



**R+S**<sup>®</sup>  
STANZTECHNIK

**KEN BOARD**

**KEN BOARD™**

**KEN BOARD AIR™**

**KEN BOARD FOAM™**

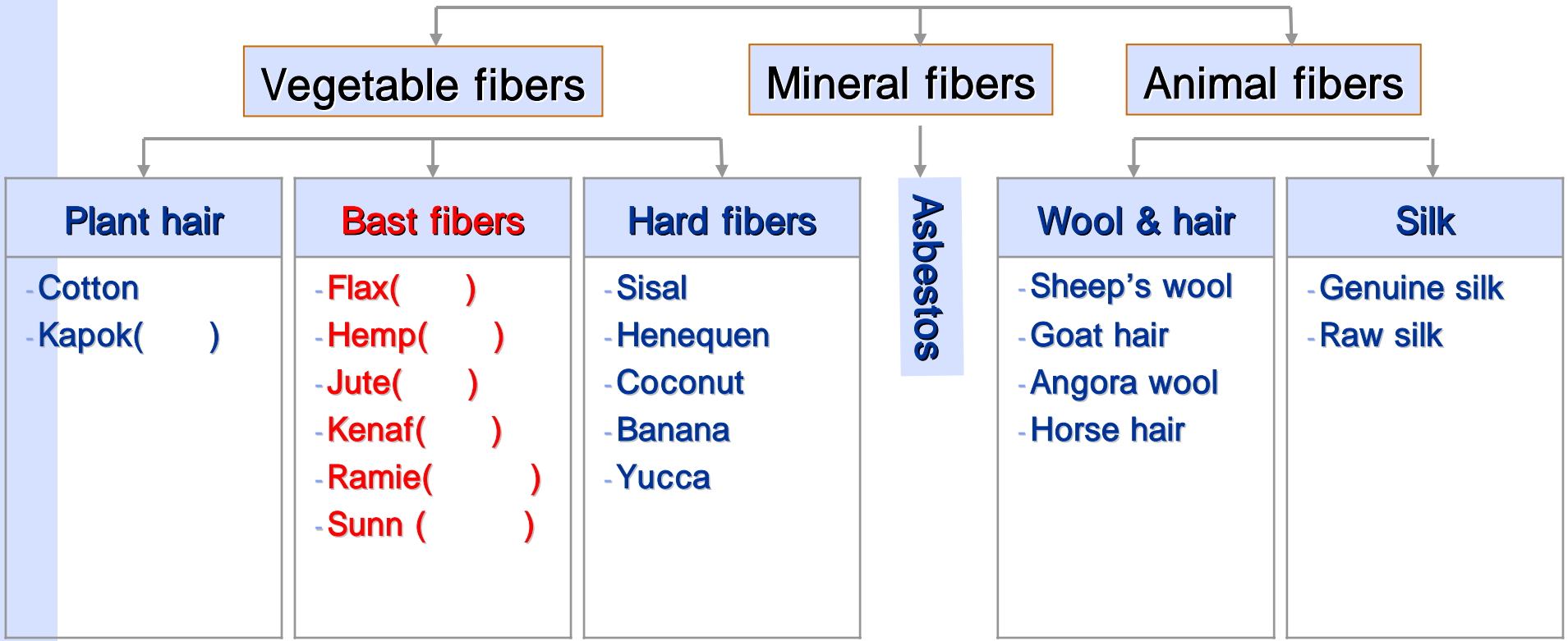
**KEN BOARD CELL™**





# Natural Fiber

## Natural Fibers

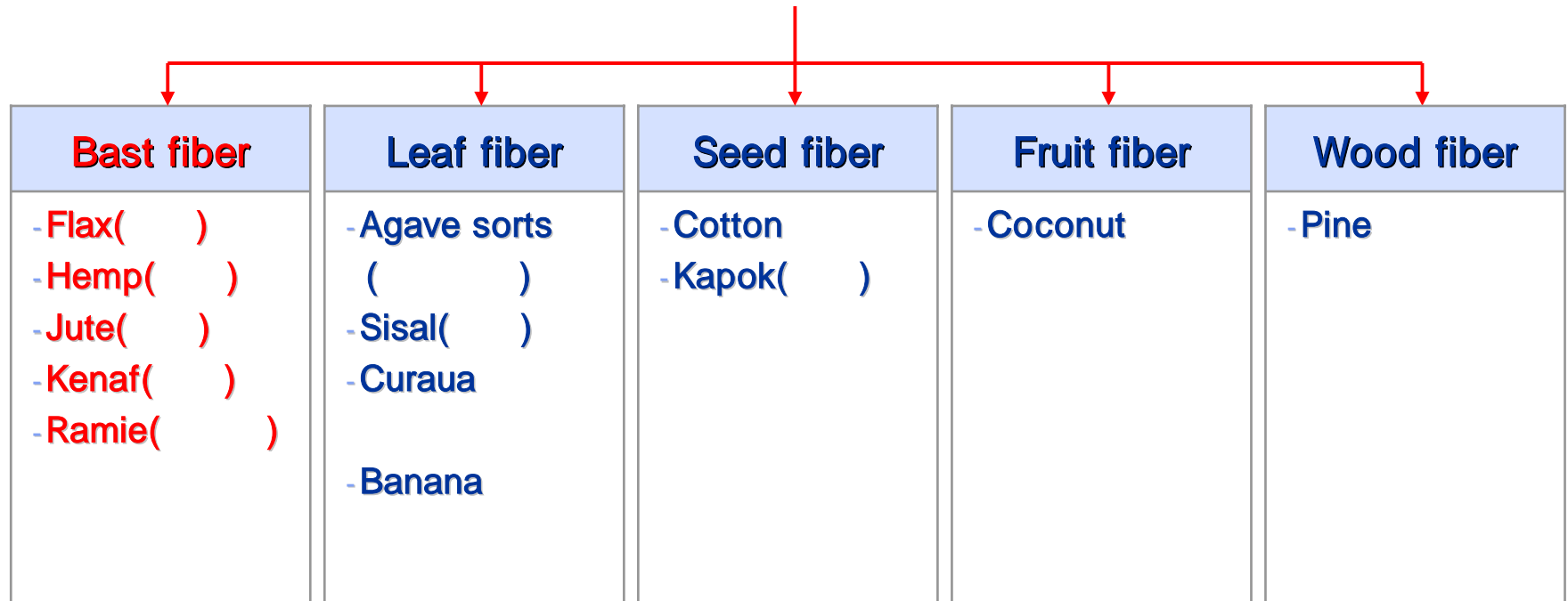






# Cellulose Fiber

## Cellulose Fibers





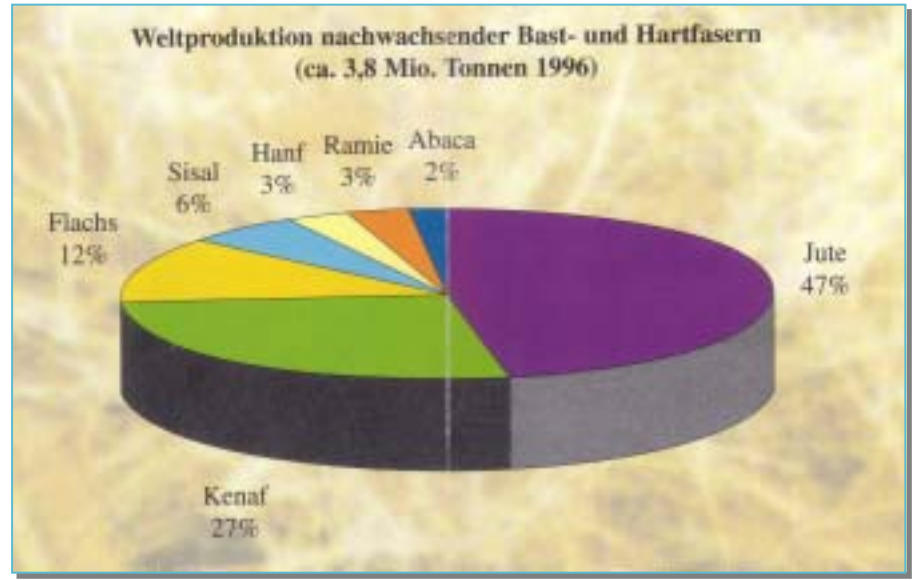
# Natural Fiber





\* 1996 ; 3.8

Fiber	
Jute( )	1.8
Kenaf( )	1.0
Flax( )	0.5
Sisal( )	0.2
Hemp( )	0.1





# Natural Fiber

Fiber	Density (g/cm <sup>3</sup> )	E - module (GPa)	Stability (MPa)	Breaking Tension(%)	Remarks
Kenaf	1.50	15~37	500	3.00	
Hemp	1.50	12.70	580	4.70	
Flax	1.30	13~26	800~900	1.3~2.8	
Jute	1.50	19~35	320	2.40	
Ramie	1.50		850~900	2.40	
Cotton	1.50	11.00	350	6.0~11	
Cuarua	1.40	50~83	700~900	1.0~1.5	
Coconut	1.45	13.70	544	3.30	
Sisal	1.45	16~37	507~835	2.80	
Banana	1.35	27~32	529~914	2.5~3.7	



## Effect of different fillers on thermoplastic compounds

Type	Tensile Streng.	Flex. Streng.	Stiff.	Impact Streng.	Heat Deflect.	Weight Efficie.	Dims Stabil.	Moisture Resist.	Heat Resist.
