HUNTSMAN

Enriching lives through innovation

Polyurethanes

Product portfolio

MDI-based solutions

Enhancing the **comfort** of flexible **foams**

ABOUT HUNTSMAN

Huntsman Polyurethanes is a leading global producer of MDI-based polyurethanes focused on formulating innovative, differentiated products.

We serve consumer and industrial markets with raw materials for the production of bedding and furniture comfort foam, lightweight and performance materials for automotive, elastomers for footwear, energy-saving insulation for construction, as well as protective coatings and adhesives for numerous applications.

Partnership in quality
Our philosophy is to engage with our customers to deliver quality products, while enabling improvement of the production processes. We collaborate to find solutions to help you meet the level of comfort and performance that consumers demand.

Manufacturing capability
Huntsman's strong manufacturing footprint ensures responsiveness to requirements. We continuously invest to make sure our materials can meet amongst the highest VOC emission standards.

MDI isocyanates
Comprehensive range of consistent high-quality MDI isocyanates

Specialty Polyols
Enhanced effects (airflow, fire safety)
Durability
Nice feel of flexible foam end products
Visco-elasticity

Specialty Additive packages
Low VOCs
Low odour
Cell structure control (cell size, airflow)

Brands portfolio

SUPRASEC® MDI
DALTOCEL® polyols
DALTOLAC® polyols
RUBIFLEX® polyurethane systems
DALTOFLEX® polyurethane semi- or fully-formulated systems

YOUR PARTNER IN FLEXIBLE FOAM

At Huntsman, we have more than 50 years of development experience in slabstock, batchblock and moulded solutions. We offer an extensive range of differentiated polyurethane raw materials, developed to create the type and quality of flexible foam you need for toppers, mattresses, pillows or upholstered furniture.

Experience and expertise

We take a hands-on approach to problem solving at our Technical Center in Everberg, Belgium. With our know-how, we can help you at every stage of your flexible foam product development, from formulation to manufacturing. Whether you are looking to improve your current flexible foam product or want to develop the next generation of foam, our technical experts are ready to collaborate with your team and help solve complex design issues with differentiated, bespoke and cost-effective solutions.

Our state-of-the-art facilities offer:

- Full scale slabstock pilot line
- 14 component discontinuous line
- Batch block machine
- Innovative physical testing & analytical labs

Benefits of MDI-based flexible foams

MDI BENEFITS

Fast Reactivity & Cure

- Very Good Density / Hardness Distributions
- No Sagging / Trapezium Effect - Very Square Blocks
- Block Heights > 1.30m
- No / Minimal Post-cure Required
- Fast Demould

Low Vapor Pressure

BENEFITS OF MDI IN FOAM

Open Foam

- Very Good Dry & Humid Compression Sets
- No / Minimal Crushing Required

Inherent Hardness

- No Polymer Polyols Required

Nice ‘Feel’

Applications

Our highly versatile polyurethane based materials can be used for products such as:

- Mattresses
- Toppers
- Pillows
- Upholstered furniture
- Office Furniture
- Medical Moulding
- Domestic Moulding
- Design Moulding
- Transportation

TOWARDS SUSTAINABILITY

We adhere to the United Nations Global Compact and our approach to innovation is founded on the UN Framework of 17 Sustainable Development Goals which address the global challenges. For bedding and furniture, three Sustainable Development Goals (SDGs) guide our work.

Good health and well-being

Our product range is designed to promote good health by adding comfort to foam materials used for pillows, toppers, mattresses or upholstered furniture.

We monitor that all our systems and facilities meet international emission standards. Huntsman products developed for flexible foams are low in volatile organic compound (VOC) and methylenedianiline (MDA). These products help manufacturers achieve the current LGA, Ökotex, CertiPUR and IKEA specifications.

Decent work and economic growth

We are constantly looking for ways to help you streamline your manufacturing processes.

