ANALYSIS TECHNICAL ECONOMIC MARKET Management DECISIONS

Robert Eller Associates, Inc.

CONSULTANTS TO THE PLASTICS AND RUBBER INDUSTRIES

OPPORTUNITIES FOR ADVANCED TECHNOLOGY NONWOVENS IN AUTO INTERIORS AND EXTERIORS

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PRESENTED AT:
TECHTEXTIL SYMPOSIUM NORTH AMERICA 2006
Atlanta, GA
March 31, 2006
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PRESENTATION HIGHLIGHTS

- **AUTO INDUSTRY OVERVIEW**
- **AUTO SUPPLY CHAIN IMPLOSION/ IMPLICATIONS FOR NONWOVENS**
- **NONWOVEN PATHS-TO-MARKET**
- **GLOBAL NONWOVENS DIFFERENCES**
- **COMPETITIVE MATERIALS/PROCESS COUPLES**
- **VALUE ADD STRATEGIES**
- **TARGET MODULES**

SOURCES/REFERENCES

- **ADVANCED TECHNOLOGY NONWOVENS MULTICLIENT: ROBERT ELLER ASSOCIATES, INC./JOHN R. STARR INC.**
- **AUTOMOTIVE INTERIOR SOFT TRIM MULTICLIENT: ROBERT ELLER ASSOCIATES INC.**

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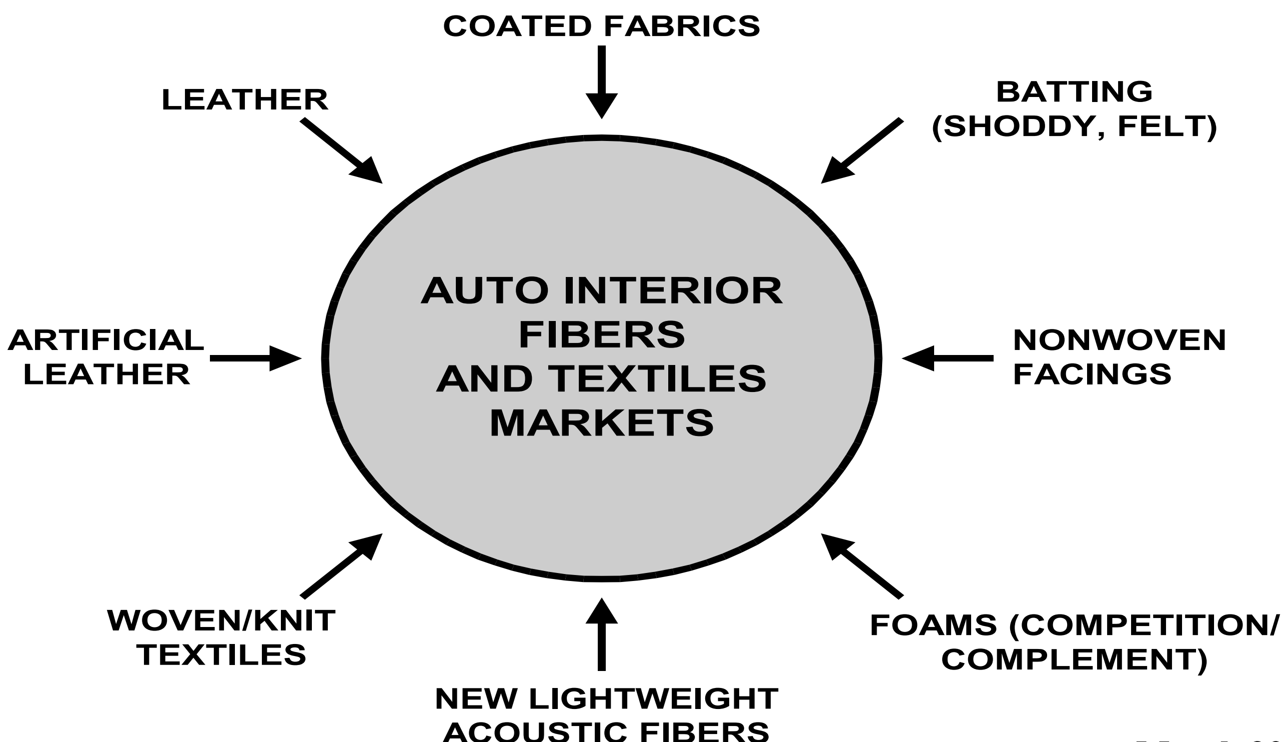
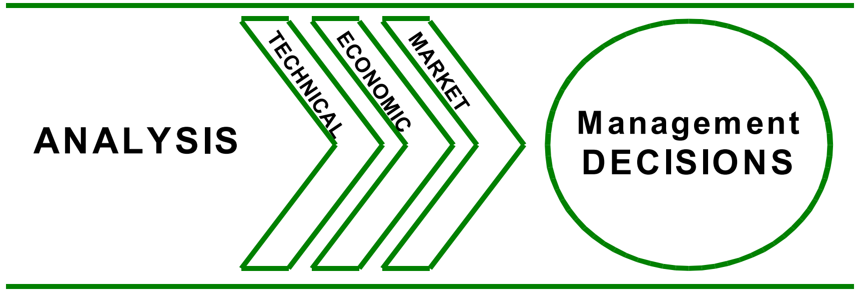
Opportunities for Advanced Technology Nonwoven Fabrics for Automotive Interior Surface and Construction Applications in NAFTA and Europe