N/F(durafill)	+	+	+		+	+	+		
Calcium carbonate		+	+		+		+		+
Wood flour	+	+	+		+	+	+		
Mica		+	+		+		+	+	+
Talc			+		+		+	+	+
Carbon			+		+		+		+
Silica			+		+			+	
Alu. trihydrate			+		+			+	



## Properties of flax filler compared with other fillers (30% in polypropylene)

Property	PP unfilled	Durafill (N/F)	Wood flour	Calcium carbonate
Tensile strength(MPa)	34	33	34	24.8
Tensile modules(GPa)	1.2	2.3	2.2	1.4
Flexural strength(MPa)	55	62	64	44.8
Flexural modules(GPa)	1.5	2.7	2.7	1.5
Impact:Izod notched(J/m)	30	21	23	17



# Natural Fiber

- \* 가
- \* 가
- \* Fogging( 가)
- \* 가
- \* ,
- \* , ( )
- \* (Friction noise)
- \* 가
- \* 가



# What is “KEN BOARD” ?

KEN BOARD

KEN BOARD AIR

KEN BOARD FOAM

KEN BOARD CELL



# KEN BOARD

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- \* One of the conditions for production of a new self carrying parcel-shelf for Skoda, Mlada Boleslav 1987 was the use of local sources.
- \* R+S developed a needled fleece from materials as being used for insulation of the Trans-European gas pipeline. This material showed outstanding properties



# KEN BOARD

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## \* Skoda

- \* 1987 Felicia: Europe's first sound insulator under carpet without phenolic materials made of a fibermix embedded in PP - matrix
- \* 1987 Felicia: self carrying parcel shelf made with materials from local resources

## \* Karmann/Heywinkel

- \* Application of PP - bonded glassfiber in LoPreFin process for accessories in Mercedes Benz luxury - cars



## \* Audi

- \* 1993: A8 trunk-door trim in Kenboard-process
  - \* Application of Kenboard with glass fiber
- \* 1993: A4 Avant quarterback-trim in "one-shot" Kenboard-process



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- \* Skoda, Audi, BMW, Mercedes, VW
- \* Ford - world-wide
- \* GM/Opel - world-wide



