



Axiomatic Redesign of a Motion Constraint Flexure Reduces Procurement Costs by 60%

Context: In manufacturing silicon wafers, the photolithography tool positions the photoresist coated wafer onto a stage where it is imaged with UV light. The positioning is done via a pre-aligner module. Motion constraint flexures in the pre-aligner determine the accuracy of wafer placement.

Problem: Existing motion constraint flexures were experiencing fatigue failure in the field. Also, the current design of the motion constraint flexure was difficult to fabricate and inspect resulting in high manufacturing cost and variations in quality.

This organization used Axiomatic Design (AD) to develop a new flexure design that reduced procurement cost by 60% and extended the usefulness of the flexure to exceed the expected life of the machine.

Solution: The designers used AD to develop Functional Requirements (FRs) and Design Parameters (DPs) for the pre-aligner to be sure the flexure satisfied all system requirements. During this process, alternatives to using the flexure component were examined but all were found to be unsatisfactory. From this point the project was able to focus on a detailed redesign of the flexure. From the possible designs, the designers used the AD Information Content axiom to select the best design that ultimately reduced the part cost.

The project team found that using the AD methodology helped identify many subtle aspects of the problem that could have gone unnoticed using a less-structured approach. Upon completing the project they found that the AD process provided complete documentation for every design decision.

Benefits of Axiomatic Design:

- 60% cost reduction
- 5 X life improvement change

Axiomatic Design Solutions is a business and technology consultancy that delivers measurable results and value through the application and support of axiomatic design methods as a basis for quality-driven design processes.

The Axiomatic Design Process

- Improves the quality of designs
- Facilitates the creative process
- Requirements driven
- Captures design intent and traceability
- Provides early phase risk assessment
- Gives objective metrics for design evaluation
- Reduces the Design-Build-Test-Design Cycle
- Scalable from small projects to very large
- Fully compatible with:
 - Six Sigma
 - QFD
 - Lean Process

Axiomatic Design Solutions, Inc. • 221 North Beacon Street • Boston, MA 02135 • USA

Email: info@axiod.com • Tel: (617) 746-9222 x205 • Web: Axiomatic Design.com