

AUTOMOTIVE TESTING EXPO 2006



Automotive Fabric Durability:

2 Testing vs. **3** Applications
D



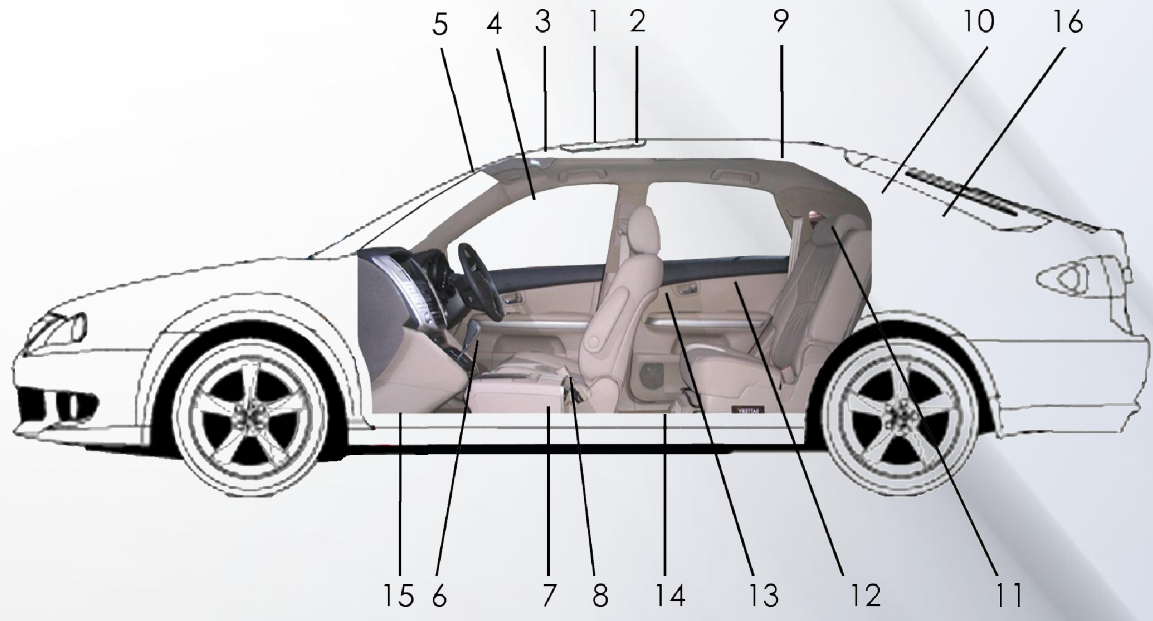
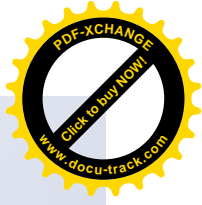
NC STATE UNIVERSITY

