Leica Geosystems TruStory
Chemical Plant Monitoring

The plant is located in the center of Italy and is a chemical plant for the production of high explosive chemical liquids.

Maintenance work inside the plant by a construction company making some consolidation works (like micropiles, etc.) is required. To avoid any effect and to maintain the plant's activity, the customer is obliged to monitor the pipes during all the construction operations. Any unforeseen deformation of the pipes causes a total stop of the prodution, which costs approximately 1.000.000 EUR per hour.
Therefore, the stability of the pipes related to their absolute as-built positions in the plant are monitored in real-time with very close human supervision of the gathered results.

Each pipe carries high explosive liquids through the plant. The monitoring area is sub-divided in two plants called "PLANT 1" and "PLANT 2".

A total station monitoring system was selected for the plant monitoring due to its flexibility during the installation of monitoring prisms on the pipes with a minimum time & work impact, the ability to easily add and remove monitoring points, the cost saving for the increase of monitoring points and the ability to measure prism's absolute position with high precision.

On each site the total stations are directly plugged into a so-called "TM30 box". These boxes are connected via WiFi to a so-called

Scope/Objective
Monitor of a highly explosive plant during consolidation works

Challenge
Continuously evaluate data to check the position of the pipes in the plant

Date
December 2011 - ongoing

Location

Project Summary
Field
"PLANT 1" and "PLANT 2"
Leica TM30 0.5"
Leica GeoMoS Monitor
SystemAnywhere (data synchronisation & calculations)
Analysis (data view)
Sensor communication in the field
Wireless LAN for sensors
Remote communication
Cellular router
Office
Analysis

Benefits
- Absolute data and differential values for real-time check of the pipes
- Reliable and precise Sensors
- Cost savings

PC box that contains a cellular router, industrial windows based PC, power and cabling. The GeoMoS Monitor software is installed on the industrial PC and manages the measurements, the calculation and the limit check computation. The complete monitoring data is transferred from SystemAnywhere to the office PC via a secure FTP server.

In the main office of an engineering company, that is contracted by the construction company and responsible for the monitoring system, the software for data analysis is installed. In this project, the local Italian SystemAnywhere software is used to analyze and validate the measured monitoring of the sites. With the SystemAnywhere software on the SQL database it is possible to work from three different workstations.

"TM30 boxes"
Installed next to every Leica TM30 is a so-called "TM30 box". All the Leica TM30 total stations are connected directly to a 220V power supply, without backup battery (because it is not allowed in the plant). Inside the "TM30 boxes" are the required devices e.g. a datalogger that reads out and stores the charge of the battery, serial to IP converters, WiFi devices and an Ethernet switch, to ensure easy connection with a laptop to check the status of all the connected devices. To allow maximum flexibility of the box, every component and device is DIN-Rail mounted.

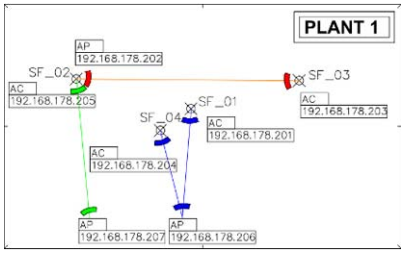
Leica TM30 field view

The battery information is automatically downloaded to the "PC box" so that the system operator can proactively react and exchange batteries if required.

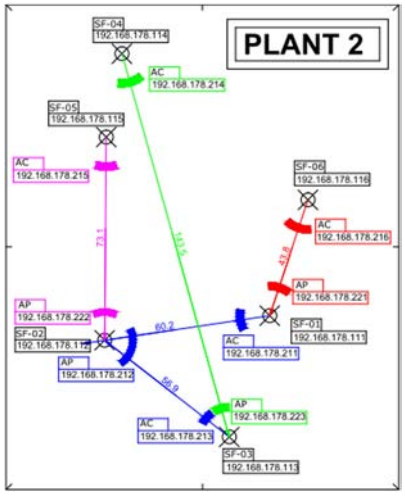
To fulfill the customers' requirements it was necessary to measure assingned 3D positions within the plant and the pipes. These coordinates are then used in a virtual sensor computation. With virtual sensors, the output of one or more sensors can be modelled using constants, mathematical functions and/or logic operators. In this project three main virtual values have been computed; height difference between two points on the same pipe but on different planimeric position, 3D vectors between points in different sections of the pipes line (like convergence measurement in the tunnel) and 2D vectors (planimetric) between points on the same pipe to check the alignment.

Based on the computed virtual sensors, automatic limit checks are computed and messages given to the customer. Based on the limit checks, the operator can make decisions about the safety of the plant.

As a result, the customer receives all the results as simple and clear graphs that show, at a glance, the behaviour and deformation of the plant.



Wifi network "PLANT 1"



Wifi network "PLANT 2"

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