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- when it has to be **right**

Leica Geosystems

How to Document Your Plant in Days

Instead of Weeks With 3D Laser Scanning

Bruce Bowditch - 4.15.2014

PART OF HEXAGON

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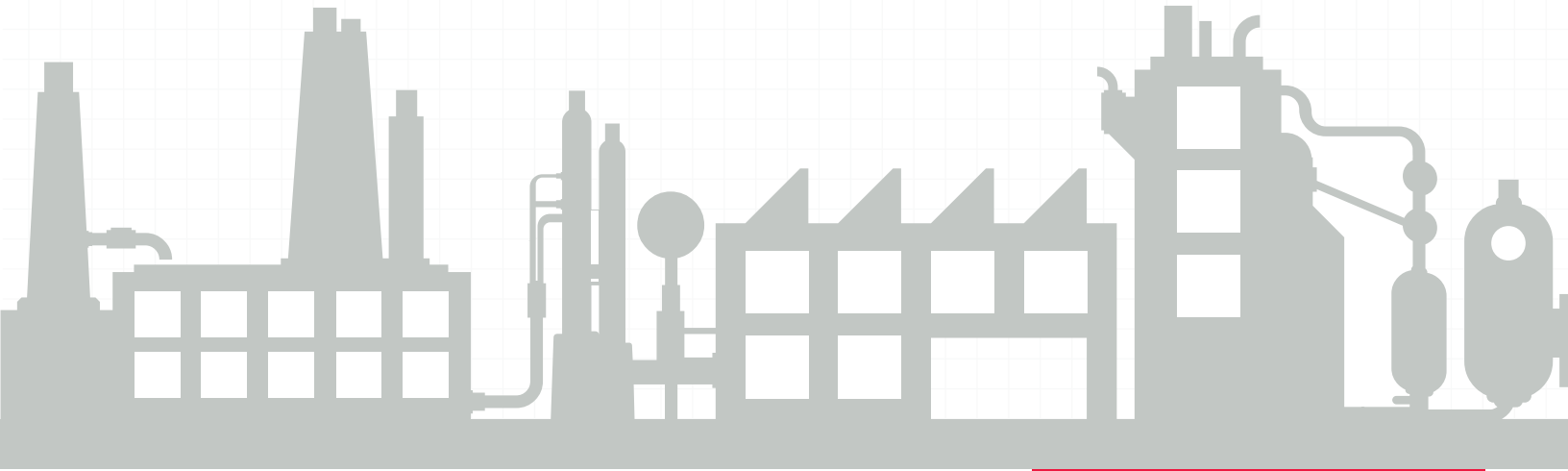

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I. Gain the Edge With Up-to-Date Plant Documentation

Plant environments are alive with change as companies upgrade existing installations, maintain equipment, and add new machinery to leverage the latest technology. Because of these constant modifications, it requires ongoing vigilance to keep your plant running smoothly, efficiently and safely.

To respond quickly and effectively to shifting needs, you must have answers to questions like these at your fingertips:

- What does your plant look like today?
- What's surrounding the leaking pipe you need to fix?
- Is there an electrical tray in the way that may cause an impasse for your planned installation of a new sprinkler system?

If you don't have your plant well documented with a detailed, visual representation, it may require a lengthy, costly investigation to answer such critical questions. Also, without precise, detailed documentation, you're more likely to take a circuitous path to maintenance and retrofits. For example, your engineers may go to the plant for some planned maintenance with a pipe that's the wrong size. Then they have to refabricate the pipe on location or back in the fabrication shop.

It happens every day. It takes time. It costs money.

With detailed plant documentation, however, associates can work around existing structures and minimize the field rework and delays that run rampant without it. Essentially, documentation serves as a map to your facility, enabling veteran and new employees to discover the quickest, easiest path to:

What does your plant look like today?

