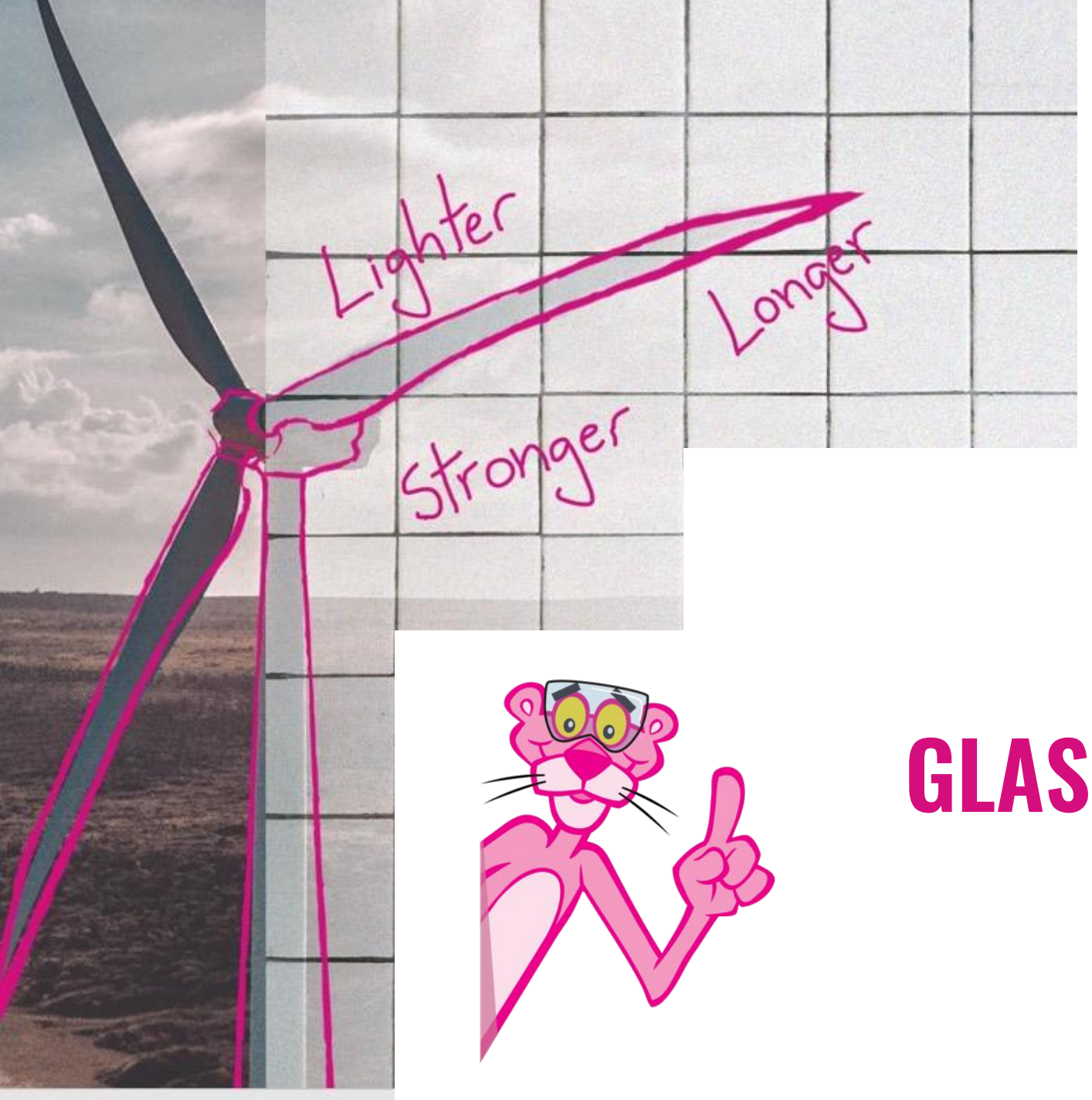


2022 USTV
GLASS CONFERENCE

Dr. Anne Berthereau

September 21, 2022

OWENS CORNING AT A GLANCE

CONSECUTIVE YEARS AS A FORTUNE® 500 COMPANY

*2021 REVENUE

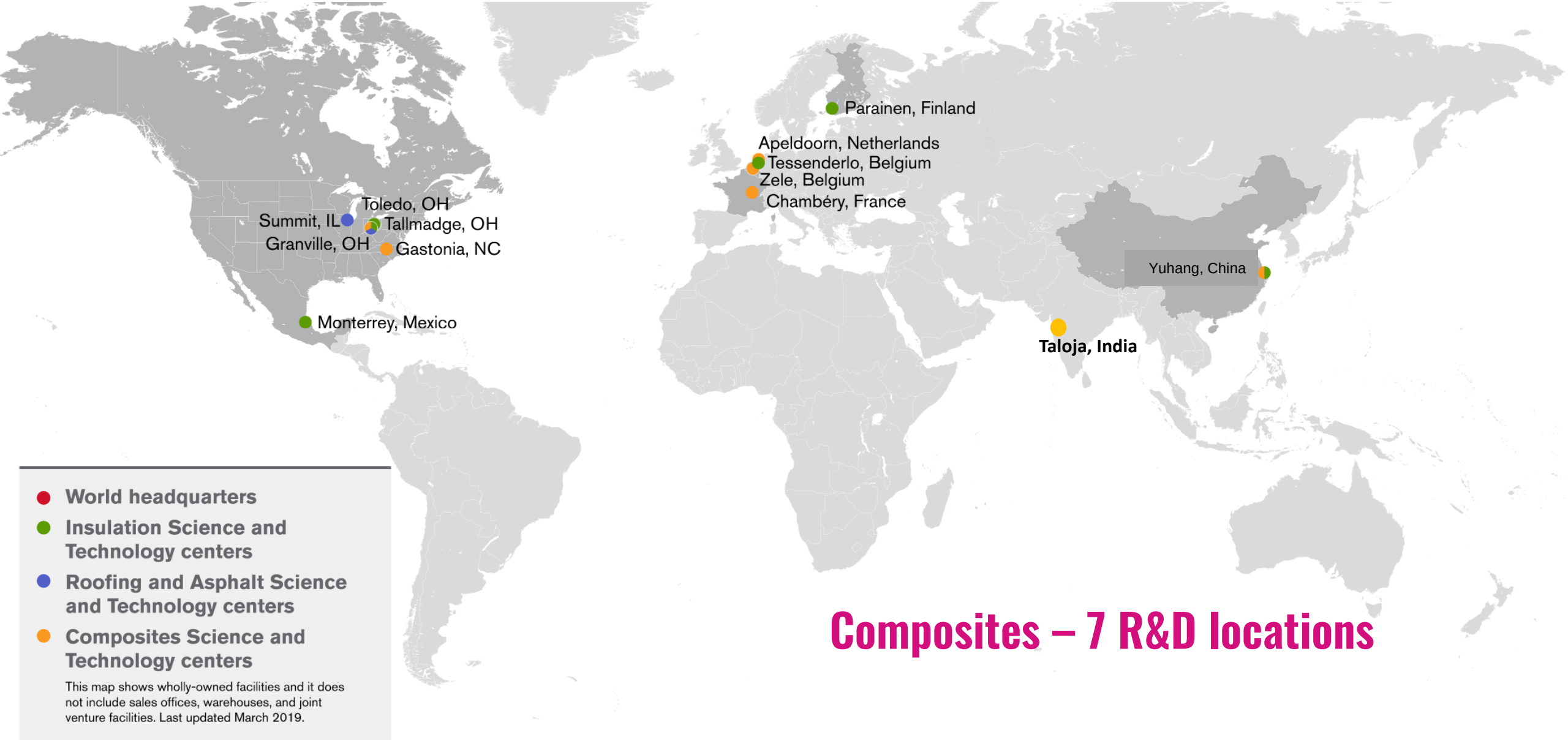
EMPLOYEES PLUS 1 PINK PANTHER

COUNTRIES WHERE WE OPERATE

Serving residential, commercial, and industrial markets

INSULATION | ROOFING | COMPOSITES

R&D NETWORK AT OWENS CORNING - GLOBAL IN SCOPE, HUMAN IN SCALE



Composites – 7 R&D locations

OUR DEEP EXPERTISE HAS A SOLID FOUNDATION

1938 First Board of Directors

1939 World's Fair

1953 Chevrolet Corvette

1956 The color PINK

1957 Recreational boating

1969 Space suits

1975 800-mile Trans-Alaska Pipeline

COMPOSITES: ENABLING A WORLD OF POSSIBILITIES

A leading global producer
of fiberglass

Redefining performance
to help customers win in all market segments

Innovator
in glass fiber since 1938

