

SmartPlant[®] Spoolgen[®] for Fabrication and Construction

Fast and Accurate Spool and Erection Isometrics

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1. Introduction

SmartPlant® Spoolgen® is a proven, industrial-strength application that enables the creation of piping isometric drawings for fabrication and erection from the design created during the detail engineering phase of projects, as shown in Figure 1. You can add additional information – such as the location of field welds – and create new drawings and reports from the same source as the original drawings. The technology is based on ISOGEN®, the industry-standard software for automated piping isometric generation, and has been deployed successfully on all sizes of plant engineering projects in every region of the world.

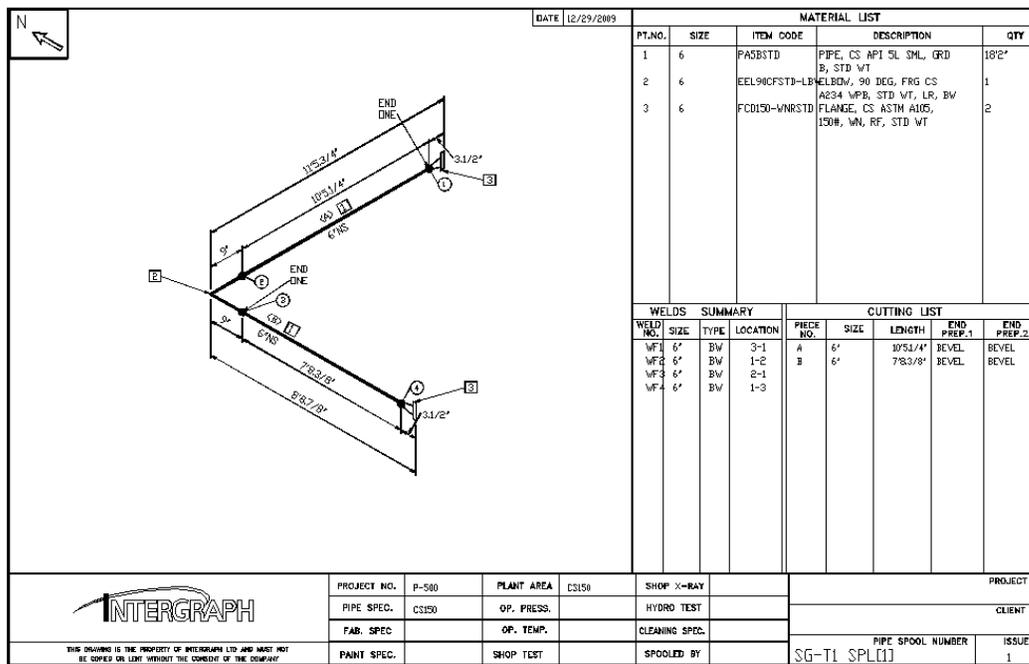


Figure 1: SmartPlant Spoolgen creates spool drawings.

SmartPlant Spoolgen is fast and accurate because it eliminates the need to redraw isometrics and manually re-create material take off reports. The software can work with piping data from almost any plant design system – Intergraph SmartPlant 3D, PDS®, and CADWorx®; AVEVA PDMS; and Bentley AutoPLANT and PlantSpace are all supported.

SmartPlant Spoolgen boosts productivity because no CAD skills are needed, yet it uses the ISOGEN engine to create industry-standard, high-quality drawings in many different formats – automatically and without drafting.

Changes to the source data are strictly controlled to maintain design integrity, helping to eliminate transcription errors and ensuring the design intent is faithfully preserved throughout the fabrication and erection phases.

SmartPlant Spoolgen offers many configuration and customization options to ensure it will fit smoothly into any existing workflow process. The solution is part of the SmartPlant Enterprise life cycle, with links upstream to SmartPlant 3D and downstream to SmartPlant Materials and SmartPlant Construction.

1.1. For the Owner Operator

SmartPlant Spoolgen can be deployed as part of a workflow to optimize the design, procurement, fabrication, and erection of piping systems.

1.2. For the EPC

Use SmartPlant Spoolgen to manage and track progress of fabrication and erection subcontractors without the need to tie-up valuable plant design seats and expertise.

1.3. For the Piping Fabricator

Use SmartPlant Spoolgen to create a competitive advantage by minimizing costs and boosting quality.

2. Business Benefits

2.1. Productivity

A set of spool drawings from a single design isometric can be created in 15 minutes or less. This is because SmartPlant Spoolgen completely automates drawing production, using ISOGEN to create industry-standard deliverables. All you need to do is “mark up” the locations of field welds; the spooling algorithm will do the rest. No drafting is required. As a result, companies have reported a tenfold improvement in drawing productivity.

SmartPlant Spoolgen offers many possibilities for automation. Users have found that up to 95 percent of data entry work (such as the addition of welding testing requirements) can be eliminated by taking advantage of these powerful automation features.

2.2. Efficiency

SmartPlant Spoolgen boosts efficiency because it enables you to employ relatively unskilled or junior engineering resources, yet still create high-quality drawings and reports. Users do not need a detailed knowledge of CAD to use SmartPlant Spoolgen.

The drawings and reports created in SmartPlant Spoolgen could, in many cases, be generated by the EPC during detailed engineering design. However, this is often an inefficient use of expensive 3D plant design software and engineering resources. Until a fabrication contractor is selected, details of the workshop capacity and capability are unknown, so it may be impossible to create fabrication drawings until just before they are needed. In this scenario, SmartPlant Spoolgen enables the optimal use of engineering and other resources.

