

## Why do CAM customers need SolidWorks?

In the modern manufacturing world, where different ISO requirements are involved in the manufacturing process, the CAM department/manufacturer needs robust design tools in order to complete the whole manufacturing process.

It does not matter whether the manufacturing organization is an in-house production department/sub-contractor or whether the manufacturing organization deals with prototype/mass production/molds design and production, **they all need to design parts and assemblies** (design jigs & fixtures, adapt the part to manufacturing standards and processes, design mold components such as core & cavity, electrodes, ejectors etc...). Drawings are required as well for detailing and for inspection purposes. Most of these design tasks are best accomplished by using the assembly top-down approach; the core of all components is the part to be manufactured and all other components should reference it. This is the classic case for using top-down design. **Who does it better than SolidWorks?**

**SolidWorks, as the best mainstream solid CAD solution, has the most appropriate tools** for doing all the above-mentioned design tasks necessary during the manufacturing process.

**If SolidWorks is not used** for that purpose, the **stand-alone CAM** such as MasterCAM, GibbsCAM, EdgeCAM, Esprit..(which is actually a CAD/CAM application) is used with its own **CAD module** and CAD tools, meaning **less SolidWorks seats** at the customer...

CAM departments/manufacturers prefer to use the same software for CAD and CAM tasks. It is obvious that most of the CAD tools of any stand-alone CAM are **inferior** to the SolidWorks tools.

**Why should the CAM user use an inferior CAD application?**

**Why shouldn't the CAM user use SolidWorks for all his production plan design tasks?**

**Why shouldn't the CAM user use the same CAD application in manufacturing as in the design department?**

**What considerations can lead the user to the poor decision of preferring a stand-alone CAM application over SolidWorks and an integrated CAM product that has the needed CAM functionality?**

This document compares between Gold Partner SolidCAM integrated in SolidWorks and a stand-alone CAM application for SolidWorks in relation to the daily tasks of a CAD/CAM department/manufacturer.

## Types of CAM customers

There are 2 main types of CAM customers:

1. In-house production department, usually in large companies that manufactures parts. All manufacturing process is done in-house.
2. Sub-contractors who get parts and are responsible for all the manufacturing process.

## Production categories

There are 3 production categories:

1. Prototypes: needed during the design process.
  - Many changes are usually applied to the base design after a prototype is produced.
  - During the prototype design, several analysis processes are done (FEA, Flow, Assembly testing for collision detection and assembling process, etc...).
  - As a result from these analysis processes, multiple prototypes may be manufactured.
  - Usually there are no drawings of the design or only preliminary drawings; complete important information exist only in the parts and assemblies of the SolidWorks model such as dimensions' tolerances, surface finish definitions, GDT, cosmetic threads etc...

Good associativity between the CAM data and SolidWorks parts and assemblies is critical. By using SolidWorks as the platform of the CAM application, all additional data (tolerances, GDT's etc...) are available directly.

2. Mass Production: On completion of the design process, the final model exists. Preparing the manufacturing plan is the initial stage of manufacturing. This includes:
  - Fixture design in context of the assembly.
  - Creating assembly configurations showing different stages of production plan and exploded views.
  - Producing drawings of the assembly in various configurations.
  - Producing inspection drawings for production stages.
  - Creating BOM of the fixture assembly.
  - Defining configurations of the model to be manufactured according to the manufacturing steps.
  - Creating additional documentation (e.g. animations of how to assemble the fixtures).

All above described operations are SolidWorks basic functionality. By using SolidWorks as the platform of the CAM application, the user can easily produce this kind of process design and documentation.

3. Molds: Designing the entire mold for a given final product. This includes:
  - Adapting the model to mold requirements (adding split lines and draft angles, scaling).
  - Design the entire mold by referencing the modified model (with all draft angles). This includes:
    - Mold block (plates)
    - Sliders
    - Core & Cavity
    - Ejectors
    - Runners
    - Bolts, screws and nuts
    - Electrodes
  - Any modification to the model of the product should automatically update the mold and toolpath.

Mold design is a classic assembly top down design and SolidWorks gives good tools for that (and has good solution/Gold partners for mold design). Associativity to the product model is critical. SolidWorks is the best available solution for this matter!

Any adaptations performed in the CAM department on the part for the mold requirements can be easily used by the designer to update the original project assembly.

By using SolidWorks as the platform of the CAM application, all above-mentioned steps are done in the same environment.

## **Benefits of SolidWorks+SolidCAM solution over stand-alone CAM**

### Importing data from other CAD systems

One of the main needs of a CAM customer is the ability to import data from other CAD systems. SolidWorks provides the best such import capabilities as opposed to stand-alone CAM. SolidWorks can create a solid from the imported data that can be easily edited after using the feature recognition capabilities in SolidWorks.