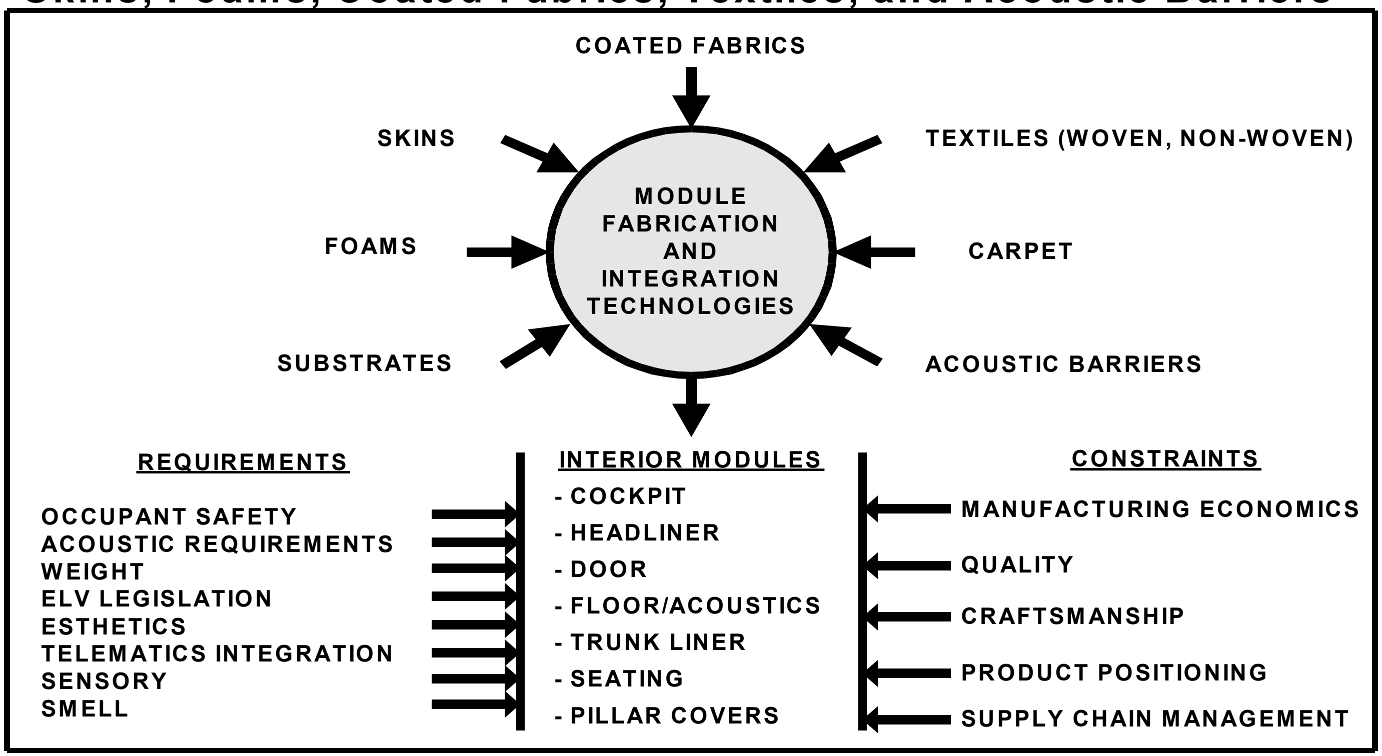


March 2004



Automotive Interior Soft Trim:

Skins, Foams, Coated Fabrics, Textiles, and Acoustic Barriers



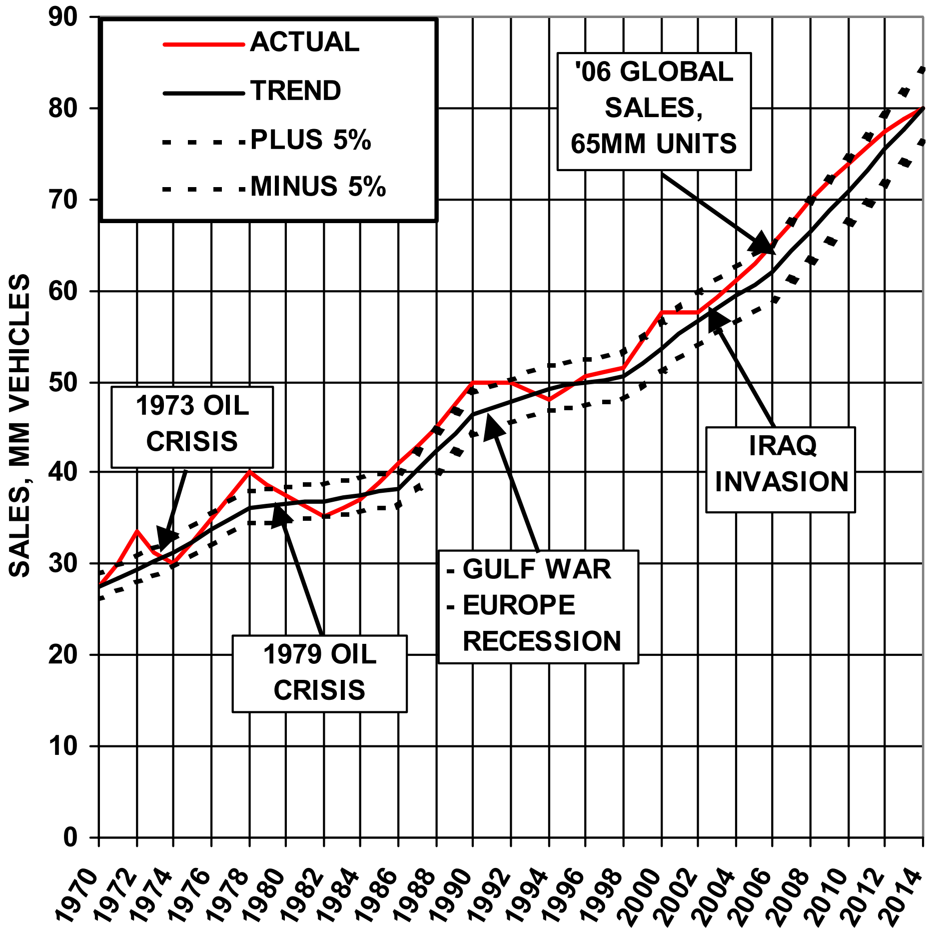
OPERATING HYPOTHESES

- **VEHICLE PRICES CONTINUE DOWNWARD**
- **THE SUPPLY CHAIN WILL BE RESHAPED**
- **GLOBAL AUTOPLASTICS/TEXTILES TECHNOLOGY CONVERGENCE (U.S. 3-5 YEAR LAG BEING REDUCED)**
- **SEVERE MATERIALS PRICE PRESSURE CONTINUES**
- **SEVERE PROFITABILITY PRESSURES DRIVE NW SUPPLIERS TO SEEK VALUE ADD STRATEGIES**
- **ACOUSTICS PERFORMANCE AND LIGHT-WEIGHTING CONTINUE AS DRIVING FORCES**
- **THE NONWOVENS MATERIALS/PROCESS COUPLE CAN OFFER SYSTEMS COST SAVINGS <u>AND</u> VALUE ADD OPPORTUNITIES**
- **MONOMATERIALS CONSTRUCTIONS PREFERRED**
- **POLYOLEFIN-BASED MODULE CONSTRUCTION CONTINUES SHARE GAIN**
- **PLASTOMER-BASED ELASTIC NONWOVENS ENTERING MARKET**
- **MAJOR CONSTRUCTION SHIFTS (TRUNK, FLOOR, HEADLINERS, DOOR TRIM)**