2.3. Accuracy

You can achieve deliverables accuracy by eliminating the possibility of transcription error. Data supplied from the design contractor is preserved through the SmartPlant Spoolgen workflow. For example, when a single design isometric is split into multiple spool sheets, the material take off is automatically divided so the correct material is assigned to each sheet. Erection material is not shown on individual spool sheets, but can be separately reported.

Likewise, dimensions are protected from the possibility of inadvertent error. SmartPlant Spoolgen users cannot change the basic engineering design by accidentally deleting or editing pipeline components. This minimizes manual checking, saving time and increasing accuracy.

2.4. Consistency

Many companies report that a significant benefit of using SmartPlant Spoolgen is the consistency of the output. In contrast, when manual or CAD-based drafting is used, the individual style of the draftsman can vary considerably from drawing to drawing and project to project. SmartPlant Spoolgen is completely automated. This means you can configure all drawings so they have a consistent presentation. This helps improve communication between engineering and the fabrication shop.

2.5. Quality Assurance

SmartPlant Spoolgen provides a number of features that help ensure a high-quality work process. The built-in database automatically tracks all revisions of every pipeline. This enables the fabricator to quickly identify changes between revisions and detect errors and inconsistencies in the data supplied by the design contractor. For example, you can easily determine if the delivered drawing does not match the data from which it was apparently derived.

2.6. Workflow Integration

Successful companies strive to continually improve their overall efficiency. SmartPlant Spoolgen can be integrated in any automated workflow using the built-in configuration and customization tools. Typically, the challenge is to procure and assemble materials in time to efficiently fabricate piping spools in a workshop and then deliver those spools, together with any erection items needed to complete the assembly, to the site in a sensible sequence.

One SmartPlant Spoolgen user has reported productivity gains of up to 33 percent by improving its ability to manage materials more accurately. The software's automated reports and other processes were a key enabling factor in reducing "wait time" for field personnel.

2.7. Return on Investment

It is easy to demonstrate tangible productivity savings during the engineering phase of a fabrication project – the preparation, checking, and issuing of fabrication drawings and material take off (MTO) reports. While a typical spool sheet might take between one to four hours using manual methods or 2D CAD, SmartPlant Spoolgen will produce a set of accurate, consistent drawings and MTO reports in just a few minutes. Normally, the purchase of SmartPlant Spoolgen can be justified on engineering savings alone, on any project with a few thousand spools. Your local Intergraph sales office can provide a customized ROI calculation for your company.

SmartPlant Spoolgen can enable additional efficiency savings downstream – in the fabrication workshop and erection and assembly site (see Figure 2). The automated and accurate drawings and reports available from SmartPlant Spoolgen enable you to implement improvements to your management of materials and reduce waste and operator wait times by ensuring the right materials are available at the right time. Companies have realized time savings of more than 30 percent by implementing improved workflows that include SmartPlant Spoolgen.

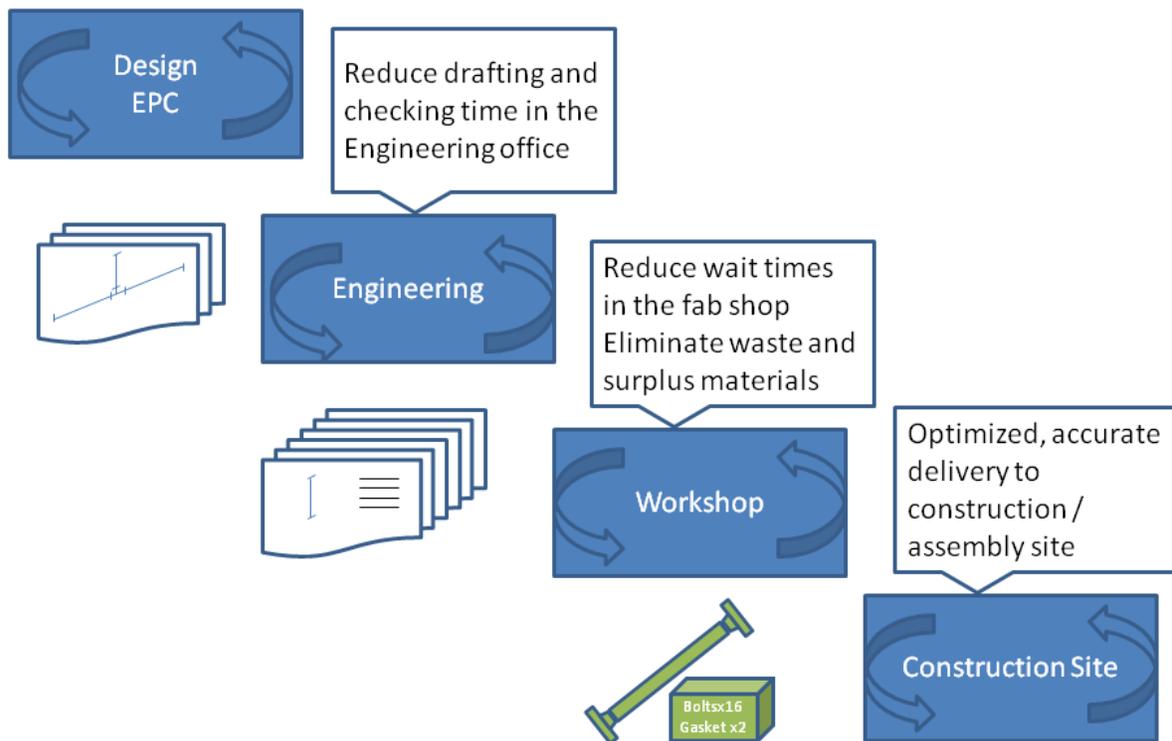


Figure 2: SmartPlant Spoolgen enables a more efficient workflow.

