The results of high performance graphical interfaces applied to Remote Control Center of wind power plants

(1) Automológica / (2) CPFL Renováveis

Abstract

In the past decades, the aviation industry has made remarkable investments around cockpits designing that led to the high levels of safety seen nowadays. The transition from the traditional style of analog dialog and gauges to well-designed large LCD screens simplified aircraft operation and navigation and allowed pilots to focus only on the most important information.

The power industry has faced similar issues due an increasing number of assets and plant complexity. In this context, graphics used at most control centers are overloaded with information and making an inappropriate use of colors. Similar to what happened in the aviation industry, a new standard needs to be designed and developed for the renewable power generation, taking the SCADA (Supervisory, Control and Data Acquisition) system to the next level of performance.

CPFL Renováveis, a Brazilian based renewable power generation company with 2GW of installed capacity in 91 plants among wind, hydro, solar and biothermal sources, was facing the issues as described above. To address this complex operation a team of SCADA designers began a journey to rethink the way operator graphic interfaces are made to achieve the highest level of performance and situational awareness. Most of these concepts adopted were inspired on technologies used on modern aircraft cockpits.

The way every information is represented on operator’s screen was carefully analyzed to allow users, in a very simple manner, have a clear overview of dozens of plants and never miss the situational awareness, especially in abnormal situations.

This paper will share the results of this project full of innovations that can set a new standard for operator graphical interfaces for wind power industry.

Methods

Main guidelines for designing:

- Vivid color used only to call attention to an abnormal situation. Dark background and pastel color for normal status. Avoid “Where’s Waldo” effect.

- Efficiency and availability at a glance. Any underperforming or unavailable machine should be immediately perceived, even though the operator may be monitoring thousands of wind turbines, so then proper action can be taken. Real-time efficiency calculation, using power curves, makes this task possible.

- Dynamic tabular screens allows operator to efficiently monitor thousands of wind turbines.

- Less screen and fewer mouse clicks are better. One single screen must fit every important information of a plant and must give the operator a clear overview of plant current condition, from wind turbines to substation. At a side monitor with a fixed screen, the operator has an overview of every plant under his responsibility.

Results

The following results have been observed at CPFL Renováveis after deploying the new graphical standard:

- The remote control center operating costs decreased by 35% due to the reduced workload. The plants used to be operated by 27 technicians. With the implementation of this new solution, the same plants can now be operated with 16 technicians.

- Time to respond to an abnormal situation has been significantly reduced, improving the availability of wind turbines by an estimated 0,2% due to the ability that was given to operators to immediately detect and take proper action.

- Avoidance of past experienced issues when the manufacturer curtailed the power of wind turbines inadvertently or incorrectly causing significant losses while not detected by the plant operator.

Conclusions

The positive results of this project come from the change of concept from building a SCADA system based on nice presentation for the media and visitors to building a fit for purpose SCADA system focused on increasing performance and situational awareness, benchmarking this solution with other more mature industries, such as the aviation.

References