Nancy Powell



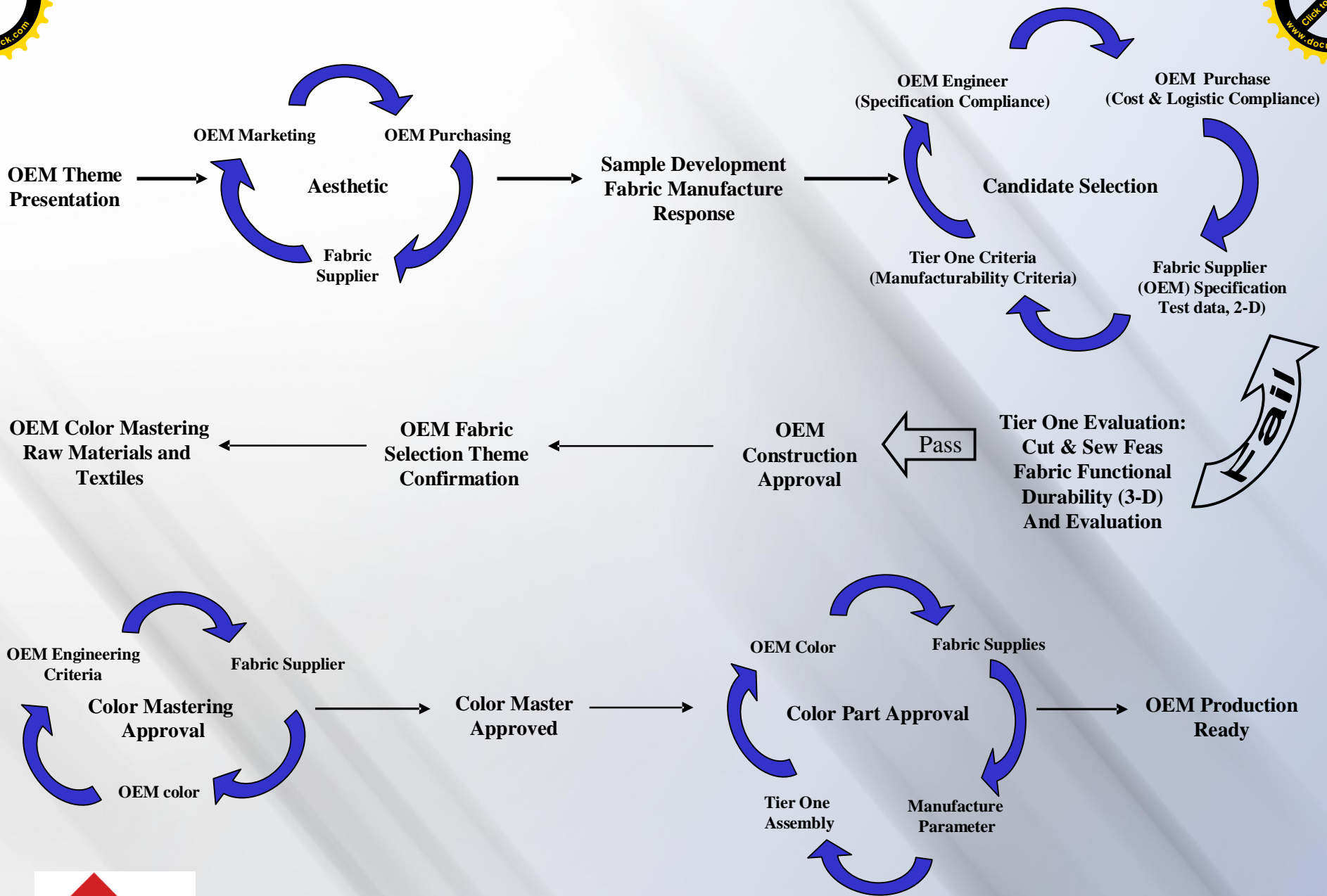
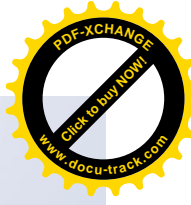
Automotive Textile Solutions Inc.

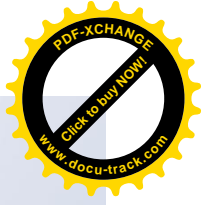
Stephanie Rodgers



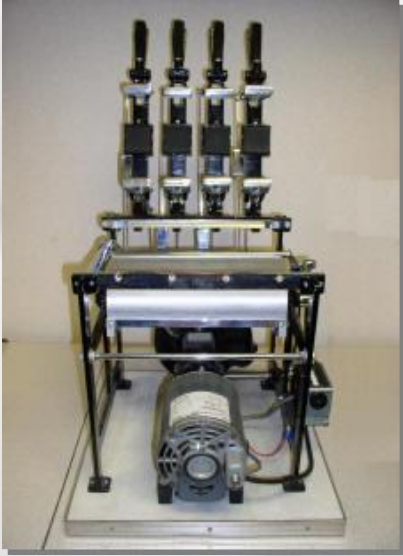
- | | |
|------------------------------|-----------------------|
| 1. Sunroof | 9. Inside Roof Lining |
| 2. Headliner | 10. Seat Cover Lining |
| 3. Convertible Tops | 11. Upholstery |
| 4. Sun Visor | 12. Insulation |
| 5. Column Padding | 13. Window Frames |
| 6. Composite Panel | 14. Carpet |
| 7. Seat Belt Anchorage Cover | 15. Carpet Backing |
| 8. Seat Belt | 16. Rear Shelf Panel |







