From reviewed P&ID to native SOLIDWORKS assembly

How MST understands P&ID process principles and native component gas-path features, then connects that knowledge to physical layout and SOLIDWORKS assembly.

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Executive summary: reuse the parts, automate the assembly work

Equipment builders already hold valuable engineering assets: approved component models, part revisions, interface conventions, process diagrams and the judgment of experienced engineers. Their assembly problem is not necessarily a shortage of newly generated geometry. It is the repeated work of translating requirements into a physically coherent arrangement of the parts they already trust.

MST Engineering Intelligence places an engineering decision layer before CAD execution. For gas-system equipment, it brings together two kinds of understanding: the process principles and connections expressed in a P&ID, and the gas-path features and physical interfaces of the customer's native component models. That understanding informs physical layout and connection planning before a customer-side Windows Agent operates SOLIDWORKS to create a native editable assembly.

This paper explains the architecture and a practical evaluation method for configured gas-system and semiconductor process-equipment modules. New component families are qualified for their intended relationships; broader mechanical assembly and drawing modules remain planned directions.

Choose a repeatable problem with a visible acceptance boundary

A useful initial case has recognizable repetition: an equipment module, a controlled set of component families, known connection rules and an engineer who can judge the result. Variation can still be meaningful. A new P&ID, changed component selection or a revised spatial envelope may exercise the system without making the acceptance target unlimited.

A poor first evaluation combines unknown part families, unapproved model revisions, undocumented process conventions and an undefined promise to design an entire machine. Those conditions make it difficult to tell whether the obstacle is input quality, missing knowledge, unsupported capability or an incorrect result. Separate those questions before comparing speed or price.

The buyer should describe the deliverable precisely: a saved native assembly and its references, a layout review, a defined set of verification results, or another agreed artifact. 'An assembly drawing' can mean a 3D assembly document or a released 2D drawing package. Those are different acceptance targets. Automatic engineering and manufacturing drawing modules are planned, not included here as demonstrated current deliverables.

Inputs and authority: establish what the system may use

Begin with the engineering authority, not a bulk upload. Identify the person authorized to approve the input scope, the native model revisions and the rules used in the evaluation. Confirm that MST and any participating infrastructure may process those materials for the agreed purpose. An NDA does not, by itself, establish permission to disclose another party's designs.

For a P&ID-led case, the input package should identify the diagram revision, relevant equipment tags and connections, the approved BOM or selection source, the native model-library subset, the spatial boundary and the applicable engineering conventions. Requirements missing from the diagram must come from an approved specification or a documented review decision. The system should not silently turn an assumption into customer engineering intent.

Maintain a reproducible evaluation record: which inputs and revisions were used, which rules were active, which uncertainties were reviewed and which output was inspected. The public website form is for non-confidential scope descriptions. It is not the transfer channel for protected P&ID, CAD, BOM or production data.

Understand the P&ID as a process-principle diagram

A P&ID is a process-principle diagram. Its engineering value lies in what the system is intended to do: equipment roles, gas-path connections, flow direction and relevant operating-state distinctions. Reading tags and linework is an input step; the engineering task is to understand how the represented devices and gas paths work together.

That process understanding defines which devices must connect and under which approved conditions. A branch, a crossing and a conditional path have different meanings. MST connects the reviewed interpretation to component selection and physical planning, while source references let an engineer resolve a tag-to-BOM mismatch, unknown symbol or ambiguous connection.

Evaluate diagram handling with an expressly permitted unseen P&ID and an independently prepared expected tag/connection list.

Understand native components through their gas-path and interface features

The component source is the customer's authorized native CAD or PDM library. Part identity, configuration and revision matter: two models with similar silhouettes can have different interfaces or approval status. The evaluation must preserve that distinction instead of treating geometric resemblance as permission to substitute a component.

The model is more than its outside shape. For the supported gas-system families, relevant engineering features include process ports, their locations and directions, sealing contacts, mounting patterns and the gas-path connection relationships associated with the component. Geometry extraction provides the underlying surfaces, axes and dimensions; qualified family/interface knowledge gives those facts engineering meaning.

