



# 3D LASER SCANNING FOR THE PROCESS PLANT INDUSTRY

From field to finish, every opportunity to reduce risk and error has impact. That's why accuracy and safety are paramount at every stage of oil and gas exploration, production and distribution.

Imprecise measures can produce safety issues or create scheduling problems that delay projects and increase costs. "When things don't fit in an environment where processes are hot, lines could snap and guides could break — it could be catastrophic," says Mark Franklin, design and reality capture lead for Kleinfelder Inc., an engineering, construction management, design and environmental professional

services firm. "Even if nobody gets hurt, it's very expensive to change field welds and cuts — up to \$250,000 when the work is up high requiring cranes and other equipment. Costs multiply exponentially in the field." Delays and safety violations also result in expensive fines.

To counteract these challenges, many oil and gas companies are adopting 3D laser scanning.

"It's changed the way we do all our projects in oil and gas," Franklin says. "The scanning is quick and our new designs are going in with fewer issues than before. We can easily prove cost savings from pure and accurate data."

## 3D LASER SCANNING FOR THE OIL & GAS INDUSTRY

Laser scanning technology has evolved beyond its original deployment as a survey tool. Additional uses include:

- **MODELING WITH PROCESS PLAN.** 3D laser scanning allows you to quickly and accurately model in the cloud, which is particularly important when doing conversions. “When you’re working with something like tie-in flanges on a pipe, you have to know exactly where that is down to sixteenth of inch,” says Irene Radcliffe, a 25-year industry veteran and BIM/CIM sales engineer with FARO® Technologies, which develops and manufactures hardware and software for high-precision 3D capture, measurement and analysis. “You pick two points on the scanned pipe and the software algorithms analyze the shape of the cylinder and determine the size of the pipe run. The AsBuilt software then models on the pipe using the predefined specification. Once the piping run is complete, it can be converted to solids. If you use Autocad Plant 3D, you can convert the AsBuilt piping to intelligent Plant 3D models and extract an isometric and bill of materials.”
- **PRECISION DEPLOYMENT.** Scans uncover issues before your team can. “We were analyzing some scans and noticed that fireproofing was falling off,” Franklin says. With the scan data, the client’s crew knew exactly where the issues were and rapidly deployed to those locations instead of manually inspecting the entire facility. Once immediate problems were addressed, the team had time to inspect other areas.
- **PLANNING.** Laser scan data is valuable for planning maintenance, construction or decommissioning activities. For example, one frequent problem is getting big equipment into an existing plant. Accurate drawings need to be looked at, but in many cases the original plans probably don’t show upgrades and changes. With laser scanning, you can take a point cloud, run a quick animation and deploy clash detection to make sure the equipment will fit — well in advance of the project.



## MINI CASE STUDY

**K**leinfelder Inc. prides itself on being an innovative company that’s always looking for new ways to improve operations and deliver value with next-generation processes and technologies. That’s why the company invested in 3D laser scanning technology.

“We looked at the hardest part of engineering, and often it was data collection and site measurement,” explains Mark Franklin, design and reality capture lead for the firm. “We do a lot of brownfield engineering, and the old way of getting the data we needed to create a new project involved old hand drawings, talking to operators, tape measures and working with surveyors. It was time-consuming and sometimes dangerous work.”

The team looked at 3D capture and what it would take to develop the in-house capacity to use it. Key considerations included the learning curve, ease of use and interoperability with existing technology.

“We were already using AutoDesk®, and when we saw that 70% of point clouds going through the platform used FARO data, that made the decision to go with them pretty clear,” Franklin says.

The results were immediate.

“Now with 3D laser scanning, we can collect fast. It’s like an instant as-built,” Franklin says. “And our own design group does it so we don’t have to hire survey companies. We also use 3D laser scanning in other areas we never thought we’d be in, like training.”

3D laser scanning is just the beginning. “There’s all this talk about Digital20 and other catchphrases. What’s important is that you’re actually pushing beyond that,” he says. “That’s what we’re trying to do here. I know some people in the industry are reluctant to adopt this kind of tech, but now that we can show results there’s no turning back.” ■

## ■ PLANT MAINTENANCE AND EXPANSION.

It can be impossible to know exactly what's in a processing plant, drilling site or pipeline facility before maintenance or expansion activities. "We had existing drawings of a 42-inch line about three stories up that needed to be replaced," Franklin recalls. "After the scan, we could see it was 6 or 7 inches off. Our engineers did a stress analysis and took a look back at construction records, and they realized the crew put on come-alongs to pull piping over. That allowed us to warn them that the pipe could spring when unbolted, which could result in serious injury."

■ **LARGE-PART INSPECTION.** Consistent, accurate measurements are critical to maintaining design intent and performance of plant equipment, but it can be time-consuming and dangerous if done manually. Laser scanning technology takes precision measurements that minimize user variability and eliminates rework and scrap.

■ **DECOMMISSIONING.** Decommissioning drill pads, pipelines and plants is a time-consuming project that requires a lot of documentation and verification. Handling the process

efficiently is more important as the industry's infrastructure ages. Consider the situation in Alberta, where about 100,000 individual well pads will soon need to be decommissioned. "There's a \$7 billion cleanup to be done here, and it will all start with going to each site and getting as-builts to establish what's there so you can plan the close-out," Radcliffe explains. "Once the project is underway, scanning can help owners and contractors document the entire process. With environmental agencies watching these remediation projects closely, detailed documentation is key. It's a lot of work to do that manually. But if you take a scanner and spend only a couple hours to capture each pad with 360-degree photos and laser scans, that's a big time-saver."

■ **REGULATORY VERIFICATION AND DOCUMENTATION.** Because 3D laser scanning creates an accurate digital representation of a site or project with a point cloud and photos, there's an added layer of verification. A company can show regulators and inspectors what's there before they walk the line.

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■ **OPERATOR TRAINING.** Because of all the data the scans generate, a company can create a virtual model of the entire plant to train employees. "We worked with a gaming company to animate our scan data so operators can go through and feel like it's real life, not a game. They feel immersed. You can even see rust on a railing," Franklin says. "We never thought we'd be doing that."

While the scanners themselves aren't explosion-proof, they are deployable inside an oil and gas facility, according to Radcliffe. "You need a hot work permit and a small personal gas monitor so you can

be alerted to potentially explosive atmospheres," she says. "You can set up the scanner and leave it in the area so you can operate it remotely via a mobile app."

With so many applications for 3D laser scanning in oil and gas deployments, it's clear that now is the time to adopt it.

"I know some firms have been reluctant to adopt laser scanning technology, but it's the way of the future," Franklin notes. "If you're not doing it, you'll be left behind." ■



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## ABOUT FARO

FARO creates portable 3D laser scanning hardware and software solutions designed to accurately capture, process and deliver pre-existing and as-built conditions to be integrated with BIM solutions for improved decisions throughout the project lifecycle.

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