

A Value-Add for Revamps



Intergraph technology, laser models together offer tangible benefits

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The broad adoption of 3D plant design tools, such as Intergraph PDS® and Intergraph SmartPlant® Review, has resulted in dramatic improvements in engineering productivity and quality. Unfortunately, a variety of obstacles have prevented universal adoption of these tools for design engineering of modifications to existing facilities. However, laser-scanning technology can allow Intergraph tools to be effectively used on facility modification or revamp projects.

The advantages offered by Intergraph tools are numerous and well documented. For example, 3D visual model representations are intuitive for user audiences ranging from

novice to expert. They can help ease coordination with project stakeholders that may lack familiarity with traditional engineering design drawings, such as steel details, piping plan drawings and piping isometrics.

Additionally, Intergraph tools support integrated, multidisciplinary design work processes, helping to ensure quality and consistency throughout the design life cycle. Other benefits include:

- Design standards and best practices that are embedded and enforced to help ensure the creation of consistent documentation
- Models that are electronically transportable to engineering design teams anywhere in the world, improving teamwork and design efficiency
- Facility data for tagged equipment and instrumentation can be associated with the visual model for easy lookup
- Tools support flexible, automated generation of legacy 2D documents, such as isometrics, plans and elevations

- Construction phase rework from dimensional and interference busts are nearly eliminated, resulting in reduced costs and schedules

These benefits are so compelling that the use of 3D tools for the design of new facilities is nearly universal. Due to the significant benefits achieved, there has been significant interest in using these same tools to revamp projects. Unfortunately, Intergraph tools did not exist when many facilities were designed and constructed, and creating models would require significant time and cost. Additionally, many facilities do not even have accurate 2D documentation, such as piping and instrumentation diagrams (P&IDs) or piping isometrics (isos). Even if accurate 2D documentation is available electronically, it is not possible to automatically generate a 3D model from traditional 2D – manual remodeling is the only available migration path.

Laser scanning and laser models

Laser scanning is rapidly becoming a standard technique for the collection of as-built data for process, power and offshore engineering and design projects. An individual laser scan is composed of billions of individual 3D spatial measurement points. Individual laser scans can be viewed as photo-realistic 2D images. Quantapoint has also introduced an innovative new technology in its Quantapoint PRISM 3D™ software that enables a series of individual laser scans which can be integrated to create a dimensionally accurate, physically complete, 3D visual representation that is photo-realistic. This Quantapoint 3D laser model™ is fully digital and easily shared.

It is important to note that in a Quantapoint 3D laser model – while each point provides a highly accurate physical measurement of a point in 3D space – there is no difference between the measurement points on the surfaces of pipes, vessels, steel, concrete, conduit or insulation. While a Quantapoint 3D laser model may look like a collection of pipes and equipment, it contains no concept of the individual entities. There is no “magic button” that will convert laser scan data into fully attributed CAD entities.

Using Intergraph tools with laser models

There are many ways in which drafters and designers can use the Quantapoint 3D laser model, the easiest of which is as a source for accurate dimensional measurements to create entities in the appropriate Intergraph tool. Measurements can be taken for individual points and from any point to any other point. For pipes, the centerline, angle and outer diameter can be easily extracted. This enables existing structures and piping to be remodeled only in those areas for which it is absolutely necessary, such as the connection points for new equipment and piping.

Additionally, Intergraph models can be imported and displayed with the Quantapoint 3D laser model. This can be used to visualize proposed modifications for design and constructability planning, to compare and validate the Intergraph models against the as-built laser documentation or share proposed updates to project team members unfamiliar with Intergraph software. The result is more accurate and faster design and review cycles.

Finally, the Intergraph models can be clashed against the Quantapoint 3D laser model to identify potential hard and soft interference or dimensional busts. This provides a work process in which design clashes are exceptions to be eliminated on the engineers' desktop, because resolving clashes during construction job is simply too expensive.

While Quantapoint 3D laser models are not equivalent to Intergraph models, combining the two modeling approaches enables many best practices associated with Intergraph tools to be applied to revamp projects. This hybrid approach has been used on hundreds of projects and has consistently resulted in engineering productivity and construction phase rework rates consistent with those achieved using 3D design technologies for new facilities.

Tangible benefits exist for all stakeholders

All project stakeholders – owner/operators, engineers, designers, maintenance personnel, project managers and equipment vendors –

are likely to find that combining Intergraph tools and Quantapoint 3D laser models can provide a significant return on investment for any revamp project. Early adopters have found it to be safer, faster and more accurate and transportable than any other option for capturing and sharing dimensional details of existing facilities.

Laser scanning is also easily justifiable for revamps to facilities originally designed using Intergraph. Similar to 2D design documentation, Intergraph models may also be incomplete. Typically, these models contain idealized representations – with all pipes being 90 degrees and plumb – and not actual "real-world" features. Models also usually exclude information such as packaged equipment details, field routed utility systems, instrument conduit and cabling and some small-bore piping. Quantapoint 3D laser models capture these features wherever visible and help to address the risk of construction phase rework caused by inaccurate dimensional assumptions and interferences against features undocumented in the original design Intergraph model.

Among the many tangible benefits of combining Quantapoint 3D laser models and Intergraph models are reduced costs, optimized schedules, increase quality and improved safety.

The combination of Intergraph tools and Quantapoint 3D laser models is a powerful tool, making it cost effective to use Intergraph design technologies for revamp projects. The facility can be any age, the available design documentation can be any format and incomplete, and the design team can be located anywhere in the world. This helps reduce the risk of project rework tied to dimensional and interferences busts and make a compelling case for adopting laser scanning in any revamp project. ■

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Parsons E&C shaves 3 months off project

READING, Pennsylvania USA – During the first quarter of 2003, the Reading Operations office of Parsons E&C, part of the WorleyParsons Group, began working on clean air projects for two fossil-fueled power stations owned by a power company based in the south-eastern United States.

"As-built data to support the configuration of these two power plants wasn't available to us," says Dan Biss, Parsons E&C's engineering manager for the projects. "We considered traditional methods such as manually collecting the data and reviewing existing engineering drawings, but both of those options would have been time-consuming and subject to error."

Parsons E&C chose Quantapoint for laser scanning existing equipment and the plant. Quantapoint team members were able to scan internal and external plant structures safely – even in congested and elevated areas where access was nearly impossible. Quantapoint's three- to four-person teams spent two weeks in the field capturing data for each station vs. the estimated three months per power generating station it would have taken for multiple teams to research existing documentation and field-verify measurements manually using traditional field survey procedures.

According to Alan Smith, manager of engineering for Reading Operations, Quantapoint's laser scanning solutions helped the Parsons E&C team design new systems and structures integrated into the customer's existing power plant, minimizing obstructions or project delays.

"Quantapoint enabled Parsons E&C to deliver an 'interference-free' design and allowed us to keep our overall project on schedule," Smith says. "Quantapoint delivered a high quality, highly accurate product that offered excellent viewing and data manipulation capabilities between its PRISM software and our existing Intergraph PDS® (Plant Design System) software packages."