Offshore wind energy represents a supporting pillar in a sustainable energy mix. In order to establish this in Europe, Siemens Wind Power opened a production facility for rotor blades of wind turbines in Hull, UK, at the end of 2016. For the production in one of the largest infrastructure projects of the region to run absolutely smoothly, Siemens relies on in-house network components for the industrial communication in the project implementation. The result: Consistent, high-performance data networks, which are available even in the salty and therefore harsh environment of the Alexandra port facility.

The port city Kingston upon Hull, known as Hull, is located approximately 180 miles north of the British capital, London. Situated directly on the northern bank of the Humber, the new production site covers an area of 540,000 square meters – roughly equivalent to 63 football fields. Here, 75-meter-long rotor blades for wind turbines in the seven- and eight-megawatt range are manufactured, assembled and warehoused. The site includes a newly built port for the pre-assembly and loading ramps to ship the wind turbine components. Warehouse, supply chain and assembly operate in networks via modern database systems. The material flow is based on the Siemens production system. Approximately 1,000 jobs have been created so far by the establishment of the production site.

England is one of the most important markets for the erection and maintenance of wind turbines. Approximately 2,100 turbines are serviced on the mainland or in territorial waters. Hull is also the ideal location for the rotor blade production from Siemens when taking geographical factors into consideration: The Alexandra port facility at Greenport Hull is home to the majority of offshore wind parks in the United Kingdom.
Industrial network components for communication networks

Especially when it comes to the forward-looking planning and optimization of production processes as seen in Hull, an intelligent data analysis through digitalization is an effective lever. Indispensable for this are high-performance industrial communication networks. They enable the reliable and continuous exchange of information – in real-time, along the entire value-added chain and across all enterprise levels.

“The data transfer must be ensured at all times with absolutely no gaps despite the challenging internal scale and external conditions present in Hull – in this case, the humid and salty air of the port facility,” says Andrew Smith, account manager at Siemens Global Services IT (GS IT) in Great Britain. To realize this data transfer, Siemens has installed its high-performance and future-proof network components from the product lines SCALANCE and RUGGEDCOM. Both the LAN and WLAN infrastructures were implemented with the aid of SCALANCE network components. The extensive communication network was executed in close collaboration with the Siemens Industrial Communication and Identification business segment, the local IT department on-site and the Solution Partner Atos.

Competence from the company’s own portfolio

In order to meet the requirements of industrial networks, attention was paid during the design process to a defined separation between office and production networks. “To this end, we have incorporated the communication relationships between the devices as well as the requirements for high availability into the cell concept of the design,” explains Smith. As a result, an industrial backbone with a capacity of 10 Gbps was implemented. It connects the individual segments (cells) of the network by means of ring topologies – in order to increase the reliability and availability of the network with the internal IT network for the communication between the office or data center network. The tried and tested ring topology for industrial networks was also implemented in the individual cells – accordingly, rings with a capacity of 1 Gbps were installed. The entire network was laid out with 25 switches from the SCALANCE XR-500 family. Two SCALANCE XR528 switches form the industrial backbone, the remaining switches are located in the cells. The SCALANCE XR528 switches with 28 ports are characterized by their high performance and are well suited for the transmission of large amounts of data.
Production team:
A team of approximately 50-80 employees is responsible for the production of the 75-meter-long rotor blades.

The protection of the industrial network was realized with the aid of firewalls and cell-related white-listings. This enables the communication to the cells using the data traffic that is required in the cell. All unnecessary data is blocked by the firewalls. This concept of white-listing increases the security of the entire network.

The WLAN infrastructure was implemented using controller-based SCALANCE W786C Access Points. This was necessary as more and more devices with wireless technology are connected to the internal company network. Throughout the premises, approximately 160 SCALANCE Access Points were installed indoor and outdoor – providing full WLAN coverage. The Access Points are powered by means of Power over Ethernet (PoE) ports on the SCALANCE switches of the industrial LAN, which ensure an optimized connection of the Access Points.
“Thanks to this network design, we can compensate for errors and perform possibly necessary network expansions while in operation, without adversely affecting existing network components,” explains Gary Wynne, Program Director for Atos. “We can thus ensure the availability of the network infrastructure as well as the optimal operation of the network around the clock,” continues Wynne.

A Security Network (CCTV, Access Control) was implemented based on ten managed PRP redundancy boxes of the type RUGGEDCOM RS950G PRP, which provide high network reliability in the event of any kind of failure. This is made possible by the complete path redundancy, which is the result of the simultaneous transmission of duplicate data packets on independent routes through the network. With its modular flexibility, the RUGGEDCOM RSG2488 layer 2 switch provides up to 28 non-blocking ports that can be configured as copper or glass fiber ports. The RSG2488 thus offers the flexibility and ease of on-site maintenance required for the efficient implementation, upkeep and further development of a broadband LAN. A total of 13 units are installed at Siemens in Hull. The 14 RUGGEDCOM RSG2100 fully managed Ethernet switches are particularly suitable for the use in electrically harsh and climatically demanding industrial environments – as present in Hull. The robust hardware design and the embedded RUGGEDCOM operating system (ROS) provide improved system reliability and enhanced functions for Internet security and networks.

A network beyond state-of-the-art

Ethernet connections are increasingly reaching all the way to the field level. This brings numerous advantages, but at the same time makes previously secure production processes vulnerable to attacks from both the outside and inside. To prevent this, the entire network has been implemented in accordance with strict internal security regulations. The “holistic security concept” applied not only covers the security standards of the network, but also of the entire site. For this reason, CCTV and access control systems have been included as well. Thanks to these different, security-relevant installations and systems, a state-of-the-art network is in operation at the Hull site, which, with the aid of Siemens network components, ensures the digitalization of the site. In the future, the open cloud-based Internet of Things (IoT) operating system MindSphere could also contribute to this. Via the cloud, data could be collected and viewed from anywhere. This would allow valuable information on the plants and machines to be utilized and evaluated in order to achieve maximum efficiency.

The market for wind turbines and their use in the sea is growing – and with it, also the demand for networked, digital production facilities. The successfully implemented project in Hull serves as a model for further projects in Morocco and Germany, which are currently under way. Due to expertise in industrial communication networks, Siemens is optimally equipped for the digital requirements of the future.