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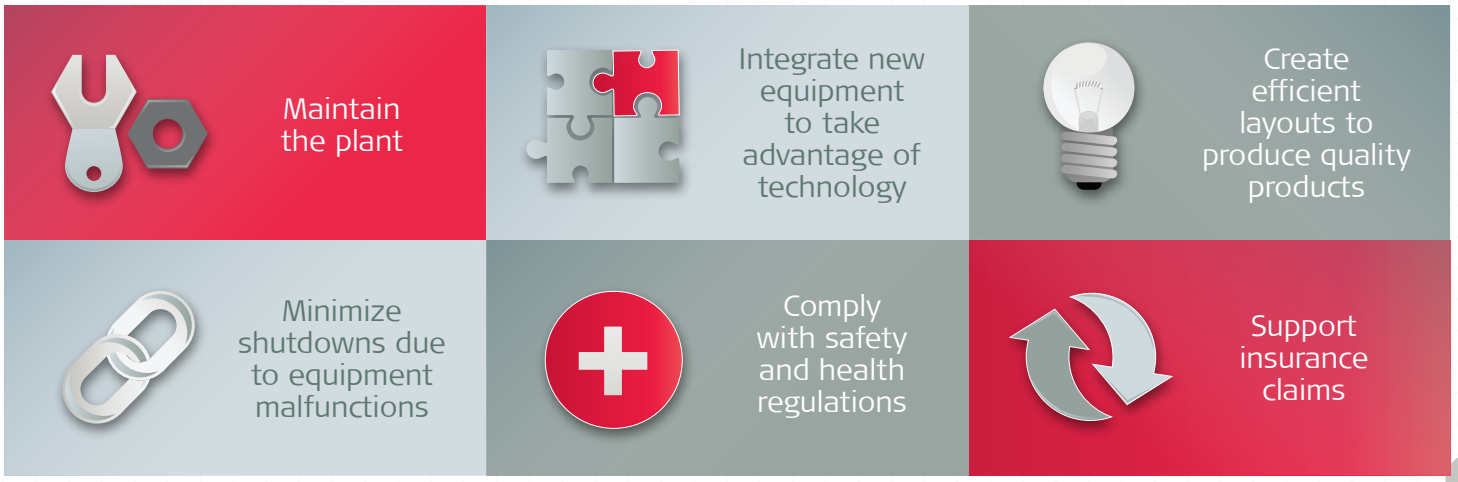

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II. Why Measuring-Tape Documentation Methods Don't Measure Up

A tape measure or hand laser. A clipboard. A drawer full of dusty, dog-eared drawings. All these long-trusted tools should, like the typewriter and slide rule, soon become distant memories. Why? Because when workers use them, they inevitably miss crucial information, take inaccurate measurements, and, over time, lose key documents.

- **Missed Measurements**

  The problem with the engineers who are taking manual measurements of your plant is ... well ... they are all human. More often than not, after they've completed the task, they go back to the shop and discover a critical dimension that they forgot to capture.

  For example, they may have overlooked a rod hanger that's holding the piping. It may be small, but it's not insignificant. After all, it can cause interference that diverts the course of the project.

- **Low Chance of High Precision**

  Even if you have superhuman engineers who capture all the data that's needed, the risk of inaccuracies abounds. For example, when they're measuring from point-to-point, the tape measure could sag slightly, causing the final reading to be off. This measurement error threatens to cause a problem with your retrofit or maintenance project.

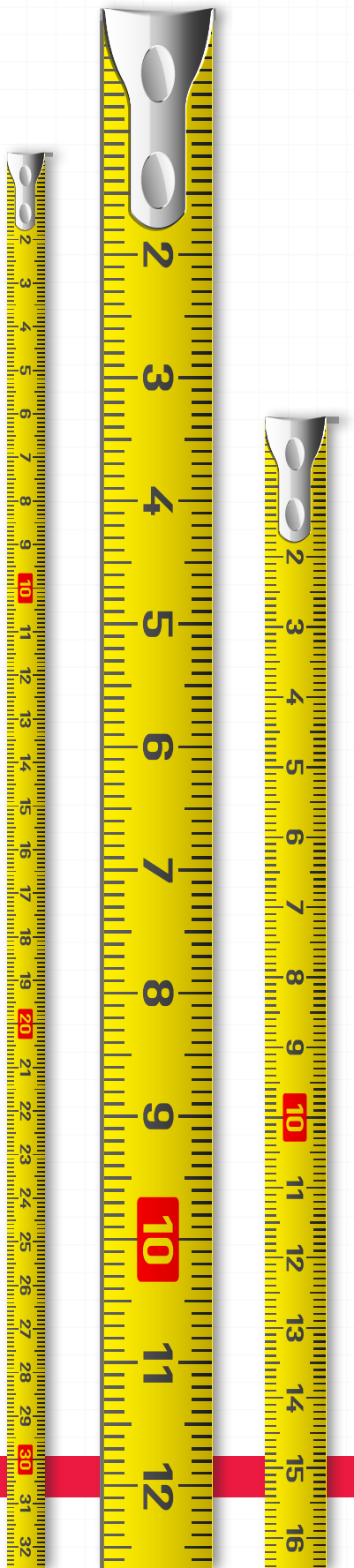
- **Scope Creep**

  Much as management tries to set in stone the project-scope, it tends to live and breathe. And as the scope changes, it sends technicians in a search of additional documentation. They rush back to the plant location to find what they need, and with each additional visit, the tab for travel costs, labor hours, project delays, and, potentially, production downtime adds up.