2021 Composites Business Revenues:

$2.3 billion





GLASS FIBER MANUFACTURING

GLASS FABRICS TECHNOLOGIES

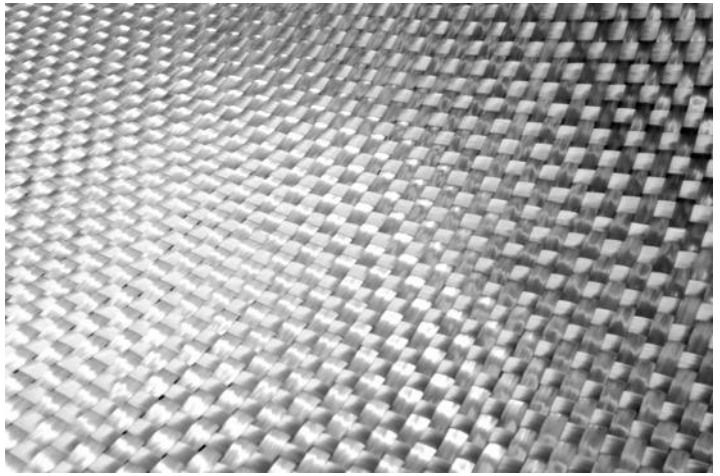
GLASS NON-WOVEN TECHNOLOGIES

AGENDA FOR TODAY

EVOLUTION OF INDUSTRIAL FIBERS

PLAN

- All started with E glass
- From E glass to H Glass : Business rationales
- Announcing OC solutions H^2 & H^3



CONNECT GLASS FUNDAMENTALS WITH INDUSTRIAL NEEDS

PRODUCT FEATURES:

- **Environmentally friendly**
- **Mechanical** properties (modulus…)
- **Thermal** properties (Softening, CTE)
- **Chemical** properties (acid, basic, water corrosion)
- **Light weight** (density)
- **Compatibility with resin** (thermoset & thermoplastics)

MANUFACTURING FEATURES:

- **Processability** (T2,T3…) melting, fiberizing
- **Cost Competitivness**

ALL STARTED WITH E GLASS*

Designation: ~~D578/D578M – 05 (Reapproved 2011)$^{\varepsilon 1}$~~ D578/D578M – 18

Standard Specification for Glass Fiber Strands[1]

4.2 *"E" Glass*—A family of glasses composed primarily of the oxides of calcium, aluminum, and silicon, which has the following certified chemical compositions.

4.2.1 The following certified chemical composition applies to glass fiber yarn products for printed circuit boards and aerospace.

Chemical	% by Weight
B_2O_3	5 to 10
CaO	16 to 25
Al_2O_3	12 to 16
SiO_2	52 to 56
MgO	0 to 5
Na_2O and K_2O	0 to 2
TiO_2	0 to 0.8
Fe_2O_3	0.05 to 0.4
Fluoride	0 to 1.0

4.2.2 The following certified chemical composition applies to glass fiber products used in general applications.

Chemical	% by Weight
B_2O_3	0 to 10
~~CaO~~	~~16 to 25~~
CaO and MgO	16 to 30
Al_2O_3	12 to 16
SiO_2	52 to 62
~~MgO~~	~~0 to 5~~
Total alkali metal oxides	0 to 2

	E glass vs current (2022)
Environmental	- -
Mechanical	- -
Thermal	- -
Chemical	=
Weight	=
Processability	+
Resin compatible	=
Cost position	- -