GLOBAL AUTO INDUSTRY CHARACTERISTICS

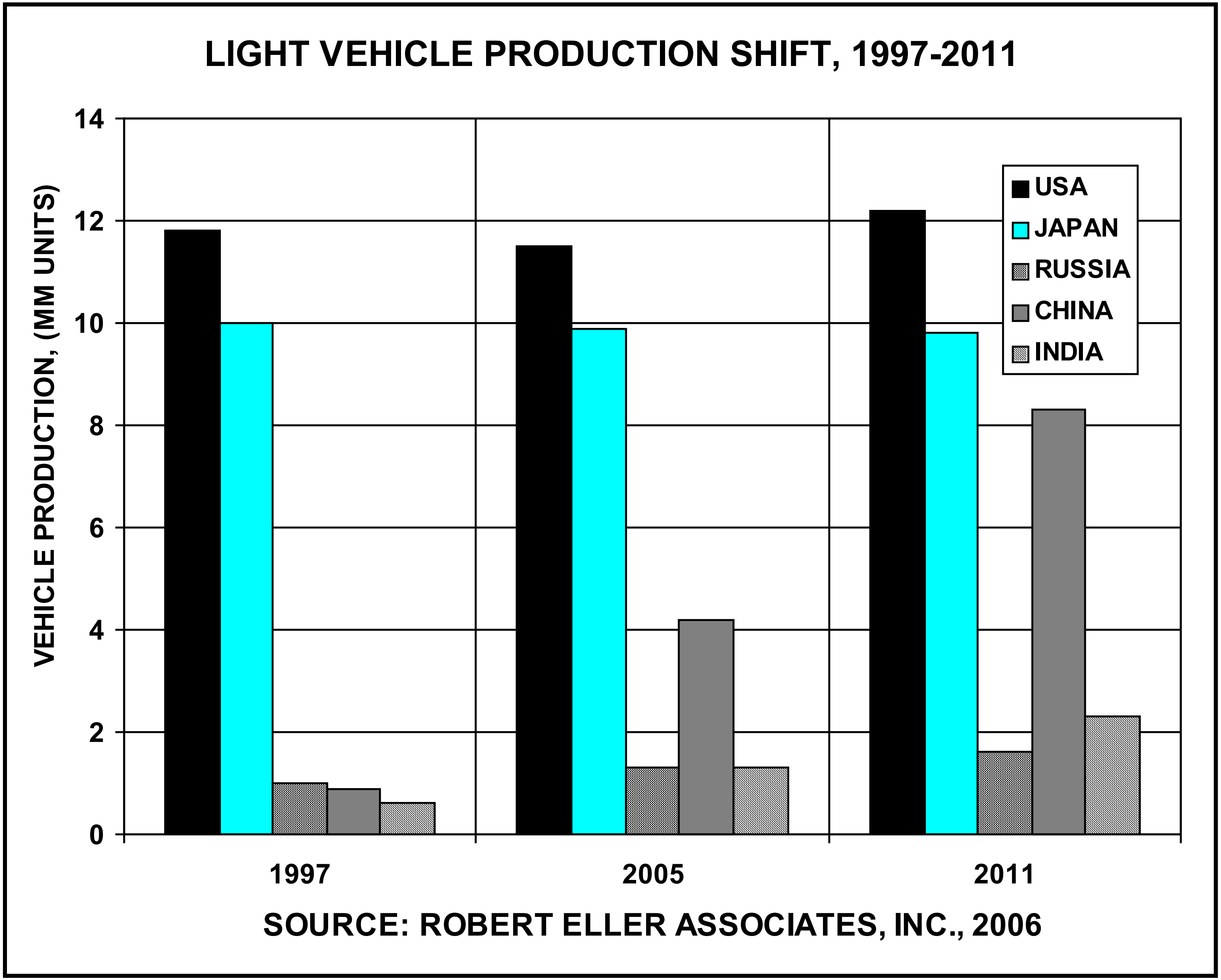
- **PRODUCTION GROWTH 3%/YR. THROUGH 2012**
- **DEMAND HISTORY +/- 5% OFF TREND SINCE 1970**
- **GLOBAL OVERCAPACITY**
- **STAGNANT U.S./EUROPE DEMAND**
- **DEMAND GROWTH SHIFT TO ASIA PACIFIC**
- **MINI/SMALL CAR (B SEGMENT) SHARE GAIN**
- **GROWTH OF DOMESTIC ASIA PACIFIC OEMs**
- **SHARE LOSS BY U.S./EUROPEAN DOMESTIC OEMs**
- **"HIGH" U.S. FUEL PRICES CONTINUE**
- **NO MAJOR U.S. ENERGY POLICY SHIFT THRU 2010**

GLOBAL LIGHT VEHICLE PRODUCTION TREND LINE

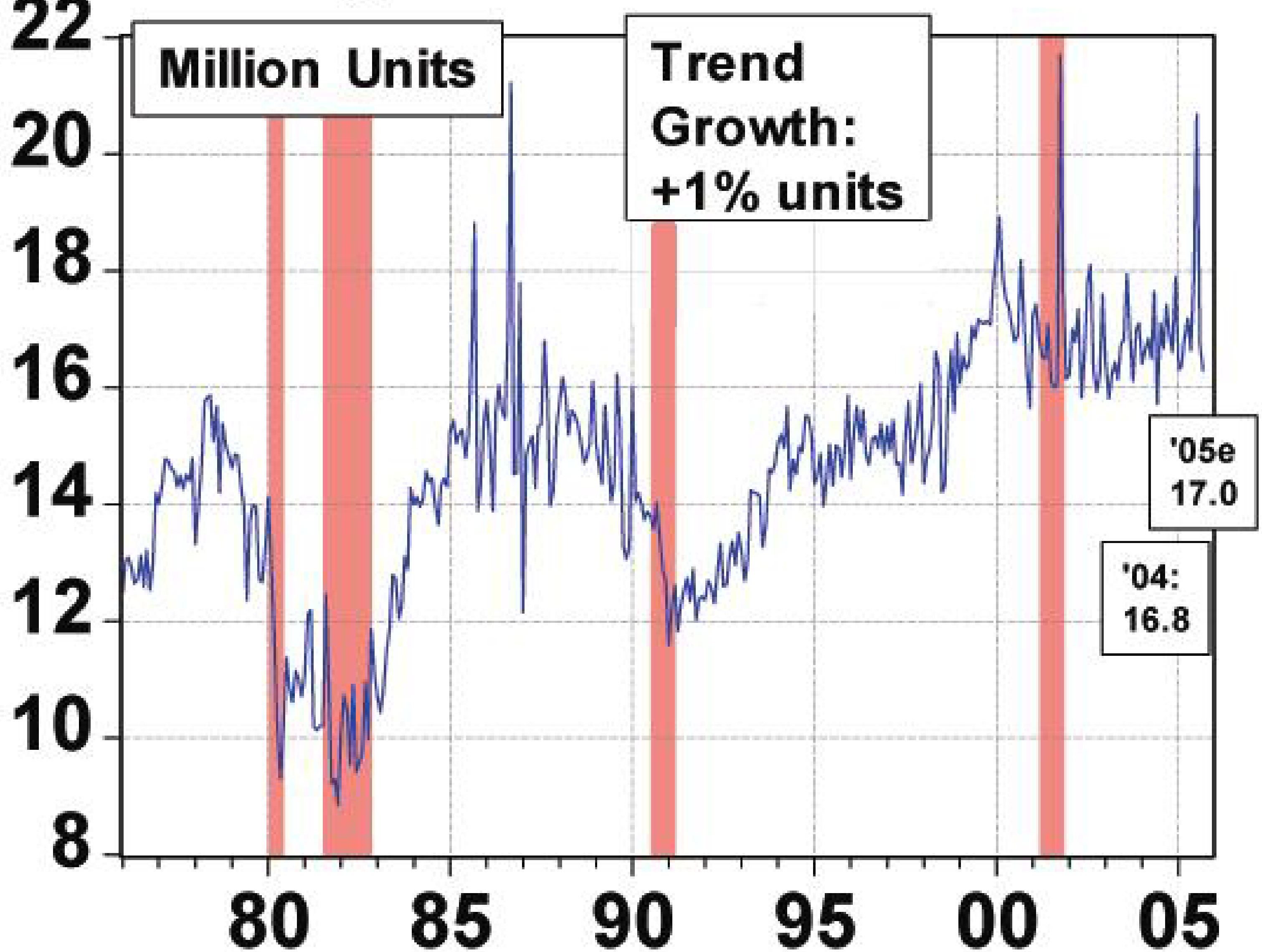


SOURCE: GM, WARDS, ROBERT ELLER ASSOCIATES, INC., 2006

- 2011 GLOBAL SALES COULD REACH 75MM UNITS
- GLOBAL AAG = 3%/YR.
- ASIA PACIFIC GROWTH 7.5-8.5%/YR.?
- WESTERN GROWTH STAGNANT OR DECLINE
- GLOBAL FLEET SHIFT TOWARD SMALLER CARS
- VARIATIONS HAVE BEEN IN +/- 5% BAND SINCE 1970