At the erection site or module assembly yard, you can achieve further savings through efficient management of spools and erection materials.

3. Key Features

3.1. How SmartPlant Spoolgen Works

Most of the world's 3D plant design systems use Intergraph ISOGEN software to automatically create piping design isometrics. ISOGEN receives a data file containing a description of the pipeline to be documented. The software then automatically lays out the drawing and creates the material take off based on the information in this file. The exact form the drawing takes – the style of dimensioning or the units of coordinates, for example – is determined by a set of controls.

ISOGEN creates a drawing using the selected CAD format – AutoCAD, MicroStation, or SmartSketch® – but the information used to create that drawing is contained in the data file created by the plant design system. This file is one of two types:

- ISOGEN Data File (IDF) is used by traditional systems, such as Intergraph PDS and AVEVA PDMS
- Piping Component File (PCF) is used by all recent systems, such as Intergraph SmartPlant 3D and CADWorx

SmartPlant Spoolgen works by allowing you to process this data file, which contains all of the necessary information from the design system, to create new drawings from the same data source. If required, you can add additional information – for example, details of pipe supports including detail sketches – to the data from the design system and include this information on the drawings you generate for fabrication or construction.

SmartPlant Spoolgen adds value to the design, while preserving its integrity and eliminating errors due to data transcription, as shown in Figure 3.

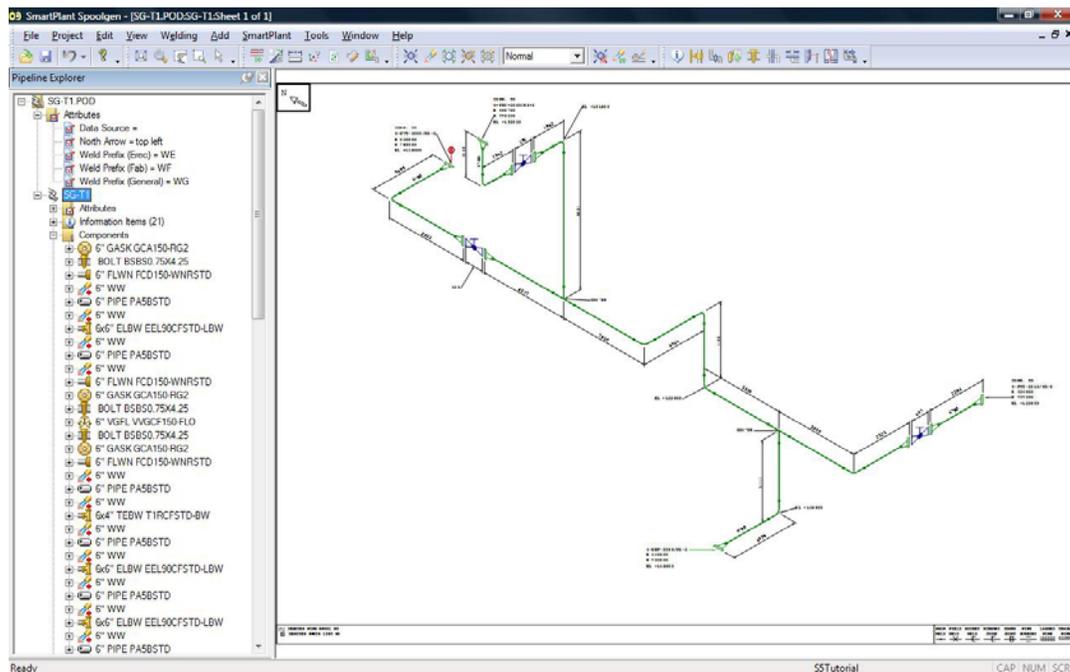


Figure 3: SmartPlant Spoolgen's simple Microsoft® Windows® user interface and familiar isometric presentation aid productivity.

The input to SmartPlant Spoolgen is the data file – IDF or PCF – from the design system.

You see this data file in the familiar form of a piping isometric, which is modified using SmartPlant Spoolgen tools. The degree of modification may be simple and straightforward – such as identifying locations for field welds – or more complex. Finally, new ISOGEN-generated drawings and reports are created.

3.2. Workflow Management System

SmartPlant Spoolgen offers an integrated workflow management system, as shown in Figure 4. You can log into a project, which represents a set of pipeline isometrics from the design contractor. Multiple users can also access the files within a project.

Pipelines – in the form of supplied IDFs and/or PCFs – are imported into the project database and can then be checked-out (reserved). While a file is checked out for processing, it cannot be modified by other users.

It is in the very nature of engineering projects that changes occur, and SmartPlant Spoolgen’s workflow system recognizes this fact. When a new revision of a pipeline is received, changes made to the earlier version are replayed so work is not wasted. For example, a field weld placed in version 1 of a pipeline is automatically placed again in version 2.