Design freedom

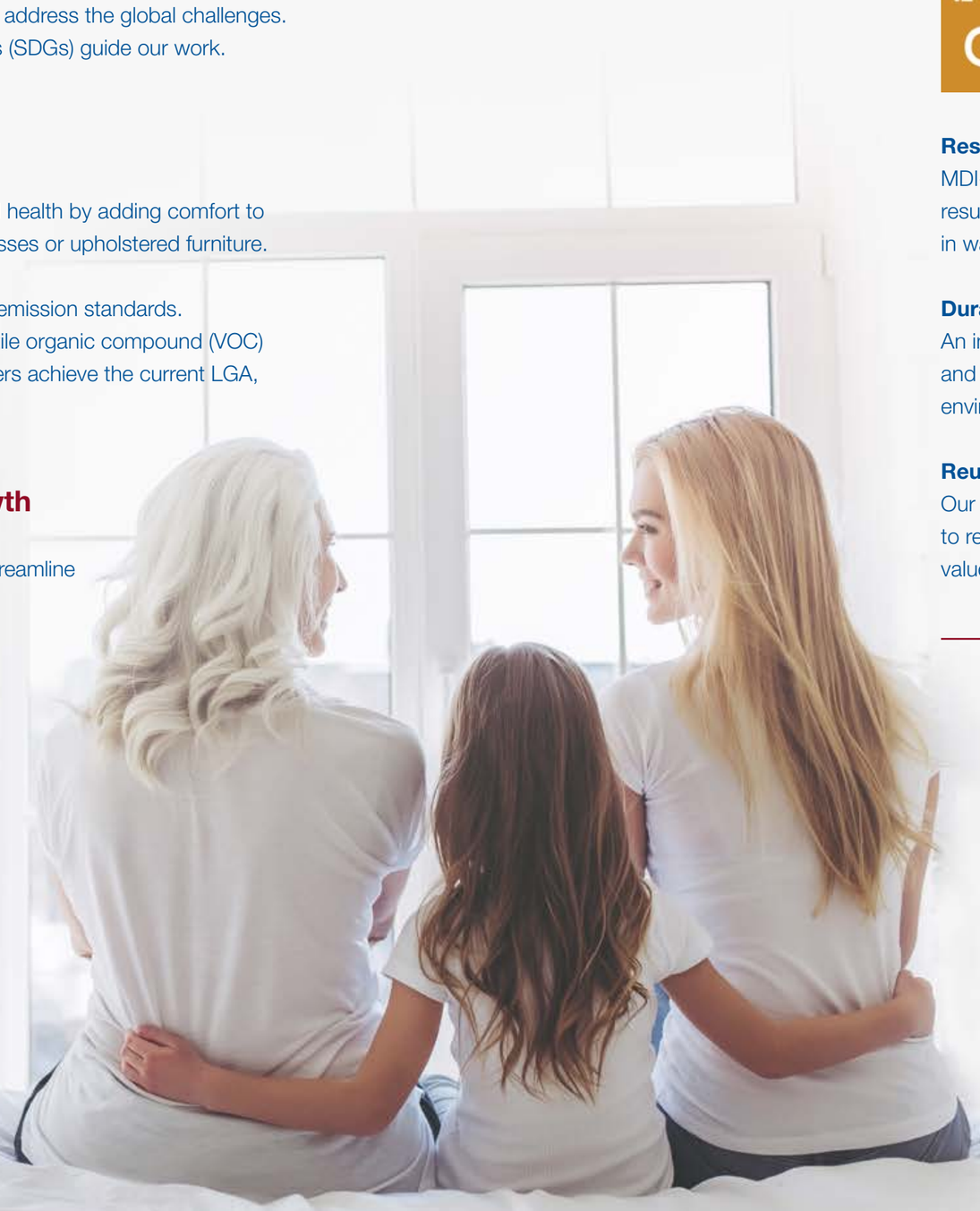
Our MDI technologies offer high formulation flexibility to achieve a wide variety of foam performance levels, enabling you to simplify your inventories.

High productivity

Huntsman MDI-based technologies for flexible foam require no or minimal post cure, which means they can be converted faster. Additionally, this enables fast demould or batchblock processes.

Decent work environment

The low vapor pressure of MDI allows a reduction in emissions and odour. This improves the working environment and customer experience significantly.



Responsible consumption and production

Resource efficient

MDI-based flexible foams have high block yields, resulting in very good block shapes and a reduction in waste.

Durable

An improved durability leads to a reduction in waste and healthier consumption patterns reduce the environmental impact.

Reusable

Our binders developed for rebond foam help you to re-purpose your production trim and create new value-added products.

EcoVadis

Huntsman's sustainability performance is assessed by EcoVadis, a sustainability rating agency used by many leading companies.

Recognition

As a pioneer in flexible foam solutions, Huntsman is widely recognized as a trusted partner for manufacturers. We serve a broad and diverse range of consumer and industrial end markets, from upholstered furniture to bedding and from the automotive industry to healthcare.

HUNTSMAN PRODUCT PORTFOLIO

Huntsman's extensive range of MDI isocyanates, specialty polyols, additives, and semi- or fully-formulated systems offers a versatile set of options to flexible foam manufacturers.

With our wide portfolio, we help foam manufacturers achieve desired product quality with technology tailored to their manufacturing process.

Outstanding quality
The range of MDI-based materials can enable the manufacturing of the quality of flexible foam you need and your customers count on.

