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# **ROBERT ELLER ASSOCIATES, INC.**

**CONSULTANTS TO THE PLASTICS AND RUBBER  
INDUSTRIES**

## **ROLE OF NONWOVENS IN AUTOMOTIVE INTERIOR SURFACE AND CONSTRUCTION APPLICATIONS**

**PRESENTED BY :  
ROBERT ELLER**

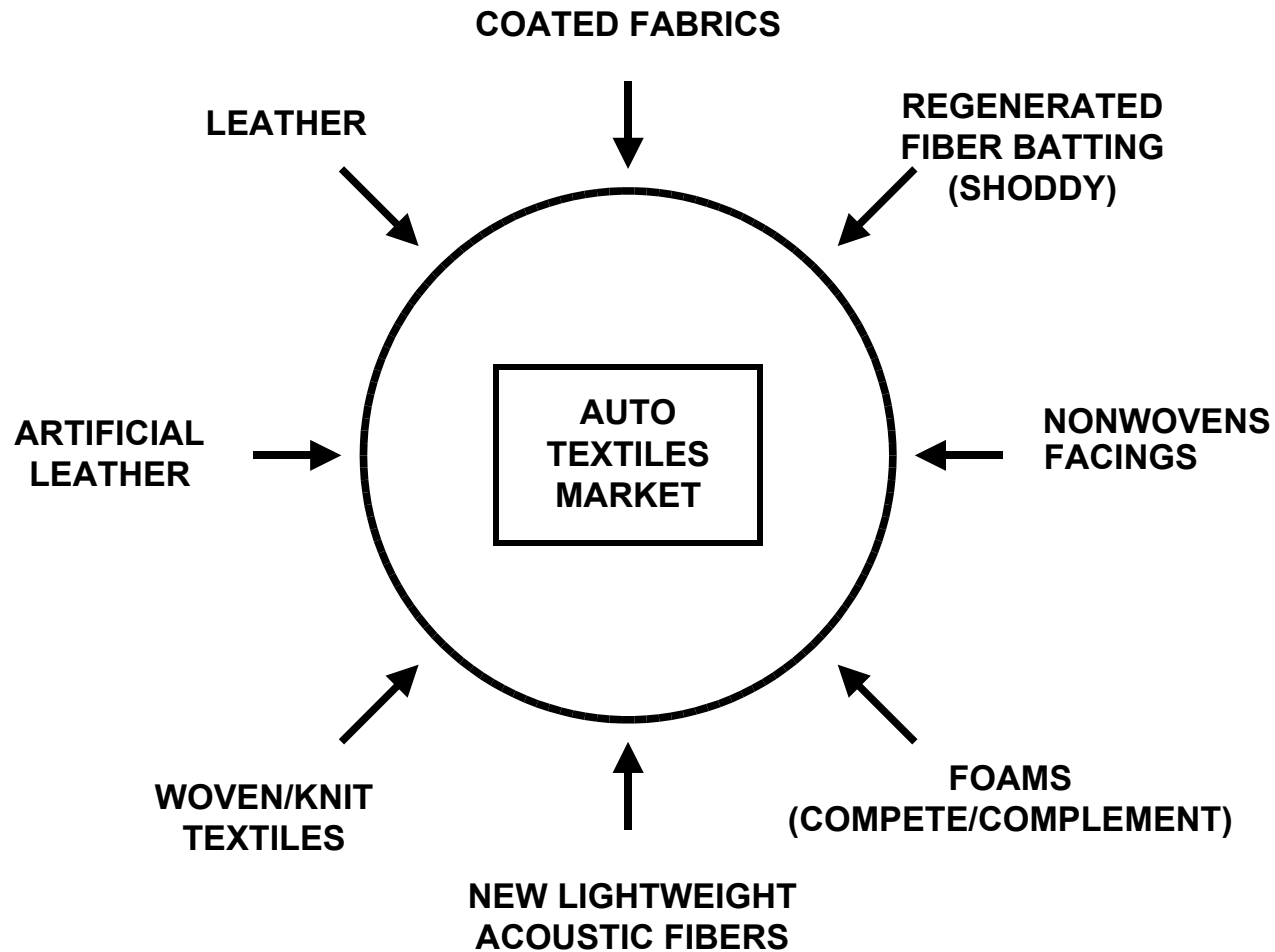
**PREPARED FOR:  
AUTO INTERIORS 2003  
DETROIT, MI**

**MAY 15, 2003**  
papers/ai03

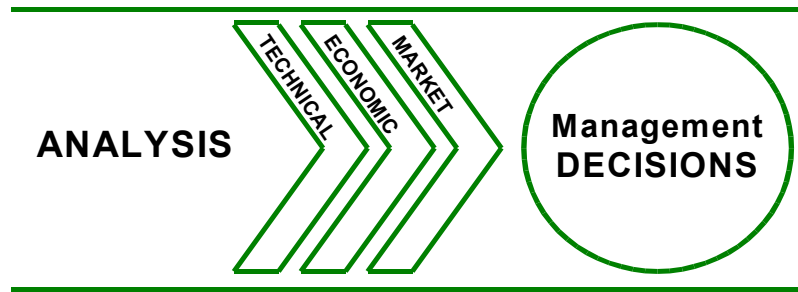
# HIGHLIGHTS

- **THE AUTO INTERIORS MARKET**
- **DRIVING FORCES FOR SUBSTITUTION**
- **MATERIALS/PROCESS TECHNOLOGY SHIFTS → IMPLICATIONS**
- **INTERMATERIALS COMPETITION**
- **EUROPE/NAFTA DIFFERENCES**
- **HEADLINER**
- **FLOOR/ACOUSTICS MODULES**
- **DOOR TRIM**
- **VALUE-ADDED OPPORTUNITIES FOR NONWOVENS**

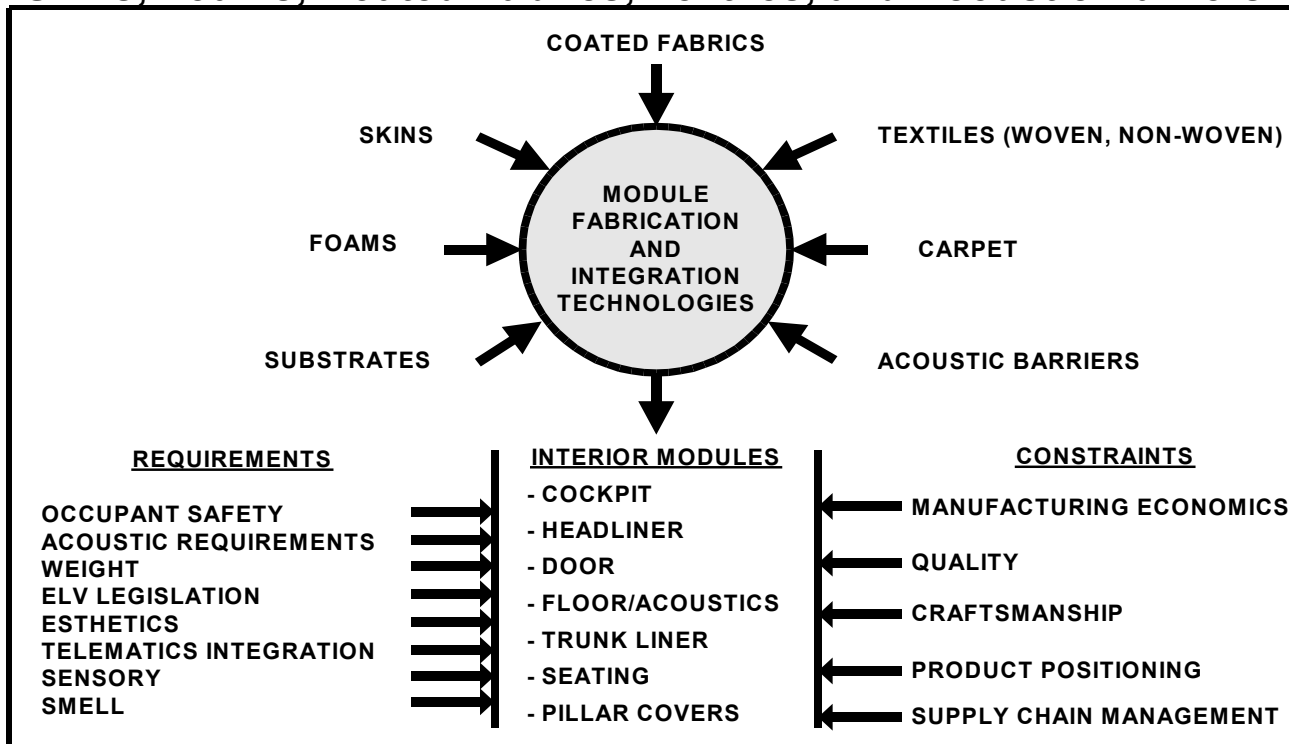
# AUTOMOTIVE TEXTILES . . . AN ECUMENICAL PERSPECTIVE



**SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003**



## Automotive Interior Soft Trim: Skins, Foams, Coated Fabrics, Textiles, and Acoustic Barriers



**Prospectus for a Global Multiclient Industry Analysis**  
**Robert Eller Associates, Inc.**

# **MULTICLIENT PROSPECTUS: NONWOVENS IN AUTOMOTIVE TRIM**

- **TECHNOLOGY,ECONOMICS FOR ADVANCED  
NONWOVENS**
- **ANALYSIS/QUANTIFICATION OF CURRENT/FUTURE  
POTENTIAL**
- **MODULE FABRICATION TECHNOLOGY IMPLICATIONS**
- **EMPHASIS ON NEW NONWOVENS TECHNOLOGY**
- **ALL INTERIOR MODULES**
- **INDUSTRY STRUCTURE IMPLICATIONS**
- **EUROPE/NAFTA**
- **TO BE OFFERED JOINTLY BY ROBERT ELLER  
ASSOCIATES, INC. AND JOHN R. STARR,INC.**
- **PROSPECTUS AVAILABLE**

# **SOME OPERATING HYPOTHESES**

- **NEW NWs TECHNOLOGY → NEW TRIM MARKETS**
- **NW VALUE-ADD OPP'YS : UNDEREXPLOITED**
- **BOTH MATERIAL/PROCESS COST SAVING POSSIBILITIES**
- **MODIFICATION POSSIBLE IN FACE FABRIC AND LAYER CONSTRUCTIONS**
- **ACOUSTICS PROPERTIES CAN BE TAILORED**
- **CURRENT PENETRATION IS PRIMARILY IN HEADLINER, FLOOR SYSTEMS, PACKAGE TRAYS**
- **ONLY 17% OF POTENTIAL IS REALIZED TO DATE**
- **NO: SEATING(LIMITED), DOOR TRIM, PILLAR TRIM, AIRBAG**
- **NWs WILL PARTICIPATE IN NON-STRUCTURAL COMPOSITES**
- **NWs AND FOAMS COMPETE AND COMPLEMENT**

# **NEW TECHNOLOGY NONWOVENS' SUPERIOR ATTRIBUTES**

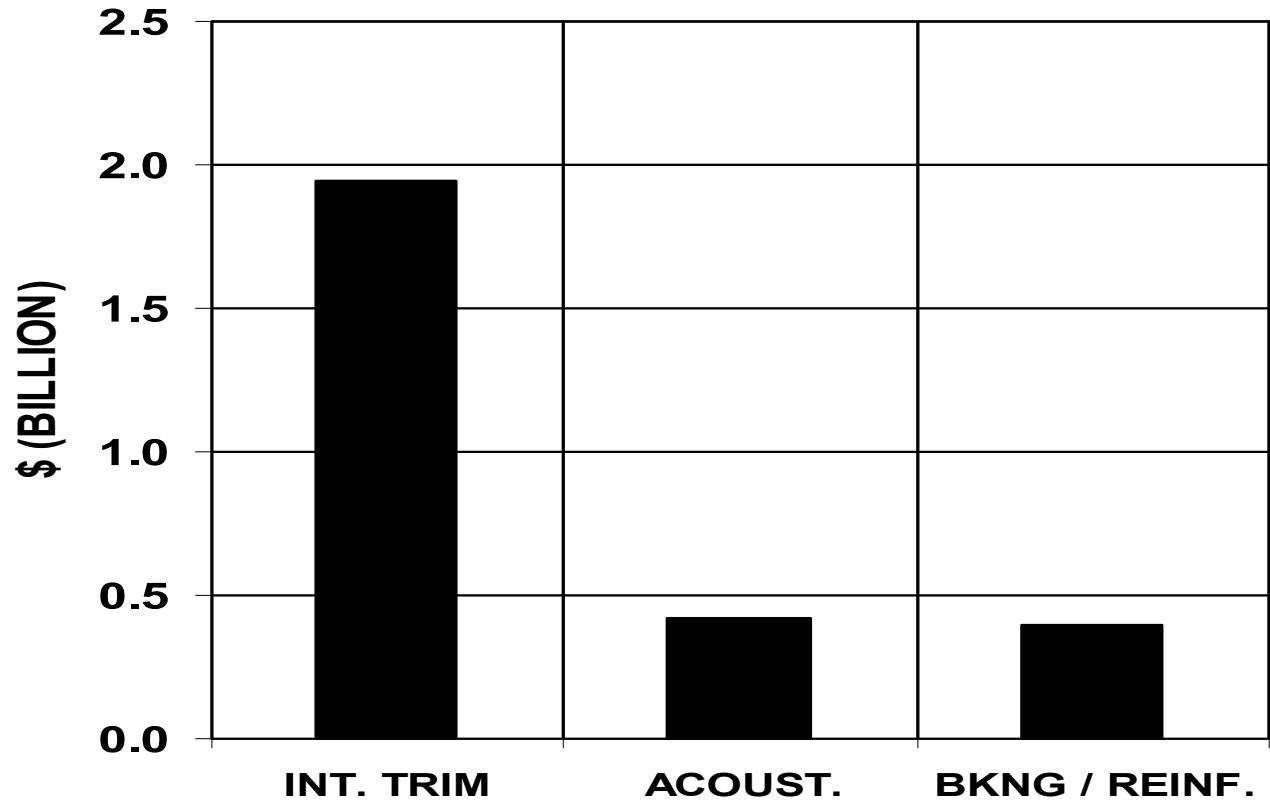
- **IMPROVED PERFORMANCE:**
  - SOFTNESS, TACTILE, CONFORMABILITY/DRAPE**
  - DURABILITY**
- **BREATHABILITY/CONTROLLED POROSITY**
- **ACOUSTIC/THERMAL INSULATION, FILTRATION**
- **UV RESISTANCE**
- **PRINTING, EMBOSSING, DYEABILITY**
- **NON-FRAYING (VS. TEXTILES)**
- **MICRODENIER**
- **FILTRATION**

