INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	_Lions Services INC_	Date Submitted	_5/6/2022_
Project Title	_Design of System to Electronically Capture Production Data_ **(LIONS_DATA)**	Planned Starting Semester	_Fall 2022_

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	1	Electrical	2
Computer	1	Systems	1

Company and Project Overview:

In 1935, the Charlotte Central Lions Club founded the Charlotte Workshop for the Blind to employ WWI veterans to re-cane chairs. In 1975, the company was incorporated as a nonprofit textile manufacturer to provide vocational rehabilitation for people who are blind and became known as Lions Services, Inc. The Agency has evolved into a manufacturer of products for the Department of Defense under the Congressional Javits-Wagner- O'Day Act. Lions Services is a respected affiliate of National Industries for the Blind and has received the Javits-Wagner- O'Day Program award from the Defense Logistics Agency for consistently producing excellent quality products. In 2010, Lions Services became ISO 9001:2008 certified. Lions Services manufactures and supplies high quality military combat gear. All made in the USA, as well as our raw materials.

Our mission consists of providing vocational rehabilitation and employment opportunities to individuals who are blind or visually impaired. We intend to provide these individuals with lifelong opportunities and choices that promote personal and economic independence for an enhanced quality of life, while respecting their dignity and right of self- determination.

Lions Services is currently working towards leaning out our processes, optimizing our resources (materials and labor) and eliminating redundant steps and waste. As a result, we look forward to improving our productivity levels. Nevertheless, we will need to monitor the success of our efforts and therefore we will need to keep track of our efficiency, as well as creating a standard set of measures (lean metrics) that show the performance of our processes.

We are choosing one department among our facilities to work with (Hydration Department) on this project. The MOLLE style Hydration System is a lightweight military equivalent carrier that holds a removable and insulated 100oz bladder to keep you hydrated on tactical outings. (Please see picture below).

Picture 1 – Molle I HSC

In this process, we have approximately 85 employees that run 27 different sewing processes on 81 sewing machines. Each machine has a counter display that shows the cycle count for units produced. (See Picture 2).

Picture # 2 - Hour by Hour piece count display

All this information is manually submitted to the production office every day. Then the production office manually enters it into an excel spreadsheet in order to analyze it. The aim of this project consists in finding a way to electronically collect in real time all the production records that are being generated on each machine among our processes and send them in real time to a database.

Project Requirements:
All of our bartack machines come with a counter which records the number of times the machine has processed a task (produced parts per task or event). Each bartack is pre-programmed to run its own sewing cycle, 1 at a time. So, the program counts every time the operator actions the needle to sew a bartack. Every morning, when the operators turn the machines back on, all these counters are zeroed out again.

The aim of this project consists in finding a way to electronically collect in real time all the production records that are being generated on each machine among our processes and send them in real time to a system. So, it can be displayed on a screen or monitor. It will be like having an electronic production hour by hour board (hourly tracking board), like the example below:

HOUR BY HOUR BOARD - Production Rate
Area: Main Panel
Date: Monday, 04/25/22

Hour	Target	Actual	Target Accum.	Actual Accum.	+ / -
7:30 - 8:30	1000	950	1000	950	50
8:30 - 9:30	1000	1010	2000	1960	40
9:30 - 10:30	1000	980	3000	2940	60
10;30 - 11:30	1000	1020	4000	3960	40
11:30 - 12:00	1000	1000	5000	4960	40
12:30 - 13:30	1000	1050	6000	6010	-10
13:30 - 14:30	1000	940	7000	6950	50
14:30 - 16:00	1000	1005	8000	7955	45

Picture # 3 - Hour by Hour board

So, when actual numbers are below the plan numbers, then actual numbers will turn red, if actual numbers are above or equal to plan numbers, then actual numbers will turn green.

In addition to that, it will be important to consider that the target can change depending on the demand. Therefore, it can be either higher or lower. (The numbers shown above are just an example).

Moreover, we would like to be able to show general information about the department such as: Safety, Quality, Productivity (it is already explained) and 5S. This is known as the SQDC board. In this regard, it'd be important that our supervisors or leads can feed the information on the system as well.
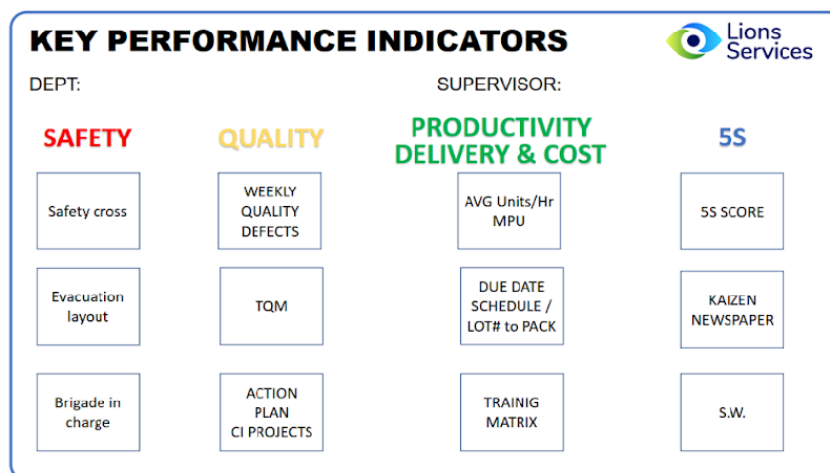
Picture # 4 - SQDC board

Therefore, we will have the screen displaying hour by hour and alternating with the SQDC board.

Expected Deliverables/Results:

The overarching goal is to design, develop, and implement a real-time data capture system for industrial sewing machines with specific focus on capturing piece counts and runtime for each specific machine within the designated department (Hydration). This data is to be transmitted over an encrypted connection to a data collection API that will store the data to a designated database.

Data Collection:
The core challenge of this project consists in how to acquire the piece counts and runtime accurately and consistently for each piece of equipment. This will likely require integrating a microcontroller with sensors, potentially including vision-based sensor systems. Alternate options could include tapping into CAN/ SPI interfaces to utilize the onboard piece count display.

Data Transmission:

All data transmitted across the shop floor network must be done so via encrypted channels (TLS).

Data Logging:
Data should be sent to an API, preferably web based, that will in turn log the data to the relevant database. Data must include a machine designator, piece count, and machine runtime (in minutes). Therefore, we will be able to generate reports providing analysis on collected data.

Supporting Hardware:
The company will provide the necessary network infrastructure and supporting servers. These are not to be considered as part of the project's budget. Likewise, any technology device (monitors, screens, scanners, sensors, microcontrollers, etc.) will not be considered part of the project budget either.

Comments:
While custom elements may be required, the company prefers to focus on microcontrollers, sensors, and other components that are readily available on the commercial market. We have existing experience with these devices and will leverage our existing contacts as needed to facilitate the teams' successful completion of the project.

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 <u>mandatory</u> 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):
- Any kind of programming knowledge such as Python, SQL, C++, etc., will be important to have.
- Ability to travel to the Lion Services facility in Charlotte, NC. Mileage will be reimbursed per ISL purchasing policy.