	DENSITY (KG/M³)	HARDNESS (N)	SLABSTOCK Components and Systems	BATCHBLOCK Systems	MOULDED Systems
HIGH RESILIENCE	30-80	80-220	Isocyanates	Formulated systems	Formulated systems
VISCO ELASTIC	40-100	40-200	Isocyanates Additives Polyols (Semi) formulated systems	Formulated systems	Formulated systems
RUBIFLEX® Cocoon	40-55	30-220	Isocyanates	Formulated systems	Formulated systems
WET GEL	40-50	32-60	Isocyanates Additives	Formulated systems	Formulated systems
PNVE	30-40	40-80	Isocyanates Additives	Formulated systems	Formulated systems

Airflow
Most of Huntsman solutions for foam technologies result in great breathability and comfort, thanks to a very open cell foam structure and very good airflow.

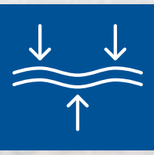
Fire safety
All our formulations can be modified to meet various fire safety standards.

FLEXIBLE FOAM TECHNOLOGIES

HIGH RESILIENCE
An all-round powerhouse, used in toppers, core, full mattresses, pillows and furniture

VISCO ELASTIC
Elastic fantastic for toppers, core, full mattresses, pillows and furniture

RUBIFLEX® COCOON
The absolute top of the line for toppers, core, full mattresses, pillows and furniture



WET GEL
Optimal temperature regulation for toppers and pillows

PNVE
The temperature insensitive solution for toppers, pillows and furniture

HIGH RESILIENCE

Applications:
toppers | cores | full mattresses | pillows | furniture

Rebound & Relax

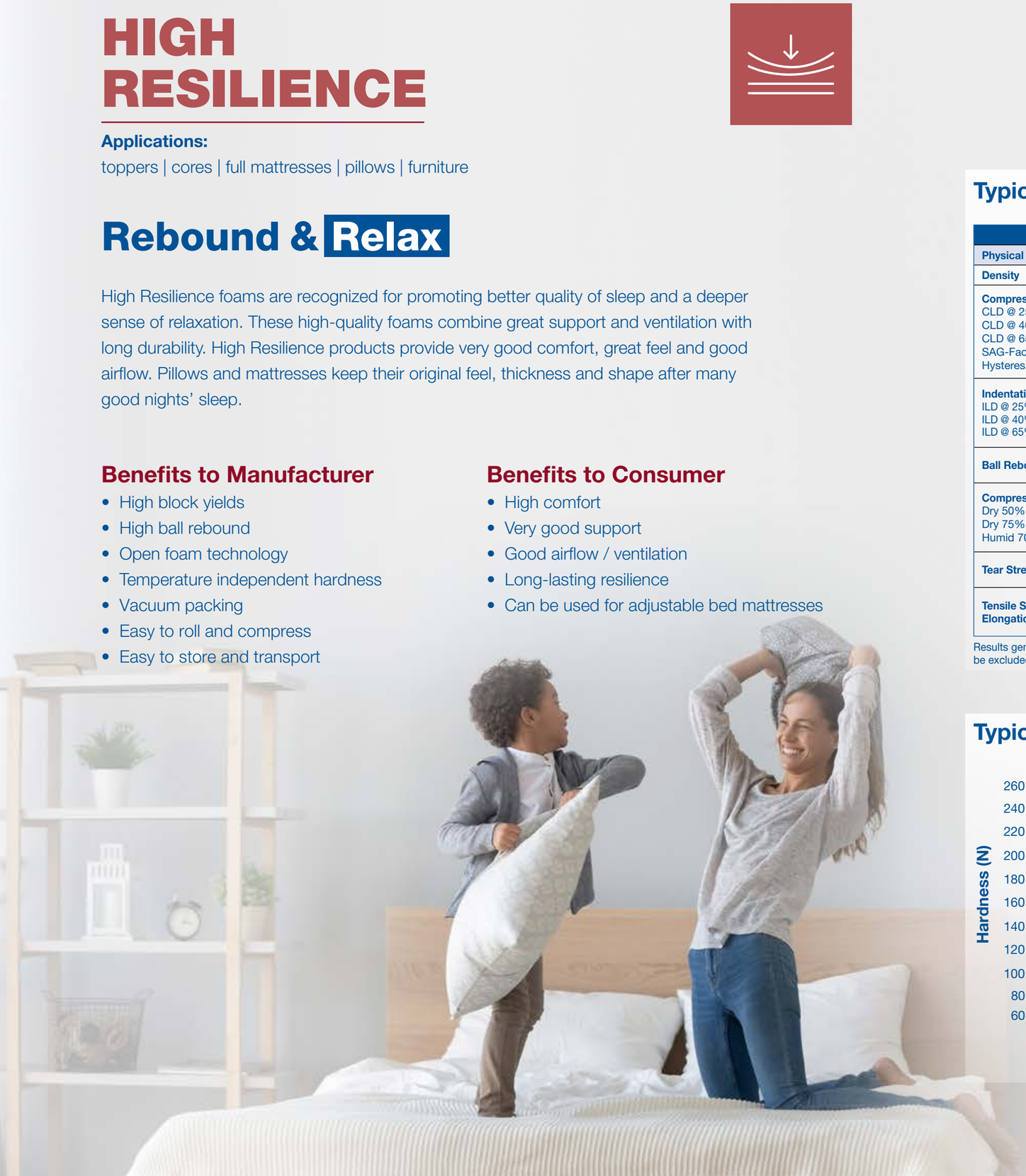
High Resilience foams are recognized for promoting better quality of sleep and a deeper sense of relaxation. These high-quality foams combine great support and ventilation with long durability. High Resilience products provide very good comfort, great feel and good airflow. Pillows and mattresses keep their original feel, thickness and shape after many good nights' sleep.