2-D Practices



10.25.06



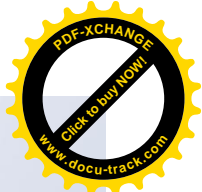
Jounce & Squirm Intier, 2006

3-D Practices

Ingress & Egress



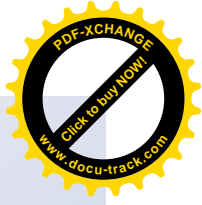
Intier, 2006



2-D vs. 3D CASE STUDY

OEM	I.						II.				III.			
Supplier	A	A	A	B	B	C	D	C	B	B	B	B	B	B
Fabric Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Vehicle Type	Car	Sm. SUV	Sm. SUV	All Classes	Sm. Car	Sm SUV	Car	Sm. SUV	All Classes	SUV	SUV Truck	Sm.SUV	Sm. SUV	Sports Car
Fabric Technology	Warp Knit	Warp Knit	Warp Knit	Flat Woven	Warp Knit	Warp Knit	Pol Knit	Warp Knit	Flat Woven	Warp Knit	Warp Knit	Flat Woven	Flat Woven	Flat Woven
Face Appearance	Flat	Flat	Flat	Flat	Flat	Plus h	Plush	Plush	Flat	Flat	Flat	Flat	Flat	Flat
Yarn Size	Dtex 220/48	Dtex 167/48	Dtex 110/34	2/150/34	1/50/36		1/70/47		2/150/34	1/50/50	1/150/36	2/300/135	2/300/68	1/150/34
Fiber Type	PET	PET	PET	PET	PET	PET	PET	PET	PET	PET	PET	PET/PVC	PET	PET
Weight (lam./unlam.)	340/210 g/m2	340/210 g/m2	350/220 g/m2	387/256 g/m2	425/290 g/m2		544/320 g/m2		351/253 g/m2	10.3 oz/yd2	432 g/m2	543/380 g/m2	407/292g /m2	397/247g/ m2
Taber	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Laminate Thickness	6mm	6mm	6mm	3mm	3mm	6mm	10mm	6mm	3mm	6mm	6mm	6mm	6mm	6mm
Functional Test: Ingress/Egress	Fail	Fail	Fail	Boarder line	Pass	Fail	Fail	Fail	Pass	Fail	Fail	Pass	Pass	Pass
Consumer Field Failure				Fail	Fail				Fail			Fail	Fail	Fail

