DON'T FALL VICTIM TO THE PITFALLS OF HUMAN ERROR: PLAN AHEAD FOR A BETTER 3D SCAN

Has your company considered using 3D scanning or a point cloud technology recently on a project?

How'd it go? If you found an experienced firm with a well-organized process, there's a good chance you're now a 3D scanning evangelist.

Unfortunately, it's just as likely that you had a rough, expensive experience and vowed never to go that route again. Before you write it off completely – or if you've never used it and are considering bringing it in as a tool on your next project – by making yourself aware of some key "watch-outs" on scanning projects, you can get the most of this exciting tool while avoiding many of its potential pain points.

Hmm. Well, first sell me on the benefits.
Scanning is a hot service right now in the A/E/C industry. It allows companies to acquire as-recorded drawing documentation without a labor-intensive, manual field data collection process and simplifies acquiring data in hard-to-access or confined-space areas.

Once a scan is complete, companies can use the models generated through the process to check for clashes on new projects. This is achieved by overlaying the scan's point cloud with the CAD/Revit/Design 3D model.

In theory, and when it's executed well, 3D scanning saves both owners and their A/E/C firms time and money. It should also help

Using a combination of point cloud scan and CAD design, the team on this project determined the location of new equipment, routing of pipe, and placement of an unloading pad. While point cloud scans and 3D modeling can save projects time and money, if the process isn't planned for properly, it can create plenty of headaches.

deliver designs that are more accurate and up-to-date than those offered with traditional field data collection practices. 3D scanning can help catch interferences that were previously handled via field confirmation.

OK, that does sound pretty great. Now, what should I look out for?
A firm experienced with using 3D scanning in the field should be familiar with these common trip-ups. As we've gained experience with this tool, we have learned a few things on our early projects that may help ensure yours go more smoothly.

- *Make sure your scanning area and outcomes are clearly defined:* Without specifying exactly what you want the end result to be, the scanning company may not scan the desired areas or capture the right items when they map the room.

It's also possible that they may not set up the scan to be easily converted into the proper CAD drawing format. There are different scan types and purposes, and your scanning firm needs to be prepared to meet your needs. The more detail you can offer(for example PDF files, CAD files, or photos of the area and conditions), the better: no one knows your plant or your project objectives better than you do; make sure you clearly communicate your desired outcomes to the team before starting the scan.

- *Wall coatings and coverings take up space:* It may seem obvious, but remember that things like wall coatings and coverings can take up physical space in a room. Your scan will treat wall coverings as if they were the actual walls themselves – if you'll be removing these coverings as part of your project, you'll gain

space that won't be reflected in the scan. In one early project, our team had 6" of insulation on a freezer wall that we scanned, but the model built from the scan didn't account for the insulation. As a result, everything was modeled 6" further into the center of the room than its eventual location. Wall coatings and wall coverings may falsely constrain the model and misrepresent the space available if they are not taken into account. The same holds true for insulated pipe. Be aware of insulation and false thicknesses.

- *Track major changes to the scan:* Even on the most watertight projects, sometimes the scope changes. Make sure you track major changes to the scan (such as demolition of walls and

openings) – don't simply remove them. If you don't track and retain that information in the beginning, when the scope changes or you decide to pursue a different option later in the project, you won't have access to that important data and that will create problems and potential errors in the ultimate design outcome.

- *Scan data can result in extremely large files:* Given the high degree of granular detail that you're hoping to get from your 3D scan, the file size of your scan data may end up being much larger than you expected it to be (or than you're used to handling). Make sure that your team has a plan to distribute, post, and share extremely large files before you find yourself wrestling with them

in a review meeting. You'll also need to ensure that both the owner/client and the A/E/C firm's systems are capable of handling files of this nature. Otherwise, this can become a bottleneck in the design phase when you overlay the 3D model with the scan data. That process is very hardware intensive and can be limiting to some PCs and networks.

Any advice for avoiding these issues on future projects?
Dealing with any of the issues described above has the potential to bloat your budget, drag out your schedule, and frustrate your team. With a little preparation, most of these issues can be avoided.