Benefits to Manufacturer

- High block yields
- High ball rebound
- Open foam technology
- Temperature independent hardness
- Vacuum packing
- Easy to roll and compress
- Easy to store and transport

Benefits to Consumer

- High comfort
- Very good support
- Good airflow / ventilation
- Long-lasting resilience
- Can be used for adjustable bed mattresses

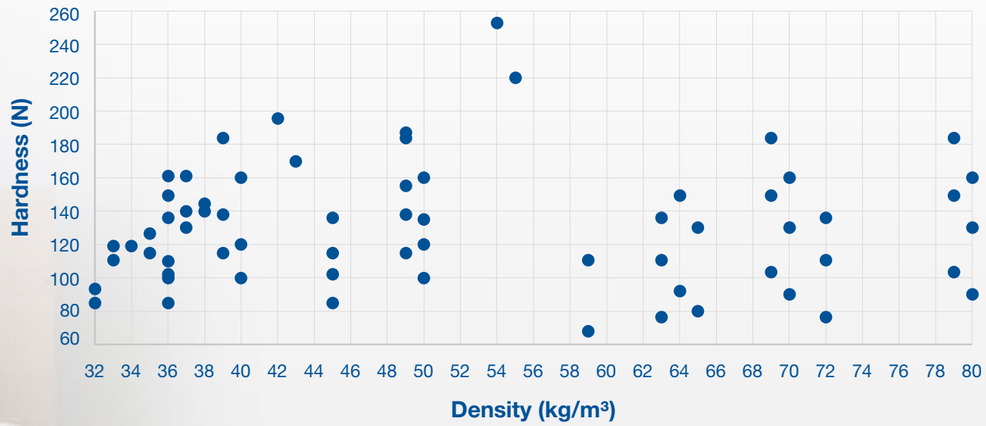


Typical physical properties

Physical Property	Unit	Specification	HR 36100	HR 36160	HR 38140	HR 40120	HR 40160	HR 50090	HR 65080	HR 70130
Density	kg/m³	ISO 845	33,7	33,7	34,4	37,1	37,9	42,6	62,2	64,3
Compression Hardness										
CLD @ 25%	kPa	ISO 3386	2,2	3,3	3,1	2,5	3,2	1,9	1,5	1,7
CLD @ 40%	kPa		3,0	4,5	4,2	3,3	4,3	2,5	2,0	2,3
CLD @ 65%	kPa		8,1	12,1	11,0	8,6	11,2	6,5	5,0	5,9
SAG-Factor			3,8	3,6	3,5	3,4	3,5	3,5	3,5	3,5
Hysteresis	%		31,9	35,8	33,8	30,0	32,3	24,1	19,6	19,4
Indentation Hardness										
ILD @ 25%	N	ISO 2439	73	111	104	84	117	64	54	64
ILD @ 40%	N		101	154	144	115	160	87	75	88
ILD @ 65%	N		232	358	328	257	357	193	165	188
Ball Rebound	%	ISO 8307	58	53	54	57	55	63	60	58
Compression Set										
Dry 50%	%	ISO 1856	3,4	3,3	3,7	4,5	3,7	2,7	2,9	0,8
Dry 75%	%		3,6	4	4,4	4,5	4,3	3,1	3,1	1,3
Humid 70%	%		12,1	12,5	7,4	8,2	7,8	5,5	1,3	1,5
Tear Strength	N/m	ISO 8067	115	136	152	130	160	101	118	110
Tensile Strength	kPa	ISO 1798	60	72	70	72	72	48	43	44
Elongation	%		83	73	77	79	81	88	120	114

Results generated (in lab or field conditions) which are typical for this application. Data variations due to varying processing or ambient conditions cannot be excluded. These properties are not part of the specifications of Huntsman polyurethane raw materials.

Typical Density-Hardness range



VISCO ELASTIC

Applications:
toppers | cores | full mattresses | pillows | furniture

Stellar comfort

Visco Elastic foam technology was first applied in mattresses to prevent bedsores. Subsequently, NASA used it in their space shuttles to help overcome the effects of G-forces. Because of its distinct qualities, such as great pressure distribution, Visco Elastic foam offers a very different kind of comfort compared to other foam technologies.