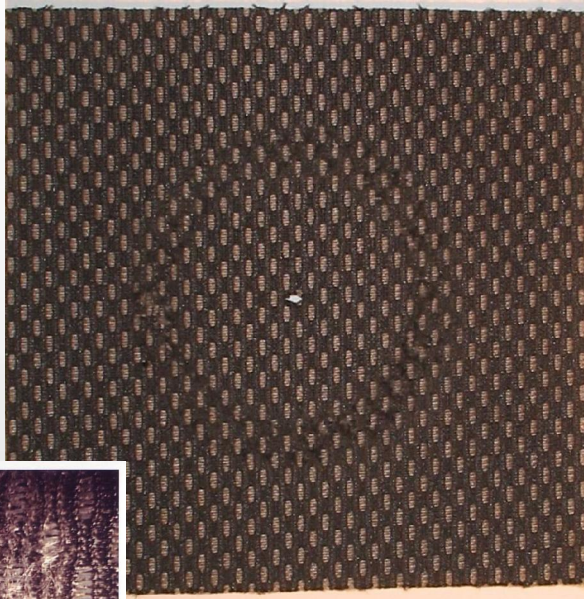




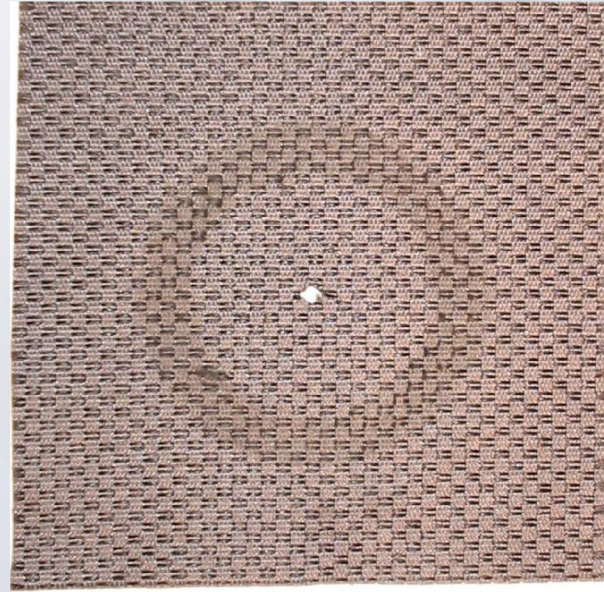
Verification Analysis

Taber Abrasion Evaluation

- All 14 samples were tested, 2 exhibited noticeable wear

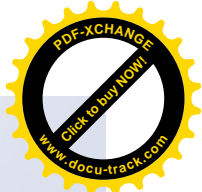


Sample 2



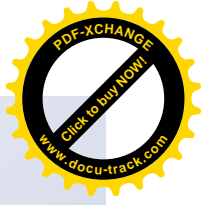
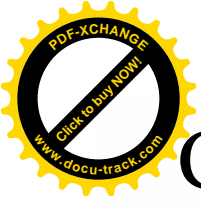
Sample 13





2-D vs. 3D CASE STUDY

OEM	I.						II.				III.			
Supplier	A	A	A	B	B	C	D	C	B	B	B	B	B	B
Fabric Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Vehicle Type	Car	Sm. SUV	Sm. SUV	All Classes	Sm. Car	Sm SUV	Car	Sm. SUV	All Classes	SUV	SUV Truck	Sm.SUV	Sm. SUV	Sports Car
Fabric Technology	Warp Knit	Warp Knit	Warp Knit	Flat Woven	Warp Knit	Warp Knit	Pol Knit	Warp Knit	Flat Woven	Warp Knit	Warp Knit	Flat Woven	Flat Woven	Flat Woven
Face Appearance	Flat	Flat	Flat	Flat	Flat	Plush	Plush	Plush	Flat	Flat	Flat	Flat	Flat	Flat
Yarn Size	Dtex 220/48	Dtex 167/48	Dtex 110/34	2/150/34	1/50/36		1/70/47		2/150/34	1/50/50	1/150/36	2/300/135	2/300/68	1/150/34
Fiber Type	PET	PET	PET	PET	PET	PET	PET	PET	PET	PET	PET	PET/PVC	PET	PET
Weight (lam./unlam.)	340/210 g/m2	340/210 g/m2	350/220 g/m2	387/256 g/m2	425/290 g/m2		544/320 g/m2		351/253 g/m2	10.3 oz/yd2	432 g/m2	543/380 g/m2	407/292g /m2	397/247g/ m2
Taber	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Laminate Thickness	6mm	6mm	6mm	3mm	3mm	6mm	10mm	6mm	3mm	6mm	6mm	6mm	6mm	6mm
Functional Test: Ingress/Egress	Fail	Fail	Fail	Boarder line	Pass	Fail	Fail	Fail	Pass	Fail	Fail	Pass	Pass	Pass
Consumer Field Failure				Fail	Fail				Fail			Fail	Fail	Fail

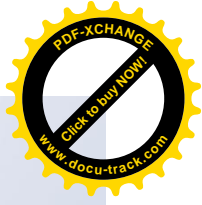


Current Testing Criteria and Evaluation Practices

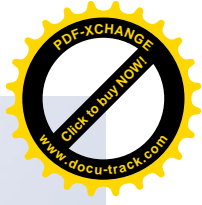


- Similar procedures and requirements to apparel
- Visual evaluation methods
- Subjective Pass/Fail reporting
- No magnification analysis
- No correlation between Taber and Functional
- Significant supply chain losses due to inconsistencies.

Are we putting PANTS ON SEATS?



Each material is unique. Each application is unique.
Neither current 2-D or 3-D testing can predict success.



Recommendations

- Testing Methodologies
 - Textile Failure Mode Effects Analysis Strategies
 - Drape Simulation
 - Performance Correlation
- Business System Modifications
 - Improve Development Time
 - Math Based Engineering
 - Quantative Analyses

