KB193120189: Studio Toolkit for Shrink Sleeves - What are the 'Friction' and 'Stretch Resistance' settings used for

Question

What are the **Friction** and **Stretch Resistance** settings and how can you use them to achieve a matching result of your virtual model compared to the physical mock-up?

Answer

These new options are the result of extra research we did on shrink behavior (triggered by a handful of customer reports where our simulations did not match the reality).

Stretch Resistance

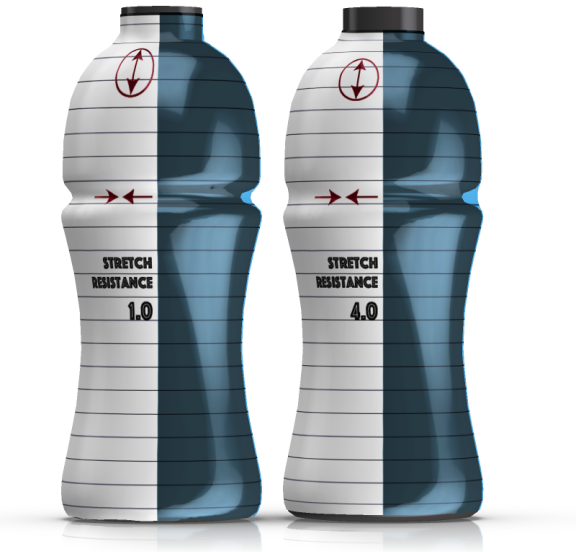
What does it do?

A shrink film wants to shrink in one direction, but sometimes this shrinking is only possible if the material is stretching in the other direction (because of the container shape). The film will find a state where these two forces are in balance. This balance between shrink and stretch will affect the position and shape of the sleeve.

Have a look at this example:

There are two places where there is a clear battle between horizontal shrink and vertical stretch, and in both cases, the "Stretch Resistance" value has a big impact on the result:

1. Near the top, the container is strongly conical. The film wants to crawl upwards (where it can shrink more), but that is only possible by stretching it vertically. The left example (1.0 stretch resistance) allows this much more than the the right example (4.0 stretch resistance). Obviously, this also impacted the final position of the top edge of the sleeve.
2. There is a strong indentation in this bottle. The sleeve wants to shrink into it, but that makes it longer in the vertical direction and the film will resist being stretched. The stronger this resistance, the less deep the valley (you will see the same effect with "valley's" in between the products in multi-pack sleeves).



Why "4.0"?

Sadly this value doesn't match with a documented shrink film property. Internally, our physics model has more than 10 material parameters, so what we're exposing to the user (H-shrink, V-shrink, friction & stretch resistance) is a simplification.

The value of 4 was obtained through a self-developed test performed on a typical PVC shrink film in a steam shrink tunnel. We believe the value is suitable for most films (maybe films with a high shrink force require stretch resistance value lower than 4).

Article information	
Applies to	Studio Toolkit for Shrink Sleeves 16.1.1 or newer
Created	20-Oct-17
Last revised	
Author	SDME, KVB
Case Number	

Contents

Friction

Let's also talk about friction, because that's another 'vague' tweaking parameters. With friction, you control how easily the sleeve can slide over the container (after it has made contact). A high value means that sliding is less likely.

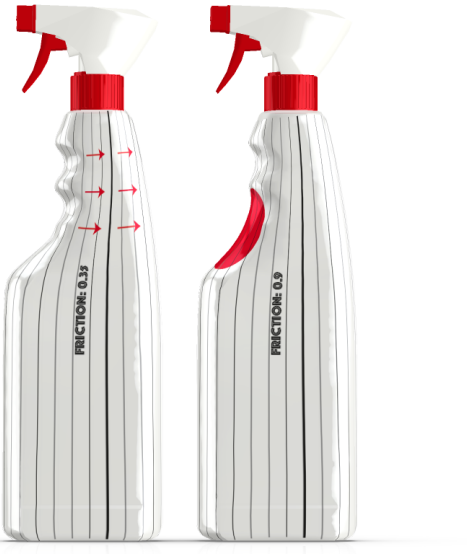
How does this affect shrink results?

The clearest example is with strongly asymmetrical containers (like trigger bottles):
Because of the shape and placement of the neck, the sleeve will first make contact with the right side, and only much later with the left side.

The bottle on the the right has a very high friction, as if the container is sticky and the sleeve is not able to glide over its surface. You get a very uneven horizontal shrink (the vertical lines are much closer (to each other?) on the left than they are on the right). In one area (marked in red) the sleeve is not even able to complete the shrink, because all the film that already touches? the container has stopped shrinking.

The bottle on the left is much more realistic: The sleeve will glide to the right side to even out the shrink more equally.

> ⚠ This gliding creates a visible distortion of the vertical lines.



So, what should you fill in?

A lot of theory, but in the end, the user needs to know what to fill in:

You should leave friction and stretch resistance on their default value **unless**:

1. You need to redo a shrink simulation and you prefer it to be consistent with the previous toolkit version. Then you can put the stretch resistance on 1.0.
2. You have a physical sample (like a grid test) to visually compare and tweak the numbers to optimize the shrink simulation:
    a. **Decrease/Increase Stretch Resistance** to make your valleys deeper/shallower (this probably means that you're dealing with a high-shrink-force shrink film).
    b. **Decrease/Increase Friction** to have a more constant/more pronounced differences in horizontal shrink across the diameter.