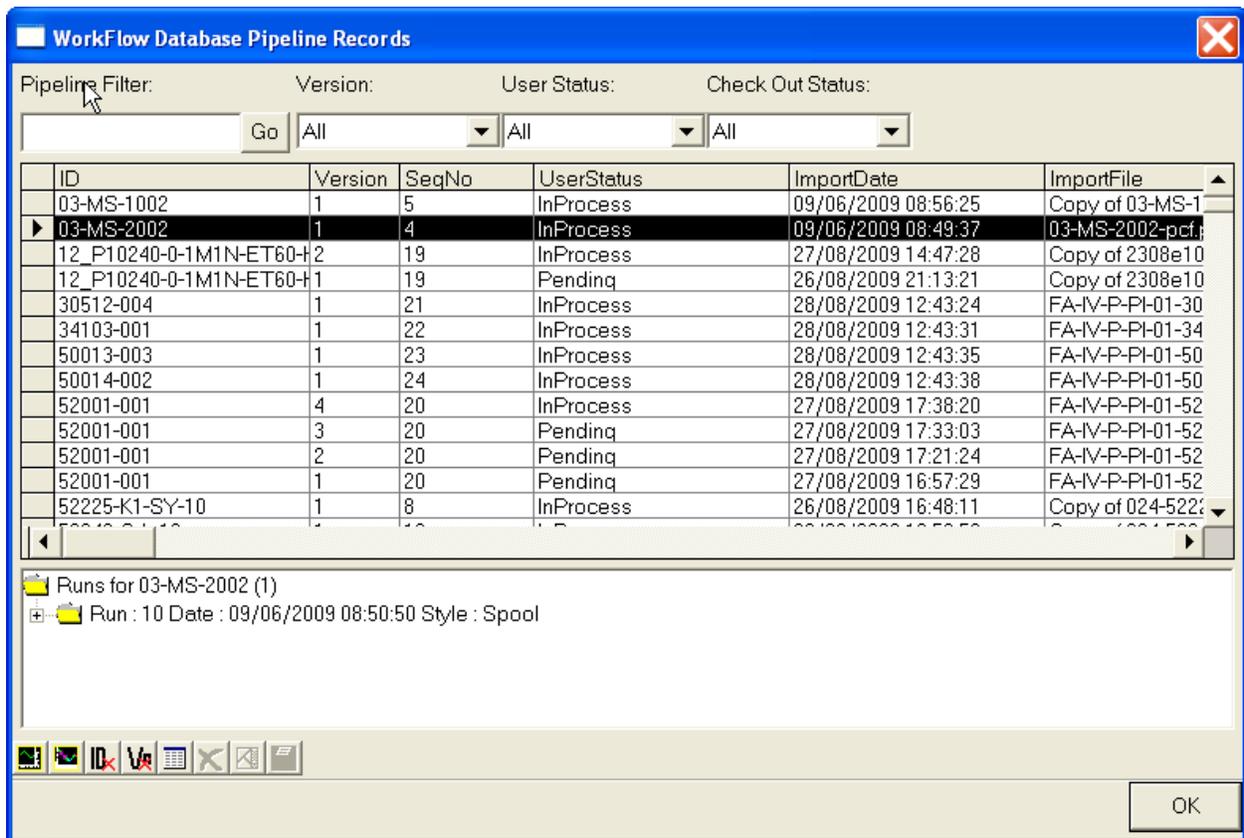


Figure 4: The SmartPlant Spoolgen Workflow Database shows the status of the current job.

3.3. Commands

SmartPlant Spoolgen commands typically enable the addition of new information to the existing design. Choose SmartPlant Spoolgen and take advantage of:

- Extensive support for the placement of different types of welds, including site or field, workshop, field fit, tack, or support
- Ability to add new pipe supports and couplings
- Ability to add bolts
- Annotations such as messages, flow arrows, and reference dimensions
- Drawing control features such as split points
- Options to control weld and part numbering
- Tools to measure and check data in the pipeline
- Tools to manage repeatability, such as preserving drawing splitting, weld, and part numbering in successive revisions of the pipeline
- A command to automatically replace fitting elbows with pipe bends, where this is permitted by the project
- A command to automatically split long sections of pipe into stock lengths
- A sophisticated “cut-and-paste” function that enables components to be moved between pipelines in the project, which empowers the piping fabricator to create “fabrication-friendly” isometrics by modifying pipeline boundaries

You are not able to delete components in the pipeline, or to change dimensions of pipe, ensuring design integrity is maintained. See Figure 5 for an example of some of the commands that are available.