# KEN BOARD

- \* R+S Natural Fiber
- \* LPF(3 Layer)
- \* ;
- \* KEN BOARD ; Dr trim, Package tray, Pillar
- \* KEN BOARD AIR ; 2 , Parcel shelf
- \* KEN BOARD FOAM ; Head lining
- \* KEN BOARD CELL ; 3
- \* ; PP 50% + Natural fiber 50%
- \* Natural fiber ; Flax, Kenaf, Hemp, Jute



# KEN BOARD

- \* GME 00009(GM - OPEL )
  - \* ; N/F(Flax) : PP =  $45 \pm 5\%$  :  $55 \pm 5\%$
  - \* Fiber ;  $80 \pm 10\text{mm}$
  - \*
    - \* ; GME 60281 ,  $20\mu\text{g/g}$
    - \* ; GME 60271 ,  $10\mu\text{g/g}$
    - \* VOC ; GME 60326 - A ,  $3\text{mg}$
    - \* ; GME 60276 , 6
    - \* , , (Hay and straw - like odor)



**\* PP Fiber ;**

\* ; 6~15 Denier(1 D = 0.05g/450m)

\* ; 80±10mm

\* ; Staple

**\* Natural Fiber ;**

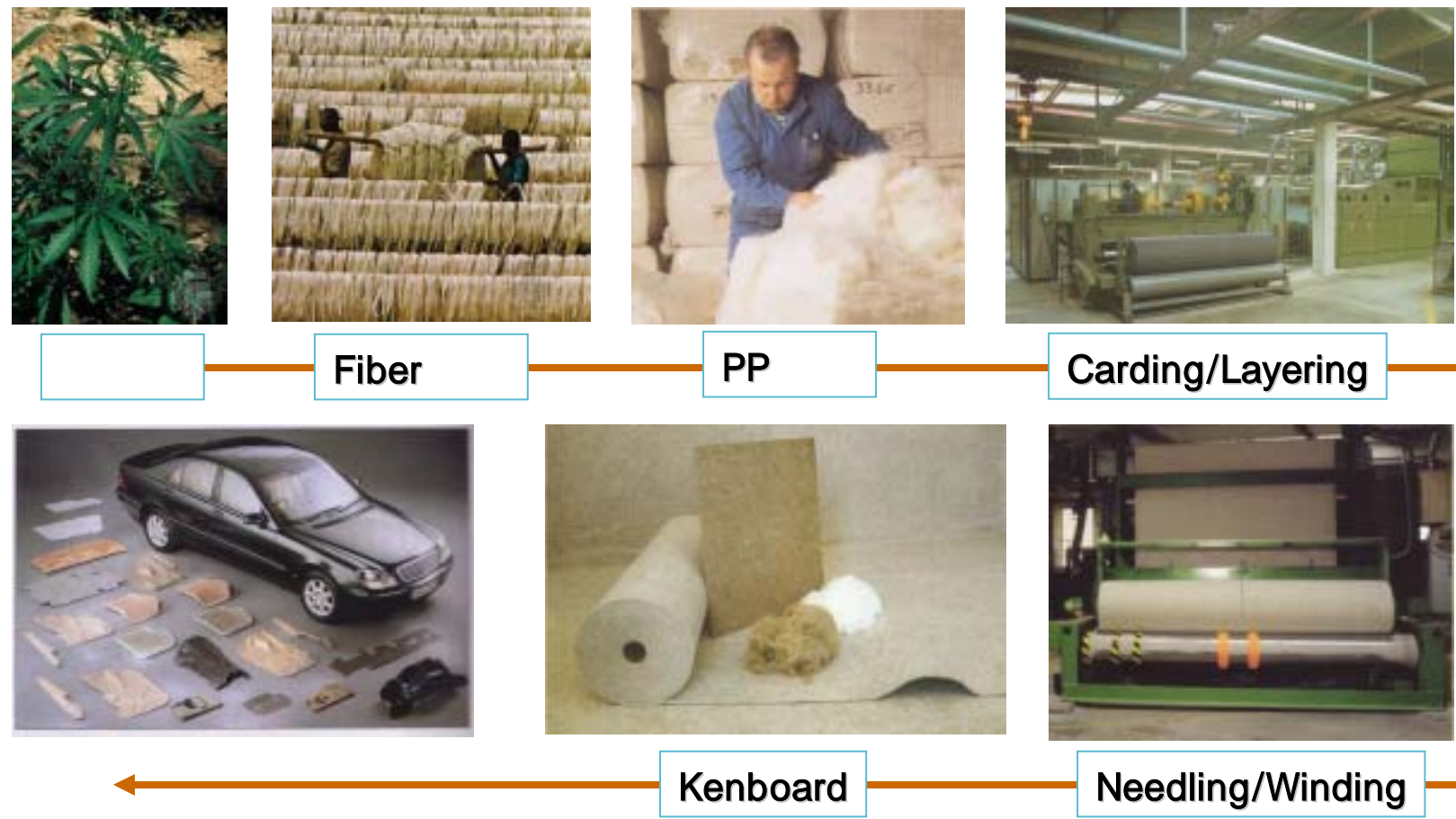
