GE Fanuc Automation

Remote data collection in the water/wastewater industry

Access all the data, all the time

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Automatic collection and storage of treatment facility data continues to increase in importance in the water/wastewater industry. This data is critical to supporting the increasing needs of CEPA compliance reporting and is the basis for driving operational performance improvements. The advent of historian products extends the ability of a traditional system to effectively store data and efficiently make use of the data.

Water treatment usually involves a large geographic area, requiring numerous remote automation locations. Advances in automation technology have provided alternatives to traditional approaches to managing these remote sites and helped users speed implementation, reduce costs, improve data integrity and the resulting treatment processes, and significantly ease accessibility.

It's better when your RTU technology does not act so REMOTE...

As the need continues to grow for consistent and complete data to be used in compliance reporting and improving the overall treatment process, the requirement of collecting data from both local and remote data sources is a reality. A typical water/wastewater treatment system usually consists of many remote sites spread over a large geographic area. These remote sites need to be tightly coordinated, or at the very least monitored by the supervisory system. In the past, this has provided challenges with obtaining "real time" information along with a complete data set with no gaps in time.

Most remote locations contain control and process equipment to run the remote processes, and are monitored or controlled by the supervisory system. These remote sites often have limited or intermittent connections to the supervisory system making it difficult to obtain the needed data. Even if there is a constant network connection, there is always the possibility of the connection being damaged or lost to the remote site.

With limited or intermittent communications to the remote sites, the need for over engineering the systems to be able to handle these obstacles has been common practice. This usually involves several different methods to try and maintain a consistent and accurate history of all the remote data such as redundant communication schemes, process logic modifications, and proprietary remote data collection systems which need to be synchronized with the central systems data.

In order to complete this synchronization when the connection to the supervisory system is present, custom database merges and synchronization routines often have to be performed.

In a system where under normal conditions a network connection exists between the supervisory system and the remote sites, many preventative measures are often taken "just in case" that connection is lost. This means conditional data logging must be engineered into the system so that when communications are restored to the supervisory system, the data can be retrieved. These methods not only take extra engineering time, but also introduce the possibility for duplicate data or overwritten and lost data.

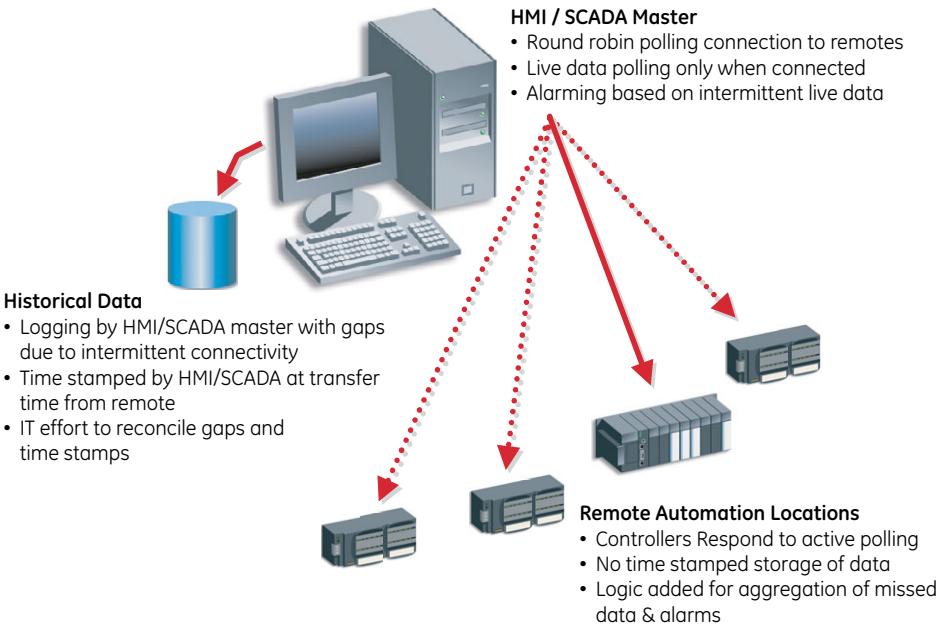

Figure 1: Simplified view of a legacy HMI/SCADA data collection and storage architecture

Making Remote sites seem local

In an ideal data collection world, there would be no gaps in data due to the network connection failing, and Alarm and Event data could be logged and time stamped when they actually happen, not when the data gets logged by the central system. In addition, you would have the ability to provide accurate reports and process analysis based on actual data, rather then interpolated data.

With the recent development in automation technologies along with the advent of historian products, this greatly extends the abilities of a traditional system to effectively store data and effectively make use of the data. With these new technologies emerging, the implementation of critical systems to provide productivity, accountability, availability and maintainability has been greatly improved. There is no longer a need for custom solutions which require numerous engineering hours when the historian and remote automation equipment provide the needed features and functionality.

So what does all this technology do? How does it save time and in the end, provide all the data for reporting and process improvement? Located at the remote sites are the controllers and local operator interfaces. These can be separate or combined into a single Windows CE device for both control and HMI functionality. The Windows CE device performs all of the standard duties of the control system, but also is a collector of local data for that site. Storage can be expanded, often using a compact flash slot on the unit to allow for large amounts of locally buffered data. This means that if communications to the supervisory system is either intermittent or it is lost, all the logged data normally being captured by the main historian server is now collected locally by the Windows CE device.

