2,000 Modeling Hours Saved with Edgewise Feature Extraction

Project Background

Built in the early 1930's, this St. Louis, Missouri chemical facility produces additives for the oil and gas industry. The plant's production and configuration has changed through the years to accommodate a variety of different chemicals and purposes. As changes were implemented, new systems were routed around the existing systems. Amongst its nine operating units hangs nearly 90 years of accumulated piping systems and structural steel. Both operational and decommissioned systems are intertwined with one another.

Accurate Technologies was sub-contracted to provide scanning and modeling services by an engineering firm responsible for producing an as-built model of the facility and corresponding piping and instrument documentation (P&ID) sheets. They were required to scan and model all pipes and their connections to structural, hanger, or support elements.

Accurate Technologies–A Branch of R.E. Warner & Associates, Inc.

Since 1987 Accurate Technologies has provided surveying services not common to most land surveyors and engineers. They utilize cutting edge technologies and, year after year, have expanded the company's services in surveying, GIS, metrology, 3D laser scanning, 3D modeling, UAV drone mapping, and high-accuracy equipment alignment.

Project Challenges

The chemical facility occupies a large area and contains a very dense set of building elements. The team was required to dramatically increase their number of scans to compensate for layers of pipes. Successive scan locations were frequently within several feet of one another. A single survey team captured 80-100 scans per day for four weeks. They worked extended hours and staggered breaks to maximize production to produce over 1600 scans (and counting).

Survey control had previously existed at the facility. Over time, however, the controls and monuments had been demolished or paved over. To establish control, the team acquired a 1960s set of drawings that showed several referenceable coordinates for building corners.

The distance between the site and Accurate Technologies' corporate headquarters was over 500 miles. Suddenly, they were faced with the challenge of moving two Terabytes (TBs) of data between their
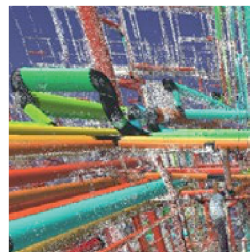
Accurate Technologies Workflow

Faro Focus 3D → Faro SCENE → EdgeWise → AutoCAD to SolidWorks

survey team and modelers. Even today's fiber networks weren't capable of moving the data in a secure and timely fashion. Instead, the survey team would scan for a week and then drive back to headquarters to deliver the point cloud data by external hard drives. Modelers would work for the next week while the survey team would return to the site for another round of scanning.

High definition laser scanning was a new technology for the owners and operators of the chemical facility. The team spent extra time at the beginning of the project to teach the client about laser scanning, its benefits, and its limitation to ensure that the expectation matched the final work product.

EdgeWise was able to accurately extract and model nearly 70% of the scanned pipes.

Workflow

Before scanning the facility, the Accurate Technologies team inspected the site thoroughly to establish control points and plan their scanning strategy. They decided to use their Faro Focus 3D scanner for the entire project. The scanner offers flexibility that matched well with the scanning conditions. In areas where the pipe systems were denser, they'd increase the resolution on the scanner. When they needed to scan at a distance to gain a better vantage point, the scanner would produce reliably high quality results.

Both spheres and checkered targets were used. The survey team made a habit of placing all checkered targets at a predefined elevation to create a referenceable plane during the modeling stages of the project.

Resultant point clouds were registered using Faro Scene then exported via COE to ClearEdge3D EdgeWise™ software for automated feature extraction and assistive modeling. To ensure piping system accuracy, the scans were sent to the client where they were annotated to identify connected P&IDs and returned to the modelers for processing. The engineering firm is a fervent Dassault Systèmes SolidWorks® user and required the model be delivered in SAT file format. To accommodate the requirement, Accurate Technologies exported the EdgeWise model to AutoCAD® to convert the file format to SAT.

Results

Accurate Technologies had been using traditional methods of converting point clouds into intelligent models for many years. In fact, the Missouri chemical facility was the first project for which Accurate Technologies applied EdgeWise. They chose to implement EdgeWise because of the impossibly tight timeframe on the project. 3D Scanning Coordinator at Accurate Technologies said, "We would not have won the project if we didn't have EdgeWise." **In total, EdgeWise was able to accurately extract and model nearly 70% of the scanned pipes.**

The Accurate Technologies team tracked and compared modeling approaches and times for several portions of the project. They concluded that their traditional methods of modeling would have required 3,600 modeling hours. Conversely, **the EdgeWise enabled workflow required only 1,600 hours: a time savings of 55%.**

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