\* ; Kenaf, Flax, Hemp, Jute

\* ; 40~120μm

\* ; 80±10mm

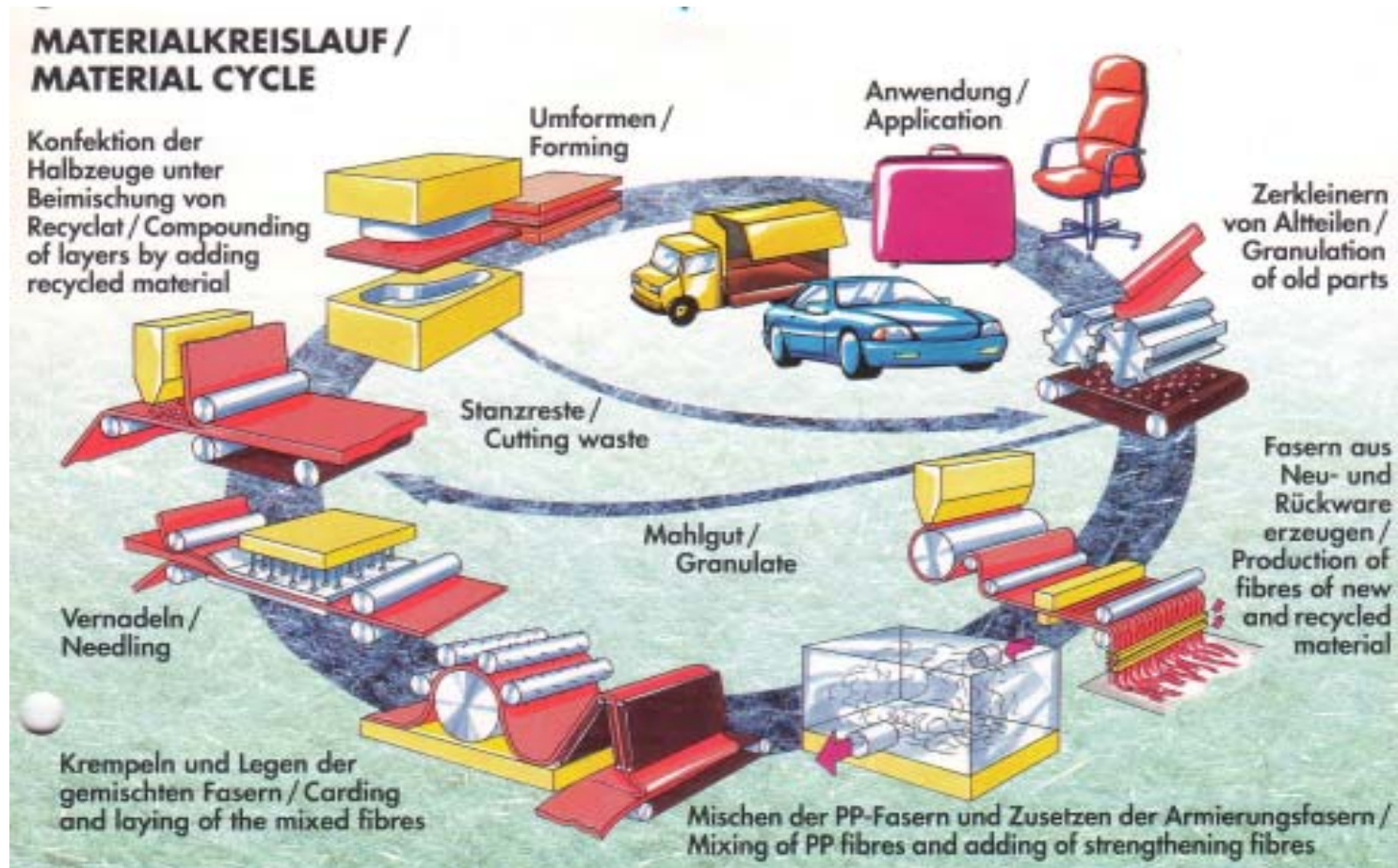


# KEN BOARD





# Kenboard recycling process

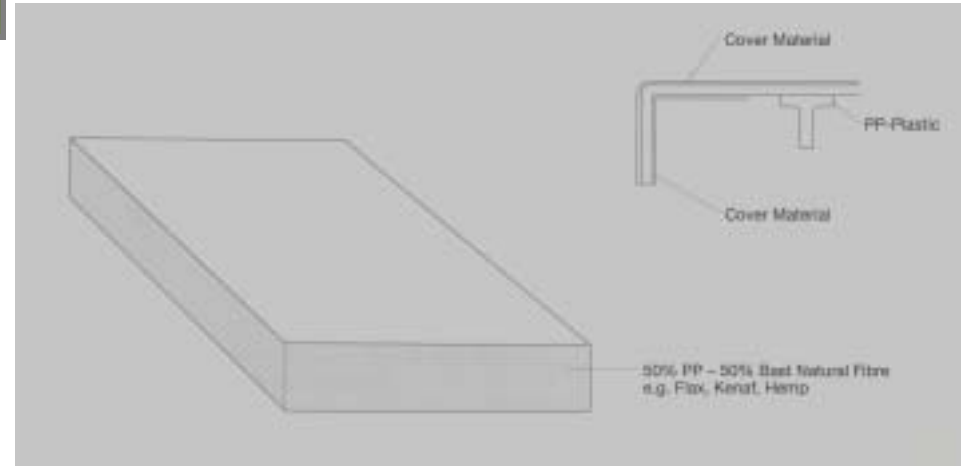




# Kenboard

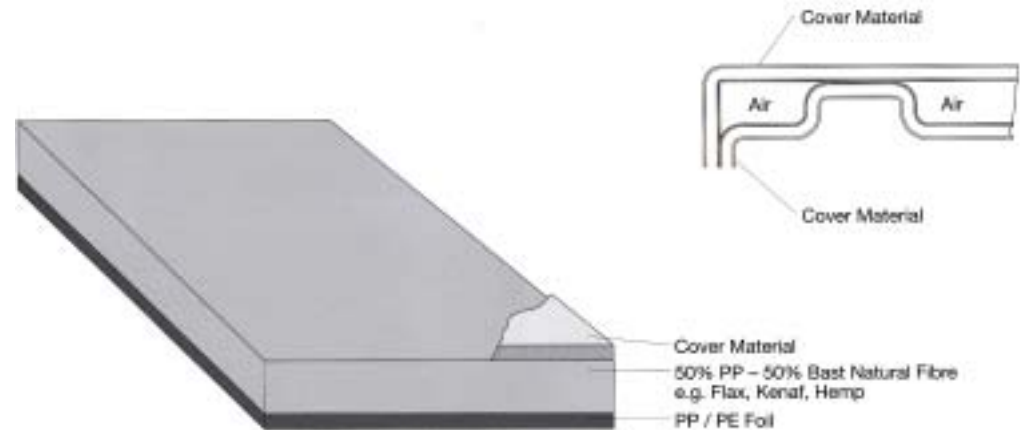


- \* **KEN BOARD**
- \* **N/F 50% + PP 50%**
- \* **300 ~2,100g/m<sup>2</sup>**
- \* **30%**



