Needs Assessment

The needs assessment page on EDGE can be found here:
http://edge.rit.edu/content/P09701/public/Identify%20Customer%20Needs?rev=0

This has been updated as needed since DPM and can be considered accurate as of 12/4/08.

Customer Needs Summary

Need	Description	Importance	Tech. Spec.?
1.1	Low Complexity	1	
1.2	Low parts cost	2	yes
1.3	Easy to maintain/work on	1.5	
1.4	Small package	3	yes
1.5	Manufacturing Documentation	critical	yes
2.1	Ease of use	critical	
2.1.2	Short setup time	critical	yes
2.2	Fast part measurement	1	yes
2.2.1	Quick turnaround between part meas.	critical	yes
3.1.1	Method of holding parts in place	critical	
3.1.1a	Can hold any part that LG gen.1 could	2	
3.1.2	Motorized LightGage head position	3	
3.1.2b	Accommodate part thickness from 1mm-100mm	critical	yes
3.1.3	Measure both sides of part	critical	
3.2.1	Very low mechanical drift	critical	yes
3.2.2a	Smallest air gap possible between LG head and part sfc.	1	
3.2.2b	Vibration isolation	critical	
3.2.2c	Repeatable part placement	1.5	yes
3.2.2d	Light canceling/polarity	critical	

Project Summary

The mission of the Design Team assigned to P09701 is to design, build, and test a working prototype of a second generation Corning Tropel LightGage metrology tool.

The LightGage is an advanced, full surface interferometer used to measure flatness, parallelism, and feature depth of parts with a maximum diameter of 40mm. The system uses a tunable near-infrared laser, a digital camera, and computer algorithms to capture with sub-micron accuracy the surface features of a part. The user then extracts the desired measurements of the part's surface features from the collected data. Corning Tropel's first generation LightGage system can measure and characterize the bottom of a part's surface, *but cannot characterize the top surface or the part thickness without the user physically flipping the part.*

The goal, for the next 22 weeks is for this Design Team in collaboration with the IT Collaboratory at RIT to develop a system around two LightGage sensors that will allow for both sides of an object to be measured simultaneously and reliably. In order to achieve this, two “heads” (pictured, right) will be aimed at one another. The team will need to develop a fixture capable of supporting the two heads as well as the part being measured.

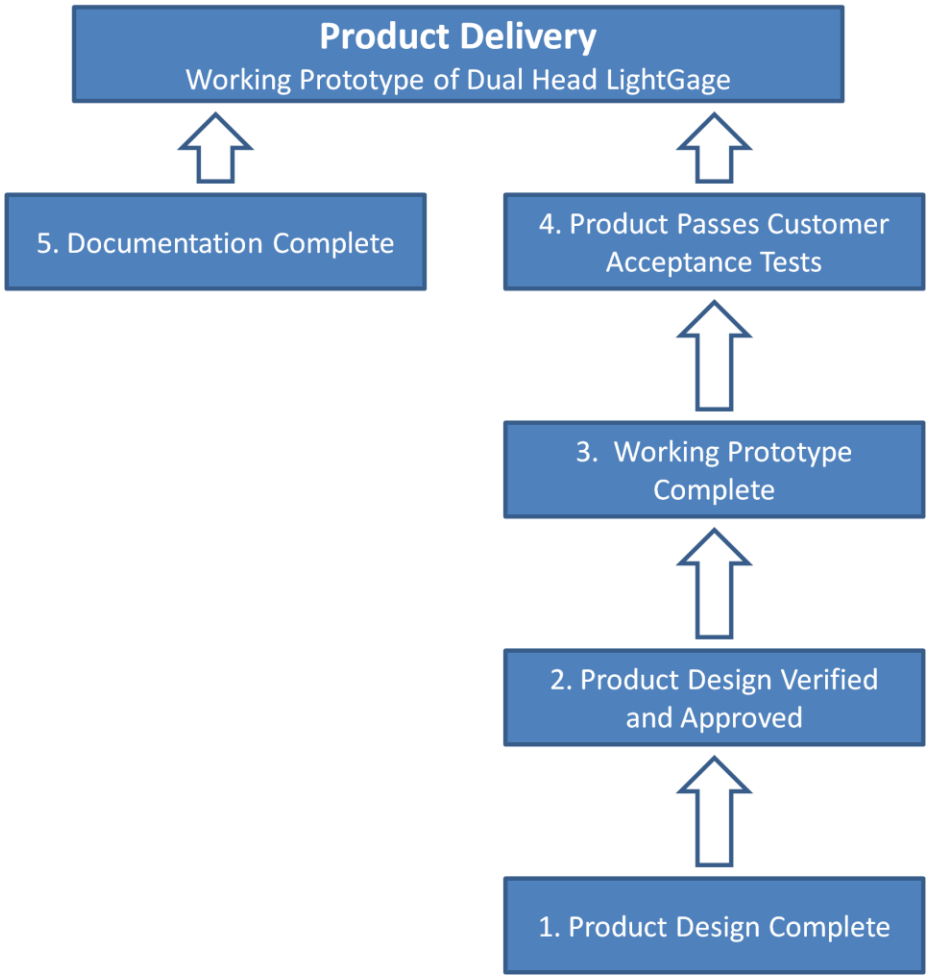
Major design considerations and business goals of this project include:

- Manufacturable and Cost Effective
  - ✓ Use of COTS parts where possible
  - ✓ Complete documentation for manufacturing and setup to Corning standards
- High Efficiency/Throughput
  - ✓ Motorized height and tip/tilt adjustment for top LightGage head
  - ✓ User can switch between parts in a matter of seconds
- Part Measurement
  - ✓ Measure Both Sides of Part
    - Must accommodate part thicknesses between 20mm and 100mm
  - ✓ Balance Accuracy & Ease of Use
  - ✓ Demonstrate Accurate, Repeatable Measurements to Corning Standards
    - Environmental Isolation
    - Part Manipulation—Repeatable and Reproduceable

Corning Tropel has received many requests from customers for a tool that has the ability to measure the coplanarity of datum points on both sides of a precision part for quality and process control. The primary market for this product is manufacturers of small, high precision parts. Applications include fuel injectors and automotive engine components, electronics (hard drives), and other parts manufactured to very tight tolerances and quality standards.

This project will operate on an initial budget of $5,000. However, the customer has made it clear that more funds may become available if necessary for successful completion of the project. Corning Tropel along with the IT Collaboratory will provide work space, technical advising, as well as all necessary parts and materials.

Work Breakdown Structure



5. Documentation Complete
- ✓ Drawing package complete
- ✓ To Corning Standards
- ✓ Materials Selected
- ✓ Suppliers Identified
- ✓ Design Complete/Approved

4. Product Passes Customer Acceptance Tests
- ✓ Throughput
- ✓ Accuracy
- ✓ Repeatability

3. Working Prototype Complete
- ✓ MSDI Complete
- ✓ Test Plan Complete
- ✓ Components Built/Back from manufacturer
- ✓ System integration complete
- ✓ Mechanical sys. Built
- ✓ Electrical sys. Built
- ✓ Parts received from Corning Tropel

2. Product Design Verified and Approved
- ✓ Prototype/P.O.C. built
- ✓ Debugged
- ✓ Mechanical
- ✓ Electrical
- ✓ Computer
- ✓ Optics
- ✓ Product Design Approved by Customer
- ✓ Meets customer specs/expectations

1. Product Design Complete
- ✓ Design meets customer specs
- ✓ All drawing packages, models, analysis complete
- ✓ All MSD1 requirements satisfied

P09701 Team Roles

Name	Discipline	Role and Responsibilities
Matthew Bradley	Mechanical Engineering	**Project Manager**—Responsible for most, if not all, of the team's administrative duties. This includes ensuring the project scope and plan is appropriate for the project schedule, maintaining open communication with the customer, and fully understanding the customer's needs. Project Manager will run meetings and ensure that the team stays on task and on schedule, as well as ensure that all resources are in place and available to the team as they are needed. The PM will maintain communication between all team members and ensure that each team member thoroughly understands the design challenge and is able to perform their respective roles effectively. PM will also be involved in mechanical design, documentation and fabrication for this project, and will also be called upon to perform some thermal and vibrational analysis. Student will be responsible for maintaining team morale and ethics.
Nicholas Schneider	Mechanical Engineering	**Mechanical Engineer**—Student will be involved extensively in mechanical design, documentation, and fabrication for the Dual Head LightGage. Areas of focus include materials research and selection, thermal and structural analysis, and aiding in part/motor selection. Technical drawing packages, computer models, and bill of materials will need to be generated. Student will also aid in system integration and manufacturing documentation. Materials, fabrication, and vibrations analysis will be very important, as environmental isolation and material selection is critical to the success of this project.
Benjamin Arkin	Electrical Engineering	**Electrical Engineer**—Student will be asked to perform electrical system design for the 2nd generation LightGage Metrology System. Tasks include circuit design, simulation, and testing, part selection (motors, power supplies, etc), as well as extensive hardware/software integration. Student will also be involved in extensive computer interfacing and programming--adapting Corning Tropel's LightGage software and control system to work with new hardware. Other tasks include system verification, debug, and electrical system documentation.
Cara Portka	Industrial & Systems Engineering	**Industrial & Systems Engineer**—Student will be asked to perform an array of tasks for this project, including feasibility and manufacturability studies, technical documentation, and aiding in schedule and project plan preparation. Due to the user-intensive nature of the LightGage system, ergonomics and ease-of-use assessments will be very important to this project, and need to be implemented in the design. There is also a focus on experimental design and planning in an effort to determine how the product will be tested for accuracy, repeatability, and reproduceability of measurements. Student will be called on to aid in fabrication of final prototype and system integration.