PAST TO FUTURE

CYCLES ARE SHORTENING | OWENS CORNING: A LEGACY OF GLASS INNOVATION

1 GEN (Generation)

1930-1940	1940-1950	1950-1960	1960-1970	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030
GEN 1: Build a glass business & mass production				**GEN2:** Sustainability & New functions (limited capacity)			**GEN 3:** Performance with limited capacity		**GEN 4:** Performances & Capacity
MAJOR INVENTION	**E GLASS* ASTM 578**			**ADVANTEX®* + S***			**H* GLASS**		**H2* GLASS**
VALUE	light, strong (vs steel, wood)			functional & sustainability			step change		Race to Modulus
CAPACITY	from single to multiple sources			Specialities business/performance			mass production		**need for capacity**

*Owens Corning patented

Cycles are shortening

FROM E TO ADVANTEX TO H GLASS

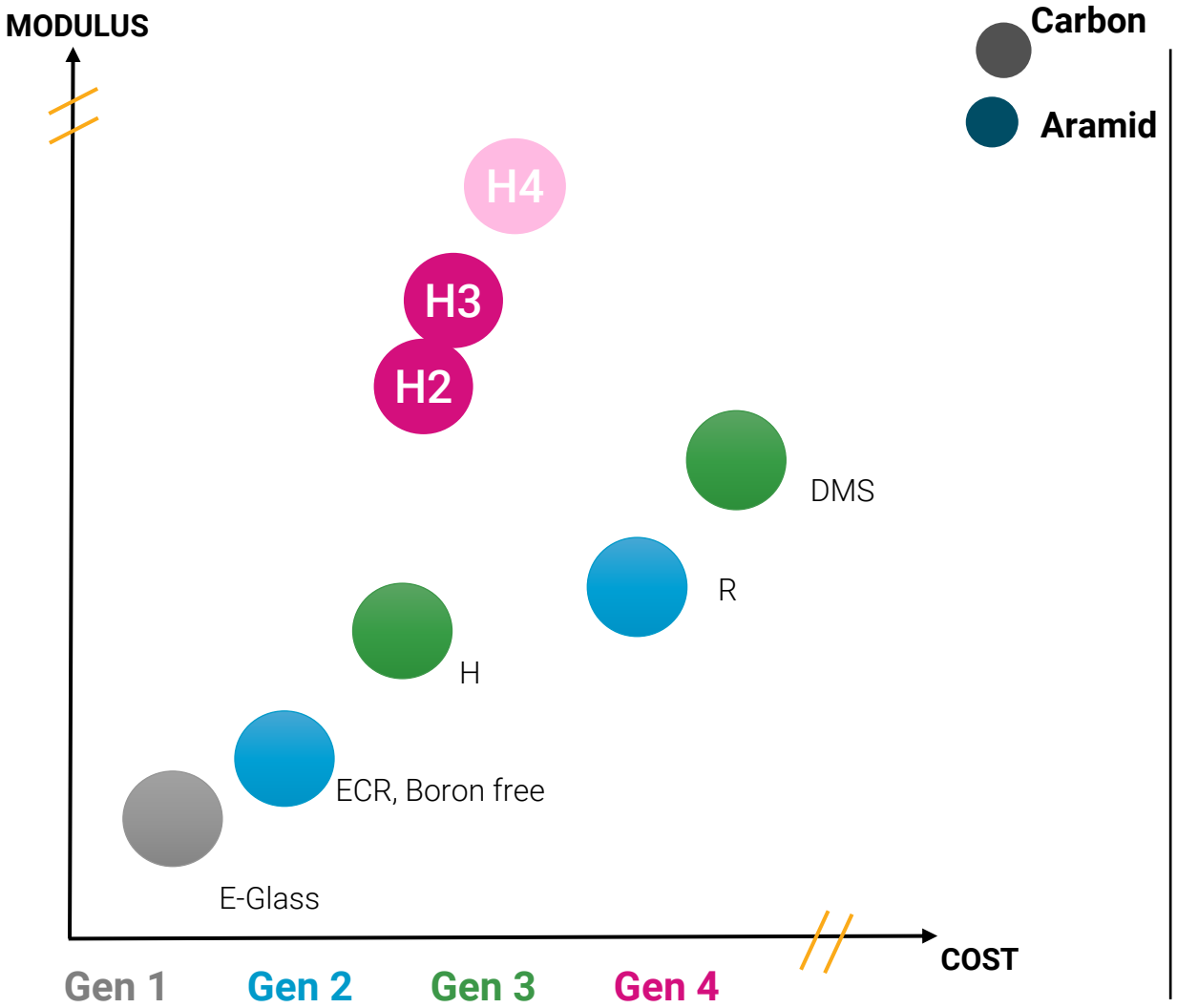
