year, according to ZTE.

To provide local edge computing, each of the base stations supplied by ZTE uses its modular NodeEngine solution, which enables processing and memory capacity to be installed within dedicated slots in each base station. The computing power in each base station works in tandem with three central

Precise tracking and control delivers productivity improvements

Supported by edge computing, the ultra-reliable low latency 5G connectivity enables the remote operation and precise tracking of machinery and comprehensive surveillance of the site. WISCO can now map the location of all its equipment and materials in real-time, according to ZTE. "The coordination between all the components of the company has been majorly improved, because all single parts

Hans Neff - Senior Director, CTO Group, ZTE Corporation

data servers on WISCO's site, enabling the connected equipment to be monitored and controlled in real-time. As no operational data leaves the complex, the system is also designed to be highly secure.

China Unicom and ZTE maintain the network on behalf of WISCO. "All the services and all the devices are SLA monitored," explains Hans Neff. "All terminals are single terminal managed. So you can see into the terminals themselves, how they are connected, the quality of service sets. All of this is remotely serviceable. And you have a dedicated service monitoring for the real end customer service, including far edge computing on the node engine, latency, packet drops, packet quality, service quality, all of it."

Following trials in 2021 and 2022 (see graphic), the dual-layer solution was deployed by WISCO in 2023, which was a world first, according to ZTE. The network is now transmitting 6 TB of data a day to and from more than 2,000 endpoints within 750 individual pieces of equipment, including more than 100 unmanned cranes.

Plans for expansion and artificial intelligence

ZTE says the next step for WISCO in Wuhan will be to deploy artificial intelligence (AI) to control the machinery, reducing the need for human beings to operate the remote control systems. Now being

developed by China Unicom for deployment in 2024, the AI solution should lead to further efficiency improvements, particularly as the AI optimises various processes over time.

Meanwhile, China Baowu Steel Group, which owns WISCO, plans to deploy dual-layer 5G networks at its other industrial sites. In total, it intends to connect about 300,000 endpoints. "By 2026, the plan is to have digital everything for the whole of WISCO," says Hans Neff.

As well as being used to increase the safety, efficiency, and quality control of metal production, ZTE says the dual-layer 5G solution could be replicated in other industries, such as manufacturing, which requires real-time data exchange and communication between machines and staff, and energy plants, utilities, and critical infrastructure sites that need robust network connectivity for monitoring and control systems.

Other target markets include industrial complexes and campuses looking to streamline operations, enhance sustainability, and improve workplace safety, as well as ports, airports, and logistics hubs, which rely on precise data for managing cargo, vehicle fleets, and passenger services. Mining operations and mineral extraction sites could also see major benefits from reliable communication for safety, machinery control, and data analytics.

These sectors could deploy dual-layer 5G in multiple ways. Rather than using dual frequencies as WISCO has done, some businesses may simply develop a solution that employs overlapping radio networks

Source: ZTE

Case Study of Unmaned Overhead Crane Application in WISCO — ZTE

Overhead travelling crane in WISCO

Challenges
- Operating In a **high-temperature and dusty working environment**, it is difficult for WISCO to recruit employees
- The work requires the cooperation of air and ground personnel, and **the efficiency is low**.
- There are **safety risks** in the working environment, such as falling objects and burns.

Reconstruction Solution
- Deployed 2~4 **cameras** on the overhead travelling crane
- **20+** overhead crane in one workshop
- Adding **control devices** (PLC) and connecting to the control system through 5G
- Building a network with large uplink capacity **(around 500Mbps)**, low latency and high reliability **(15ms@99.99%)**

Application effect
- **100+** unmanned overhead travelling crane running in WISCO.
- **400%** Loading and unloading efficiency
- **20%** Labor cost
- The solution has been **copied** in the Ansteel Group and HBIS Group Project.

Source: ZTE

from multiple operators. In markets where there isn't a dedicated spectrum available for private 5G networks, this could be an attractive option.

"You would have two completely independent layers, aggregating connectivity from operator A and from operator B, to have an ultra-reliable service," explains Hans Neff. "You would have SIM cards from operator A and SIM cards from operator B and employ your own VPN and core network, where you would aggregate the data." In Europe, ZTE is discussing this kind of dual-operator solution with a company involved in road construction.

As it is designed to support overlapping wide area networks, licensed spectrum is well suited to dual-layer deployments. Businesses using licence-exempt spectrum with Wi-Fi would be unlikely to achieve the same result because the radio signals wouldn't travel far enough and there would be a high risk of interference. The WISCO deployment "really brings out the advantages of using 5G in this context," notes Hans Neff. "It's one of the most outstanding cases we have."

Dual-layer 5G could enhance productivity and sustainability across the economy, as industries use the reliable connectivity to optimise their processes and reduce downtime, as well as to enable safety improvements and better resource utilisation and environmental monitoring. ZTE believes employing dual layer 5G could also confer a competitive advantage for some companies while catalysing further innovation by enabling greater usage of AI, the Internet of Things and data analytics.

"Our solution is scalable to accommodate the evolving needs of industries as they expand and adapt to changing market dynamics," adds Hans Neff. "It empowers businesses to transform their operations, achieve higher levels of efficiency and safety, and remain competitive in a rapidly evolving industrial landscape. It sets the stage for a new era of digital industrialisation."

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Hans Neff - Senior Director, CTO Group, ZTE Corporation

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About ZTE ZTE

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