Sustainable Alternatives for Fiber Optic Cable Disposal

COMMS_OPTICS
Senior Design I
January 2021

Team Lead: Nicholas Melton (nmelton2@uncc.edu)
Team Members: Ahmed Alrayyed (aalrayyed1@uncc.edu)
Jillian Hutson (jhuoton2@uncc.edu)
Nathan Skantze (nskantz@uncc.edu)
Josiah Thompson (jthom414@uncc.edu)
Eli Trotensko (etrotens@uncc.edu)
David Wicklin (dwicklin@uncc.edu)

Faculty Mentor: Gary Teng, P.E.
Grading Instructor: Gary Teng, P.E.
Supporters: Joan Gier
Dan Parke
Dr. Jon Merket

Identifying methods to reuse, repurpose, or reallocate waste fiber optic cable generated by CommScope’s manufacturing methods as well as worn or old cable generated by the industry.

Procedural Steps

Results and Conclusions

- Our testing involved varying the frequency setting of the feeding wheel, to determine the optimally speed of cutting through the cable.
- Additionally, the depth of the blade into the boot had to be adjusted using spacers, in order to ensure the blade was completely cutting through the outer jacket of the cable.
- From our tests, we found that 39.9 hertz was the ideal frequency for the feeding wheel, in order to slice through the outer jacket, without damaging any of the central components of the cables.
- The necessary cutting depth to fully separate the outer jacket is 0.124 inches.

<table>
<thead>
<tr>
<th>Hz of Machine</th>
<th>Depth of Cut (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.971</td>
</tr>
<tr>
<td>17</td>
<td>0.085</td>
</tr>
<tr>
<td>25.8</td>
<td>0.083</td>
</tr>
<tr>
<td>30.7</td>
<td>0.067</td>
</tr>
<tr>
<td>39.9</td>
<td>0.124</td>
</tr>
</tbody>
</table>

- All tests were conducted with the outer jacket separated, to remove the outer jacket.

Chemical Separation

- A significant portion of Fiber Optic Cables recycling possibilities are hampered by an industrial gel that coats the inner components
- Our team experimented with ways to remove this coating:
  - Control (no solution)
  - Tap Water
  - Hexane
  - Vinegar (75%)
  - KOH (Potassium Hydroxide)
  - D'Gel

Our team experimented with ways to remove this coating involving:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>5 Minutes</th>
<th>10 Minutes</th>
<th>15 Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOH</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Tap Water</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Hexane</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Vinegar</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>KOH</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

- All tests were conducted with the outer jacket separated, to remove the outer jacket.

Conclusions

- Based on the chemical experiment, none of the above chemicals would be recommended.
- Each solution proved highly ineffective when compared to the control.
- Further potential options of study:
  - Acetone and Acetic Acid were not used due to their flammability and difficulty of being implemented on an industrial scale.
  - Supercritical CO2 was not used due to its expensive nature and inability for the team to afford to test it.
  - It is unlikely CommScope would be able to implement such a chemical solution without great cost.
  - From the team's discussion with Dr. Markel of the UNCC chemistry department and our own observations, we must conclude that these cables should be ignored for now by CommScope and research begun to reengineered the gel with the mindset of end-of-life operations such as recycling.

Budget

- Chemical Total: $143.44
- Mechanical Total: $1,264.48
- Electrical Total: $801.89
- Full Expenditure: $2,219.82

Budget Expenses Breakdown

- Chemical Test
- Mechanical Test
- Electrical Test