This material creates a memory effect and provides that comfortable feeling of gently sinking into a mattress. Visco Elastic foam enables natural sleep movements of the body throughout the night, which can improve the quality of sleep and promotes a deep level of relaxation.

Benefits to Manufacturer

- High block yields
- Low MDA emissions
- Fast curing time
- Open foam technology
- Excellent compression set (dry & wet) characteristics
- Vacuum packing
- Easy to roll and compress
- Easy to store and transport

Benefits to Consumer

- Excellent comfort
- Excellent pressure distribution
- Maximizes blood flow [1]
- Memory effect – takes body shape
- Suitable for adjustable bed mattresses

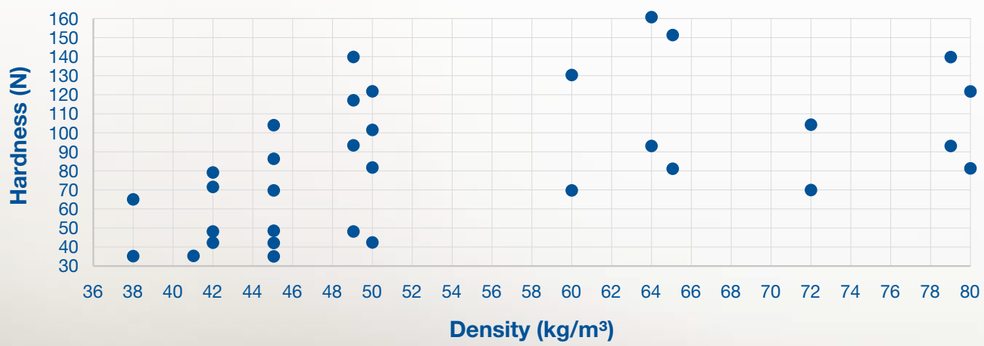
[1] Rothenberger J, Krauss S, Held M, Bender D, Schaller HE, Rahmanian-Schwarz A, Constantinescu MA, Jaminet P. A quantitative analysis of microcirculation in sore-prone pressure areas on conventional and pressure relief hospital mattresses using laser Doppler flowmetry and tissue spectrophotometry. J Tissue Viability. 2014 Nov;23(4):129-36. doi: 10.1016/j.jtv.2014.05.001. Epub 2014 Jun 6. PMID: 24950658.

Typical physical properties

Physical Property	Unit	Specification	VE 42060	VE 50060	VE 50100	VE 65060	VE 80080	VE 80180
Density	kg/m³	ISO 845	41,2	46,6	46,6	62,4	73,5	79,8
Compression Hardness								
CLD @ 25%	kPa	ISO 3386 Modified (no precycles)	1,3	1,5	3,0	1,6	1,8	6,4
CLD @ 40%	kPa		2,1	1,8	3,6	1,9	2,5	7,1
CLD @ 65%	kPa		4,5	3,8	7,5	3,9	4,3	13,0
SAG-Factor			3,5	2,6	2,5	2,4	2,4	2,0
Hysteresis	%		48,0	51,1	66,6	42,3	51,3	66,2
CLD Relax								
Peak Hardness	kPa	HPU-FT-011	2,1	2,3	4,7	2,4	3,9	10,1
Relaxation Hardness @180s	kPa		1,3	1,1	1,7	1,2	1,8	3,7
Relaxation	%		38,2	51,9	63,3	50,0	53,8	62,9
Indentation Hardness								
ILD @ 25%	N	ISO 2439 Modified (No precycles)	51	44	81	45	68	144
ILD @ 40%	N		69	58	106	60	83	177
ILD @ 65%	N		134	111	202	113	180	313
Ball Rebound	%	ISO 8307	17	8	9	8	9	9
Compression Set								
Dry 75%	%	ISO 1856	7,5	1,3	1,3	1,3	0,7	0,7
Dry 90%	%		7,8	1,8	1,2	1,2	0,5	0,8
Humid 70%	%		1,9	-0,5	0,9	-0,5	-0,5	-0,5
Tear Strength	N/m	ISO 8067	168	282	411	188	187	182
Tensile Strength	kPa	ISO 1798	72	118	184	165	158	151
Elongation	%		130	160	155	150	146	123

Results generated (in lab or field conditions) which are typical for this application. Data variations due to varying processing or ambient conditions cannot be excluded. These properties are not part of the specifications of Huntsman polyurethane raw materials.

Typical Density-Hardness range



RUBIFLEX® COCOON

Applications:
toppers | cores | full mattresses | pillows | furniture

All that **matters** combined in one **mattress**

RUBIFLEX® Cocoon polyurethane flexible foam is of a different class. The technology combines the advantages of both High Resilience and Visco Elastic (memory) foams in one flexible foam. It provides unique comfort benefits to end users, and it gives you significant processing and supply chain benefits.

