**Business Model and Economics**

**Supply Chain Flowchart**

To construct our product, we will use three different companies:
- American Foam Corp
- National Velour
- Claremont Foam

National Velour and Claremont Foam are members of the American Flock Association and already have a supply chain in place. American Foam and National Velour also work closely; as National Velour flocks foam to make Sim-U-Vel; which American Foam and National Velour both sell. Our manufacturing process would be a drop-in to the existing supply chain. The extra process steps lie in sending the Sim-U-Vel back to Claremont to be treated and sending the treated material back to American Foam so layers can be laminated and our final product is assembled.

**Construction Options**

- **Hydrophobic Finish**
  - Gives the ability to be used in wet or dry applications without getting slick and losing functionality
- **Antimicrobial Finish**
  - Gives the surface the ability to be used in any environment and minimizes the spread of bacteria through contact

**CleanTech360° Product Line**

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost to Manufacturer</th>
<th>Selling Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1: Basic Sim-U-Vel plus surface treatments</td>
<td>$5.77/yd²</td>
<td>$12.00/yd²</td>
</tr>
<tr>
<td>Option 2: Profiles Sim-U-Vel plus crosslinked polyethylene reinforcement and surface treatments</td>
<td>$34.60/yd²</td>
<td>$55.00/yd²</td>
</tr>
<tr>
<td>Option 3: Durables Sim-U-Vel plus closed cell #2 polyethylene reinforcement and surface treatments</td>
<td>$33.17/yd²</td>
<td>$40.00/yd²</td>
</tr>
</tbody>
</table>

**Innovation**

CleanTech360° is uniquely assembled and treated by materials and chemicals that already exist. Once the product is in the customer's hands, it can be cut to fit the size of the job.

After application of GS chemistry, the acrylic flocked surface gained hydrophobic character. The picture above shows a water droplet sitting on top of the treated surface (as identified by the red line). Prior to treatment, water was absorbed immediately by the acrylic fibers.

This is the structure of Ruco-Bac AGP; the active chemical in the antimicrobial finish that was applied to our prototypes:

- Applied via continuous padding application to Sim-U-Vel
- Sim-U-Vel was treated like fabric and withstood the drying temperature of 130°C without discoloration or degradation
- Treatment makes the surface resistant to bacteria, helping prevent the spread of germs and microbes

**Methodology & Results**

**State of the Art Technology:**

What is flocking? The method of texturizing a surface by applying a large amount of small fibers. Flocking a surface will change the appearance, feel, and overall functionality of an object.

**Flocking Application**

Roll-to-roll flocking, used for any substrate that can be stored on a roll.

Continuous application: a web of moving substrate passes through rolls where adhesive is applied. From there flock fibers are deposited on the surface of the adhesive with the aid of electrostatic forces. The flock fibers are positively charge and the substrate is grounded. This ensures that the fiber enter the substrate at a perfect perpendicular angle, creating uniformity across the entire surface of the material.

This image, courtesy of the American Flock Association website, depicts the roll-to-roll flocking process. As you can see, the flock fibers in the hopper are charged and the substrate is grounded. This results in the fibers being “shot” onto the substrate.

**Construction of Prototype**

After conceptualizing the product, we began the prototyping process. Three different variations of our idea began to take shape; we used Sim-U-Vel, which is a product from National Velour and American Foam. Sim-U-Vel is an aliphatic foam flocked with acrylic fiber which has a soft and velvety feel. It is used exclusively in packaging, for applications such as jewelry display cases. We wanted to use it differently. We obtained constructed samples from American Foam of Sim-U-Vel laminated with a pressure sensitive backing by itself and layered with two other foams we chose; crosslinked polyethylene and closed cell #2 polyethylene.

Our vision for CleanTech360° was for it to be used any time anywhere in any environment. To make this possible, we decided to apply antimicrobial and hydrophobic finishes. Treating the product in this way minimized the problems of moisture, mold, mildew, slippage, germs, and degradation of the material itself, giving the customer complete freedom to use CleanTech360°.

**Acknowledgments**

Thank you to the American Flock Association, Claremont Flock, American Foam Corporation, National Velour, Microfibres Inc, TECS department and offices.