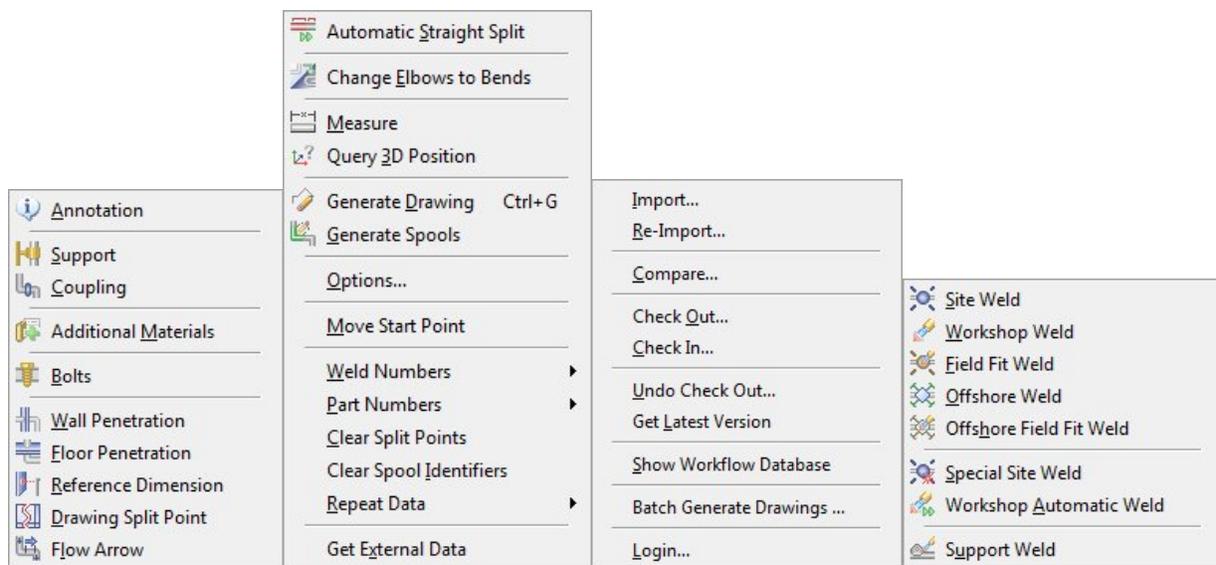


Figure 5: SmartPlant Spoolgen menus offer a variety of focused commands.

3.4. Automation

SmartPlant Spoolgen offers a powerful automation function – Get External Data – that enables data from external sources to be added to the pipeline. This means that tables of data – for example, welding procedures – can be held in external data sources such as spreadsheets and databases and automatically associated with welds in the pipeline.

The automation uses standard SQL syntax to identify the data to be added to the pipeline itself or to individual components within it. Companies using this system have been able to eliminate 95 percent of manual data entry, saving time and eliminating manual data input errors.

The Get External Data command can be executed at several points during the processing of pipelines – during import, interactively, or during drawing generation.

The I-Data Integrator application, which is included with SmartPlant Spoolgen, enables the automated processing of ISOGEN reports to create data for downstream systems – for example, material take off roll-ups across the project, by spool.

3.5. Fabrication-friendly Isometrics

The splitting of piping systems into individual pipelines (isometrics) is managed by the piping design contractor. On occasion, the logic for splitting – for example, by plant area – results in a less than ideal work package for the piping fabricator.

The built-in “cut-and-paste” functionality can overcome minor issues, but in some cases, the fabricator needs to merge together several pipelines into one and then create spool or erection drawings from the merged system. SmartPlant Isometrics’ I-Tools application performs this function (see Figure 6). This can result in significant cost and efficiency savings.

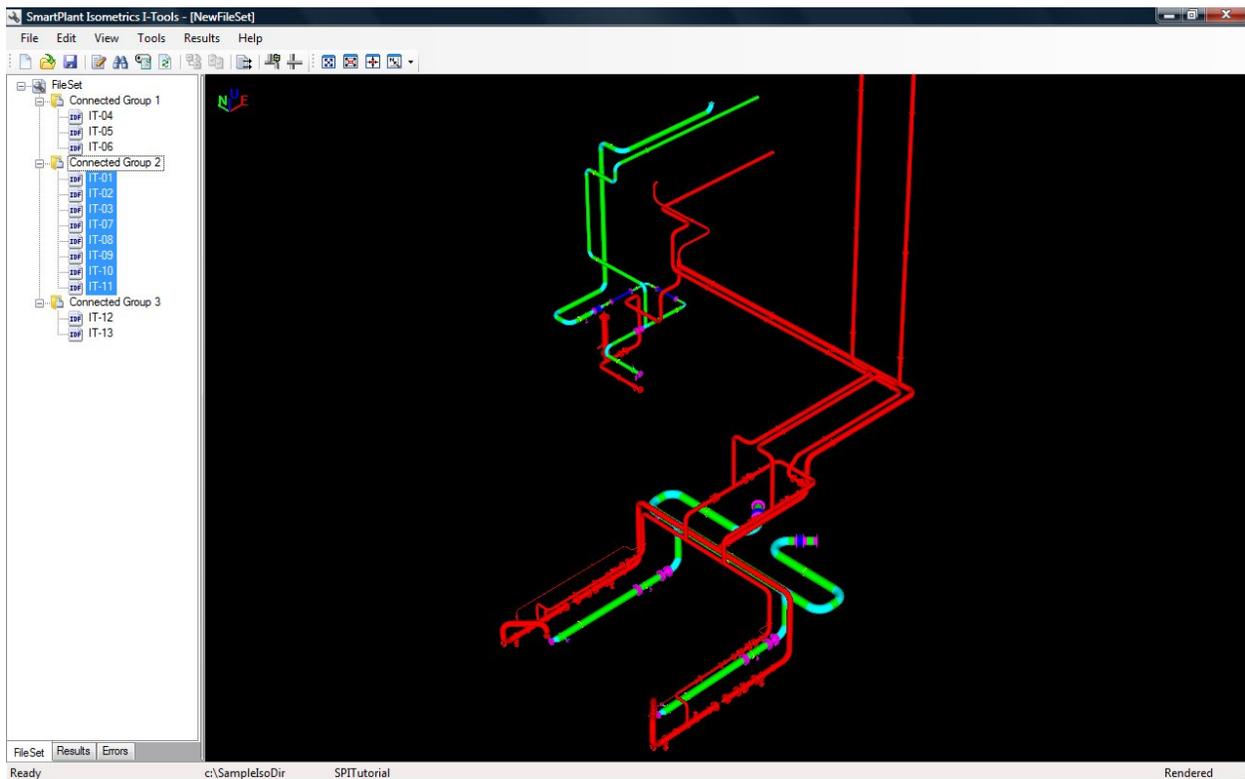


Figure 6: SmartPlant Isometrics I-Tools depicts a visualization of complete, connected piping systems.