Benefits to Manufacturer

- High block yields
- Open cell foam technology
- Very durable and resilient
- Very good compression set (dry & wet) characteristics
- Very good mechanical properties (very high tear strength, tensile strength and elongation)
- Temperature independent hardness
- Vacuum packing
- Easy to roll and compress
- Easy to store and transport

Benefits to Consumer

- High comfort
- Very good heat regulation
- Humidity control
- Minimizes pressure points
- Maximizes blood flow[1]
- Supportive and unique silky feeling
- Deeper, more restful sleep and higher sense of wellbeing

[1] Rothenberger J, Krauss S, Held M, Bender D, Schaller HE, Rahmanian-Schwarz A, Constantinescu MA, Jaminet P. A quantitative analysis of microcirculation in sore-prone pressure areas on conventional and pressure relief hospital mattresses using laser Doppler flowmetry and tissue spectrophotometry. J Tissue Viability. 2014 Nov;23(4):129-36. doi: 10.1016/j.jtv.2014.05.001. Epub 2014 Jun 6. PMID: 24950658.

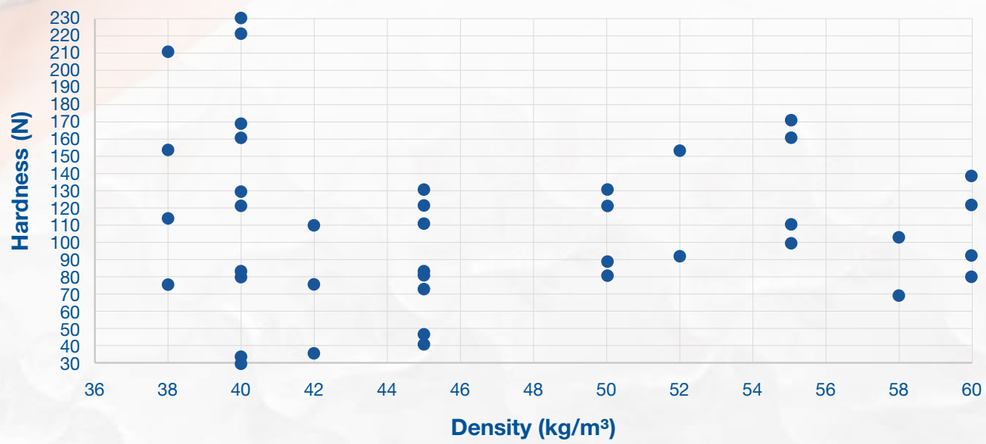
Typical physical properties

SLABSTOCK	Unit						
Density	kg/m³	40	42	44	48	55	56
Hardness ILD 40%	N	76	222	97	192	80	194
Tear strength	N/m	425	257	343	181	242	161
Compression set at 70°C dry and 90% compression	%	2,9	3,0	1,3	2,3	2,4	1,6
Resilience	%	59	48	58	55	62	60
Dynamic Fatigue	ISO3385						
Thickness Loss	%	1,5	1,1	1,2	1,1	0,8	0,8
Hardness Loss	%	17,8	19,7	15,0	14,5	8,0	8,9

BATCHBLOCK	Unit				
Density	kg/m³	42	39	40	47
Hardness ILD 40%	N	83	137	193	137
Tear strength	N/m	231	223	217	190
Compression set at 70°C dry and 90% compression	%	2,6	4,8	2,6	2,3
Dynamic Fatigue	ISO3385				
Thickness Loss	%	1,2	1,8	2,1	1,0
Hardness Loss	%	15,4	27,3	28,6	16,8

Results generated (in lab or field conditions) which are typical for this application. Data variations due to varying processing or ambient conditions cannot be excluded. These properties are not part of the specifications of Huntsman polyurethane raw materials.

Typical Density-Hardness range



WET GEL

Applications:
toppers | pillows

One foam for all seasons

Wet Gel technology facilitates very good temperature regulation, making it a great material for all seasons. When used in toppers and pillows, Wet Gel flexible foam feels like a gel, resulting in a soft and silky feel. In addition to its thermal benefits, it has an excellent airflow.

Benefits to Manufacturer

- High block yields
- Open foam technology
- Fast cure
- Vacuum packing
- Easy to roll and compress
- Easy to store and transport