# SOME NW TARGET MARKETS(NAFTA)

| <b>MODULE</b>               | <b>AREA<br/>(MM SM)</b> | <b>NOTE/PENETRATION</b>                           |
|-----------------------------|-------------------------|---|
| <b>SEATING</b>              | <b>90</b>               | <b>STARTING EUROPE(SIDES)</b>                     |
| <b>FLOOR<br/>/ACOUSTICS</b> | <b>55</b>               | <b>LT WT FIBER OPP'Y</b>                          |
| <b>TRUNK LINER</b>          | <b>41</b>               | <b>13% SHARE</b>                                  |
| <b>HEADLINER</b>            | <b>35</b>               | <b>15% FOR FACE FABRIC</b>                        |
| <b>DOOR TRIM</b>            | <b>32</b>               | <b>START MEDALLIONS<br/>FOAM LAMINATION OPP'Y</b> |
| <b>DASH MAT</b>             | <b>23</b>               | <b>COMPETE WITH PU FOAMS</b>                      |

**SOURCE: ROBERT ELLER ASSOCIATES, INC., SOFT TRIM MUTLICLIENT STUDY**

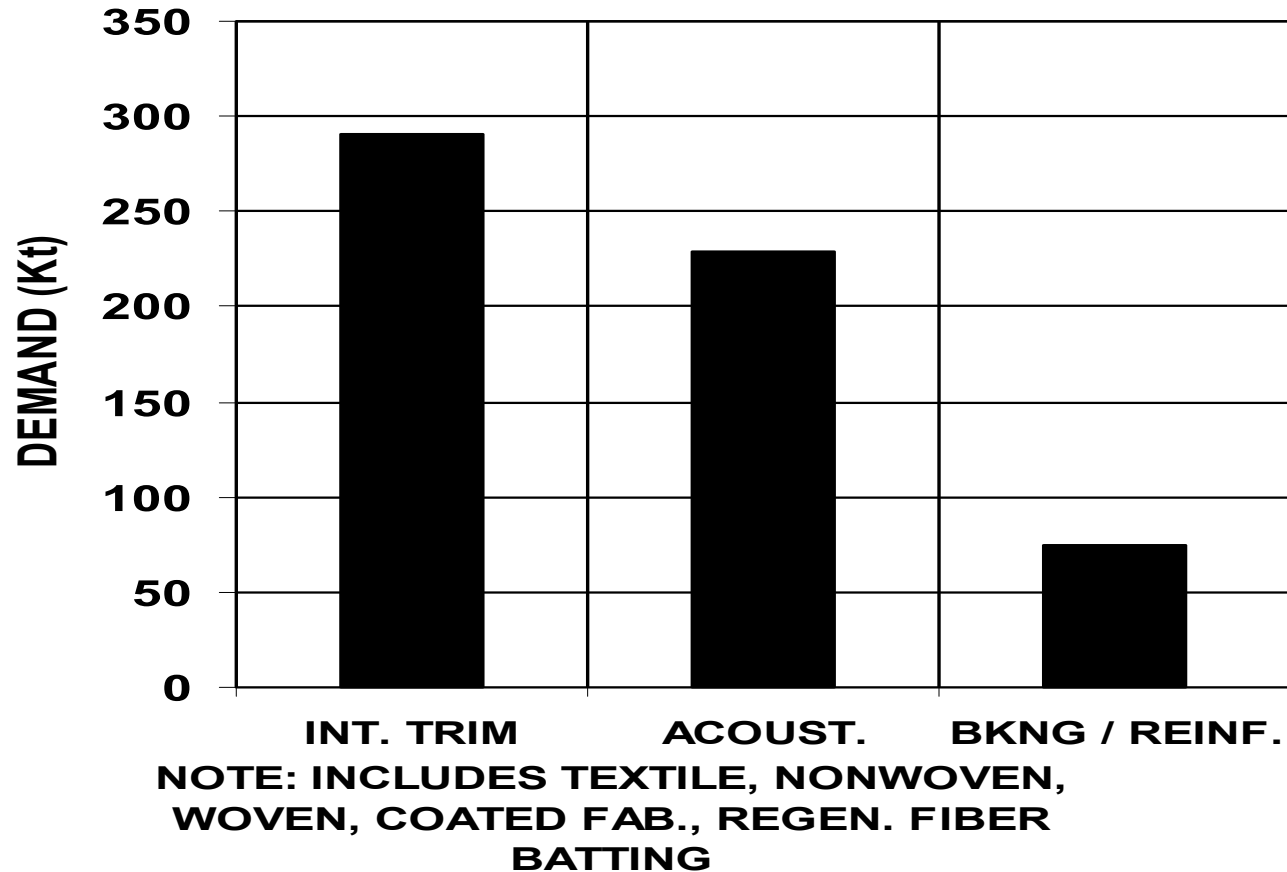
**AUTOMOTIVE FABRICS MARKET VALUE  
(NAFTA/EUROPE), 2002**



**NOTE: INCLUDES TEXTILE, NONWOVEN,  
WOVEN, COATED FAB., REGEN. FIBER BATTING**

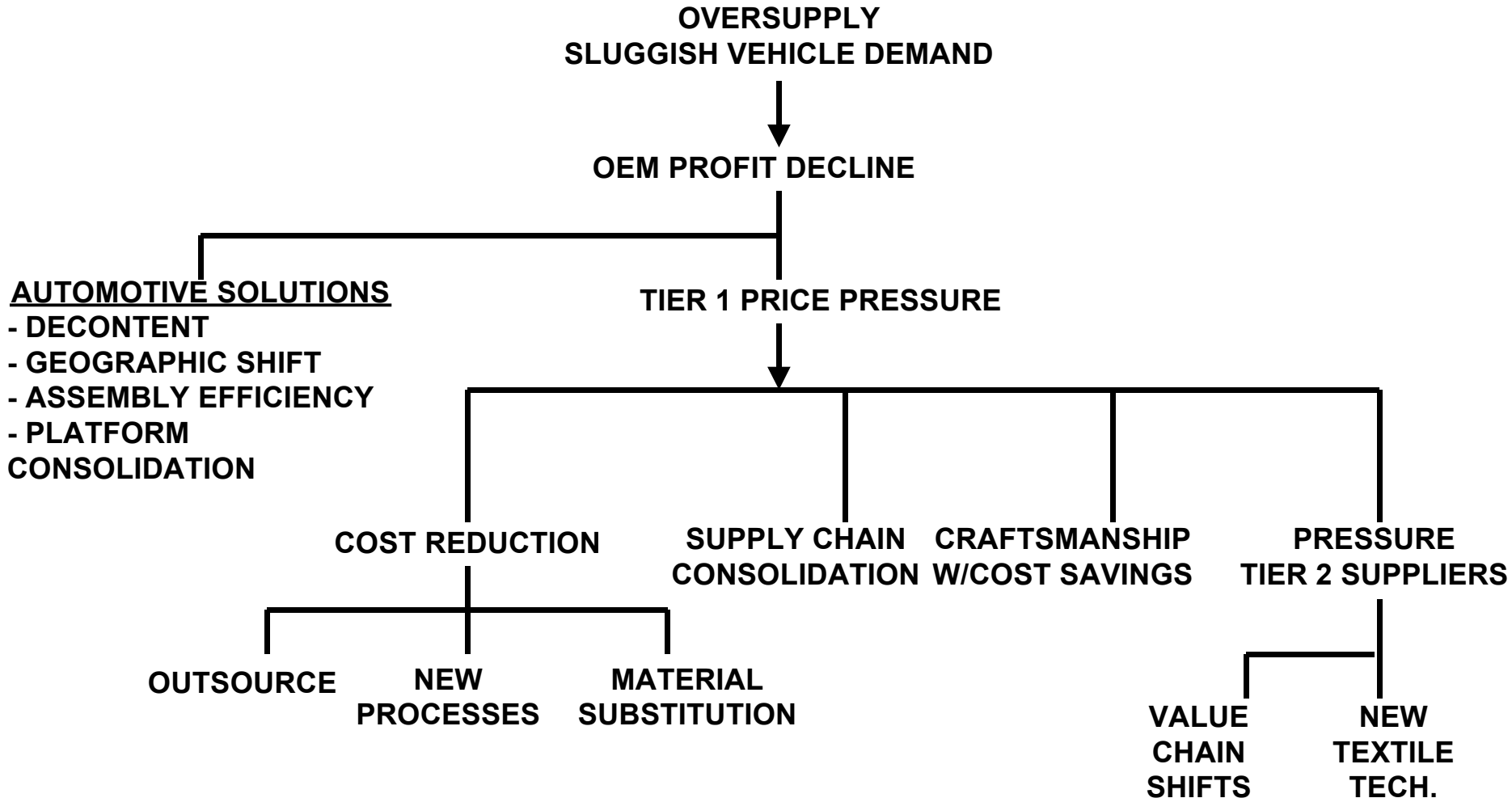
**SOURCE: ROBERT ELLER ASSOCIATES, INC.,  
JOHN R. STARR INC.**