- **Disappearing Documentation**

  When you document your plant manually, you usually end up with a hard copy plan – something that's easy to misplace and, perhaps, lose altogether. It's a common problem. In fact, information workers (any employees who spend their time creating, developing, sharing, and consuming information) waste 3.5 hours each week on searches that don't turn up the right information. You don't want to burn up valuable man-hours looking for paperwork.

These inaccuracies, omissions in data, and lost documents increase the chance of encountering unexpected interferences and requiring field rework when completing plant maintenance, upgrades, and new installations.



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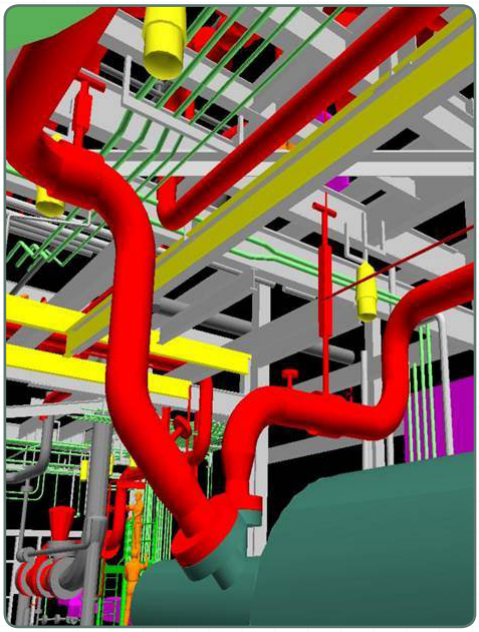
III. The Safe, Easy and Accurate Way to Document Your Plant

How to Capture Data With Confidence



You'll be glad to know laser scanning offers a safer, easier and more accurate way to document your plant. A scanner rapidly captures rich detail of the entire scene by systematically sweeping a laser beam over an area and calculating the distance between the scanner and any objects it detects. It's like a camera taking a 360 degree photograph with an accurate position for millions of data points that reflect the scanned surfaces.

The result is a point cloud – a set of data points in a three-dimensional coordinate system (x, y, and z axis), which represent the external surface of an object. You can use indexed point clouds in many CAD platforms through a plug-in product such as Leica CloudWorx to create valuable models for planning, fabrication, and clash detection.

Laser scanning enables you to collect better as-built information faster and reduces risks and costs. Since it captures everything, you rarely need to go back to the site for more details, even if the project scope changes. You can safely and conveniently revisit a scene any time on your computer and verify measurements, complete virtual fit ups, and plan for maintenance or new, more efficient plant layouts.

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IV. Discover the Proven Time Savings of Laser Scanning for Documentation

1. Case Study: Laser Scanning Reduces Project Time From Half a Year to One Month

A large refinery in California, part of one of the biggest oil corporations globally, was upgrading a fluid catalytic cracking unit. They needed documentation created quickly. Because of the short timeframe and complexity of the project, they knew laser scanning was the only possible way to reach their goals. Plant management was aware of F3 & Associates, a company that does 3D laser scanning and modeling, and hired them to conquer the challenge

F3 & Associates created a strategic workflow that used three Leica High Definition Surveying (HDS) laser scanners working concurrently. The firm's associates used two Leica ScanStation P20 laser scanners, which scan up to 1 million points per second with a range up to 120 meters, to capture most of the data. They also put the Leica ScanStation C10 laser scanner to work. This scanner, which captures up to 50,000 points per second with a range of up to 300 meters, was used on long-range, high-elevation scans that could not otherwise be reached.

"The combination of the two scanner types was great because we could get the C10 working for 45 minutes on a long-range scan while the P20s captured five more scans at the specified high-resolution requirements, plus captured photographs," said Sean Finn, Principal, F3 & Associates. The use of high resolution scans and photographs provided the richest possible data set to facilitate the most accurate planning.

Five F3 associates worked the job, some doing surveying ahead of the scanners while others ran the scanners. F3 & Associates downloaded the data into the Leica Cyclone software, which allowed them to quickly register the high accuracy point clouds. The associates then provided the refinery with a high resolution registered point cloud with photographs, as well as 3D prints for strategic areas to help stakeholders visualize the plant.

