UNC Charlotte College of Engineering Senior Design Program

Senior Design Project Description

Company Name	*Corning Optical Communications*	**Date Submitted**	*5/31/2019*
Project Title	*Automation of a Fiber Optic Cable Stripping Operation – Phase 2* **CORN_STRIP2**	**Planned Starting Semester**	*Fall 2019*

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person. Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	1
Computer	1	Systems	
Other ( )			

Company and Project Overview:

Corning is one of the world's leading innovators in materials science, with a 166-year track record of life-changing inventions. Corning applies its unparalleled expertise in glass science, ceramics science, and optical physics. Corning has approximately 45,000 employees worldwide and annual sales of $10.5 billion. Corning invented the world's first low-loss optical fiber in 1970. Since that milestone, they have continued to pioneer optical fiber, cable and connectivity solutions. As global bandwidth demand driven by video usage grows exponentially, networks continue to migrate from copper to optical-based systems that can deliver the required cost-effective bandwidth-carrying capacity.

Corning's Hickory NC location produces a wide variety of fiber optic cable assemblies for use in communications systems around the world. The first operation in the manufacture of a cable assembly is to strip and cut the various layered components of the cable. The objective for this series of projects is to automate this process. The goals of the automation are to eliminate operator to operator variation, improve quality and reduce costs.

Project Requirements:

I. Background:

The process for preparing a fiber optic cable for the installation of a connector consists of three successive jacket and coating removal steps, as well as a step to cut the aramid yarn to length. A typical cable is shown in Figure 1.

Figure 1 – Fiber optic cable

The yellow part is the outer jacket. The light yellow fibers are aramid fibers which protect and strengthen the cable. The white part is the inner coating which protects the actual fiber optic element.

The current state of the art is a four-step manual operation. Each step is performed with a different hand-held plier-like stripping tool. Prior to each hand operation, the operator must measure and mark the cable location at which to strip the jacket or coating. Figure 2 shows the tools required to perform the manual operation.

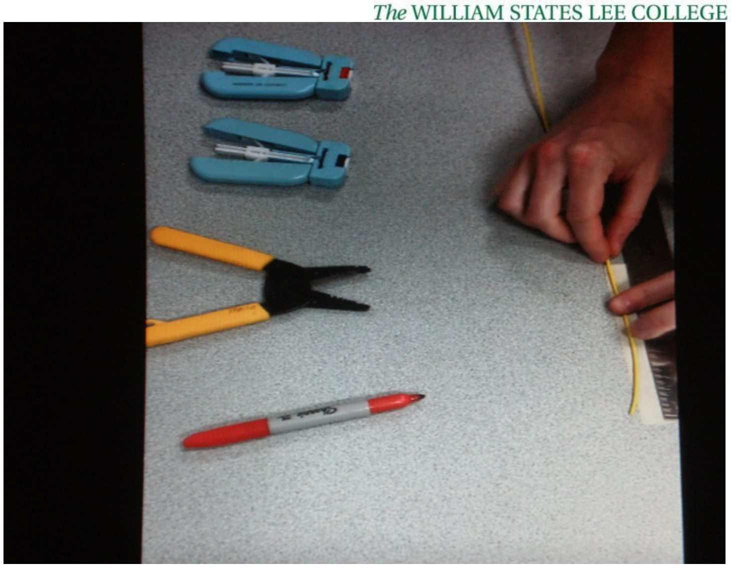

Figure 2: Hand tools required for manual preparation steps. Operator is manually measuring and marking the strip location.

Figure 3 shows the specified strip lengths for two popular styles of optical connector.