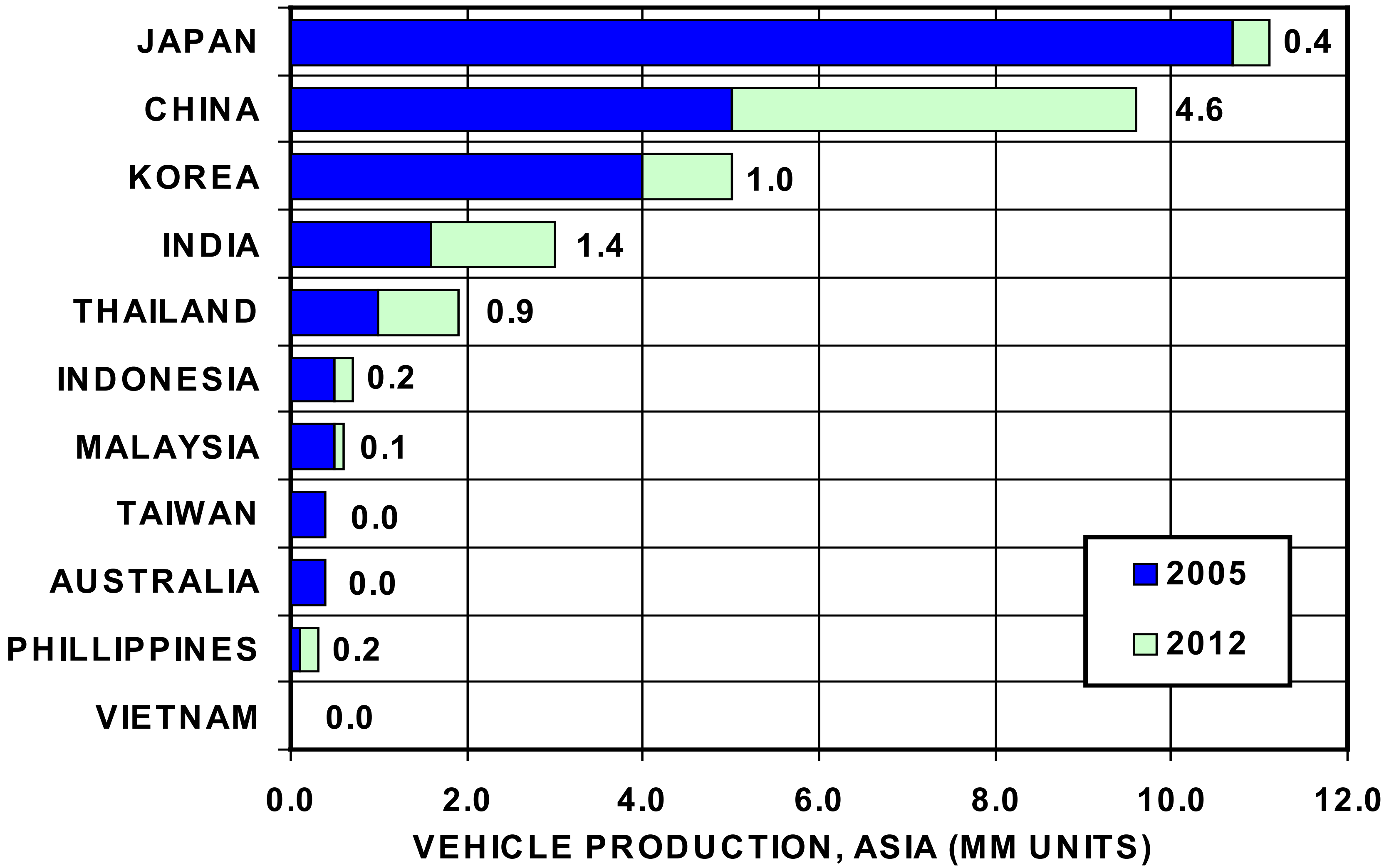

LIGHT VEHICLE PRODUCTION SHIFT, 1997-2011
VEHICLE PRODUCTION, (MM UNITS)
14
12
10
8
6
4
2
0
1997
2005
2011
USA
JAPAN
RUSSIA
CHINA
INDIA
SOURCE: ROBERT ELLER ASSOCIATES, INC., 2006

Light Vehicle Sales



SOURCE: CLEAR VIEW ECONOMICS L.L.C., 2006

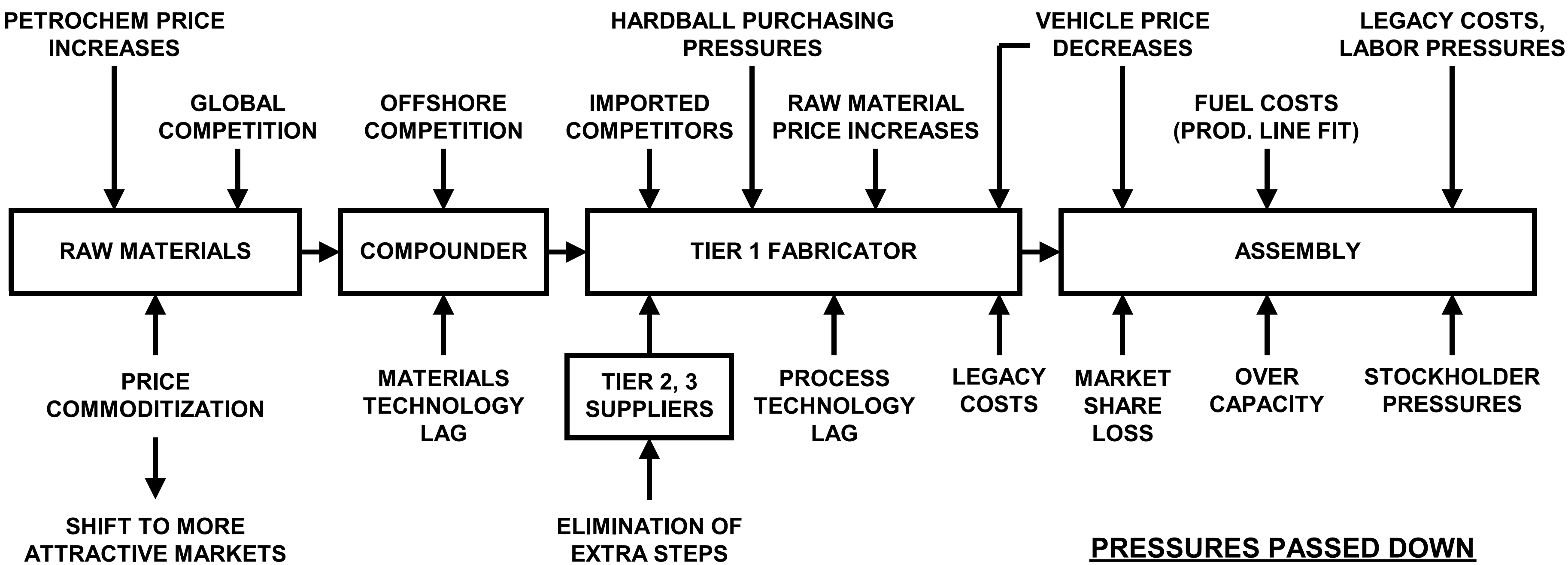
PROJECTED AUTOMOBILE PRODUCTION IN ASIA: 2005-2012



7 MM NEW VEHICLES ARE EXPECTED TO COME FROM <u>CHINA, INDIA, AND THAILAND</u> BY 2012.

SOURCE: CSM, ROBERT ELLER ASSOCIATES,INC., 2006

AUTOPLASTIC SUPPLY CHAIN IMPLOSION



PRESSURES PASSED DOWN THE SUPPLY CHAIN:

- PRICING PRESSURES
- SUPPLY CHAIN "MANAGEMENT"
- DEMAND SLOWDOWN
- REVISED SPECIFICATIONS
- GLOBALIZATION PRESSURES

ELIMINATE/REDUCE THE INEFFICIENCIES:
-MULTIPLE STEPS
-EXCESSIVE LOGISTICS
-SCRAP GENERATION
-INEFFICIENT PROCESS TECHNOLOGIES
-SALES/MARKETING COSTS
-EXCESS LABOR COSTS
-OVER-GLOBALIZATION?

