In the production of microelectronic components, ultra pure water is an unavoidable necessity. The microelectronic industry worldwide is constantly searching for solutions to improve the performance, reduce the size and increase the flexibility of the components used. To achieve such results, there is a need for investing in research and development, as well as being able to count on the technological solutions necessary to support that kind of production. Today, ultra pure water is a vital factor in the manufacturing of microelectronic components, especially semiconductors. Meaningfully, the water used must be extremely pure and characterised by a low concentration of salts, pyrogenic components, oxygen, suspended solids and bacteria. If this is not the case, delicate circuits may be damaged irreparably and lead to a real economic “disaster”.

Microelectronics and water

Ultra pure water has become an extremely valuable commodity, especially in countries where fast economic growth forces industries to meet greater needs in terms of microelectronics. Christ Ultrapure Water Ltd, a leader specialist in that sector, has received an important order from a Taiwanese manufacturer for a new plant able to produce about 300m3 of water per hour.

In plants of that size, in which the characteristics of the liquid produced are subject to very strict monitoring, supervising plays a vital role. During each stage of the process dozens of samples are taken and checks are implemented to assess the values of the liquid and be able to act immediately to prevent any deviation from the desired limits.

Analysing, comparing and contrasting, understanding thousands of
assessments clearly is an impossible task for any human operator.
The collaboration between Wonderware, Step Progetti and the Automation department of Christ Ultrapure Water Ltd. - represented by Jean-Yves Walch e Laurent Misslin - on this particular project has been considered as a great experience for achievement of such a complex automation case-study.

Keeping constant track of the values is a vital factor in such processes, where even the least deviation may have negative repercussions on the whole industrial production. The software installed is called upon to constantly monitor the quality of the liquid during all the stages of the treatment, immediately identify any negative trend and keep track of all the measured values. The creation of a historical archive, similar to that developed in the sector of food traceability, allows knowing all the details of the production history. Thus, if any problem is reported by the end user or identified during one of the following stages, the manufacturer can trace all the components of the same lot and also understand the reasons why conditions have obtained different from those expected.

Is it better to know in advance
Identifying the causes after an electronic circuit was damaged may be useful but it is a belated action both from an economic viewpoint and in terms of the image of the firm. Consequently, Christ Ultrapure Water Ltd. requested a particularly effective supervision system, capable to immediately detect if the given limits were exceeded and identify the trend followed by the individual values being monitored. Thanks to Wonderware’s production & performance management, proactive interventions are possible to forecast and prevent the insurgence of problems which may have a devastating impact on such highly sophisticated productions.

We choose what is best …
Andrea Faciocchi, Technical Manager of Step Progetti, stated: “To meet those specific needs we had to search the market for the most effective solutions capable of providing the functions necessary to meet all the needs of such a delicate and peculiar production, and at the same time ensure very large volumes. Such conditions urged us to implement one of the first customised integrations of Wonderware IndustrialSQL Server on a real application” Dealing with such an innovative task, characterised by particularly demanding specifications in terms of performance and schedule, was a difficult challenge. Nevertheless, Faciocchi recalls that “we have worked as Wonderware System Integrator since 1998 and have a certification for their products. Our know-how allowed us to become rather familiar with all production & performance management solutions. Furthermore, on this specific occasion, the Wonderware philosophy envisaging the constant supply of solutions compatible with all previous releases simplified the job of our engineering team. Albeit the need emerged for managing a particularly complex architecture, the integration process was completed quickly
without any trouble by writing a few lines of code. As the result was very consistent, the final installation has been completed directly by our customer in a few weeks, without even requiring the remote assistance support we had set up in case of necessity”.

... so that we never have to stop

Roberto Falaschi, area manager of Wonderware Italia S.p.A., states: “Our familiarity with the systems used and the constant dialogue with the Wonderware technical staff made the job easier for the team led by Faciocchi; nevertheless, the very complexity of the system to be monitored required a particularly accurate preliminary analysis. The specifications required by the customer were clear: although there were twelve-thousand tags, values had to be monitored and compared and contrasted in real time, without having to stop the plant.” The request was very clear and involved the creation of a fully redundant supervision system which could stand any trouble without repercussions, regardless of the causes. Roberto Falaschi adds: “Of course, the data collected had to be stored without losses and made available at any time in aggregated form.”

To achieve such goals, the market provides different components and operational systems and Faciocchi explains: “during our experiences in this sector we have tested several options. However, Wonderware has always ensured maximum compatibility and supplied innovative and reliable products which allow us to complete our integration projects and be certain that constant support will be ensured also after the next evolutions”.

Increasing quality along the full production process

To ensure the full reliability of the plant destined to the production of ultra pure water, all systems had to be made redundant and an architecture was designed based on connections capable of preventing any trouble.

A system was created in which the data collected by the measuring instruments installed along the whole production process are processed immediately by four pairs of Plcs. The task of those tools is the quick implementation of a series of logic operations, comparing and contrasting the data collected directly and those stored in two parallel connection SQL Servers. It was the implementation of Wonderware software solutions that enabled a modular and scalable architecture which allows the system to grow according to future evolutions and further needs. This result was achieved by maximising the advantages of the partnership formed by Wonderware and Microsoft. The integration of productivity tools on the ArchestrA platform gives engineers and managers the possibility to analyse all collected field data, thus enhancing productivity and - more importantly - the constant quality assurance.

To achieve those goals, four Wonderware InTouch HMI interfaces were installed. The personnel, who are always present on site, have all the information necessary for the perfect monitoring of the plant. All the data collected are managed, analysed and presented in a clear and easy-to-read way. An important role is also played by the analysis of statistical data updated in real time, giving the additional possibility to identify and report negative trends immediately. Thus, immediate actions can be taken to bring the water used in the manufacturing of microelectronic circuits increasingly closer to the ideal formula, and ensure the necessary conditions to constantly improve the performance of components.

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