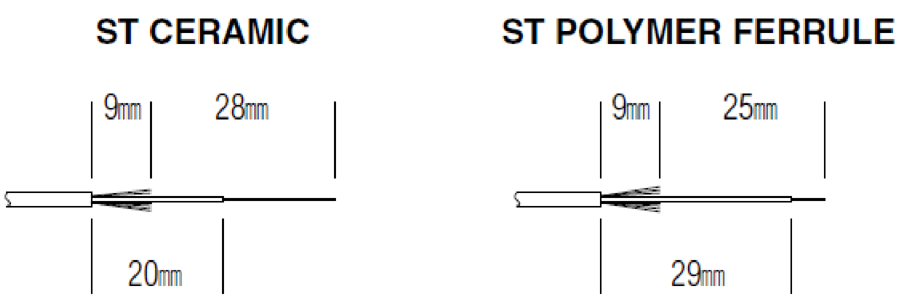

Figure 3: Strip position diagrams for two typical types of connectors

II. Objectives:

The long-term development objective is to automate the four-step process on a single platform:

1. Jacket stripping
2. Aramid fiber cutting
3. Buffer stripping
4. Coating stripping

An assumption is that the four process steps will be each be automated, and packaged on a platform that will move the cable from step to step.

Steps 1, 3, and 4 may be done by applying electro-mechanical actuation to a series of fixtures that have already been developed to take the place of the hand-held tools. See example of fixture at

Figure 4.

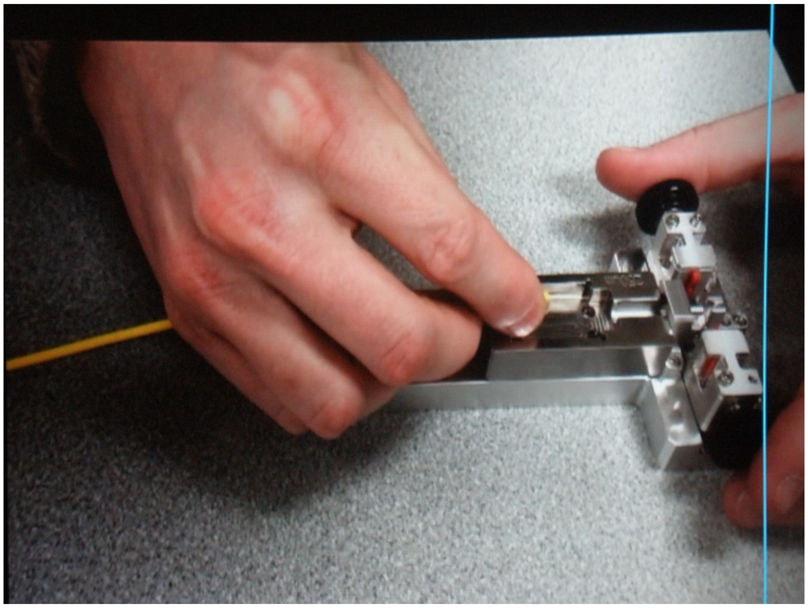

Figure 4: Cable stripping fixture showing manual squeeze and pull

The objectives of this specific project are:

1. Develop a transit platform to engage the cable, and move it from one process step to the next. Control of positioning and alignment for each step are necessary.
2. Develop the first automated step (jacket stripping) and install on the platform.
3. Make provisions for the development and integration of the second, third and fourth process steps on the platform.
4. (Stretch objective) Develop the second automated step (aramid fiber cutting) and install on the platform.

Other requirements:

- the platform must be designed for future integration of all four separate automated processes into one continuous process
- The platform, and each stripping step, should be configured with a menu-driven system for pre-setting strip lengths (as shown in Figure 3) from a stored database
- Speed of each step, and of the entire end-to-end operation should be faster than the current manual process. Faster is better.
- Safety of operation

The project team may, or may not, use the existing blade technology and stripping fixture devices (e.g. Fig. 4) in developing the technical concept. The team will also be provided the prototype and documentation from a previous prototype project (Fall 2018 Project – Short Name "CORN_STRIP") for review and potential use. A previous lesson learned is that variation in axial position of the cable along its length must be considered in aligning the cable at each station.

Expected Deliverables/Results:

- Automated device that achieves the first three objectives and meets the other requirements as defined above.
- Documentation of the platform for future integration of successive process steps.

Disposition of Deliverables at the End of the Project:

The device may be utilized by a follow-on project team to develop and integrate the remaining steps. After the Expo demonstration, Corning will either take the device or leave with ISL to pass on to the next team.

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