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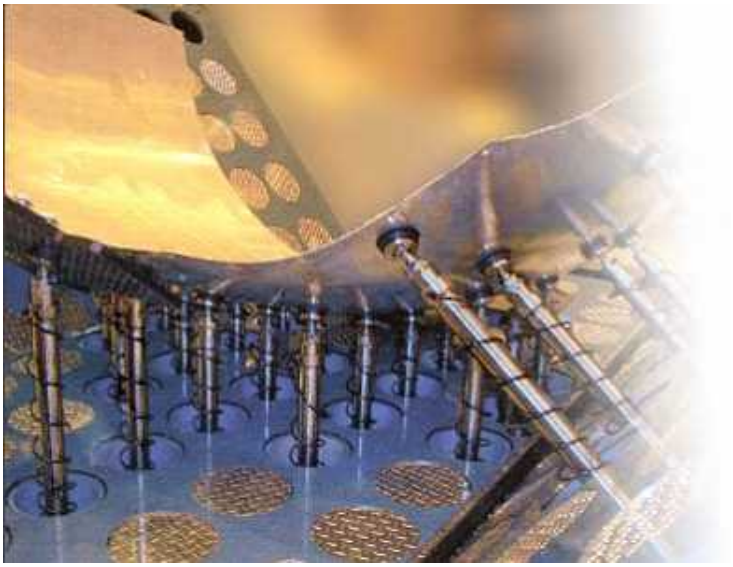
Case Study - Aircraft Production



This programming system was created for a vendor supplying programmable fixtures for their customers in the aircraft industry; they manufacture high precision programmable devices for holding flexible sheet aluminum or composite materials in a rigid position for final machining via CNC waterjet, laser, or router.

CHALLENGES:

Traditional static trim fixtures for aircraft skin panels work fine, but aircraft manufacturing is a low volume (10 per month) operation of very large (5' to 75') parts. Static fixtures must therefore be stored when not in use (which is most of the time).

Air conditioned and secure floor space alone for large static fixtures costs mega-bucks, frequently approaching millions per year. When needed, the fixture must first be located, then retrieved from storage (frequently a remote storage facility), transported via flat bed truck, mounted in the correct position on the machine, and re-certified.

To rigidly hold panels having radical curvature, tilting table components have been developed, introducing a collision avoidance requirement. To further complicate matters, a typical aircraft exterior is composed of a wide variety of shapes and sizes, and when the device isn't being used for large panel trimming, customers want to program the device for a mixture of smaller parts to get as much production as possible from their large CNC equipment investment.

Finally, end users need to be able to import CAD geometry from a variety of sources (CATIA, Pro/E, UG, SolidWorks, etc) and quickly position parts in the optimal orientation for trimming.

Because no commercial programming software has been available for this emerging market many facilities have been forced to create custom "home brew" solutions that get the job done, but most require frequent tinkering and/or expert user skills.

DESIGN GOALS:

Our customer (the programmable fixture vendor) wanted the following capabilities:

(a) Import CAD model geometry produced by any commercial CAD system.
(b) Quickly and easily position multiple parts on multi-component fixture tables.
(c) Quickly calculate actuator programs for multiple parts.
(d) Support tilting table components and collision avoidance for all actuators when tables are tilted.
(e) Allow for a variety of spacing between actuators.
(f) Allow for re-calibration of actuators that are slightly misaligned without software modifications.
(g) Edit-free CNC code generation for the device.
(h) Maintain all settings and geometry used to create a multi-part fixture program to allow edit/rework.
(i) Professional user documentation and technical support.

SOFTWARE COMPONENTS:
The PogoProgrammer "System" has been developed to meet these goals; it consists of a program that runs within SURFCAM(R) CAM software as an Add-In application.

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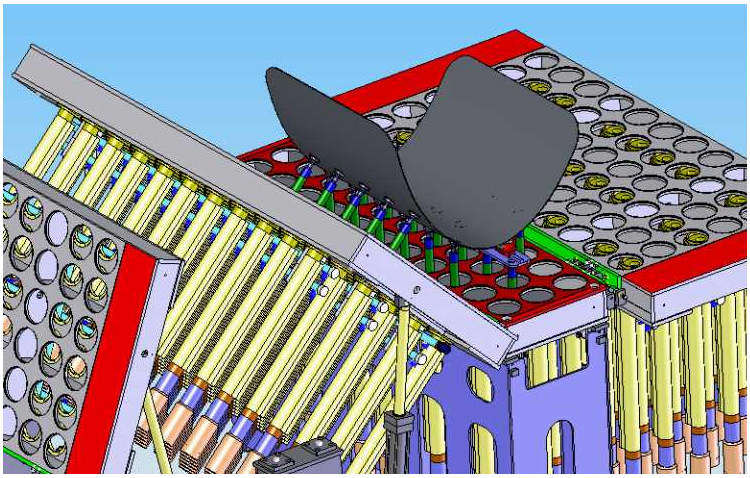
PogoProgrammer



Once the CAD model files have been identified via simple browse/import technique, the user identifies two circles (representing two tooling holes) on each part to locate it on the fixture. The first circle XYZ center is mated to the fixed fixture block at the desired height, and its IJK axis is aligned to the POGO actuator axis. The second circle is used for part alignment along the X or Y axis. All data used in the process is stored in XML format to allow a project to be re-opened, altered, and the fixture program re-built to reflect these changes.

Once trained, the user can generate an accurate fixture program for and mixture of flat and/or tilting table components for one or more parts in a few minutes.

- If another CAM system (CATIA, Pro/E, UG, etc) is to be used to generate the tool path and final CNC program data, a complete CAD model of the fixture table, all actuators and extension arms, and all parts can be exported in one of several (IGES, X_T, etc) available standard CAD formats.
- If SURFCAM is to be used for tool path generation the parts are ready for tool path generation. Available upgrades expand its abilities to perform 5-Axis trim tool path generation and post-processing, forming a complete, inexpensive, stand-alone CAM solution.