OBJECTIVES

- To characterize the tenacity of 600 denier Kevlar KM2 yarns
- To characterize the effects of gage length on the tenacity
- To characterize the effect on tenacity resulting from damages induced by weaving on the warp and fill yarn separately
- Begin to establish an extensive material database for input into the FE simulation of the impact of woven fabrics

YARN SPOOL VS. SCOURED FABRIC: 4 IN.

Probability Density Function (PDF)

\[ f(x) = \begin{cases} \frac{1}{\sigma_p} \left( \frac{x-x_0}{\sigma_p} \right)^{m-1} e^{-\left( \frac{x-x_0}{\sigma_p} \right)^m} & \text{if } x \geq x_0 \\ 0 & \text{otherwise} \end{cases} \]

where \( \sigma_p \) is the scale parameter, \( m \) is the shape parameter, and \( x \) is the threshold parameter.

Cumulative Distribution Function (CDF)

\[ F(x) = 1 - e^{-\left( \frac{x-x_0}{\sigma_p} \right)^m} \]

YARN SPOOL VS. SCOURED FABRIC: 4 IN. CONTINUED...

Retention of Tenacity for 4 in. pulled at 0.5 in/min:

<table>
<thead>
<tr>
<th>4 in. Spool</th>
<th>4 in. Warp</th>
<th>4 in. Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.46</td>
<td>15.66</td>
<td>19.37</td>
</tr>
<tr>
<td>22.59</td>
<td>16.21</td>
<td>20.06</td>
</tr>
<tr>
<td>23.67</td>
<td>16.59</td>
<td>20.91</td>
</tr>
<tr>
<td>22.59</td>
<td>16.59</td>
<td>20.91</td>
</tr>
<tr>
<td>22.59</td>
<td>16.59</td>
<td>20.91</td>
</tr>
</tbody>
</table>

Table: Probability of Failure

<table>
<thead>
<tr>
<th>4 in. Spool</th>
<th>4 in. Warp</th>
<th>4 in. Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.72</td>
<td>0.72</td>
<td>0.90</td>
</tr>
<tr>
<td>0.72</td>
<td>0.72</td>
<td>0.89</td>
</tr>
<tr>
<td>0.72</td>
<td>0.72</td>
<td>0.89</td>
</tr>
</tbody>
</table>

End-Tabbing (Sample Preparation)

- Center a sample on one end tab
- Use two staples to secure sample to the tab
- Use a paper clamp to fix the end of the sample with the attached end tab to a ruler
- Attach a second end tab to the other end of the sample and adjust to the desired gage length using the ruler
- Use two staples to secure the second end tab to the sample

End-Tabbing (Epoxy Treatment)

- Using a glue gun, apply a drop of epoxy on top of the sample and end tab at both ends of the sample
- Place another end tab on top of the epoxy making a sandwich
- Using a stapler apply two staples to hold the second end tab in place
- Repeat the process at the other end of the sample

End-Tabbing (Data Collection)

- Using Instron 5567 and 5000 N grips place a sample within the grips and close the top grip
- Allow self alignment within the bottom grip and then close
- Apply about 5 N for a few seconds to the sample to straighten microfibers
- Reduce the load to about 0.1 N for sample testing and collect data: maximum modulus, peak load and the strain at peak load of sample

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