Benefits to Consumer

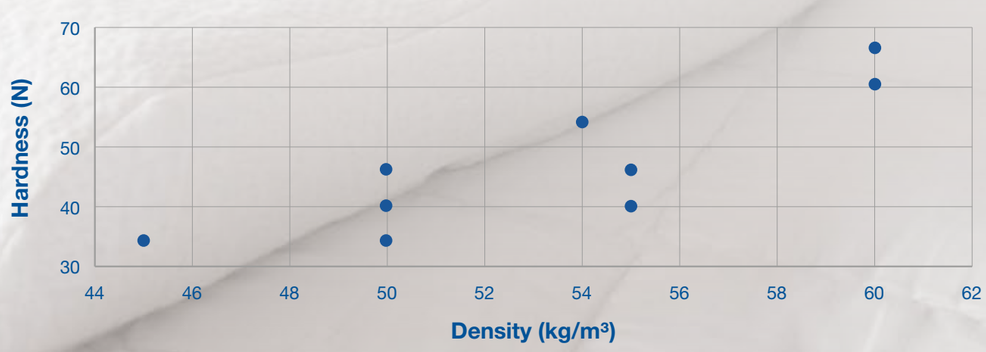
- Very good temperature regulation
- Improved sleep quality and relaxation
- Silky feeling
- Great ventilation

Typical physical properties

Wet Gel Grade			WG 50040	WG 55040	WG 60060
Physical Property	**Unit**	**Specification**			
Density	kg/m³	ISO 845	47,4	54,4	58,6
Compression Hardness					
CLD @ 25%	kPa	ISO 3386	0,9	0,9	1,2
CLD @ 40%	kPa		1,1	1,1	1,5
CLD @ 65%	kPa		2,4	2,4	3,1
SAG-Factor			2,7	2,7	2,6
Hysteresis	%		17,1	13,1	11,6
Indentation Hardness					
ILD @ 25%	N	ISO 2439	34	31	45
ILD @ 40%	N		45	40	58
ILD @ 65%	N		86	76	109
Ball Rebound	%	ISO 8307	36	47	52
Compression Set					
Dry 50%	%	ISO 1856	0,7	1,1	1
Dry 75%	%		1,1	1,3	1
Humid 70%	%		-2,3	-2,7	-2,6
Tear Strength	N/m	ISO 8067	115	136	141
Tensile Strength	kPa	ISO 1798	60	55	44

Results generated (in lab or field conditions) which are typical for this application. Data variations due to varying processing or ambient conditions cannot be excluded. These properties are not part of the specifications of Huntsman polyurethane raw materials.

Typical Density-Hardness range



PNVE

Applications:
toppers | pillows

Comfortably cosy

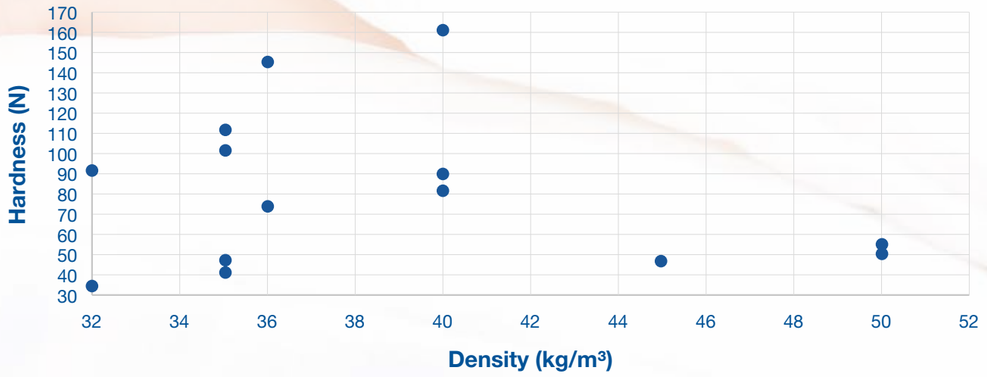
PNVE (pneumatic visco elastic) foam is a physical approach to memory foam. The main advantage of PNVE foam is that it retains the soft cushion feel of memory foam, regardless of its surrounding temperatures. Since PNVE can be made at lower densities, it also offers an improved cost performance.

Typical physical properties

MDI Visco Elastic Foam Grade			PNVE 35040	PNVE 35100	PNVE 40080	PNVE 40160	PNVE 50050
Physical Property	**Unit**	**Specification**					
Density	kg/m³	ISO 845	35,7	35,3	40,3	36,6	49,9
Compression Hardness							
CLD @ 25%	kPa	ISO 3386 Modified (no precycles)	1,1	2,5	1,8	5,0	1,0
CLD @ 40%	kPa		1,3	2,8	2,0	5,7	1,2
CLD @ 65%	kPa		2,2	4,6	3,1	8,8	2,0
SAG-Factor			2,1	1,9	1,8	1,8	2,0
Hysteresis	%		58,1	60,0	42,5	62,5	32,1
CLD Relax							
Peak Hardness	kPa	HPU-FT-011	3,3	7,2	2,4	6,9	1,8
Relaxation Hardness @180s	kPa		1,6	3,3	1,5	2,9	1,2
Relaxation	%		51,2	54,7	36,4	58,1	33,3
Indentation Hardness							
ILD @ 25%	N	ISO 2439 Modified (No precycles)	32	75	62	128	39
ILD @ 40%	N		41	94	77	160	49
ILD @ 65%	N		68	147	120	247	79
Ball Rebound	%	ISO 8307	10	10	14	11	9
Compression Set							
Dry 75%	%	ISO 1856	2,6	2,7	0,8	4,6	1,2
Dry 90%	%		3,5	3,2	0,6	4,3	1,4
Humid 70%	%		-0,2	0,2	-1,8	-0,5	-2,2
Tear Strength	N/m	ISO 8067	70	109	74	118	60
Tensile Strength	kPa	ISO 1798	34	38	31	53	32
Elongation	%		121	125	124	107	89

Results generated (in lab or field conditions) which are typical for this application. Data variations due to varying processing or ambient conditions cannot be excluded. These properties are not part of the specifications of Huntsman polyurethane raw materials.

