TTTech industrial

Case Study: Vestas

Delivering safety control systems for wind turbines

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Vestas is a leading name in sustainable energy solutions. The company designs, manufactures, installs, and services wind turbines across the globe.

> We chose to work with TTTech Industrial due to their outstanding experience in functional safety. The scalable DCS allows us to the focus on extending functionality and offering customers new services, confident in the knowledge that Vestas turbines meet the highest safety standards.
>
> David Steele,
> Vestas

Challenge

Vestas faced a situation where the internal control systems for different turbines varied widely, often requiring a significant architecture redesign for each new turbine model.
Previous generations of turbines had been based on control systems where safety and non-safety functions were physically separated. This ensured safe operation but restricted the way that data could be gathered from the control system. Physical separation of systems meant that there was a lot of external wiring between the actuators and the controllers which made servicing and maintenance challenging.
Vestas wanted to migrate from restrictive safety systems based on dedicated safety PLCs to a more flexible system with a consolidated design. TTTech Industrial offered great experience in functional safety and deep technical knowledge that stood out from other suppliers.

Solution

TTTech Industrial built a scalable Distributed Control System (DCS) for Vestas that fulfils safety requirements and can be reused in multiple turbine models. At the heart of the DCS is the Safety Control Board, designed by TTTech Industrial to converge safety and non-safety functions on one piece of hardware. The entire DCS allows safety and non-safety systems to operate seamlessly together. It was developed with safety standards in mind so that it meets the requirements of safety certification bodies like TÜV. Additional Safety Control Boards can be easily added to the DCS in order to scale it for use in larger turbines or models with special features, such as ice removal for use in cold climates.
Using Deterministic Ethernet within the DCS allows more data to be shared on the network whilst ensuring optimal bandwidth usage.

Benefits

Vestas is integrating the scalable DCS from TTTech Industrial into thousands of wind turbines every year. The company is benefitting from increased flexibility and reduced complexity which brings down the cost of setting up new turbine control systems substantially. The scalability of the DCS has also streamlined development, with more than 70% of the turbine control architecture now being reused when building new turbines.
The reduction in external wiring enabled by the converged safety control and networking equipment has led to lower maintenance and servicing efforts. The system not only requires fewer spare parts in total, the spare parts required are also easier to change. Network switches can now be replaced or added without affecting the safety control board which remains in place. Vestas has enjoyed significant improvements in turbine uptime which ensures that customer contracts are fulfilled and the overall cost of energy for consumers is reduced.

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解説

Wind Power DCS　Solution

1. Vestas 世界シェア5年連続1位。（18%@2019）
2. 風力発電機各種あり。
3. 新しい機械と入れ替えるには大幅な設計変更が必要だった。
4. 安全機能と非安全機能を物理的に分離することにより達成。→リモートで外部へのデータ取出し困難。
5. 物理的に分離されていたのでアクチュエータとPLCコントローラの間の配線が輻輳し、調整、メンテに多大の時間、労力を必要。
6. TTTech → Scalable DCS Solution を提供。（各種タービンにも水平展開可能）
7. 安全機能、非安全機能を1枚の基板に統合（TUV規格の安全基準準拠）
8. 大型タービンや特注仕様（例：寒冷地の氷結防止装置）に対し、同じ基板を追加することによって拡張可。
9. TSN技術を使って、ネットワーク上で必要データを共有化しつつリアルタイム監視・制御を可能とした。
10. Vestas は上記TTTechのソリューションを毎年数千台の風力発電機に導入している。.