Finn estimates that the use of Leica Geosystems' laser scanners, plus their creative workflow, reduced the time on the job from approximately six months to one month. However, he adds that without laser scanners, "I'm not sure it would even be possible." Because the refinery obtained such a wealth of information within just a few weeks, they were able to plan accurately for the installation of their new catalytic cracking unit.

> "To survey something like this traditionally, it would take half a year and cost probably six times as much as laser scanning. It would be astronomically challenging. They'd still be out there now with pocket tapes and scaffolding trying to figure out tie locations. At the end of the day, it wouldn't be as good as a laser scan."
>
> *— Sean Finn, Principal, F3 & Associates http://f3-inc.com*

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2. Case Study: Laser Scanning Transforms Weeks of Data Collection Into Days

A power plant in Wyoming needed to capture the as-is conditions for pre-planning, fabrication, and clash detection for the addition of a new system, similar to a catalytic converter for vehicles. Collecting the data manually to help avoid clashes seemed almost impossible. After all, the space they were modifying was dominated by a complex gridlock of steel, and many of the key features of the "catalytic converter" needed to be l ocated above the steel support structure in the power plant. So when TruePoint Laser Scanning introduced the engineering firm to laser scanning, they realized this technology could be the answer to their challenge.

TruePoint Laser Scanning chose a Leica ScanStation laser scanner for collecting data because its long-range capabilities accommodated the height and distances required. In three days, two technicians completed the job, which included 48 scans.

Ryan Hacker, President of TruePoint Laser Scanning, estimates that to do the same job using traditional measuring devices would have taken six people about three weeks. To complicate matters, they would have had to rent lifts to access some of the higher locations. And this, of course, would have introduced additional safety concerns and prompted the need for additional Occupational Safety and Health Administration (OSHA) training.

TruePoint Laser Scanning imported the data into Leica Cyclone, registered the point clouds, and provided the engineers with files in Autodesk format (PCGs) for use in their modeling software. In addition, TruePoint gave them Leica TruViews, dimensional photographs overlaid on top of the point cloud data, which can be viewed in Leica Geosystems' free TruView panoramic viewer. Since the engineering firm handling the project was based in a different state, the Leica TruViews helped to familiarize them with the scan area and allowed them to return to the plant virtually as needed without traveling physically to the site. This allowed them to provide a much faster turnaround on deliverables for the plant.

Within three days of receiving the data, the engineers had already found some major clashes with their structural steel, which more than offset the scanning costs.

> "There's just a ton of steel, and they basically had to thread the needle through a 150 foot high structure. They were going to insert the new support structure down through there, but how else could they really know if they were going to clash with anything?"
>
> *— Ryan Hacker, President, TruePoint Laser Scanning http://truepointscanning.com*

> "We have discovered a few clashes with our structural steel, which may not have ever been caught, so I feel the service has already paid for itself."
>
> *— Joseph M. Gidcumb, P.E., Project Manager*

Images courtesy of TruePoint Laser Scanning LLC

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V. What to Look for in a Laser Scanner

Since most scanners have a long list of specifications, sifting through them to discover the ones that matter most can be challenging. So what should you look for? How you plan to use the scanner dictates the functionality that you need, so keep that in mind as you consider the following attributes:

Speed

Laser-scanner speed ranges from a few thousand to 1 million points per second. If you need high-resolution scans of a complex environment such as a plant in a short amount of time, speed will be critical.

Range

When considering the range you require, think about the accessibility of areas you need to scan. If you need to capture data from a structure that's hundreds of feet above the ground and don't want to invest in lifts or scaffolding, then you'll need a scanner with a longer range.

Accuracy

Measurement accuracy is the range within which measurements from point clouds are accurate. Make sure the laser scanner you purchase meets your accuracy requirements.