GROWTH APPLICATIONS DRIVEN




	E glass (reference)	Advantex	H	H+++
Patent priority date		1995	2004	> 2015
Environmental		++	++	++
Mechanical		+	++	+++
Thermal		+	++	+++
Chemical		+	+	+
Weight		=	=	=
Processability window		=	-	- -
Resin compatible		=	=	=
Cost position (better)		+	=	-

High Modulus Fiberglass requires advancement in melting/fiberizing technologies combined with productivity gain

RACE TO HIGHER MODULUS/$ – 2 ENABLERS



ENABLER #1: GLASS CHEMISTRY

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt									

1st generation (1930 - 1965)
2nd generation (1965 - 2000)
3rd generation (2000- 2010)
next (2020-2030)

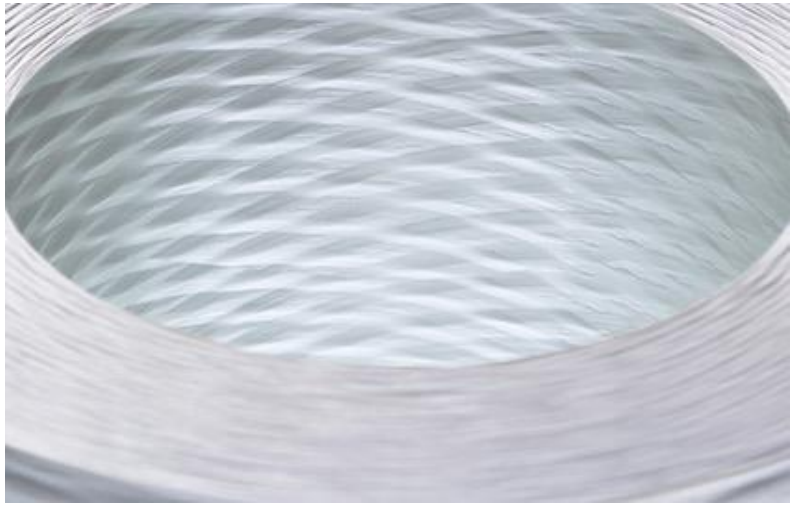
ENABLER #2: MANUFACTURING TECHNOLOGY

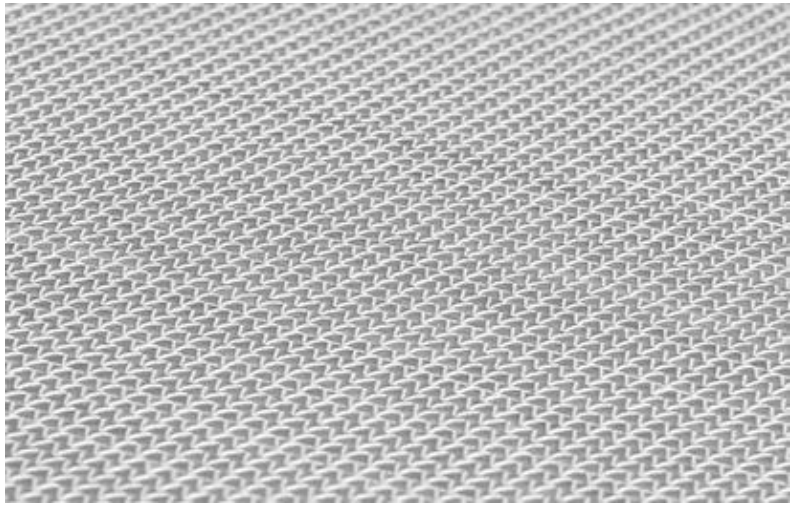
Nomenclature
Na => Na_20

WELCOME TO THE
HIGHER MODULUS AREA

H2, H3 ...