3.6. Integration

SmartPlant Spoolgen is integrated with SmartPlant Foundation – the basis of the SmartPlant Enterprise suite. SmartPlant Spoolgen drawings and data can be published for retrieval by SmartPlant Materials and SmartPlant Construction (see Figure 7).

- **SmartPlant Foundation** – The world's most proven, industry-standard engineering information management solution in the process, power, and offshore industries is the backbone for the common architecture that extends across Intergraph's premier industry solutions.
- **SmartPlant Materials** – This software provides strong material management workflow and functions, from preliminary design through detail engineering and procurement to construction
- **SmartPlant Construction** – This solution meets the specific needs of construction companies, project management offices, fabricators, and owners in managing construction resources, materials, and schedules.

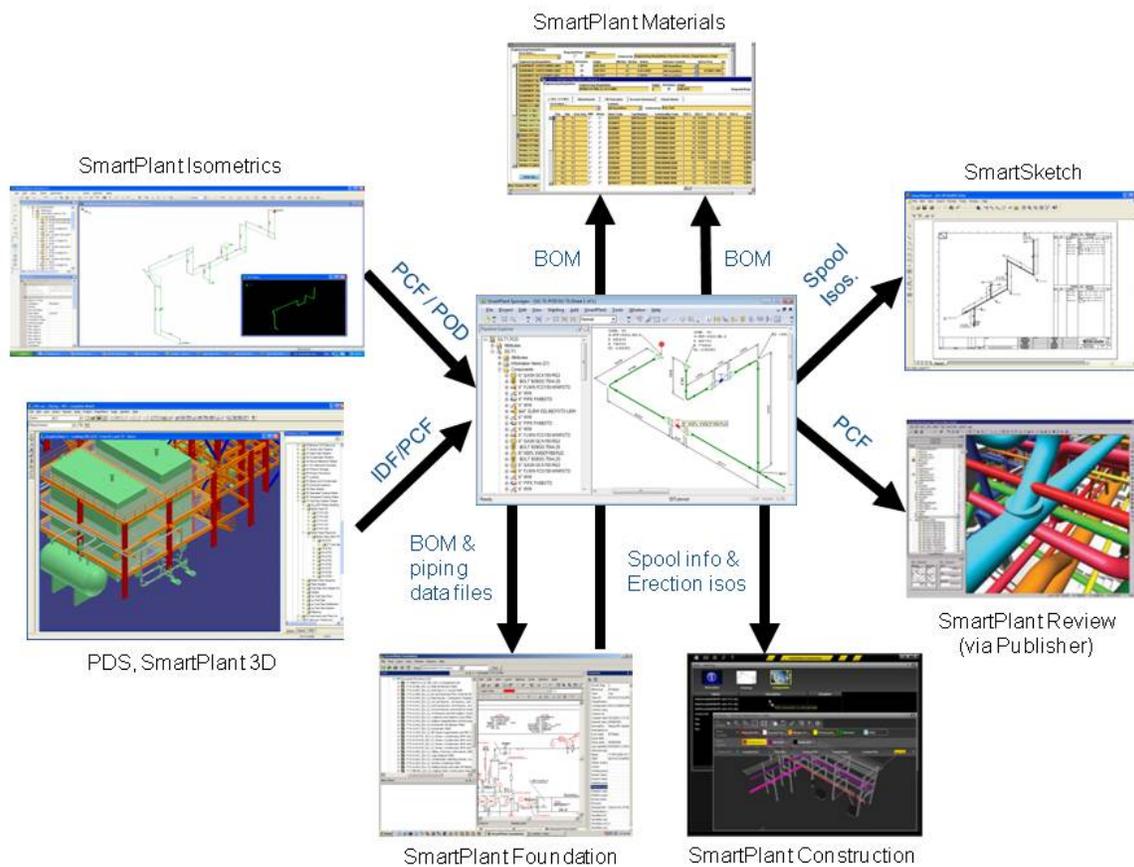


Figure 7: SmartPlant Spoolgen integrates with many members of the SmartPlant Enterprise suite.

3.7. Utilities

In addition to I-Data Integrator and I-Tools, other utilities provided with SmartPlant Spoolgen include SmartPlant Isometrics, SmartPlant I-Configure, Symbol Editor, and Material Editor.

3.7.1. SmartPlant Isometrics

This application is used if new pipeline data must be generated, or if minor changes are required to existing pipelines to reflect as-built conditions (for example, the addition of vents or drains). Many piping fabricators still receive some of their work in hardcopy (paper) form. When isometrics have to be redrawn, SmartPlant Isometrics can rapidly and accurately replicate the original hardcopy in electronic form (see Figure 8), which can then be processed using SmartPlant Spoolgen. This means that a single workflow supports both electronic and hardcopy inputs.