**AUTOMOTIVE FABRICS MARKET SIZE  
(NAFTA/EUROPE), 2002**



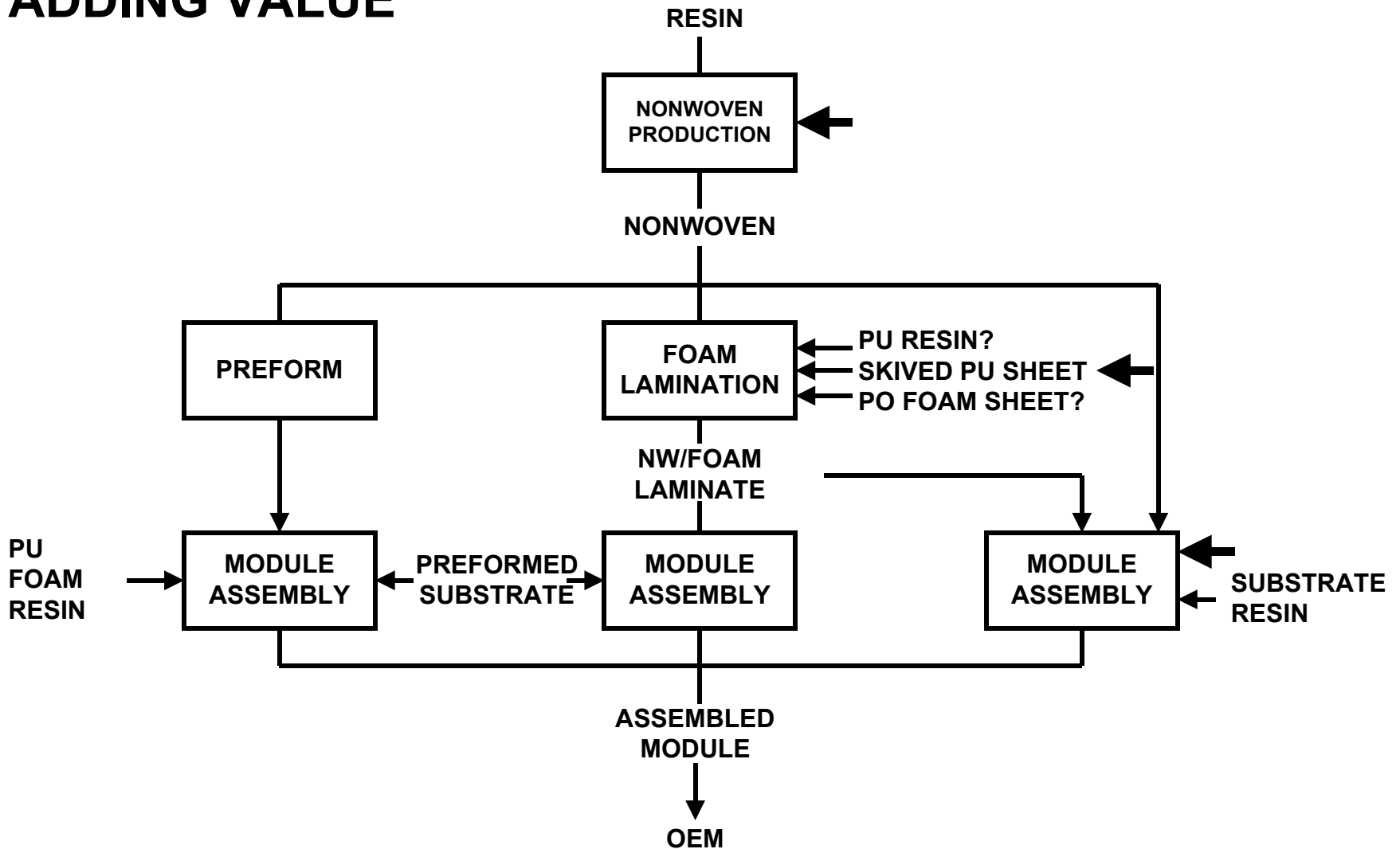
**SOURCE: ROBERT ELLER ASSOCIATES, INC.,  
JOHN R. STARR INC.**