SOURCE: ROBERT ELLER ASSOCIATES, INC., 2006

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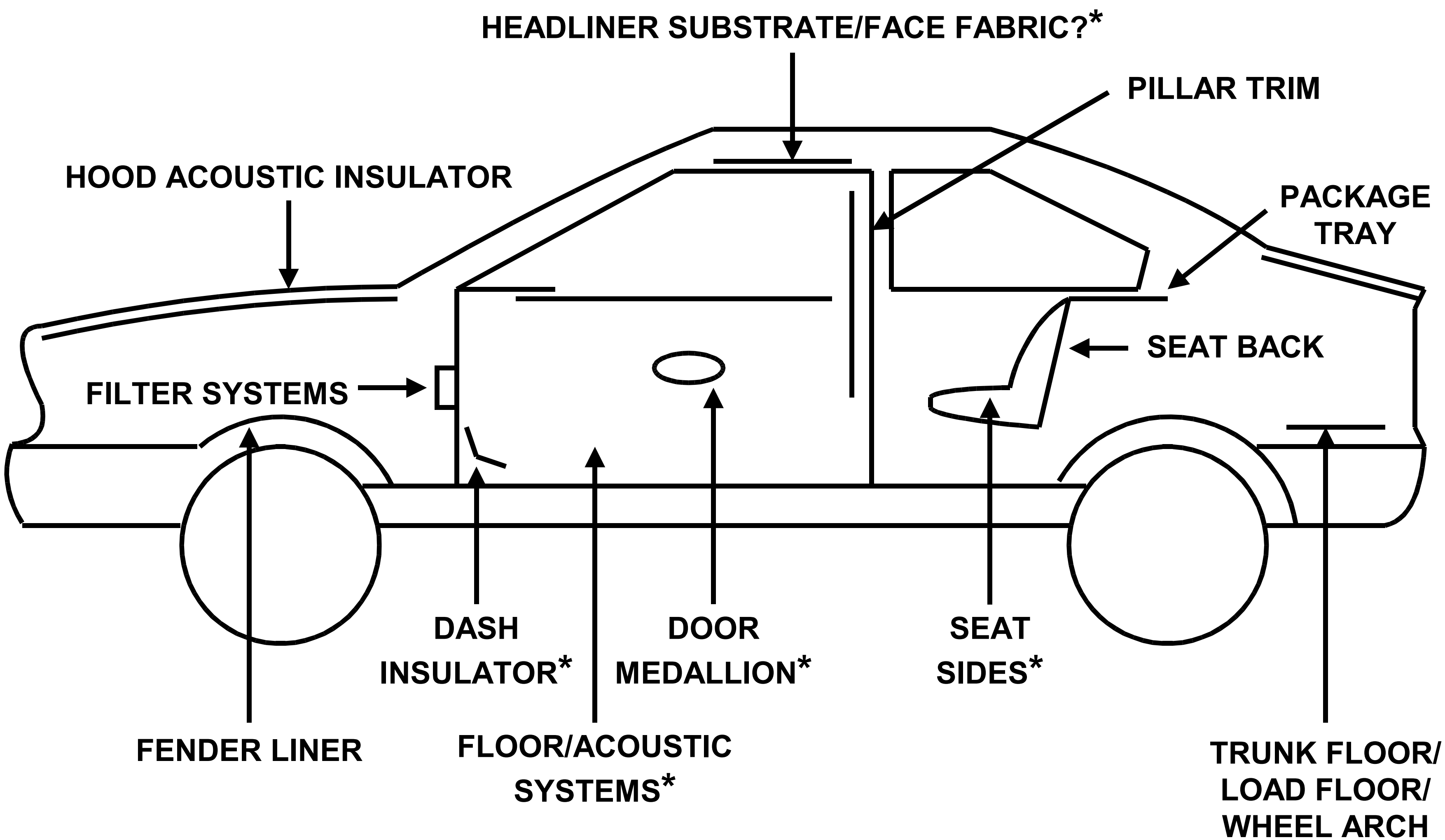
ADVANCED TECHNOLOGY NONWOVEN TARGETS



*INDICATES FOAM/FIBER INTERFACE

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SOURCE: ROBERT ELLER ASSOCIATES, INC., 2006

EUROPE/NAFTA NONWOVEN DIFFERENCES

TARGET MODULE/ KEY PARAMETER	NONWOVEN POSITION
TRUNK/FLOOR MODULE CONSTRUCTION SHIFTS	-DEVELOPMENT TARGET IN BOTH REGIONS -EUROPEAN "BEER CRATE" LEGISLATION -"TALL CARS" INCREASING FASTER IN NAFTA -EUROPEAN SPARE TIRE COVER DESIGNS MORE ADVANCED
RECYCLING PRESSURES	-SIGNIF. IN EUROPE/VERY MODERATE IN NAFTA -FAVORS PO MONO-MATERIAL CONSTRUCTIONS
WEIGHT REDUCTION PRESSURES	-HIGHER IN EUROPE -INCREASE IN NAFTA DUE TO: -"HIGH"FUEL PRICES -SLOWLY CHANGING FLEET MIX
HEADLINER FACE FABRIC	-HIGHLY PENETRATED BY NWs IN EUROPE
NW CARPET SURFACE	-HIGHER (65%) IN EUROPE(STARTING IN U.S.)
ACOUSTIC PERFORMANCE. REQUIREMENTS	-DIFFERENT FREQUENCIES, SIMILAR PERFORMANCE REQUIREMENTS
USE OF LIGHTWEIGHT FIBER CONSTRUCTIONS	-SIMILAR (SLIGHTLY MORE ADVANCED IN EUROPE)

AUTO INDUSTRY SHIFT IMPLICATIONS

AUTO INDUSTRY FACTOR	NONWOVEN EFFECT
SUPPLY CHAIN IMPLOSION	REDUCE TIER 2, 3 SUPPLIERS
PROFIT PRESSURES	ROLL GOODS SUPPLY SHIFT
WEIGHT SAVINGS VALUE GAIN	-GROWTH OF ACOUSTICS NWs -HEADLINER TARGET
POLYOLEFINS FOAM INCREASE	POLYOLEFIN NW INCREASE
INCREASE PP IN INTERIORS	FAVORS PP NONWOVENS
MONOMATLS CONSTRUCTIONS	FAVORS PP NONWOVENS
GLOBAL VEHICLE SHARE GAIN	-TECHNOLOGY CONVERGENCE -“GLOBAL” SUPPLIERS
ACOUSTIC IMPROVEMENT REQ’D	MICRODENIER NW PENETRATION
B-VEHICLE SHARE GROWTH	-REDUCE SQ M/VEHICLE -INCREASE NW USAGE
TECHNOLOGY CONVERGENCE	U.S. NEARS EUROPE/JAPAN TECH.

ADVANCED TECHNOLOGY NW OPPORTUNITIES/CHALLENGES

PARAMETER	IMPLICATION
NONWOVEN PERFORMANCE CAPABILITIES	MIRODENIER SHARE GAIN ELASTIC NONWOVENS IMPROVED UV RESISTANCE
VALUE CHAIN POSITION SHIFT	SUPPLIERS MUST ADD VALUE TO ROLL GOODS
WEIGHT/MAT'LS COST SAVE	-GROWTH OF PP NWs
PROCESS COST REDUCTION	-IN MOLD FORMING/BACKMOLDING
PET BICO MARKET SHARE GAIN	-FOLLOWED BY PP?
QUALITY IMPROVEMENT	ELASTIC NWs?/IN MOLD QUALITY
TECHNOLOGY CONVERGENCE	U.S. NEARS EUROPE/JAPAN TECH.