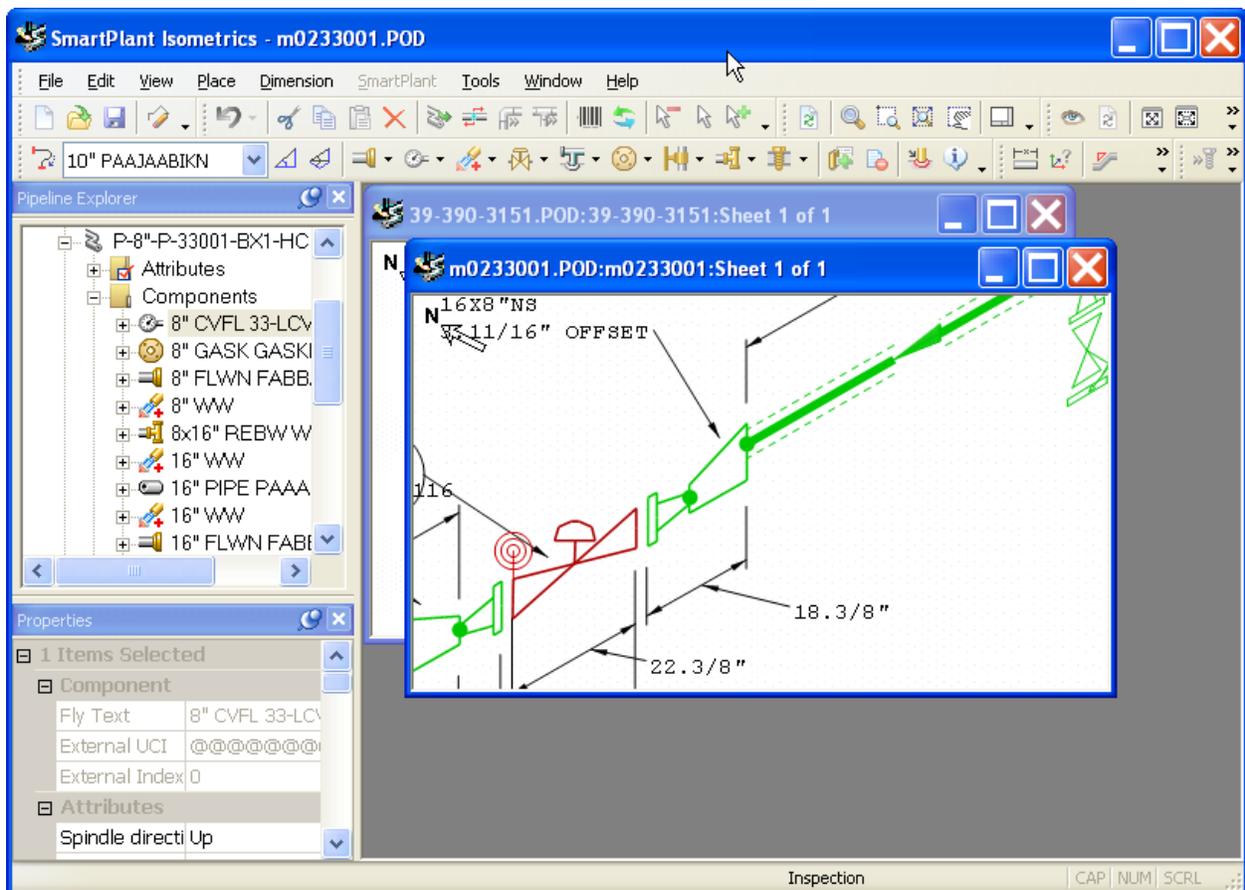


Figure 8: SmartPlant Isometrics can create an electronic design isometric from a delivered paper drawing.

3.7.2. SmartPlant I-Configure

This application is used to configure drawings and reports from SmartPlant Spoolgen. Figure 9 shows an example of this functionality.