### Data Handling

With stand-alone CAM products, there are three ways to transfer the data from SolidWorks to the CAM application:

1. Exporting the part's geometry (as a Parasolid or any other neutral file format) into the CAM application.
2. Installing a specific utility in SolidWorks (as an Add-In) to read data from the SolidWorks part and convert it to the CAM application format (usually Parasolid).
3. Loading the Parasolid geometry directly from SolidWorks \*.sldprt file.

With integrated Gold-partner SolidCAM, there is no need for any data transfer since SolidCAM works totally inside SolidWorks and have access to all the SolidWorks data

	<b>Integrated Gold Partner SolidCAM</b>	<b>Stand-alone CAM</b>
Require data exchange	No	Yes
Data transfer includes:	All information:	Only geometry
<ul style="list-style-type: none"> <li>▪ Feature Definition</li> <li>▪ Dimensions Tolerances</li> <li>▪ Cosmetic Threads</li> <li>▪ Datum Feature Symbols</li> <li>▪ GDT's</li> <li>▪ Surface Finish Symbols</li> <li>▪ File Properties and Summary</li> <li>▪ Notes</li> <li>▪ Any other Annotation Types</li> <li>▪ Configurations of Manufacturing stages</li> <li>▪ 2D &amp; 3D sketch entities, 3D curves</li> <li>▪ Origin and Coordinate Systems</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> </ul>	

## Associativity

There are two levels of associativity:

1. Part modifications during prototype design process (and perhaps even after that stage).
2. Part modifications cause other components of the assembly (e.g. the fixtures) to be changed as well. This is common when designing fixtures using a top down approach.

### Scenario #1

Part is designed in SolidWorks. A first prototype part is manufactured using a CAM application. Some modifications are applied to the part after the production stage. How SolidCAM and stand-alone CAM applications handle these changes?

SolidCAM automatically gets the modifications from the SolidWorks internal database. SolidCAM synchronizes only the toolpaths that reference the geometry that was modified.

Stand-alone CAM must perform new CAM feature recognition in order to find the modifications applied to the model.

## Scenario #2

A part should be manufactured. An assembly of fixtures and jigs should be designed referencing the original part. Assuming this functionality is available in stand-alone CAM applications (and it is well known that no such application can have functionality similar to the SolidWorks functionality in top-down design...), how the assembly is affected by the part's changes?

With integrated SolidCAM in SolidWorks, the powerful assembly mechanism of SolidWorks updates all references, and changes to the original part are automatically applied to all surrounding components. 100% associativity is achieved between all components involved in the manufacturing process and the assembly. All components are always up-to-date and reflect the changes applied to the part. Design intent is kept throughout the whole process.

With stand-alone CAM, the changes of the original part do not automatically affect the fixtures and jigs. Design intent is not kept and the user has to manually modify each and every component involved.

## Scenario #3

A mold is designed. After the part is manufactured and inspected, some changes are applied to the part and all mold components should be modified according to the part's changes.

The powerful assembly mechanism of SolidWorks updates all mold assembly components. When these parts are opened in SolidCAM, relevant toolpaths are **automatically** updated.

With stand-alone CAM, the user would face difficulties to update all mold components and toolpaths due to inferior assembly capabilities and inferior associativity.

### Additional needed CAD functions

There are additional needed CAD functions to complete a CAM process plan:

- Using the "additional" information defined in the parts and assemblies. "Additional" means the non geometric data, including: Dimension tolerances (in a sketch and in the feature definition),GDT's ,Cosmetic threads, Datums, Surface Finish Symbols and File properties.

The market's tendency is to eliminate hardcopy drawings and reduce to a minimum the production of detailing drawings. In many cases (e.g. while in the prototype design stage), there are no detailing drawings at all. Still, there are important information that the designer has to define in order to explain how the part should be manufactured. If this important data is not transferred with the part to the CAD/CAM department/manufacturer, there are two alternatives for solving this lack of information:

1. The data has to be verbally transferred – risk of misunderstanding and missing information. Also some iterations may be required (between the designer and CAM user).
  2. Detailing drawings have to be produced - this wastes valuable time and changes the company's regulations (if they prefer to minimize detailing drawing production).
- Producing inspection drawings and other drawings (of fixtures and jigs, assembly of all components, assembly instructions etc.):
    - When dealing with fixtures and jigs design, drawings are usually required.
    - Inspection drawings for the process stages are often required.
  - Using SolidWorks capability to create Flat Pattern from 3D Model prior to manufacturing. Stand-alone CAM systems do not have such functionality.

## Conclusions

- Any CAM job requires CAD functionality!
- SolidWorks is the best tool available for the manufacturing department CAD needs.
- File management of all types of data (parts, fixtures, molds..) can be done in the same SolidWorks environment.
- CAD capabilities of any stand-alone CAM product is in direct competition against SolidWorks.
- From the perspective of a production company – it's SolidWorks + SolidCAM or a stand-alone CAM (without SolidWorks).

**SolidWorks + SolidCAM is the best mainstream CAD/CAM solution for manufacturing**