Once the connection is established to the supervisory system, the locally collected data is then forwarded onto the historian, filling in the gaps in the database when the connection was not present. The setup to perform this database synchronization and local data logging is quite simple, and is built into the programming software for the Windows CE device. This eliminates the need for custom database merges and logic to accomplish these tasks, greatly reducing the implementation and engineering time.

Another feature that is available on the Windows CE device is the built in Web-publish capabilities, which allows for connection to the remote sites to access live data and even control. This allows for remote troubleshooting as well as full access to the screens to perform checks and monitor data from any internet browser with no special software required.

The supervisory system still consists of the SCADA software, but also incorporates a historian product which is responsible for all the logged data for the entire system. The main advantage of using the historian is the database itself. Traditional SCADA packages either have proprietary databases and utilize an ODBC interface to a relational database, or log directly to a relational database. This means significant custom engineering for each defined access and can have slow performance when queries cover large data sets or long time periods of data. The historian product technology dramatically changes the abilities to quickly access large amounts of critical stored data. Historians are high performance systems designed to access up to 100,000 different data points per server, with the capability to transfer 20,000 events per second in and out of the system. Along with the greatly improved speed, calculation extensions and aggregation of the recorded data can be easily applied at the time of storage. This performance greatly exceeds the abilities of the traditional SCADA system.

In reality, nothing in the process changes 20,000 times per second, let alone once per second. However, as an example, there is a need to plot for the previous month the hourly average, minimum and maximum values for several process parameters such as flow rate, turbidity and pH. All of these parameters may have been recorded at different logging intervals and have different scaling associated with them. To perform such a query in a traditional SCADA would be almost impossible without a tremendous amount of engineering for database calls, SQL statements and more. The historian technology has been specifically designed for these types of queries and other needs that are based on the real day to day dynamically changing requirements of the process. The ability to retrieve and display critical data from the plant historian can now be done in a fraction of the time of what can be offered from a relational data base type system. For the most part, with all the obstacles and time involved for a traditional SCADA system, this type of analysis is never done.

The performance enhancements are not limited to the speed of gathering the data alone. Storage capacity and data security are also greatly improved in the historian products. The historian uses optimized data compression techniques, allowing for more efficient storage of time-streamed data by eliminating unnecessary overhead. This improved storage ability again saves tremendous engineering time involved in managing logged file sizes and archiving of historical data in a traditional SCADA system.

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The historian also adds data security in the forms of traceability and audit trails for the storage and detailed identification of and changes to the data as part of the data storage technology. This means the critical operation data has a higher level of integrity and assures accuracy and compliance for potential CEPA audits.

It is important to note that these historian products are designed with the protection of historic investment in mind. They can be implemented in new systems as well as existing systems with the ability to import data from the existing databases to immediately take advantage of the improved performance enhancements. Historians are often designed to have open interfaces allowing the use of data from outside systems such as HVAC to be incorporated into a single, secure database.

Overall, the ability to bring remote sites separated by large amounts of geography together and make them act like a local node in the next room, has been greatly simplified and improved utilizing the remote GEFanuc Quickpanel CE devices combined with the GEFanuc Proficy Historian product. Great improvements have been made in data availability, accountability and tracking of data and any changes made to the data, the ability to improve productivity of the overall system and maintainability of the system with the new technologies now available. As the requirement increases for accurate and complete historical data in the water treatment process continues to increase, Proficy Historian has been designed to meet these demands. The overall implementation costs are greatly reduced with the use of off-the-shelf technologies. Proficy Historian allows you to explore the possibilities of improving the overall process and allows you to see what you have been missing.

This white paper was co-authored by GESCAN, a division of Sonepar Canada Inc

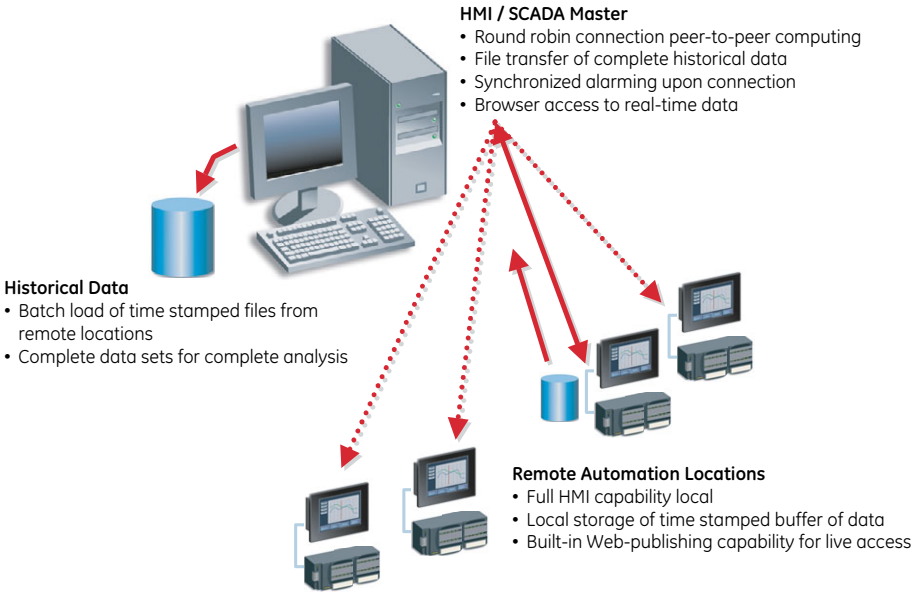

Figure 2: Simplified view of alternative architecture designed to deliver higher data capability

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Additional Resources

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