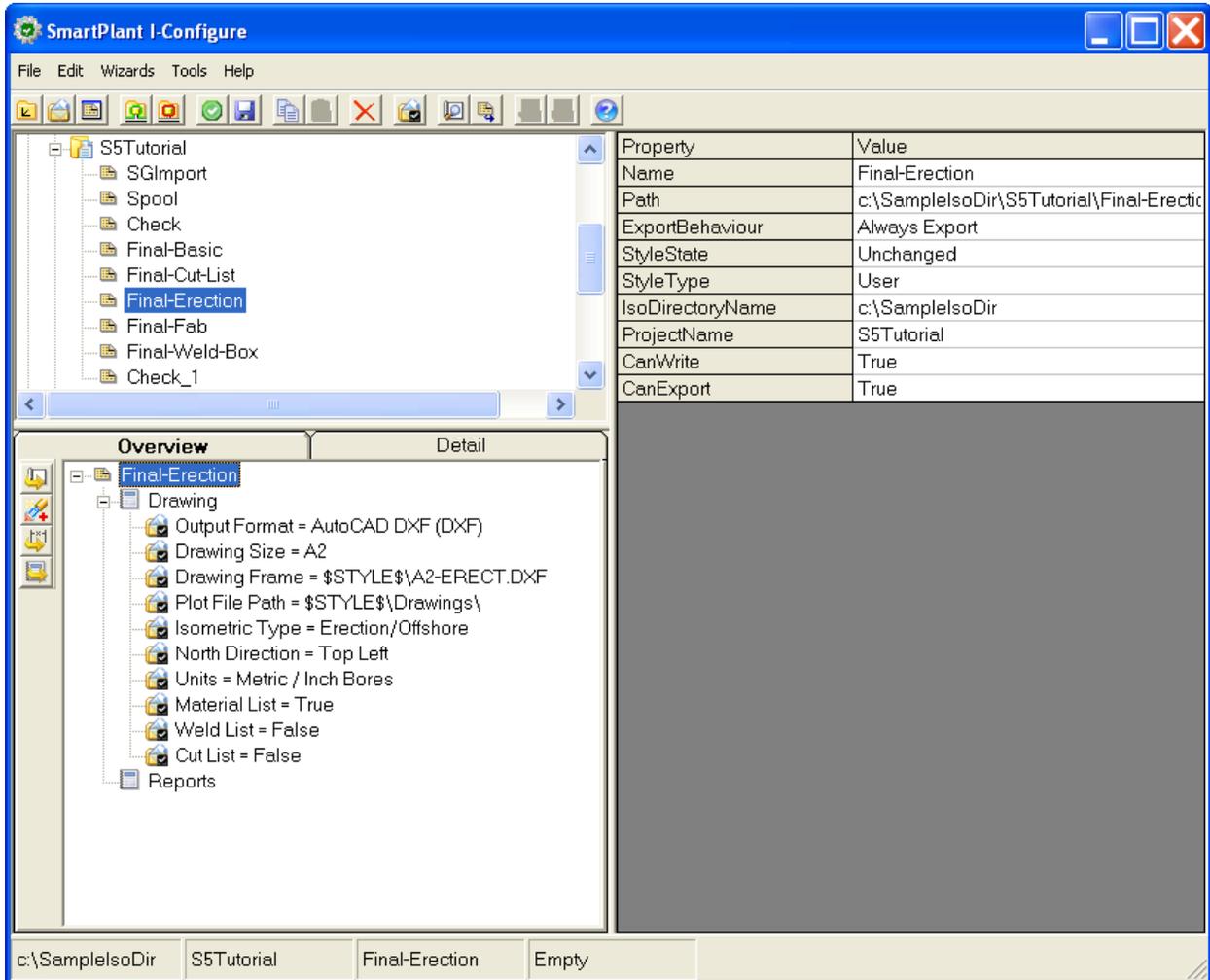


Figure 9: SmartPlant I-Configure simplifies and accelerates the setup of company-standard drawings.

3.7.3. Symbol Editor

Take advantage of this application to create and modify user-defined 2D symbols for use by ISOGEN. See Figure 10.

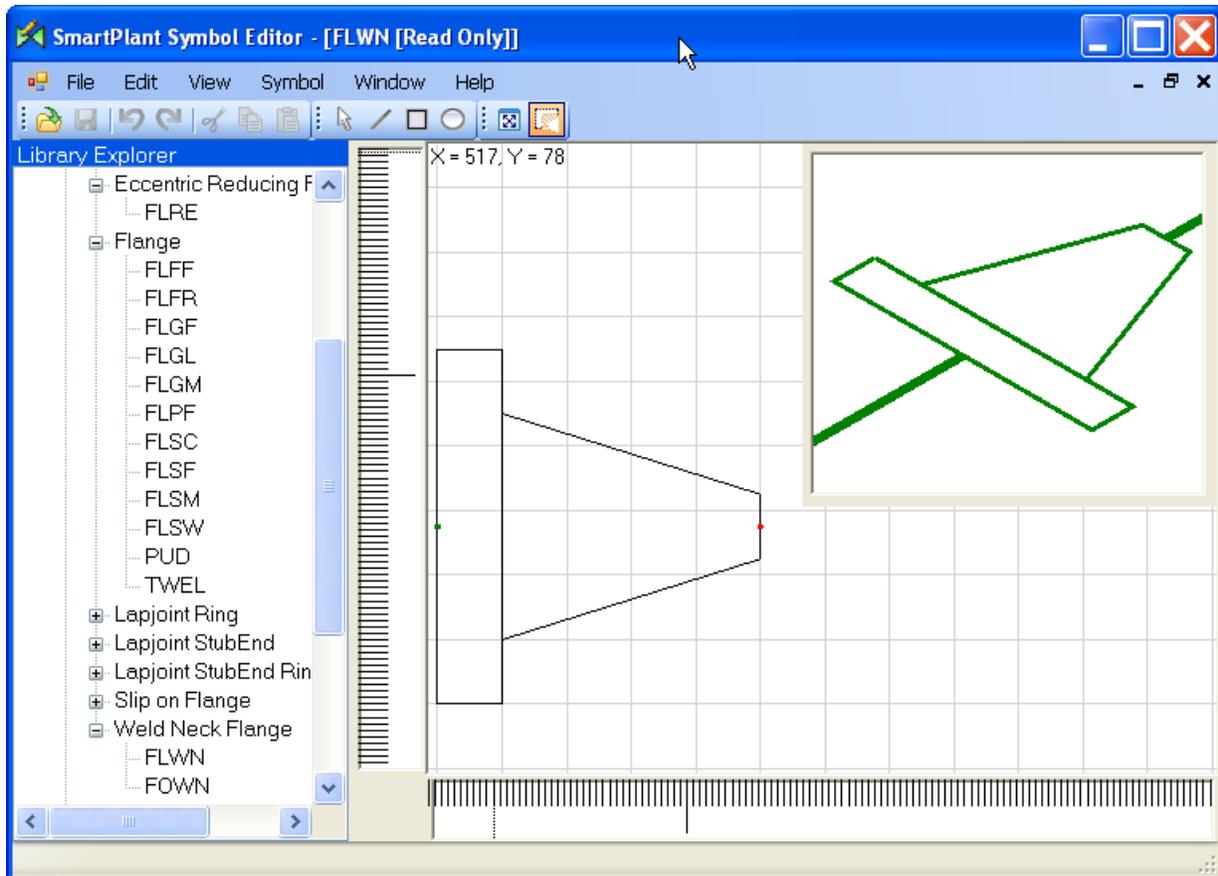


Figure 10: The Symbol Editor customizes symbols for use in ISOGEN drawings.

3.7.4. Material Editor

You can manage material reference data for use in SmartPlant Spoolgen. These are typically additional items not included in the pipeline data from the design contractor, such as material items needed to make up a pipe support in the field.

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