Environment

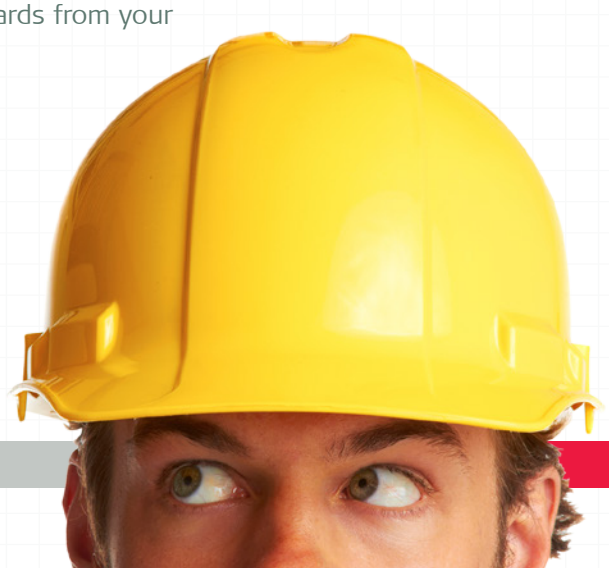
The environment can have a huge impact on your productivity with a laser scanner. That's because some scanners don't produce accurate measurements in extreme temperatures and humidity. So check the scanner's operating-temperature ranges. Also, if you need to scan in rain or extremely high humidity, make sure the scanner is non-condensing, in other words,its performance is not affected by humidity.

Eye Safety

All laser scanners are rated by the Center for Devices and Radiological Health (CDRH) for their eye safety. The levels range from Class 1 to 4, with a Class 1 device being the safest, as no precautions are required. A Class 2 laser is also considered quite safe because the human blink reflex will limit the exposure to no more than 0.25 seconds.

Software, Training, & Support

You need to be able to use the scanner's data easily in order to make critical decisions regarding new installations and maintenance. So try to find a laser scanner from a company that also provides a seamless solution for software, training, and support. That way you can rest assured that you'll reap the rewards from your scanner investment.



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VI. Find Out About Leica HDS Laser Scanners and Cyclone Software

The combination of state-of-the-art Leica HDS laser scanners, powerful Cyclone software, experienced support and efficient workflows provides a complete solution for gathering as-built data and surveys in plant environments. Leica Geosystems' solutions facilitate quick project turnaround, save money and substantially reduce the likelihood of errors. And because the scanners collect noise-free data, you won't spend time trying to decipher between a construction defect and extraneous points.

Collect Data Almost Any Time

While the use of many laser scanners may be limited by heat and humidity, Leica HDS laser scanners operate effectively in a wide range of conditions. The Leica ScanStation P20, P15 and C10 are non-condensing and operational in 100% humidity, which means you can operate them in rain or snow.

Find out more about the Leica ScanStation P20 and Leica ScanStation P15.

Analyze Data Quickly and Easily With Leica Cyclone Software

Leica Cyclone enables you align point clouds captured from different scanning positions quickly and easily. You can work with point clouds directly and create models for export into CAD and other applications. It's comprehensive, quick, and easy to use, and it enables you to dig deeper into the data to meet your project goals.

Find out more about Leica Cyclone.

Share Information Globally With FREE Leica TruView Point Cloud Viewer

You can publish point cloud data for web-based sharing anywhere in the world using the FREE Leica TruView panoramic point cloud viewer. TruView enables you to share information easily with others who don't have the Cyclone software.

Rely on the Insight of Experienced Professionals

From on-site and factory-based classroom and field training to a global network of experienced HDS support specialists, no organization can help you succeed in 3D laser scanning better than Leica Geosystems. Also, with an extensive network of Service Centers and authorized Dealer Service Centers, Leica Geosystems ensures that your equipment is maintained and repaired in a timely and professional manner.

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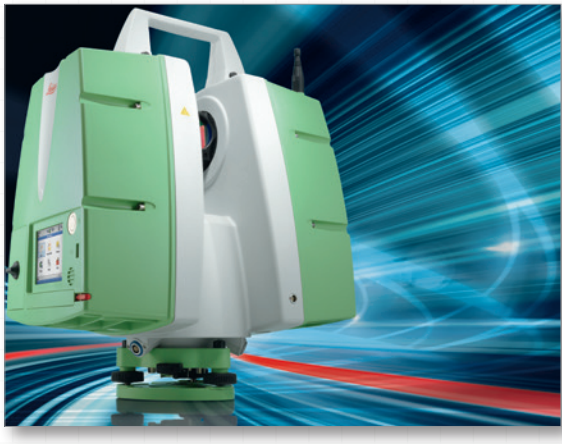
VII. About Leica Geosystems



Over the last two centuries, Leica Geosystems, in its various forms, has grown into the industry leader in solutions for surveying, civil and structural engineering, monitoring and deformation, building and construction, mining and exploration, and asset management. Solutions include technologies, such as GPS global positioning systems, lasers, optics, wireless communication, Internet services, and application software, which enable customers to do their job with speed and efficiency. Also, these technologies are integrated with industry specific products to provide customers with a solution that addresses their entire workflow.

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