The next step is correspondence: relate a device and connection in the P&ID to the appropriate physical component and interface in the native model library. This lets the layout and assembly plan respect the process connection requirement as well as the part's physical connection features. Component geometry and qualified interface information work together; a rendered mesh alone is not that engineering interpretation.

Known, qualified families can reuse established interface knowledge. A previously unseen family may require additional rules, a reviewed interface definition or implementation work. Do not promise that every new model becomes automatically assemblable because its faces can be read. A library-readiness assessment should expose unresolved families before the evaluation is timed.

This makes two costs visible. Initial enablement includes authorized extraction, identity reconciliation and family qualification. Repeat use includes the human work still required when the next approved diagram or configuration is run. Measure them separately; a demonstration with a prepared library should not be reported as zero-cost onboarding.

Plan a physical layout that follows the process and the components

With the P&ID connection requirements and the components' gas-path/interface features understood, MST plans how the selected parts should be arranged and connected in physical space. For the configured application, orthogonal arrangements, component poses and routing relationships are considered with the supported spatial constraints before native CAD execution.

Separate hard requirements from preferences. Hard requirements might include the agreed envelope, allowed orientation, required connections and explicitly modeled exclusion regions. Preferences might concern occupied space, route length or a permitted arrangement choice. The actual supported constraint set and objective must be documented for the deployment and case; a generic product page is not a promise that every maintenance, fabrication or safety rule is encoded.

A feasible solution satisfies the constraints the solver actually checked. That is different from a global optimum, and both differ from engineering release. Ask for the active rules, any objective value and the reason for stopping. If a requested criterion is unsupported or unmeasured, record it as such. Do not infer globally minimal footprint or shortest piping from a compact-looking assembly.

Layout and native CAD results should be compared in the same coordinate conventions and units when that comparison is an acceptance obligation. A real-part mesh preview improves visual inspection, but a preview alone does not demonstrate matching saved SOLIDWORKS poses. Required checks need their own read-back evidence.

CAD is the tool, not the engineering decision layer

Before invoking a CAD operation, the workflow needs a sufficiently explicit plan: the intended occurrences, approved component references, physical relationships, poses and required execution steps. MST describes this handoff as Assembly IR. Its value is the separation between the engineering plan and the operations used to realize it in a particular CAD system.

A customer-side Windows Agent operates SOLIDWORKS in the customer's working environment. The agent is an execution boundary, not evidence that every upstream operation is local or offline. CAD availability, supported versions, access to authorized files, output paths, job ownership and operational recovery all need a deployment-specific agreement.

Execution should leave a reviewable result and a clear status. Insertion, mate creation, saving and reopening are distinct events; success at one does not imply success at the others. A stopped or incomplete job must not be marketed as a completed accepted assembly. Operators also need an agreed way to inspect failures and recover without confusing an older successful artifact with the current attempted run.

Verification: define the obligation before reading the result

Verification is useful when it answers a specified question about the actual output. Can the saved assembly reopen with the intended references? Are the expected occurrences and revisions present? Are the required mates in the agreed state? Does the rebuild complete? Are the requested connectivity and spatial checks covered by evidence? These questions must be scoped to what the evaluation can actually observe.

A PASS means a particular declared check was performed and met its expected result. FAIL means the check was performed and the result did not meet it. CANNOT_VERIFY means sufficient evidence or supported verification was unavailable. N/A is appropriate only for an explicitly excluded, non-required criterion with a recorded reason. These labels are not interchangeable.

An aggregate technical acceptance must not hide unresolved required criteria. At least one required FAIL prevents acceptance. A required CANNOT_VERIFY or blank result prevents acceptance even if other rows passed. N/A cannot be used to remove a requirement after the result is known. Changes in scope require the buyer's recorded agreement and, where relevant, a new run.

