Lifelike Apparel Mannequins from 3-D Human Data

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Who we are?

• GD - have been in the mannequin business for over 30 years, US company

• Daisy Veitch, anthropometrist and mannequin builder with apparel background, founder SD

• Dr Kath Robinette, Director CAESAR survey, founder of 3-D body scanning technology, USAF
Overview

• How has it been done in the past and what are the issues?
• How is our process different?
• Why our mannequins are better
• Demonstration of:

Right information + Right process
= Right fit
# How has it been done in the past?

<table>
<thead>
<tr>
<th>Process</th>
<th>Issues</th>
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| • Choose a fit model that “looks right”  
  • Use stylized Dressform  
  • Use draping or old patterns to create new styles  
  • Use fit model to test fit in base size only  
  • Use traditional grade of even amounts  
  • Sell product and see how well it sells | • Fit model & grade may not represent target market  
  • Fit model changes (weight, leaves job, pregnancy)  
  • Unrealistic Dressform shape  
  • Dressform properties ineffective for fit  
  • Fit problems not identified until after product hits market, or worse, not at all  
  • Grading uncheckable for fit |
Where is your fit model?

CAESAR North America Women with 50% Confidence Band

Hip = 419.15 + 0.8046 * Waist

Fit Sweet-spot: regression center line of target market:
ASTM Size 12
Waist = 750 mm
Hip = 1016 mm

Accommodation Range equals ± 40 mm for Hip

Any deviation from the center “Sweet Spot” will accommodate fewer people with same number of sizes.
Where is your grade?

CAESAR North America Women with 50% Prediction Range
Hip = 419.15 + 0.8046*Waist

ASTM Misses Sizes are in the Sweet Spot Band
51.2% of Target Market within 40 mm

50% Accommodation Range approx. ± 40 mm for Hip

Within 40 mm of Mid-line (n=646: 51.2%)
Outside 40 mm of Mid-line *(n=616: 48.8%)
Alternate Size Range has equal Waist/Hip Grade
This grade veers from Sweet Spot Band
Only 36.5% of Target Market within 40mm
Base Size not in center of Sweet Spot
New Size Range ± 40mm for Hip
Sweet Spot ± 40mm for Hip
51.2% Accommodation

Same number of sizes
14.7% fewer people accommodated!

Within 40 mm of Size Range (n=461:36.5%)
Outside 40 mm of Size Range (n=801:63.5%)
Mannequin Shapes

SHARP mannequin

Difference Map

Standard workroom mannequin

Classic mannequins are not shaped like humans
Effect of shape on fit

Ready-to-Wear Dress

- RIGHT size
- WRONG shape
- Bunching
- Uneven hem

Made-to-3-D-Body Dress

- RIGHT size
- RIGHT shape
- Unflattering
Change your market: 
Change your Sweet Spot

Note different equation:
CAESAR US equation: \( \text{Hip} = 419.15 + 0.8046 \times \text{Waist} \)
Effect of shape on fit

Ready-to-Wear Jacket

Made-to-3-D-Body Jacket

RIGHT size
WRONG shape

RIGHT size
RIGHT shape

Bunching
Uneven hem
How is our process different?

- Fit model’s location in target market is determined
- Mannequin adjusted to best represent market sweet-spot
- Mannequin maintains fit model 3-D shape and posture
- Lifelike mannequin materials to assess fit
- Mannequin doesn’t gain weight, get pregnant, leave job or age
- Grade is determined by sweet spot band
- 3-D mannequins of other sizes are available to test grade
How is our process different?

Use bone 3-D landmarks to produce underlying skeleton

- Bone not visible on surface in scans
- Must be palpated and pre-marked
- CAESAR provides 73 bone landmarks
- SizeUSA provides NO bone landmarks
- Shapely Shadows has NO bone landmarks
- Alvanon has NO bone landmarks

Use bone 3-D landmarks to produce underlying skeleton
How is our process different?

• Use polygon data format to maintain precision (Not IGES128)
• Use numerically controlled milling & ALL of the approx. 300,000 3-D points
  – Alvanon 1-D measurements extracted from scan
  – Shapely Shadows reduces data (smooths) and then uses half so it is different than original
• Mannequin does NOT use mirroring
  – Line of symmetry is a myth
  – Mirroring degrades both size and shape
• Apparel pattern remains symmetrical
Typical process

- Select sample to represent target market
- Measure & evaluate location of fit model
- Determine & machine a 3-D base form prototype
- Customer reviews size and shape & form is adjusted
- Produce mold for final form
- Insert accurate skeleton based on 3-D landmarks
- Pour the fleshy portion
- Finish – cover and landmark
Scan provides 300,000 3-D data points for milling.

Mannequin is exact copy of person including skeleton and real landmarks.

Garments fitted on this real-body mannequin also fits real shoppers.
SHARP mannequins are:

• Real-body copies

• Bio-fidelic - squishy in the right spots

• Sitting in the “sweet spot” - representing the majority of your customers

• 3-D communication tool for product development team and QA whose copies can be in multiple locations at once

• consistent fitting base - doesn’t get pregnant, change weight or age
Benefits

• Improved fit for more customers leading to
  – increased sales
  – increased customer satisfaction
  – brand loyalty
  – less wastage and markdowns

• Increased product development efficiency leading to
  – improved slopers and grading
  – less samples to approval
  – reduced lead times
  – increased through put - reduced opportunity cost
  – increased flexibility in styling

• Improved consistency of fit and QA control
Summary

- Hit your target market Sweetspot
- Shaped to fit
- Less dependence on fit model
- Right information
- Right process
- Right fit
- Better tools = better results
**Contact Details**

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