SUPPLY CHAIN STRATEGIES FOR NW SUPPLIERS

- **FORWARD/BACKWARD INTEGRATION**

  -LAMINATION

  -PRE-FORMED ROLL GOODS

  -HIGH VOLUME TAILORED ROLL GOODS
- **ADAPT NEW NW MATERIALS/PROCESS TECHNOLOGIES**

  -ELASTIC NWs

  -ALTERNATIVES TO FLAME LAMINATION

  -IMPROVED BACKMOLDING
- **SANDWICH LAYER CONSOLIDATION**

  -ALL-FIBER CONSTRUCTIONS
- **REDUCE SECONDARY OPERATIONS**

  -LASER SCORING

  -IN MOLD TRIM

INCUMBENTS AND CHALLENGERS IN NONWOVENS CONSTRUCTIONS

MATS		TEXTILES/SKINS		CARPET		SEMI-STRUCTURAL(c)	
INCUMBENT	CHALLENGER	INCUMBENT	CHALLENGER	INCUMBENT	CHALLENGER	INCUMBENT	CHALLENGER
-SHODDY -PU FOAM	-MD NW -N-PUNCHED -SPUNBOND -MELT SPUN -LIGHTWEIGHT FIBER MAT(b)	-KNITS -WOVEN -SKINS -COATED FABRIC -LEATHER	-NWs -NON-SKIN TECH -LUXURY COATED FABRIC -2-SHOT MOLDING	-TUFTED -NONWOVEN	-NW	-FOAM LAM. -BLOW MOLD -INJECTION	-LFTPs(a) -PU/HONEYCOMB -PO FOAMS

NOTES:
(a) AZDEL SUPERLITE®, SYMALITE
(b) FROM RIETER, C+A, LEAR, PELZER, FAURECIA INCORPORATING MICRO-DENIER NONWOVENS
(c) E.G., EXTERIOR WHEEL ARCH LINER, LOAD FLOORS/TRUNK MODULE, HEADLINER

SOURCE: ROBERT ELLER ASSOCIATES, INC., 2006

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ADDING VALUE VIA IMPROVED FUNCTIONAL CHARACTERISTICS

VALUE-ADDED STRATEGY	NONWOVEN EXAMPLE/TARGET MODULE
IN-MOLD DECORATION	-PILLAR TRIM
WEIGHT SAVE	-FLOOR/ACOUSTICS, HEADLINER
SURFACE ESTHETICS	-MICRO-DENIER NONWOVENS -NEGATIVE FORMING
-BETTER ACOUSTICS -IMPROVED DRAPE -REDUCED WRINKLING	MICRO-DENIER NONWOVENS
CRAFTSMANSHIP/QUALITY	-JCI CRAFTECH® PROCESS -OTHER IN-MOLD PROCESSES
ELASTIC NONWOVENS	-VIA NEW PO RESINS
LUXURY FABRICS	PENETRATING SEATING, DOOR TRIM, INSTRUMENT PANEL

IN-MOLD FORMING AND SANDWICH CONSOLIDATION

- NUMEROUS METHODS AVAILABLE
- PROCESS COST SAVE POTENTIAL
- PO FOAM/TEXTILE LAMINATES EVOLVING IN EUROPEAN FLEET
- BASED ON PET AND PO TEXTILES
- INCREASED POLYOLEFIN SUBSTRATE MOLDING RESINS ACCELERATES PO NWs
- ROLE IN ENERGY MANAGEMENT COMPONENTS (e.g., B-PILLAR)

EPP SEMI-STRUCTURE/TEXTILE COVERING CONCEPT

SOURCE: TARACELL

NONWOVEN/PO FOAM LAMINATES

- **NONWOVEN/PO FOAM LAMINATES SHOW POTENTIAL FOR PENETRATION INTO INTERIOR SOFT TRIM MODULES BASED ON:**
  - **IMPROVED THERMOFORMABILITY VS. TEXTILE/PO FOAM LAMINATES**
  - **IMPROVED RECYCLABILITY WITH DOMINANT PO SUBSTRATES**
  - **MATERIAL AND PROCESS COST SAVINGS**
- **TEXTILE/PO FOAM LAMINATES→ PENETRATION OF PO NWs**
- **UV RESISTANCE, ABRASION RESISTANCE ELASTIC PROPERTIES AND MICRODENIER WEIGHTS WILL FACILITATE PO NONWOVENS PENETRATION**

FLOOR/TRUNK TARGETS

- **DASH MAT/PASSENGER COMPARTMENT**
  - **ELIMINATE/REDUCE HEAVY LAYER**
  - **MICRODENIER NW PENETRATION HAS STARTED**
- **TRUNK MODULE**
  - **GROWTH OF CONSOLIDATED TRUNK MODULE**
  - **NEED FOR SEMI-STRUCTURAL PROPERTIES**
  - **ROLE FOR HONEYCOMB CONSTRUCTION**
- **BOTH**
  - **FOAM/FIBER COMPETITION**
  - **NEED FOR FORMING PROCESS TECHNOLOGY SHIFTS**
  - **ROLE IN THRU-THE-FLOOR CONSTRUCTION**

EXAMPLE OF DASH MAT LAYER CONSTRUCTION

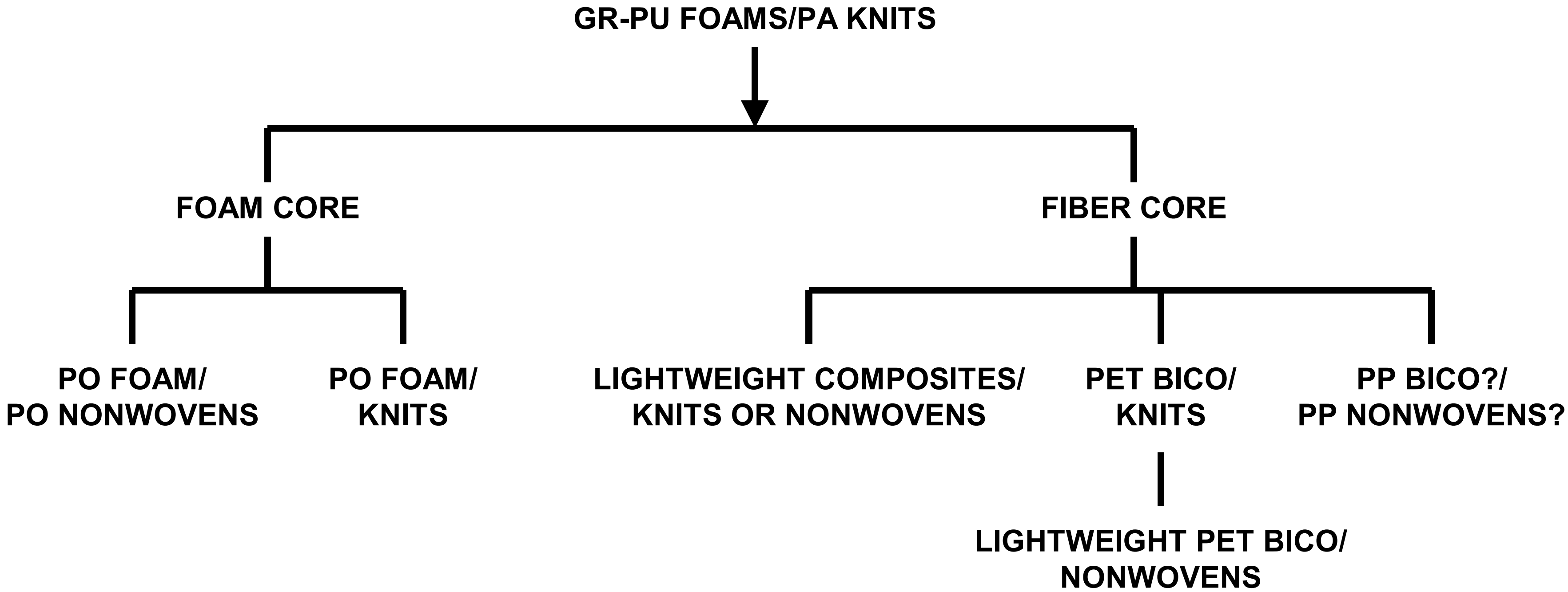
HEAVY LAYER

ACOUSTIC BATTING

CARPET

SOURCE: COLLINS & AIKMAN

HEADLINER CONSTRUCTION SHIFTS/ROLE OF NONWOVENS



NOTES:
- OVERHEAD MODULE DESIGN CHANGES COULD SHIFT HEADLINER CONSTRUCTION REQUIREMENTS
- ROLE OF HEADLINER IN THRU-THE-ROOF OVERHEAD MODULE