Human engineering approval remains separate from software verification. A finite check set does not establish every property needed for safe manufacture or operation. Production release, applicable engineering standards and process-safety review remain with the responsible qualified people. This paper does not provide a certified gas-system design method.

Deployment and data flow: make each boundary explicit

Customer-side CAD execution and data isolation are not the same claim. An evaluation may involve a web interface, orchestration services, model processing, object storage, logs and the Windows Agent. Identify which components actually participate and what each receives. The deployment schedule should name the responsible operator, authorized users and retention/deletion treatment for every data category.

Before protected files move, agree where original files, extracted geometry, intermediate plans, outputs and logs are processed and stored. Confirm the actual hosting region, subprocessors or model providers if present, model-training use, access controls, support access and exit arrangements. These are questions to resolve for the chosen deployment, not universal promises made by this document.

Screenshots and diagnostics can also expose sensitive information. Customer names, drawings, file paths, part geometry, project structures and network identifiers do not belong in public support threads or promotion. Public demonstrations require their own asset-level publication approval; an agreement to evaluate the software is not publicity consent.

Measure repeatability and economic value without hiding preparation

Use one permitted baseline case to qualify the workflow, then introduce a bounded variation. Keep a prepared-library test distinct from a new-family test. The former measures repeat use; the latter measures the cost and reliability of extending coverage. A buyer should know which of these results is being presented.

Record setup and extraction time, family/rule work, execution time, human review, corrections and rework. Compare total accepted-deliverable effort with a documented manual baseline using the same output scope and review standard. Machine runtime alone is not the buyer's labor saving, and elapsed wall time is not always engineer effort.

Also record quality and change effort: missing or incorrect components, unresolved references, rejected mates, manual edits and the work needed for a new revision. A repeatable accepted result with low correction effort is more commercially informative than a fast clip without a defined endpoint. No fixed speedup or ROI is promised by the public demonstration.

Commercial proposals should identify the licensed software scope, initial enablement, optional modules, supported versions, updates, support, change requests and acceptance. A one-time license should not be assumed to include unlimited new-family adaptation, all future modules or permanent support. Terms are agreed in a separate proposal; no public price is specified here.

Current, demonstrated and planned are different categories

Category	What the reader may conclude
Current product scope	Configured Mechanical Assembly AI: reviewed P&ID/BOM, authorized native parts, qualified interfaces, supported physical planning and customer-side SOLIDWORKS execution. Confirm case and version coverage.
Publicly recorded	The approved muted execution-stage clip shows a native CAD workflow. It is not a complete P&ID trace, customer case or full-chain benchmark.
Evaluation-specific	Input handling, saved native artifacts, reopen/read-back checks, intervention and performance need case-specific evidence and acceptance.
Planned direction	Broader mechanical assembly coverage and additional engineering/manufacturing drawing modules. Not implied to be available or accepted today.

Working glossary and evaluation handoff

Revision 1.0, reviewed 5 September 2026. Publisher: MST Engineering Intelligence. Use the linked online edition for corrections and related onboarding, demonstration and acceptance resources.

- P&ID: a piping and instrumentation diagram. In this workflow it supplies process information to be reviewed, not a complete physical machine design.
- BOM: the bill of materials or approved selection source used to reconcile component identity and quantity.
- PDM/native library: the authorized source of component models, configurations and revisions; coverage is deployment-specific.
- Interface semantics: the engineering meaning assigned to geometric features for a supported connection or assembly relationship.
- Assembly IR: the planned handoff between engineering decisions and native CAD operations.
- Read-back: observing facts from the saved native result for declared checks, rather than relying only on the intended plan.
- First evaluation: agree a bounded task, authorized inputs, supported families and the acceptance checklist. Share a non-confidential scope description first.

Sources and next steps

MST product scope

MST PDM and native model-library approach

MST physical layout approach

MST public evidence boundaries

MST deployment responsibilities

Read the online edition and related resources

Request an MST workflow evaluation

Technical scope: Current application: controlled modular gas-system and semiconductor process-equipment assemblies. Qualification and human engineering authority remain necessary.