# OEM/SUPPLIER DYNAMICS



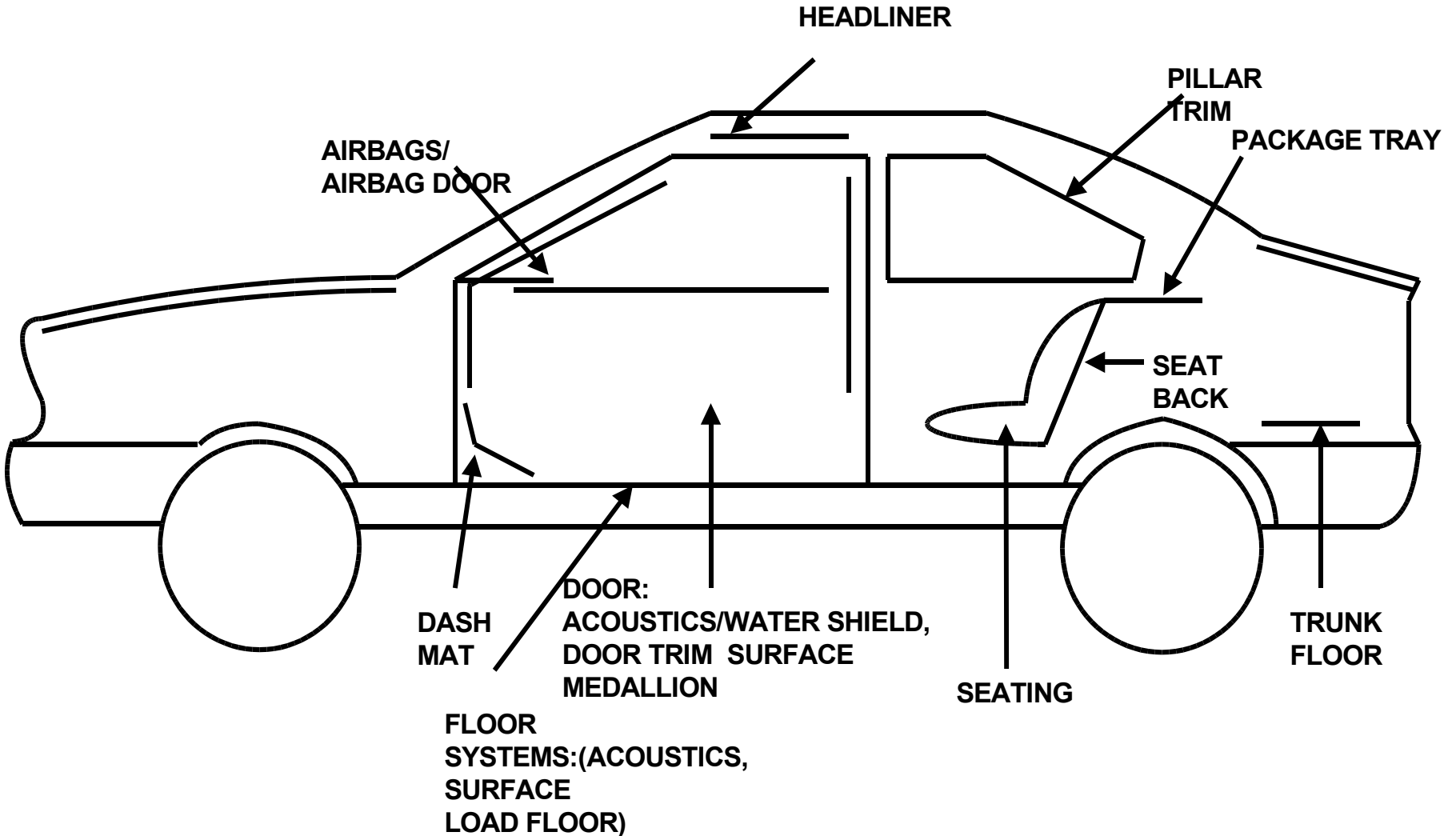
SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003

# NONWOVEN PATH-TO-MARKET OPPORTUNITY FOR ADDING VALUE



NOTE: **➔** = VALUE ADD OPPORTUNITIES FOR NONWOVENS

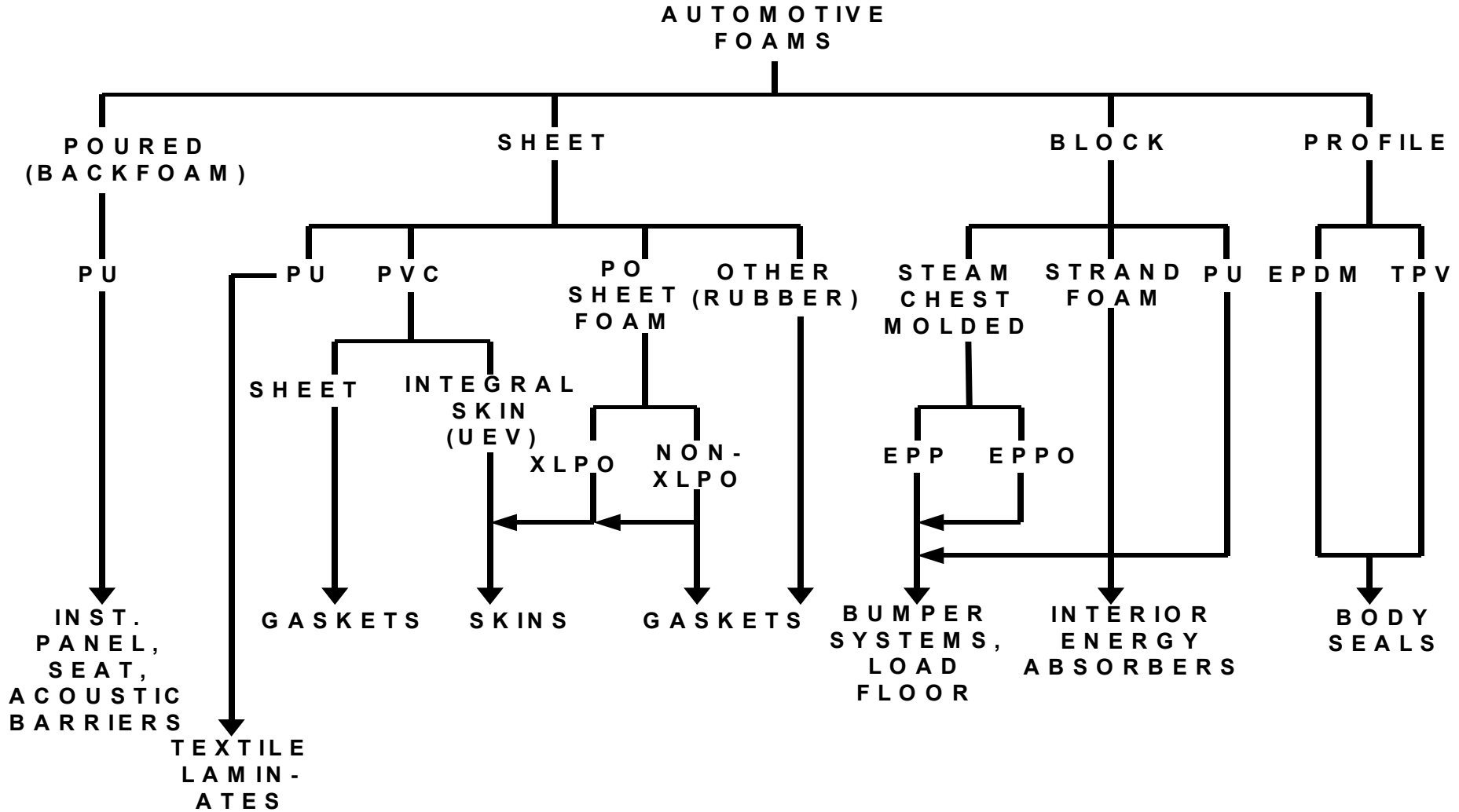
# AUTOMOTIVE TRIM TARGETS FOR NONWOVENS



SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003

foam tgts 02.vsd

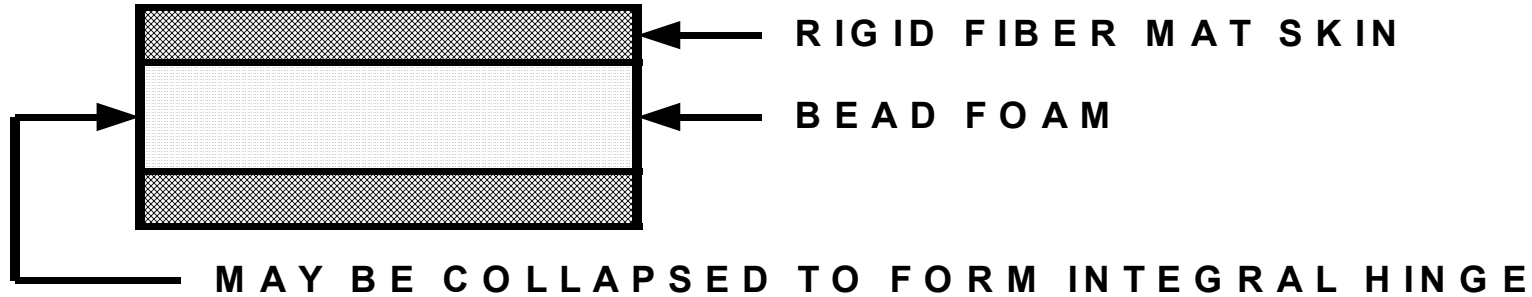
# AUTOMOTIVE FOAM FAMILIES AND EXAMPLE APPLICATIONS



