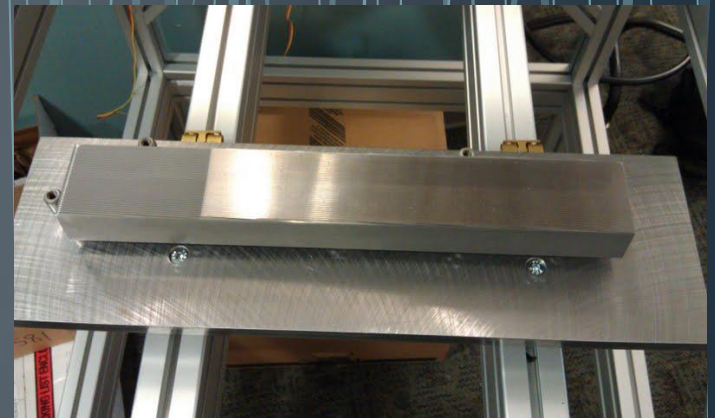


Thread Roll Die Inspection P11581

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Matt Turner



Agenda

- Project Background and Objective
- Deliverables
- Design
- Assembly/Structure
- Die Fixture
- Programming
- Reccomendations

Project Background & Objective

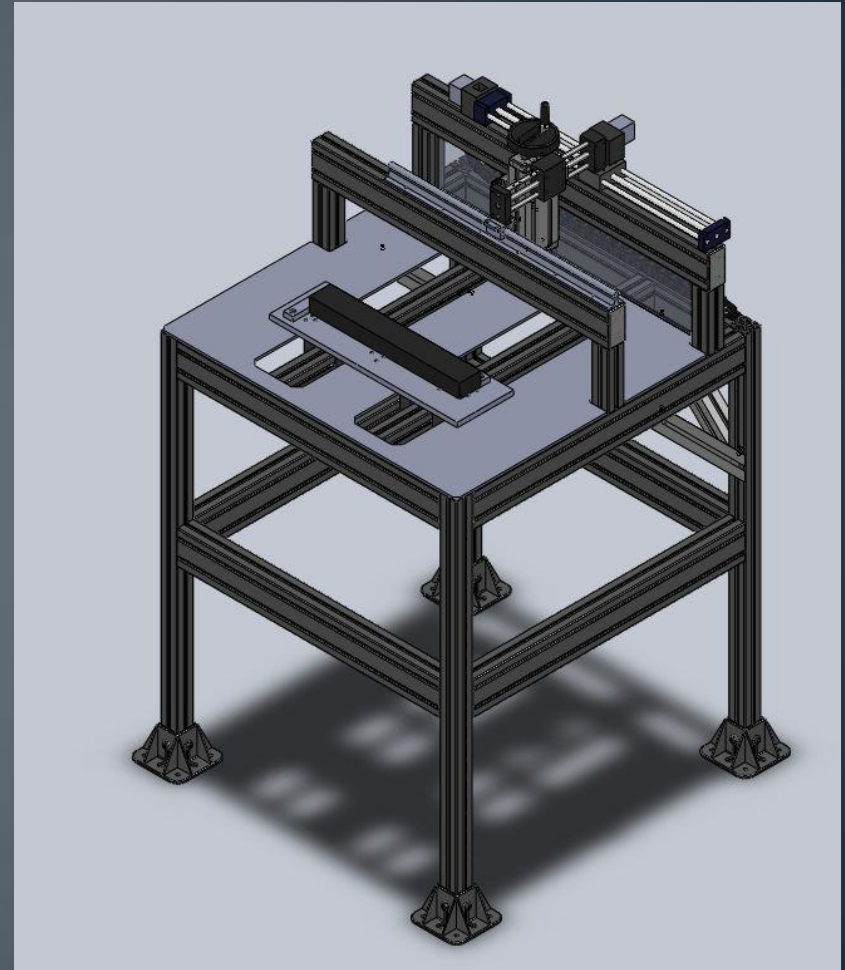
- SPS Fastener Division uses dies to produce high strength fasteners. SPS currently has no way of validating that the dies are in spec, other than running product through and analyzing the threads of the fasteners. This is time consuming and expensive when the dies are out of spec.
- The objective of the project is to design and construct a device to measure, inspect and validate critical die dimensions. Data collected may be used to develop statistical process control and help determine tool life due to wear.