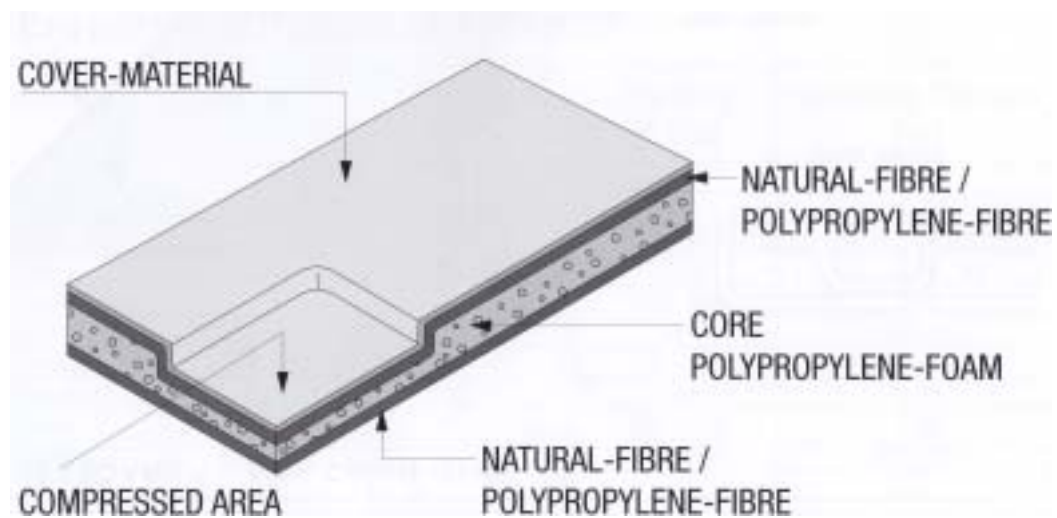


## \* KEN BOARD AIR





## \* KEN BOARD FOAM





# KEN BOARD

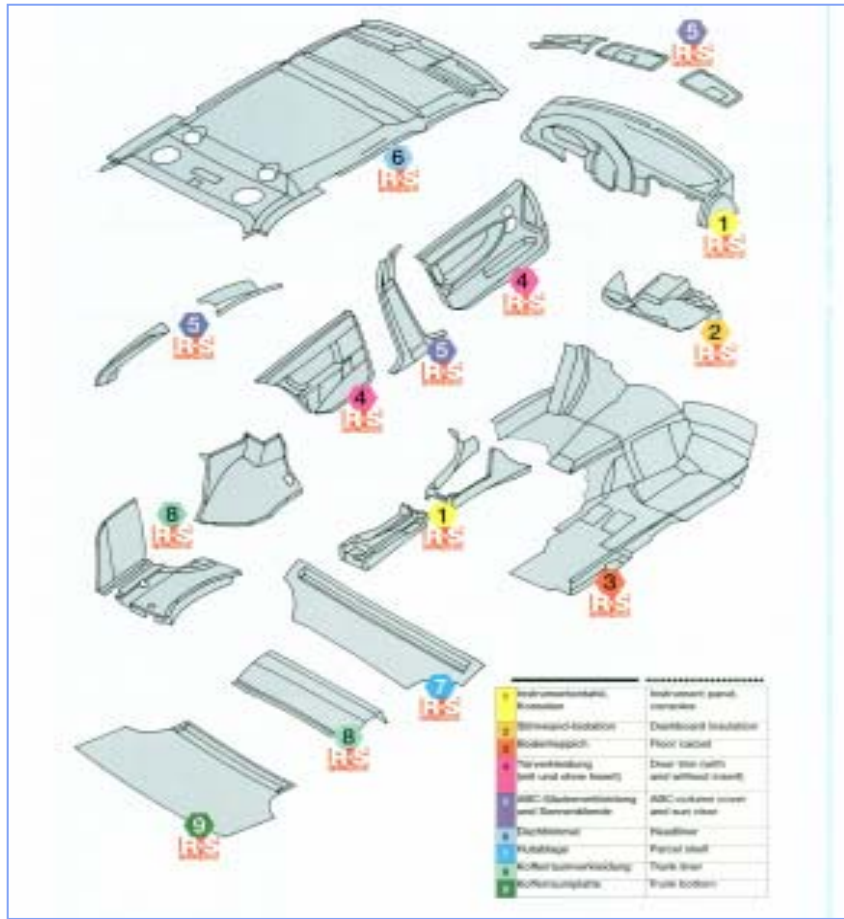
- \* ,
  - \* (Lower weight with comparable mechanical qualities)
  - \* 30~40%
  - \*
- \*
- \* (Good temperature stability)
  - \* ( )
- \* 가
  - \* (Good usability in the technical circulation of materials)
  - \* ; ,PP
  - \*