SOURCE: ROBERT ELLER ASSOCIATES, INC., 2006

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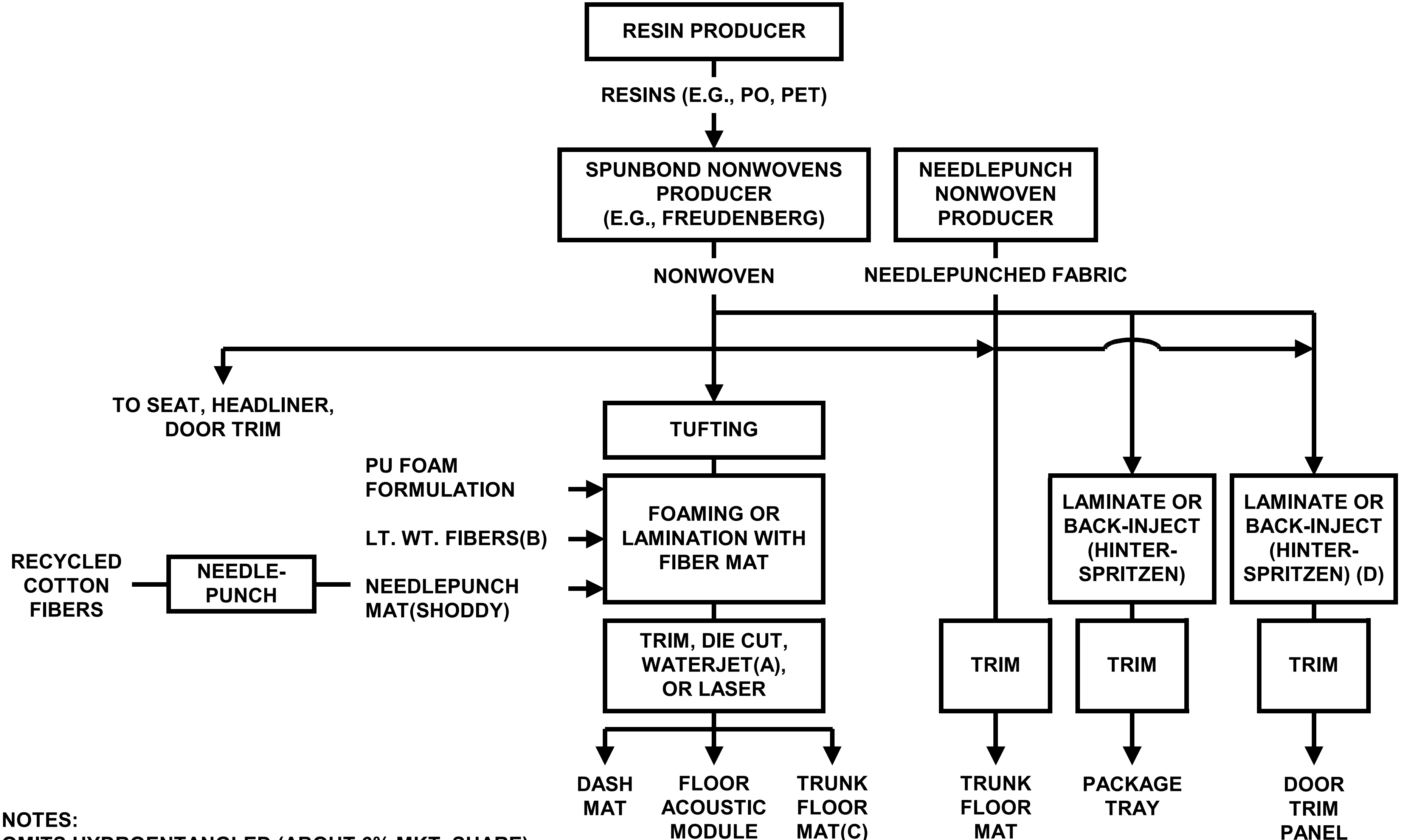
PATHS TO MARKET FOR AUTOMOTIVE NONWOVENS