Deliverables

- Develop an automated system to measure the dies
- Measure critical die dimensions
- Be cost effective for potential future builds
- Rugged and durable design
- Ability to run

Design

- Table/Gantry Structure
- Linear Stages
- Stepper Motors
- Motion Controller
- 2D Laser Profiler
- LabView Integration
- Die Fixture

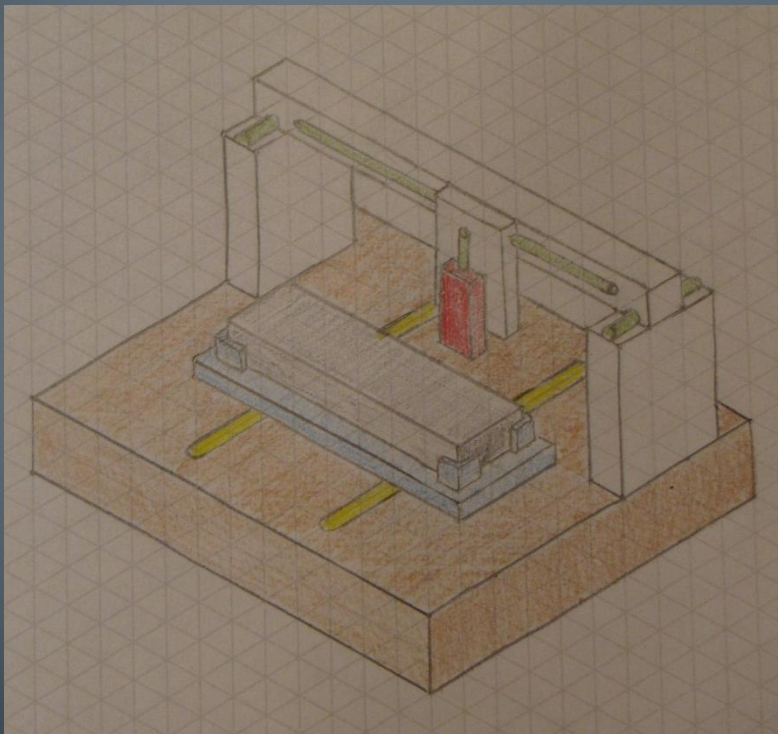


Assembly

- Table/Gantry Structure (Minitec)
- Linear Stages and Z-axis adjustment
- Motor Mounts and Couplings
- Die Fixture and Mounting

Structure

Initial Concept



Hand sketch of initial concept as discussed in Preliminary Design Review – Week 5

Final Design



Complete structure set up to demo – Week 19

Structure

Advantages

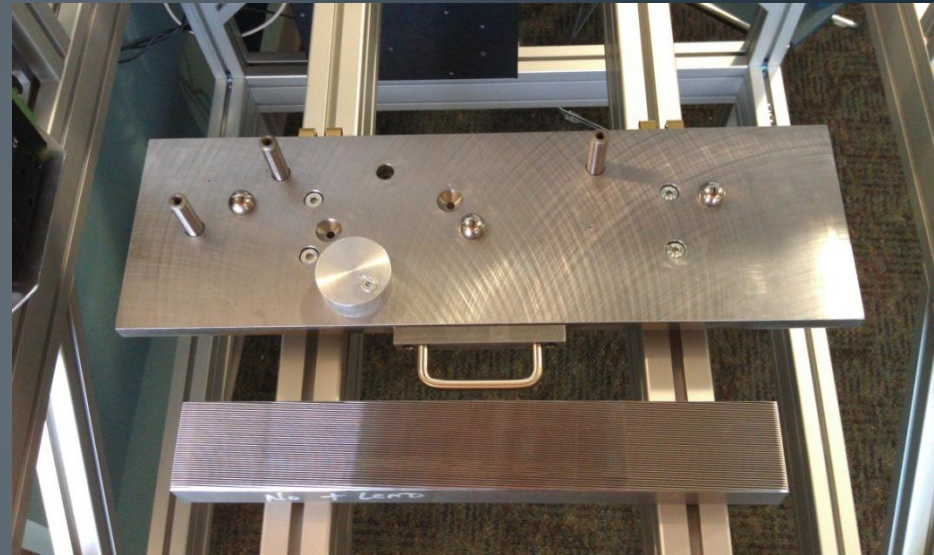
- Solid structure
- Good, reliable linear slides
- Small footprint while providing access to all components
- Loading and die cleaning area

Disadvantages

- No shock absorption
- Difficulty to tear down, ship and rebuild

Die Fixture

- 20" x 6" x 5/8" block of cold rolled steel
- 3 3/4" ball bearings create a 3-point plane, minimizing area of contact
- 3 1/2" dowel pins press fitted into the fixture, creating two edges, forming a 90° angle, against which the die rests