- *Develop a proper scanning specification:* Many of the complications described above could have been avoided through the development of a proper scanning specification. Make sure that your scanning company thoroughly understands your needs and intended outcomes. Scans are worth their weight in gold when they are well-thought-out and deliberately planned. Discuss potential issues or concerns in advance, and keep a close eye out for potential complications. Think outside the box (literally) and consider scanning slightly more area than you need. In our insulation example, for instance, scanning the outside of the insulated wall would immediately provide you with true wall thicknesses that could be addressed up front in the model.
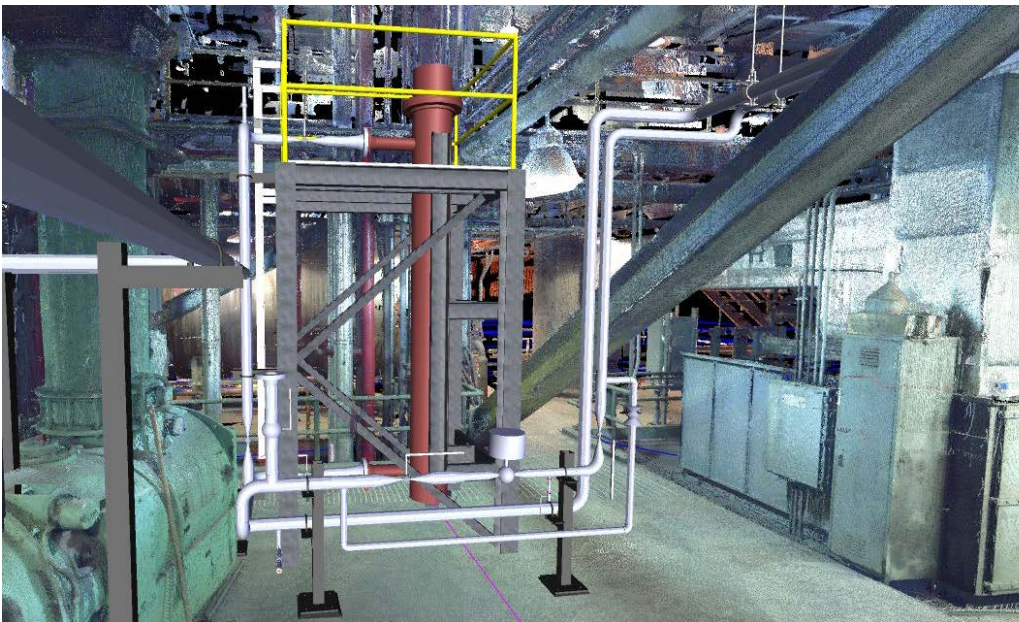
Once a point cloud scan is developed, new equipment, structures, piping, etc. can be added through 3D modeling software. In this case, the scan was used to help place and size structural members, design a pipe run design, place instruments, and determine the location of a fuel oil heater.

- *Spend a little time on manual field verification:* While a 3D scan will go a long ways toward reducing the amount of time spent on data collection and field verification, it's still imperative to have some sort of manual field verification process. Good, old-fashioned surveying techniques and measurement back checks should be done. Human errors occur in setting up the scans and technology, and it will save you pain later in the project if you can ensure that the scan is accurate and things were set up correctly early on. You don't need to cross-check everything – it can be as simple as a series of "spot checks" to make sure that what's showing up in the scan is reflecting reality. The old saying holds true: measure twice, cut once.

- *Don't take model conversions for granted:* Though it seems like the process should be relatively seamless, make sure that your model converts correctly and was accurately modeled from the scan. Make sure to establish a cross-checking process within your project to avoid later confusion and frustration. A 3D model is typically comprised of straight, true lines and surfaces; in reality, we know that walls bend and warp slightly, so cross checking various points for accuracy is essential. Hopefully, if you're working with an experienced firm this won't be an issue, but it never hurts to check and double-check. If you plan for this process from the beginning, you'll feel more confident about the ultimate end result.

In the end, when implemented well, point cloud scanning is a useful tool that will save you time and money on your projects. Like any tool, though, its value resides in how carefully it's used and planned for. Take time to create a well-thought-out plan and work closely with both your A/E/C and scanning firms to ensure that your project needs are well-defined and that your objectives are understood and met. Before you know it, you'll be a 3D scanning evangelist, too!

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About the Author: Kelly is a skilled packaging engineer with an aptitude for solving challenging problems with innovative solutions. Throughout his career, he has supported several of the world's leading food and consumer products companies. Kelly currently leads POWER's packaging team and is always on the lookout for creative ways to make their work more effective, efficient and valuable to our clients.