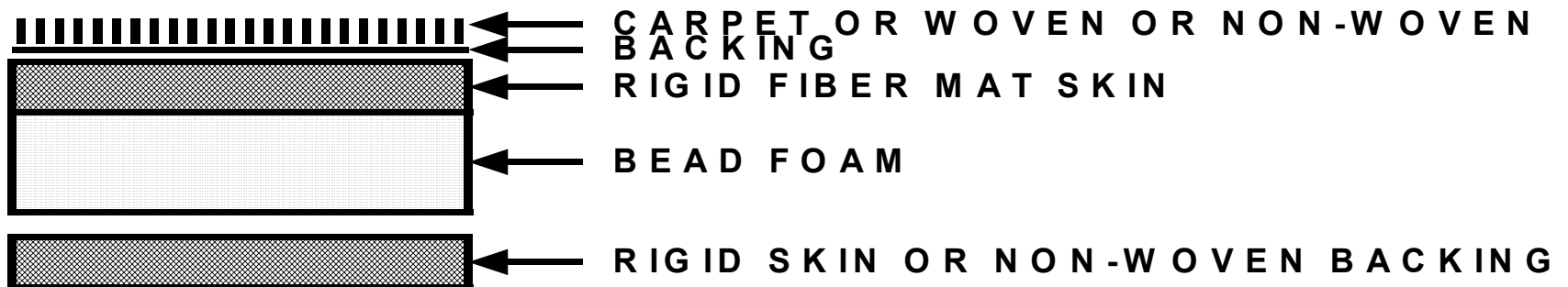
SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003  
 foam families 02.vsd

# RIGID SEMI-STRUCTURAL FOAM SANDWICH STRUCTURE

BARE:



CARPET/NON-WOVEN/WOVEN TEXTILE LAMINATE:



SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003

rs foam sandwich 02.vsd

# DRIVING FORCES FOR NONWOVEN GROWTH

| DRIVING FORCE          | ACTUAL OR POTENTIAL CHANGE   | MATERIALS/PROCESS IMPLICATIONS AND EXAMPLES                                     |
|------------------------|--|---|
| PROCESS COST REDUCTION | <b>MODULARIZATION</b><br>-PARTS CONSOLIDATION<br>-SANDWICH CONSOL. | <b>ON-BOARD ACOUSTIC BARRIERS</b><br>-"POPULATED" PANELS<br>-ON-BOARD ACOUSTICS |
| ACOUSTIC PERFORMANCE   | -REDUCED NOISE<br>-EARLY ACOUST INVOLV.<br>-TAILORED ACOUSTICS     | -ELIM. HOT POUR PU FOAM SEATING<br>-ENHANCED MICRODENIER POSITION               |
| INTERIOR EMISSIONS     | -NO-SMELL INTERIOR<br>-REDUCED V.O.C./FOG                          | -REDUCED COATINGS<br>-MATERIAL SHIFT<br>-BINDERS ?                              |
| OCCUPANT SAFETY        | <b>HEAD/SIDE IMPACT REGULATIONS</b>                                | -ENERGY ABSORBING FOAMS GROWTH<br>-AIRBAG SOLUTIONS                             |
| END OF LIFE            | -ELV LEGISLATION   | -MONOMATERIAL SANDWICHES<br>-RECYCLATE CONTENT, NFCs                            |
| FLOOR SPACE MANAGEMENT | <b>SEMI-STRUCTURAL SANDWICHES</b>                                  | -AZDEL SUPERLITE<br>-BEAD FOAMS<br>-NONWOVENS                                   |
| UTILITY FUNCTION/LOOK  | -NON-CARPET FLOOR<br>-INVISIBLE AIRBAG DOORS                       | -IMPROVED ESTHETICS<br>- CRAFTMANSHIP   |

