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Machining Fixture Design for Multi-Feature Weldment

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Machining Fixture Design for Multi-Feature Weldment

Client: Quality Manufacturing Corporation, Urbandale, Iowa

Problem Statement

- Current fixture for machining an OEM weldment is lacking robustness and ease of use. An improved machining fixture for use in a horizontal machining center is desired.

Objectives

- Develop a simple yet effective machining fixture for a horizontal machining center.
- Implement fixture and improve on old fixture design in the areas of load time, machine run time, operator ergonomics, and feature accuracy.

Constraints

- Fixture must be compatible with Makino A51nx (machine reach, total size, available tooling).
- Must utilize *Jergen's Ball-Lock®* mounting system.
- Must be produced primarily with methods available in-house.
- Must provide improvement over current fixture in one/all areas of: load time, machine run time, operator ergonomics, machined feature accuracy.

Scope

- Taking into account the current fixture, solve the current issues and present the client with an improved fixture design that is ready for use by the end of the spring semester.
- This is to include SOP's on fixture construction as well as part loading.

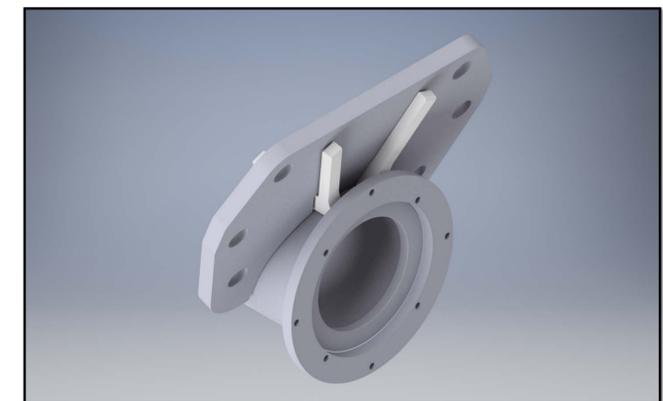
Current Fixture Analysis

Pros:

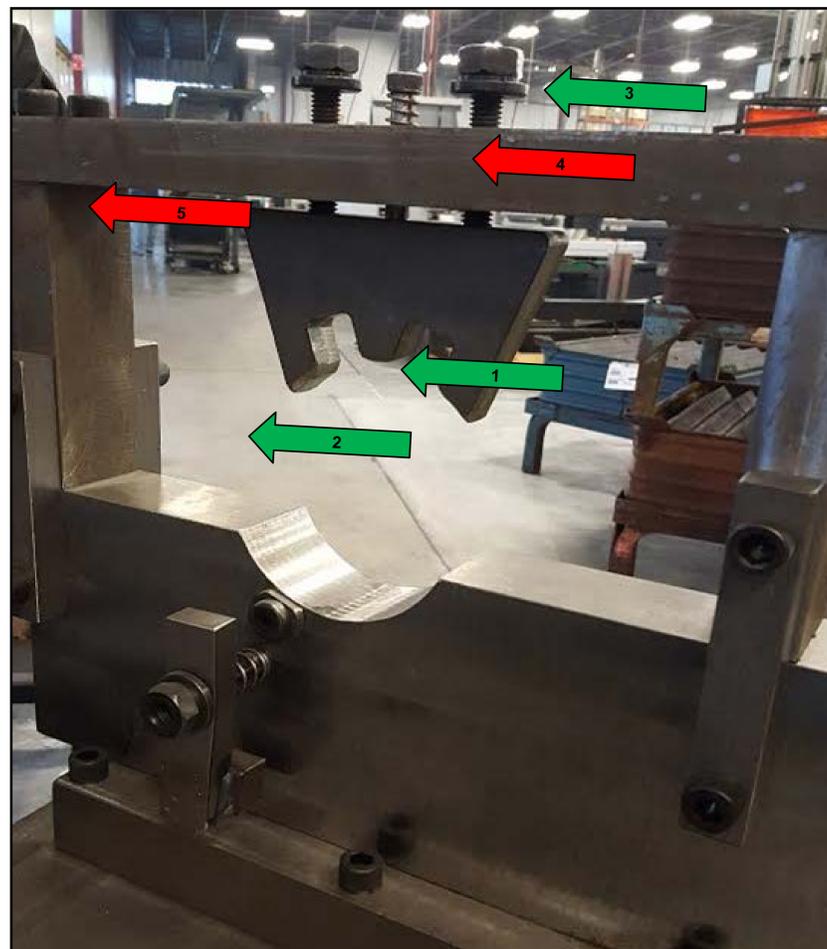
1. Distributes clamping force across bottom of part
2. Locates front flange against hardened pin
3. Reduced number of clamps that must be actuated by operator

Cons:

4. Top clamping structure pin-points force and deforms part
5. General lack of rigidity
6. Unnecessary space between parts
7. Operator must manually align part feature with digital level



Above: Current weldment being machined



Above: Current machine fixture in use.

Methods

- Analyze quality reports from previous production runs using Excel.
- Analyze part critical features and datums.
- Design new fixture utilizing Autodesk Inventor.
- Provide manufacturing prints for fabrication.

Major Outcomes

- Design a new working fixture
- Prototype the new fixture
- Test new fixture
- Iterate design if necessary
- Implement new fixture into production

Benefit to Client

- Tighter tolerance on parts and better repeatability
- Ability to move work to a smaller mill including options for future automation
- Ergonomics improved along with load and cycle time reduction