Die Fixture

Advantages

- Ability to hold a wide range of die sizes
- 3 point contacts eliminate concerns of even surface
- Backstops ensure proper placement
- Handle for easier sliding

Disadvantages

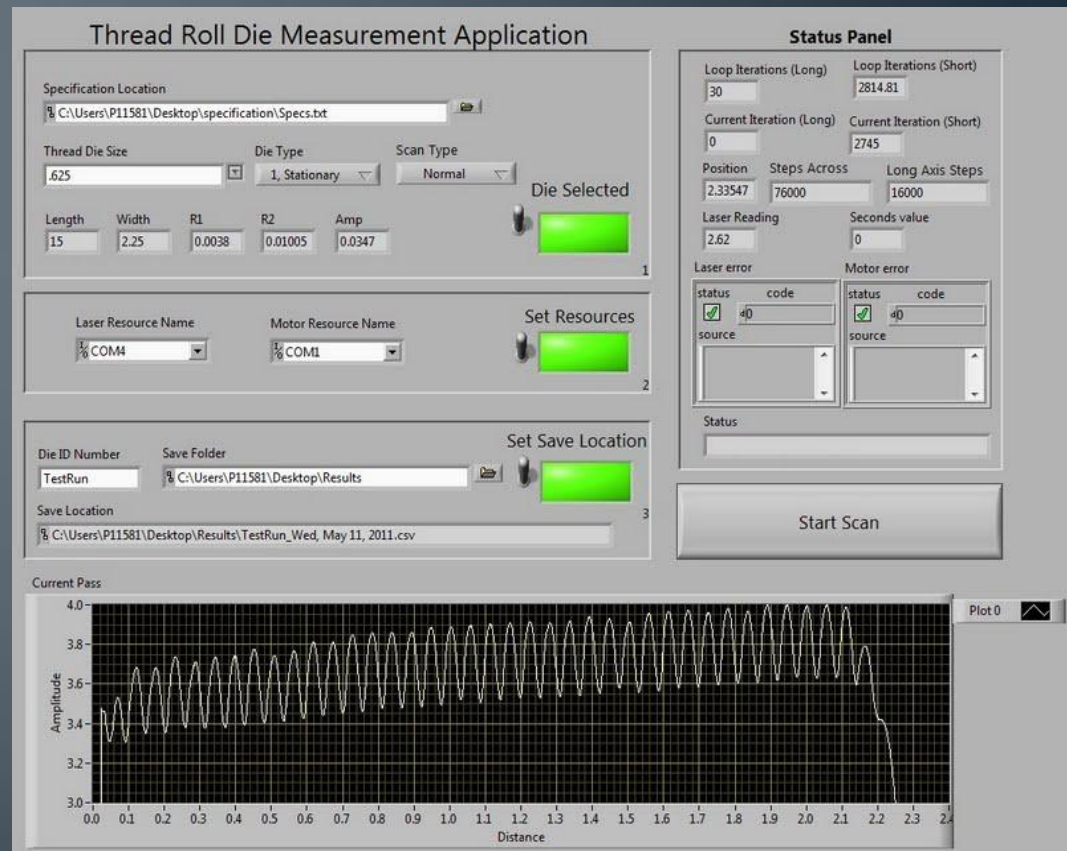
- No proximity switches to eliminate running unless proper positioning under gantry
- Requires parallelism of linear slides to easily move

Results

- Linear stages: fully integrated with stepper motors and motion control.
- Die Measurement Scan Time:
 - 30 Minutes at every 1 inch
 - 1 Hour at every half inch
 - Time increases as the resolution becomes more refined

Programming

- Easy to use interface for operators
- Easy to modify with a small amount of programming experience
- Looping sequence



Changes for Next Time

- Find a better solution for Z-axis motion
- Increase size of support rods on linear stages
- CNC all end and stage blocks to maintain high tolerances
- Use flexible couplings from the start
- Data analysis and checking to specification

Special Thanks

The Die Inspection Team would like to Thank the following for their time and help:

- Faculty Guide: Dr. Alan Raisanen
- Sponsors: Rich Drinker and Chris Enwright (PCC)
- All PCC and SPS staff
- Rob Kraynik (Machine Shop)
- Steve Kosciol (Machine Shop)
- Senior Design Team P11582

The image features a background of thin, vertical, light blue lines of varying lengths and positions, creating a textured, rain-like effect. A solid teal horizontal bar spans the width of the image, positioned in the lower half. The word "Questions?" is written in white, bold, sans-serif font on the teal bar.

Questions?