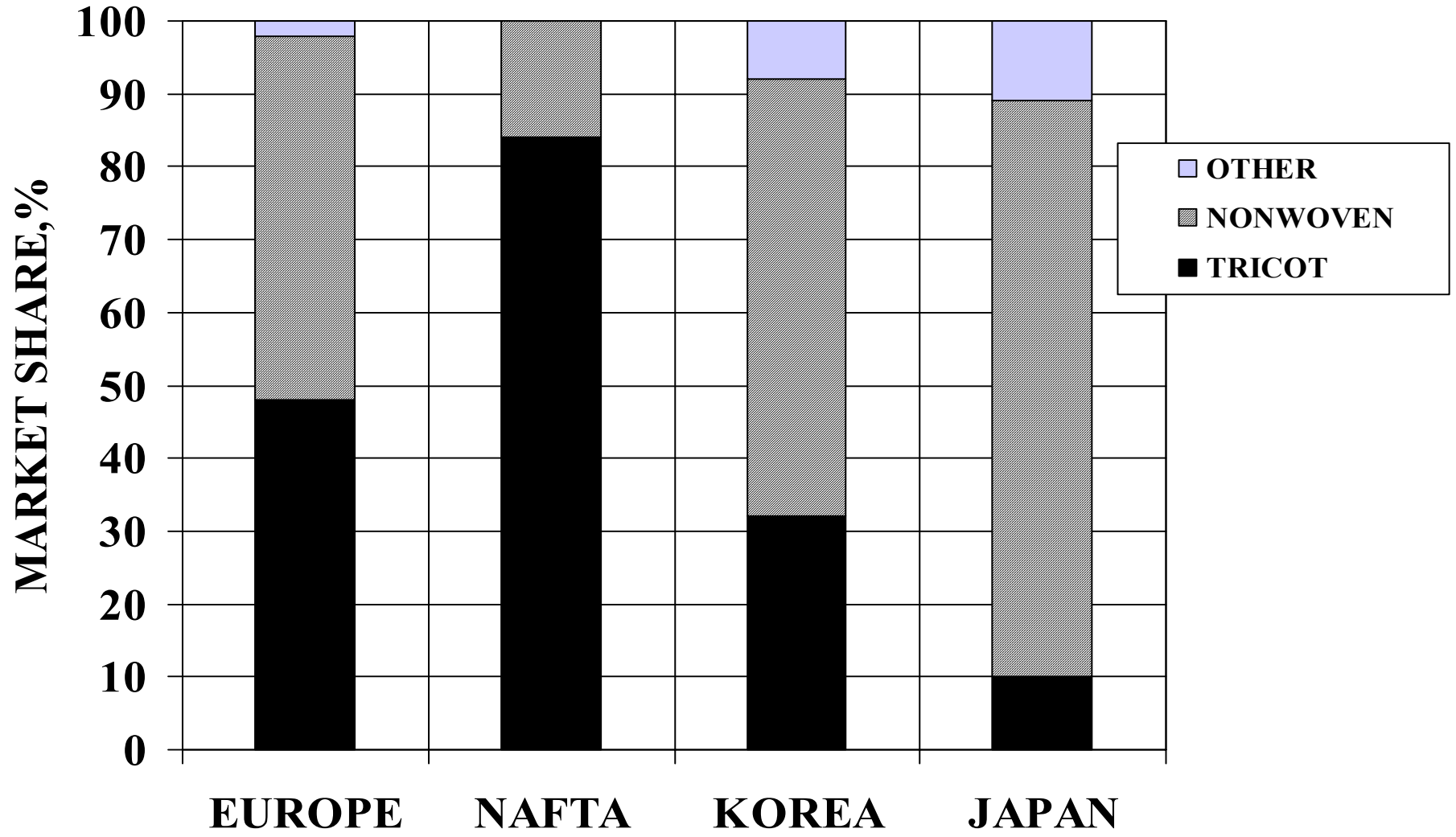
# EUROPE/NAFTA DIFFERENCES

| <b>PARAMETER</b>                      | <b>NON WOVEN STATUS</b>                          |
|---------------------------------------|--|
| <b>HEADLINER FACE FABRIC</b>          | <b>HIGHLY PENETRATED - EUROPE</b>                |
| <b>FLOOR/SURFACE</b>                  | <b>HIGHLY PENETRATED- EUROPE</b>                 |
| <b>ACOUSTIC PERFORMANCE PRESSURES</b> | <b>SAME</b>                                      |
| <b>COST SAVE PRESSURES</b>            | <b>SAME?</b>                                     |
| <b>WEIGHT SAVE PREMUIIM</b>           | <b>HIGHER IN EUROPE</b>                          |
| <b>POLYOLEFIN PRESSURES</b>           | <b>HIGHER IN EUROPE<br/>FAVORS MONOMATERIALS</b> |
| <b>WT. SAVE VALUE</b>                 | <b>HIGHER IN EUROPE</b>                          |

# HEADLINER

- **FACE FABRICS: NAFTA HAS LOWEST NW PENETRATION(15%→ 20% IN 2004,FORD,GM)**
- **TRICOT WILL DECLINE**
- **LOW VALUE MODULE**
- **PROFIT IS IN THE OVERHEAD SYSTEMS**
- **COST REDUCTION MAJOR DRIVER**
- **PP NONWOVEN OPPORTUNITY?**
- **HYDROENTANGLED NWs→ SHARE GAIN**
- **SUBSTRATES→PP FOAMS, AZDEL SUPERLITE®**
- **GLASS/PU LOSING MARKET SHARE**
- **EUROPEAN PENETRATION→NW GROWTH**
- **ACOUSTICS ARE CRITICAL**
- **ROLE FOR MICRODENIER NWs**

# NON WOVEN HEADLINER SHARES

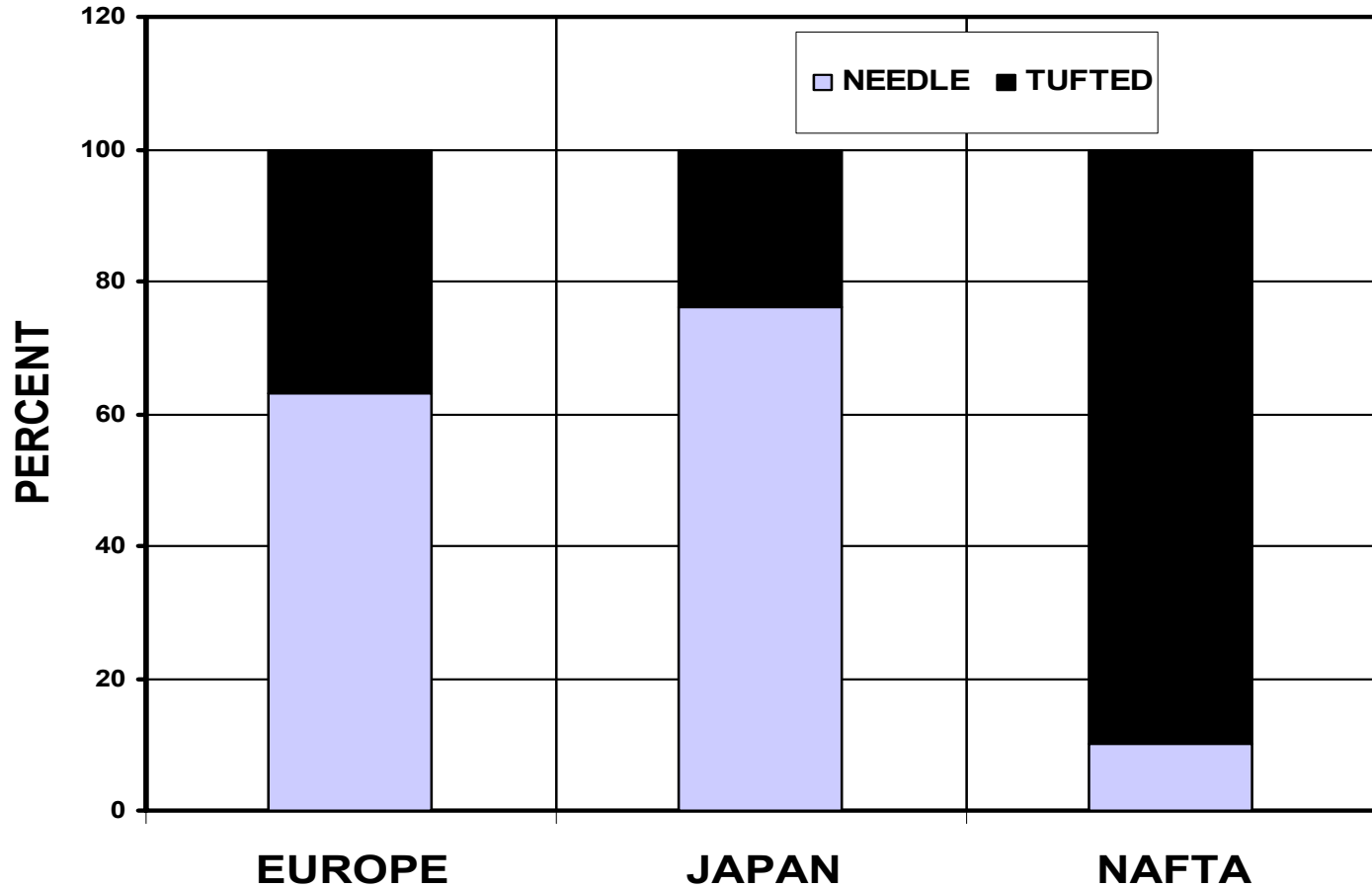


SOURCE: FREUDENBERG VITECH

# FLOOR/ACOUSTICS

- **3-5 LAYERS**
- **INCREASED FUNCTION(E.G. LOAD FLOORS)**
- **SPUNBOND PET HAS 43% SHARE IN NAFTA BACKING**
- **IMPROVED ACOUSTICS REQUIRED**
- **HEAVY LAYER ELIMINATION→ NEW CONSTRUCTIONS**
- **HIGH NW PENETRATION IN EUROPE**
- **LT. WT. FIBER WILL CHANGE CONSTRUCTION**
- **FIBER/FOAM COMPETITION IN UNDERLAY**
- **ABILITY TO VARY IN XY AND Z-PLANES IS NONWOVEN ADVANTAGE**
- **MONOMATERIALS CONSTRUCTION OPPORTUNITY**