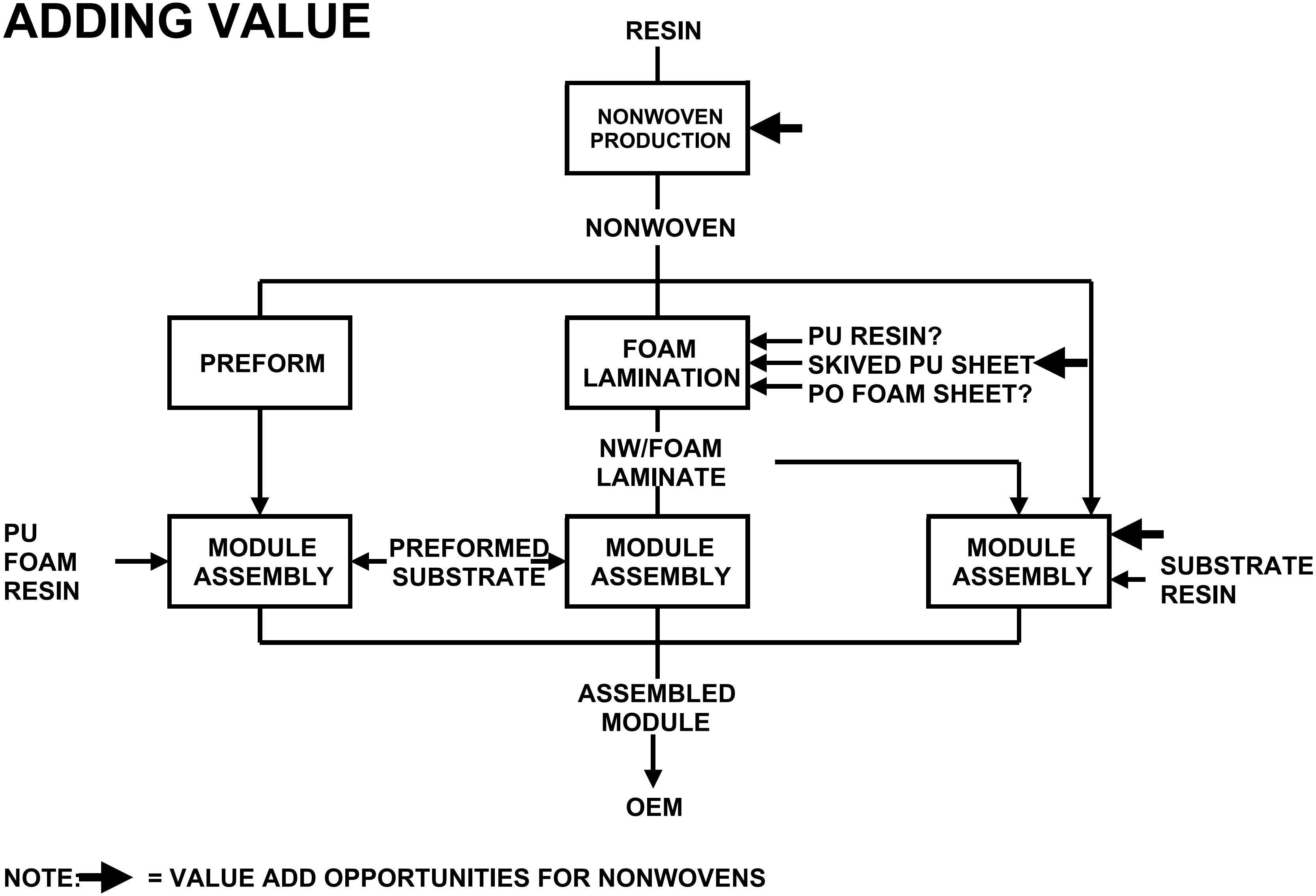


NOTES:
OMITS HYDROENTANGLED (ABOUT 6% MKT. SHARE)
(A) DOMINANT METHOD
(B) E.G., AcT™ (C+A), ULTRALIGHT™ (RIETER), SonoTec AT (LEAR), DUAL IMPEDANCE FIBER (PELZER)
(C) HIGH END VEHICLES ONLY
(D) EPP FOAMS MAY BE USED FOR HINTERSPRITZEN

nonwoven ptm 03.vsd

SOURCE: ROBERT ELLER ASSOCIATES, INC./JOHN R. STARR, INC. AUTOMOTIVE NONWOVENS MULTICLIENT STUDY

NONWOVEN PATH-TO-MARKET OPPORTUNITY FOR ADDING VALUE



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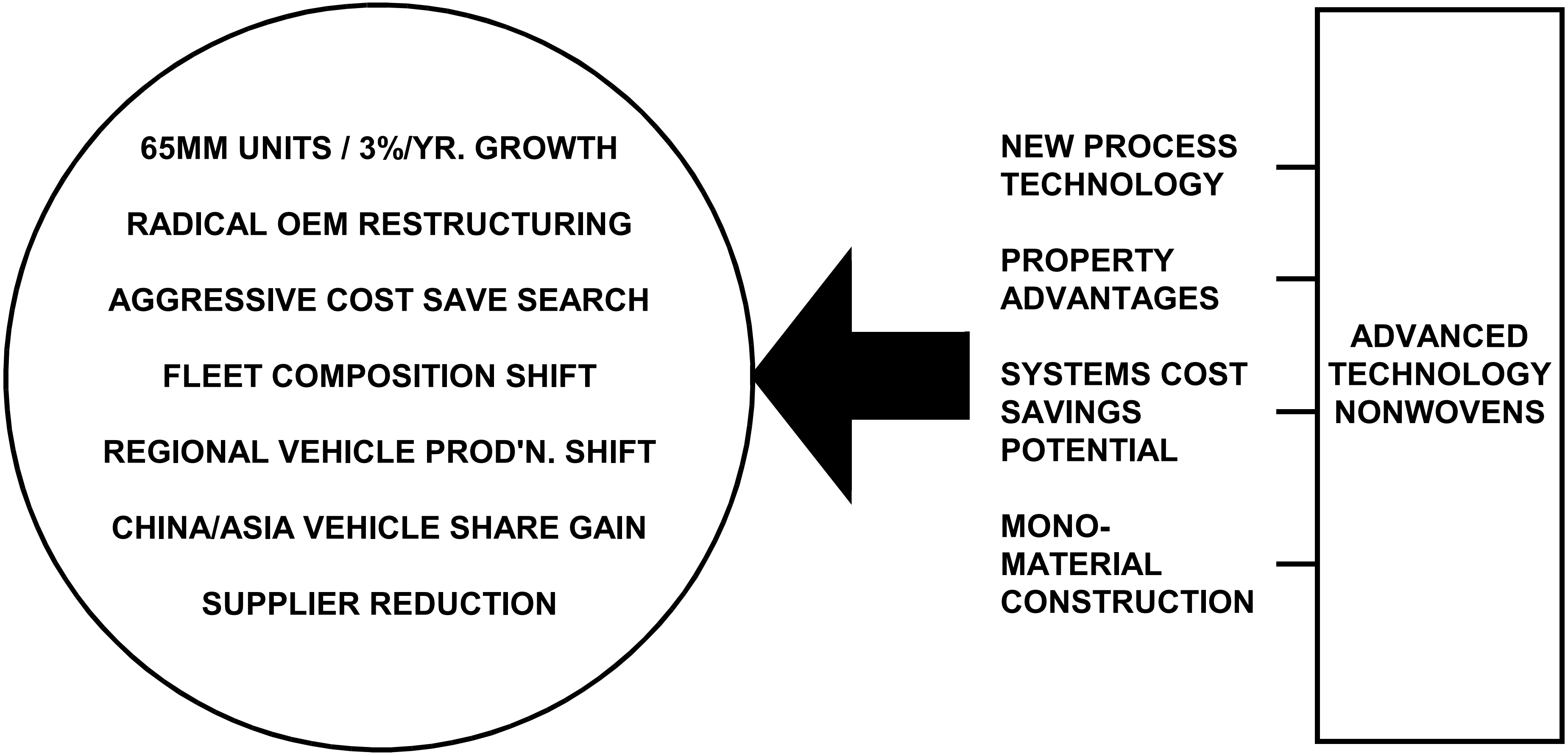
SOURCE: ROBERT ELLER ASSOCIATES, INC./JOHN R. STARR, INC.
AUTOMOTIVE NONWOVENS MULTICLIENT STUDY

AUTO DEMAND/ OPPORTUNITIES

ENABLERS



SOURCE: ROBERT ELLER ASSOCIATES, INC., 2006

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SUMMARY

- **PROFITABILITY PRESSURES WILL INTENSIFY**
- **VEHICLE GROWTH WILL BE IN ASIA PACIFIC**
- **SUPPLY CHAIN SHIFTS OFFER OPPY'S/CHALLENGES FOR NWs**
- **POLYOLEFIN FOAM/NW LAMINATES WILL GAIN SHARE**
- **ADVANCED TECHNOLOGY NWs OFFER VALUE ADD POTENTIAL AND SYSTEMS COST SAVINGS VIA:**

  - MONOMATERIAL CONSTRUCTIONS

  - ELASTIC NONWOVENS

  - IMPROVED ACOUSTIC PROPERTIES (ELIMINATION OF HEAVY LAYER (PARTIAL IN FLOOR SYSTEMS)

SUMMARY (CONT'D.)

- **KEY TARGETS ARE**

  - HEADLINERS (SUBSTRATE/FACE FABRIC, NW vs. KNIT COMPETITION)

  -FLOOR/ACOUSTIC SYSTEMS (MICRODENIER NWs)

  -DOOR MODULES (PO NW/PO FOAM LAMINATE

- **PO NONWOVENS PENETRATION WILL BE FACILITATED BY:**

  - UV RESISTANCE

  - ABRASION RESISTANCE

  - ELASTIC PROPERTIES

  - MICRODENIER WEIGHTS/ACOUSTIC PROPERTIES

  - BICOMPONENT FIBERS

THANK YOU

ANALYSIS
TECHNICAL
ECONOMIC
MARKET
Management
DECISIONS

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