MARCH 2021 – INTRODUCING THE H² GLASS GENERATION





玻璃纤维纱
WINDSTRAND® 4000

MADE WITH H² GLASS
95 GPa – ITS Modulus²
91 GPa – Single Filament Sonic Modulus¹

- **Patented technology** that delivers highest specific modulus in its class
- **Now available with dedicated, reliable large-scale production**

玻纤织物
ULTRABLADE® 2

MADE WITH WINDSTRAND® 4000
51 GPa – Laminate modulus at 55% fvf for UD fabrics

- Manufactured with the world's best fabric technology at Owens Corning's state-of-the-art facilities.

拉挤玻板
ULTRASPAR™ 2

MADE WITH WINDSTRAND® 4000
63 GPa – Laminate modulus at 70% fiber volume fraction

- Pultrusion allows us to maximize the power of H² Glass.

¹NOL TR 65-87 testing method - true performance of the material proven by the industry's most advanced and reliable modulus testing for glass fiber.
²ASTM D2343/ISO9163 testing method.
Data verified by DNV-GL certified testing laboratory

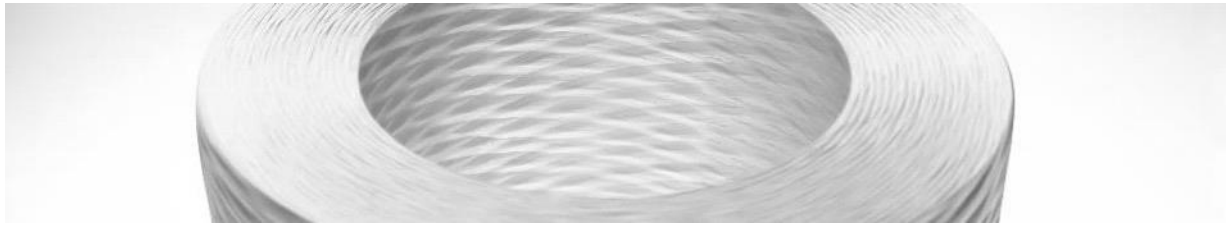
2023 - INTRODUCING H^3 GLASS

GLASS SCIENCE
Designed to power the next wind blade generation.

MORE MODULUS
Modulus increase proven by the most reliable, accurate testing protocols of sonic modulus.

STABLE PERFORMANCE
Stable specific modulus to enable reliable blade design & production.

2006	2021	2023
H-GLASS **WINDSTRAND® 3000A**	**H^2 GLASS** **WINDSTRAND® 4000**	**H^3 GLASS** **WINDSTRAND® 5000**
90 GPa (ITS Modulus)	**95 GPa** (ITS Modulus)	**100 GPa+** (ITS Modulus)
87 GPa (Sonic Fiber Modulus)	**91 GPa** (Sonic Fiber Modulus)	**95 GPa+** (Sonic Fiber Modulus)



Data verified by DNV-GL certified testing laboratory (H-Glass, H^2 Glass). H-Glass WINDSTRAND® 3000 properties valid in China. H-Glass properties vary outside of China dependent upon source. H^3 Glass targeted performance stated above. Final product performance may vary based upon further development and customer requirements.

ZEBRA – RECYCLABLE WIND BLADES

Design for recyclability
Partnering with customers
on recyclable material system

Reducing waste full chain
Through taking a system
design mindset

IRT JULES VERNE · ARKEMA · canoe · ENGIE · LM WIND POWER a GE Renewable Energy business · HOW WE POWER NOW · suez

PINKBAR™ Composite Rebar

2x tensile strength compared to steel

Lighter, easy for labor and transportation

Resistance to corrosion, saving maintenance cost

Fast installation

WE NEED YOU TO INVENT The NEXT GLASS

LONGER BLADES

Redefining higher modulus

LOWER CYCLE TIME

Driving customer productivity

SUSTAINABLE

Sustainability at our core

As the world and climate changes, so do we – together, as partners we adapt to deliver a material difference in the world.

Together we make the impossible, possible: lighter, stronger, more-durable, more cost-effective.

This is **HOW WE POWER™** the future of sustainable energy.

THANK YOU