## COMPARISON OF REGIONAL TRENDS IN AUTOMOTIVE CARPET (2002)



**SOURCE: ROBERT ELLER ASSOCIATES, INC.;**  
**SOFT TRIM MULTICLIENT STUDY**

# INCUMBENTS/CHALLENGERS IN AUTO ACOUSTICS

| INCUMBENT        | BARRIER TYPE |          | CHALLENGER                                  | EXAMPLE LOCATION                     |
|------------------|--------------|----------|---|--------------------------------------|
|                  | DAMP         | INSULATE |   |                                      |
| GLASS FIBER      |              | X        | -PLASTICS/CELL.<br>-NONWOVENS               | HOOD, OH SYSTEM                      |
| HEAVY LAYER      | X            |          | -METALLOCENES<br>-ELIMINATE →LT. WT. FIBERS | DASH, FIREWALL, FLOOR, FENDER LINERS |
| MASTIC           | X            |          | -BETTER MASTIC<br>-ELIMINATE?               | FLOOR                                |
| PU FOAM (SKIVED) |              | X        | POLYOLEFIN SHEET FOAMS                      | FLOOR, DASH, OH SYSTEM               |
| PU FOAM (POURED) |              | X        | EPP BEAD FOAMS                              | FLOOR PANELS                         |
| REGEN. FIBERS    |              | X        | TAILORED FIBERS                             | FLOOR, DOOR                          |

# ACOUSTIC BARRIER MATERIALS IN AUTOMOTIVE FLOORING

| MATERIALS                                    | CURRENT SHARE % |           | NOTE  |
|--|-----------------|-----------|---|
|  | EUR             | NAFTA     |   |
| <b>REGENERATED CELLULOSE FIBERS (SHODDY)</b> | <b>20</b>       | <b>50</b> | <b>SHODDY USE WILL DECLINE</b>                |
| <b>PU FOAM</b>                               | <b>75</b>       | <b>50</b> | <b>TUNED ACOUSTICS ACCELERATE PENETRATION</b> |
| <b>OTHER</b>                                 | <b>5</b>        | <b>5</b>  |   |
| <b>AZDEL SUPERLITE</b>                       |                 |           |   |
| <b>PO FOAMS</b>                              |                 |           |   |
| <b>PET/PP FIBERS</b>                         |                 |           | <b>LT. WT FIBERS</b>                          |
| <b>NATURAL FIBERS</b>                        |                 |           |   |

# **DOOR TRIM**

- **VERY LOW PENETRATION RATE**
- **TARGETS ARE:**
  - MEDALLIONS(PO FOAM LAMINATION OPP'Y)**
  - ACOUSTIC PADS/WATER SHIELDS**
  - FACE FABRICS**
- **CRAFTSMANSHIP OPPORTUNITY**
- **3D FORMING IS CHALLENGE**
- **IN MOLD FORMING OPPORTUNITY**
- **INTEGRATION WITH LOW PRESSURE MOLDING**
- **TEXTILE USUALLY MATCHES SEAT**

# NONWOVEN COMPETITIVE INTERFACES

| <b>MODULE</b>                    | <b>INCUMBENT</b>                           | <b>NOTE</b>  |
|----------------------------------|--|--|
| <b>FLOOR:</b>                    |  |  |
| <b>CARPET</b>                    | <b>TUFTED<br/>NYLON(NAFTA)</b>             | <b>HI NW PENET. (EUROPE)</b>   |
| <b>BACKING</b>                   |  | <b>SPUNBOND PET HAS<br/>43%(NAFTA)</b>                                       |
| <b>UNDERLAY</b>                  | <b>SHODDY, PU FOAM</b>                     | <b>LT. WT FIBER/FOAM<br/>COMPETITION</b>                                     |
| <b>HEADLINER<br/>FACE FABRIC</b> | <b>TRICOT</b>                              | <b>15%(NAFTA) INCREASING</b>   |
| <b>DOOR<br/>MEDALLION</b>        | <b>WOVENS, KNITS<br/>COATED FABRIC,</b>    | <b>NW STARTING (EUROPE)<br/>PO FOAM LAM. OPP'Y<br/>PP IS MAJOR SUBSTRATE</b> |
| <b>SEATING SIDE<br/>PANELS</b>   | <b>PVC COATED FABRIC<br/>WOVENS, KNITS</b> | <b>NW STARTING(EUROPE)<br/>TPO COATED FABRIC<br/>START(EUROPE)</b>           |

# VALUE-ADDED DECORATION WITH NONWOVENS

TPE  
VENEER:



IN-MOLD DECORATION (IMD)  
BACK-PRINTED LAMINATES



IN-MOLD DECORATION (IMD):  
CO-EX FILM/SHEET



**SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003**

# **WHAT WILL DRIVE NONWOVEN GROWTH?**

- **CONTINUED SEVERE PRICE PRESSURE**
- **MATERIAL COST SAVE**
- **PROCESS COST SAVE**
- **PERFORMANCE IMPROVEMENT**
  - UV RESISTANCE**
  - VOC/FOG REDUCTION**
  - OCCUPANT SAFETY**
  - ACOUSTICS**
  - FILTRATION**
- **MONOMATERIAL CONSTRUCTION**
- **PO SHEET FOAM/TEXTILE LAMINATION**
- **SURFACE ESTHETICS IMPROVEMENT**
- **VALUE ADD OPPORTUNITIES**

# **VALUE ADDED OPPORTUNITIES FOR AUTOMOTIVE NONWOVENS**

- **IMPROVED SURFACE ESTHETICS**
- **AVOID PREFORMS**
- **IN-MOLD FABRICATION**
- **CRAFTSMANSHIP WITH COST SAVINGS**
- **DIRECT PU FOAM LAMINATION**
- **POLYOLEFIN FOAM LAMINATION**
- **IMPROVED/TAILORED ACOUSTICS**
- **IMPROVED PP NONWOVENS**
- **TARGET ALL-PP CONSTRUCTIONS**
- **X,Y AND Z-AXIS MODIFICATION**

# SUMMARY

- **MATERIAL/PROCESS DRIVERS FAVOR NONWOVENS:**
  - ACOUSTIC REQUIREMENTS, WT. SAVINGS**
  - PROCESS COST REDUCTION**
  - MATERIALS COST REDUCTION**
- **NONWOVENS AND FOAMS WILL COMPETE**
- **CONTINUED SEVERE PRICE PRESSURES LIKELY**
- **RECYCLING - NOT U.S. DRIVER, SIGNIFICANT EUROPE DRIVER**
- **EUROPE- EARLY TECHNOLOGY LEADER**
- **EURO/NAFTA USE PATTERN WILL CONVERGE**
- **SYSTEMS/PROCESS TECHNOLOGIES – ADD VALUE**
- **HEADLINER, FLOOR-MAJOR EARLY TARGETS**
- **SEAT, DOOR TRIM, PACKAGE TRAY,PILLAR TRIM-NEXT TARGETS**
- **BARE ROLL GOODS VS SYSTEM SUPPLIER ROLE?**
- **POTENTIAL UNDER-EXPLOITED**

# **ABOUT ROBERT ELLER ASSOCIATES, INC.**

- **TECHNICAL, MARKET AND ECONOMIC ANALYSIS IN SUPPORT OF MANAGEMENT DECISION**
- **AUTOMOTIVE – SPECIALTY**
- **OFFICES IN US AND EUROPE**
- **RECENTLY COMPLETED SOFT TRIM MULTICLIENT STUDY**

# **ABOUT JOHN R. STARR, INC.**

- **MANAGEMENT AND TECHNICAL CONSULTING FIRM SPECIALIZING IN NONWOVEN PRODUCTS FIELD, WORLDWIDE FOR 30 YEARS.**
- **AUTOMOTIVE NONWOVEN AN IMPORTANT PART OF THE PRACTICE.**
- **PARTICULAR FOCUS ON LEADING EDGE NONWOVEN TECHNOLOGIES WITH POTENTIAL TO DISPLACE OTHER NONWOVENS, WOVENS, KNITS AND OTHER MATERIALS**