- \*
  - \* (Health and medical advantages for employees)
    - \* - G/F
- \*
  - \* (Lower cost in comparison to glass fibres)
    - \* One shot process ;
    - \* Bonding
- \*
  - \* (Recyclability)
    - \* CO2 (Very low global CO2 emissions when
    - \* burned)
    - \* - 2~3%, G/F



# KEN BOARD



1	Instrument pnl, Console
2	Dashboard insulation
3	Floor carpet
4	Door trim, Door insert
5	A/B/C Pillar, Sun visor
6	Headlining
7	Parcel shelf
8	Trunk liner
9	Trunk bottom



# KEN BOARD

Mitsubishi	1997 Space - van	Door inserts
AUDI	1997 A4 Variant	Rear side panel
AUDI	1997 A8	Trunk liner
BENZ	1997 S-Klasse	Business table
MAN	1997 Bus	Head liner
FORD US	1998 Cougar	Door insert
Opel	1998 3001	Door inserts
Renault	1998 B65	Door inserts
SAAB	1998 Coupe	Door panels
VOLVO	1998 Coupe	Door panel, Door insert, Parcel shelf



John deer	1998 Crawler, Tractor	Head liner
Caterpillar	1998 Crawler, Tractor	Head liner
VW	1998 Golf 4 Variant	Carpet kit with isolator for Parcel shelf & Trunk parts
DWMC	1999 Y - 120	Door panel
LADA	1999	Rear shelves, ABC Columns
SATURN	1999 Saturn	Parcel shelves
Brilliance	2000 China M1	Headliner, Floor carpet, Wheel house cover, Rear shelf, Trunk part, Door panel & inserts
KIA	2000 W - 3	Head liner
AUDI	2000 A6	Seat back panel





BMW	2000 5series	Seat back panel
Ford EU	2000 Mondeo	Door inserts
D+C	2001 JR41	Door inserts
D+C	2001 JR27	Door panels
Citroen	2001 C5	Door inserts
Opel	2001 Spain	Storage tray
VW	2001 Passat	Trunk door cover
D+C	2002 Viper	Console & Door panel
D+C	2002 E class	Trunkliner
Ford	2002 Australia	Door inserts
Ford	2002 Fiesta	Floor carpet, Trunk liner



GM USA	2002 Pontiac	Door inserts
Opel	2002 Vectra	Trunk door cover
Porsche	2002 SUV	Load floor
HMC	2002 TB	Sunshade
Project	D+C	Sunshade(Kenboard air)
	Opel Astra	Door panel(Special method)
	Porsche	ABC Column