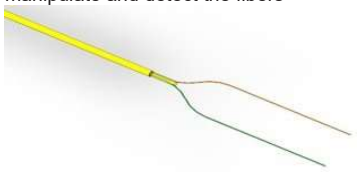
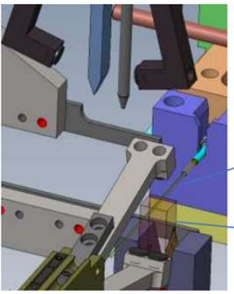
Automated Vision Identification, Separation, and Orientation of Coated Fiber

Corning Optical Communications

PROBLEM STATEMENT

- To produce LC Uniboot Jumper cable, the fibers within the cable must be correctly separated and oriented based on color
- Utilize original design concept provided by Corning to develop a prototype work cell
- Must include the FANUC robot, pneumatic systems, and Beckhoff vision using the MAKO camera to manipulate and detect the fibers





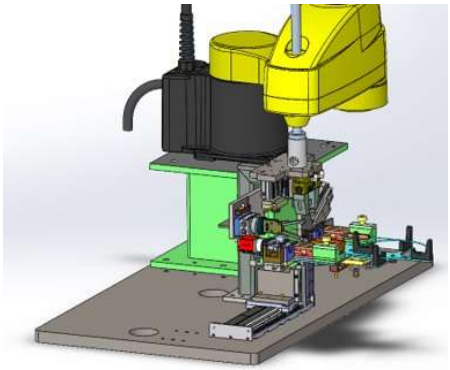
REQUIREMENTS

#	Description
1	Orientate fibers to desired position by color
2	Properly fix cable in place
3	Detect fiber color
4	Separate fibers
5	Integrate Beckhoff vision
6	Maintain condition of product
7	5 second cycle time

FINAL DESIGN

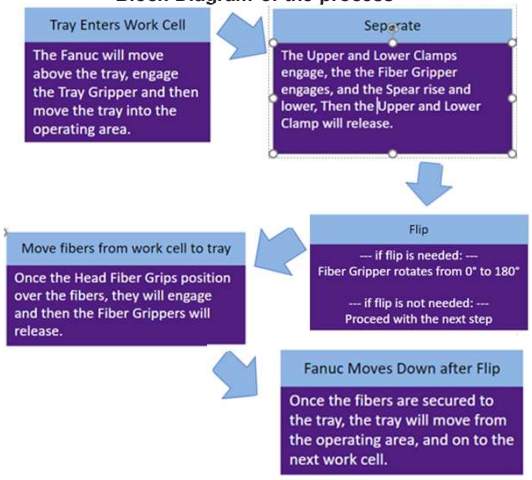
Mechanical

3D Model of Separate and Flip Design

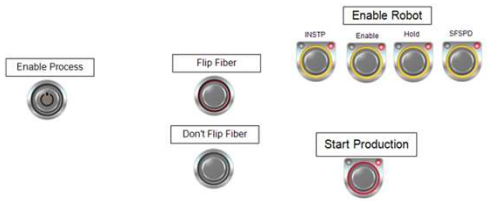


Electrical

Block Diagram of the process

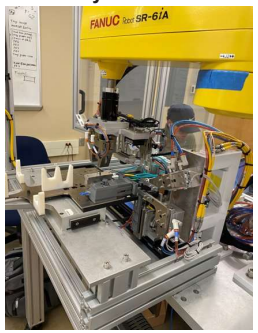


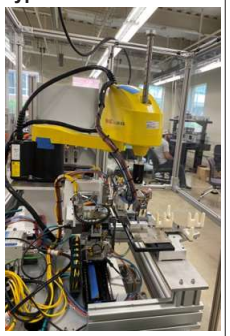
Digital User Interface



RESULTS

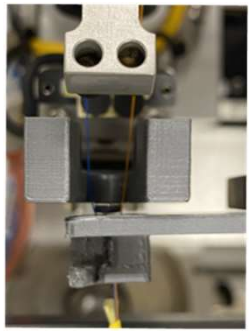
Fully Assembled Prototype Work Cell





- Completes Separate & Flip within 5.44s

Separation of Fibers



- Separation Success Rate: 63.3%

Testing LC Uniboot Cable in Work Cell

Sample Testing: Running sample through entire process, observe for successful completion and check integrity of fibers

Operator rotates fibers			Operator does not rotate fibers		
Test #	Successful Completion?	Damage to Fibers?	Test #	Successful Completion?	Damage to Fibers?
1	yes	no	11	no	no
2	yes	no	12	yes	no
3	yes	no	13	yes	no
4	yes	no	14	yes	no
5	yes	no	15	yes	no
6	yes	no	16	yes	no
7	yes	no	17	yes	no
8	yes	no	18	yes	no
9	no	no	19	yes	no
10	yes	no	20	yes	no

- Completes both processes 9 out of 10 times without damaging the product

SUMMARY AND CONCLUSIONS

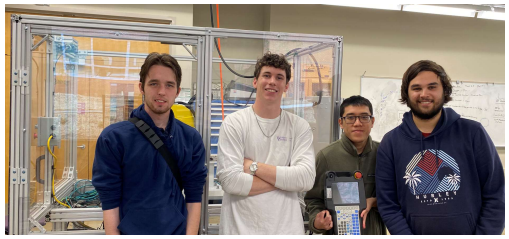
- The team fully assembled the initial concept design provided by Corning
- Implemented process improvements
- Developed code to provide a solution to the vision systems being inoperable
- Successfully developed prototype work cell that completes the separate & flip process

FUTURE WORK

- Process improvements & debugging of systems (Linear Rail, Vision System, Update PLC)
- Construct mirrored design for upper assembly to complete separate & flip for both ends of LC Uniboot Cable
- Design alternative process for initial separation

TEAM & ACKNOWLEDGEMENTS

- **Student**
  - Philip Ky – ECET
  - Dustin Pease – BSEME
  - Zachary Easter – BSEME
  - David Kellogg – ECET
- **Faculty Mentor**
  - Paul Yanik
- **Sponsor Contact**
  - Paul Fleenor
  - Jeremy Schermerhorn
  - Neil Lukowski



References

1. Learn Beckhoff - https://learn.beckhoffus.com/catalog
2. Beckhoff information system - https://infosys.beckhoff.com/english.php?content=../content/1033/tc3_plc_intro/2525041803.html&id=