Typical Density-Hardness range



Benefits to Manufacturer

- High block yields
- Temperature independent hardness
- Easier conversion vs. chemical visco elastic
- Low densities (cost benefits)

Benefits to Consumer

- Improves sleep quality and relaxation
- Minimizes pressure points
- Maximizes blood flow[1]
- Temperature insensitive

[1] Rothenberger J, Krauss S, Held M, Bender D, Schaller HE, Rahmanian-Schwarz A, Constantinescu MA, Jaminet P. A quantitative analysis of microcirculation in sore-prone pressure areas on conventional and pressure relief hospital mattresses using laser Doppler flowmetry and tissue spectrophotometry. J Tissue Viability. 2014 Nov;23(4):129-36. doi: 10.1016/j.jtv.2014.05.001. Epub 2014 Jun 6. PMID: 24950658.

BINDERS

Recycle **Rebond** Reuse

Complementary to our technology portfolio for the manufacture of flexible foams, Huntsman offers a range of MDI-based binders. These can be used for recycling trim foam to produce rebonded foam.

With properties ranging from soft to semi rigid to hard, these binders have a short cure time, are available for fast reactive, catalyst or steam induced technology and offer durable solutions for a variety of applications, such as under carpet and sound absorption products.

HUNTSMAN

Enriching lives through innovation

HUNTSMAN

Enriching lives through innovation

EUROPEAN HEADQUARTERS
Huntsman Polyurethanes
Everslaan 45
B-3078 Everberg Belgium
Telephone: +32 2 758 9211

For more information on Huntsman product portfolio for flexible foams
Contact a Huntsman representative or visit our website at **www.huntsman.com**
Or send us an email:
polyurethanes_eu@huntsman.com

About Huntsman:
Huntsman Corporation is a publicly traded global manufacturer and marketer of differentiated and specialty chemicals with 2019 revenues more than $7 billion. Our chemical products number in the thousands and are sold worldwide to manufacturers serving a broad and diverse range of consumer and industrial end markets. We operate more than 70 manufacturing, R&D and operations facilities in approximately 30 countries and employ approximately 7,000 associates within our four distinct business divisions. For more information about Huntsman, please visit the company's website at **www.huntsman.com**.

Huntsman Polyurethanes warrants only that its products meet the specifications agreed with the buyer. Typical properties, where stated, are to be considered as representative of current production and should not be treated as specifications.

While all the information and recommendations in this publication are to the best of our knowledge, information and belief accurate

at the date of publication, NO GUARANTY, WARRANTY OR REPRESENTATION IS MADE, INTENDED OR IMPLIED AS TO THE CORRECTNESS OR SUFFICIENCY OF ANY INFORMATION OR RECOMMENDATION OR AS TO THE MERCHANTABILITY, SUITABILITY OR FITNESS OF ANY PRODUCTS FOR ANY PARTICULAR USE OR PURPOSE.

IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE. NOTHING IN THIS PUBLICATION IS TO BE CONSTRUED AS RECOMMENDING THE INFRINGEMENT OF ANY PATENT OR OTHER INTELLECTUAL PROPERTY RIGHT AND NO LIABILITY ARISING FROM ANY SUCH INFRINGEMENT IS ASSUMED. NOTHING IN THIS PUBLICATION IS TO BE VIEWED AS A LICENCE UNDER ANY INTELLECTUAL PROPERTY RIGHT.

Products may be toxic and require special precautions in handling. The user should obtain Safety Data Sheets from Huntsman Polyurethanes and Huntsman Performance Products containing detailed information on toxicity, together with proper shipping, handling and storage procedures, and should comply with all applicable safety and environmental standards.

Hazards, toxicity and behavior of the products may differ when used with other materials and are dependent on the manufacturing circumstances or other processes. Such hazards, toxicity and behavior should be determined by the user and made known to handlers, processors and end users.

SUPRASEC®, DALTOCEL®, DALTOLAC®, RUBIFLEX®, DALTOFLEX® are registered trademarks of Huntsman Corporation or an affiliate thereof in one or more, but not all, countries.

1139-2021V1

www.huntsman.com/polyurethanes