



Company Information

Company Name	<i>Eli Lilly</i>	Date Submitted	<i>04/30/2026</i>
Project Title	<i>Design of a Vision Inspection System for Syringes (LILLY_INSPECT)</i>	Planned Starting Semester	<i>Fall 2026</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	1-2
Computer	2	Systems	

Company and Project Overview:

Creating Medicines That Make Life Better

Lilly was founded in 1876 by Colonel Eli Lilly, a man committed to creating high-quality medicines that met real needs in an era of unreliable elixirs peddled by questionable characters. His charge to the generations of employees who have followed was this: "Take what you find here and make it better and better."

More than 145 years later, we remain committed to his vision through every aspect of our business and the people we serve, starting with those who take our medicines, and extending to health care professionals, employees and the communities in which we live.

Concord, NC

At the Eli Lilly site in Concord, NC we are a brand-new sterile manufacturing and filling facility that produces pre filled syringes and the delivery devices for Eli Lilly's products.

Project Overview

One critical step of the syringe filling process is the manual in-process visual checks completed by the operations team. These checks are performed on filled and plungered syringes after they exit at the end of the line and are tasked with detecting defects created during the filling process.

Operators remove 10 syringes from the tub and check 5 syringes at a time and repeat this process for a total of 3 rows of 10 syringes.

Operators use the following camera and holder to inspect the syringes for defects as well as plunger height.



Project Goal

The goal of this project would be to create a desk top inspection camera system that would allow the operator to place syringes into a device and produce results showing if the syringes have any of the specified defects. This system will replace needing to rely on human judgement to assess if a syringe contains any defect and would be a more robust system at detecting defects.



Project Requirements:

Design Problem

The main problem with the current design is that it requires human judgment to determine if a syringe contains any of the specified defects. It also takes resources away from running the filling line to complete the manual inspection process. Automating this would reduce the time this individual is away from running the filling line and increase the reliability of the inspection process.

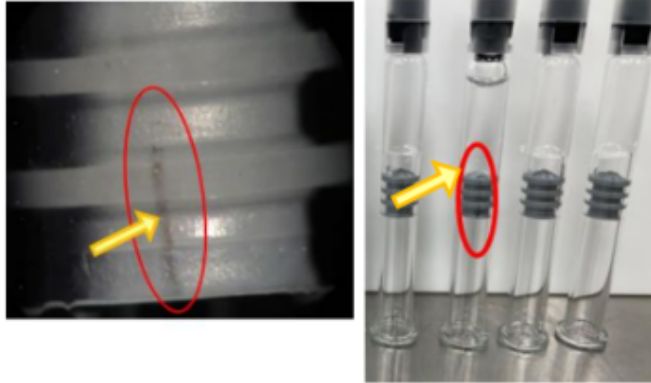
Examples of Defects

Below are examples of the defects that will need to be detected by the system.

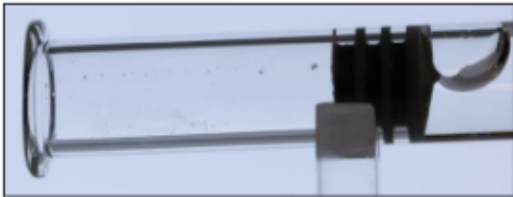


**INDUSTRIAL SOLUTIONS
LABORATORY**

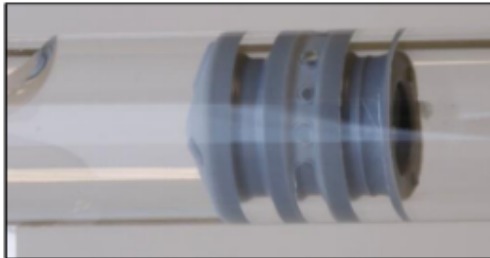
Stain on plunger



Residual product (Above the plunger)



Product in plunger rib: Product between plunger and glass wall



Project Objectives

The main objective of this project would be to design a solution that would allow the operator to place syringes into the device and tell them if any defects are present.

The solution would can not damage the integrity of the syringe and the product inside it. The syringes that are inspected are commercial products if they are free of defect.



General Requirements

- The solution must be no larger than 2 ft x 2 ft x 2 ft and able to fit on a desk top table. The more compact the solution available the better.
- The solution must be no heavier than 30 lbs.
- Any exposed surface of the machine to the room must be made of pharmaceutically friendly materials acceptable in a grade C area. Example: 316SS, Delrin, Peek.
- The solution must be safe for operator use and have guarding in place for moving parts and be free from sharp edges and burrs.
- The solution may use a standard wall outlet as a power source if deemed necessary for the design solution.
- The solution must not damage the integrity of the syringe or product within it.

Expected Deliverables/Results:

- A solution that satisfies the design problem, project objectives, desired output, and general requirements.
- The solution can verify plunger height and detect all specified defects supplied by Eli Lilly.
- A detailed design of the solution so it can be replicated for other lines within the site.
- A 3D model that can be used to showcase the design during the 1st semester exposition if a prototype is not available by then.
- A standard operating procedure (SOP) on how an operator can use the designed solution.
- A share point or digital site containing the project files and data generated from this solution.
- A solution that is safe in function and use for the operator.



Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

Suggested:

- Inspection camera experience or interest
- Current Good Manufacturing Practice (cGMP) experience or interest
- Interest in machine learning and machine vision systems