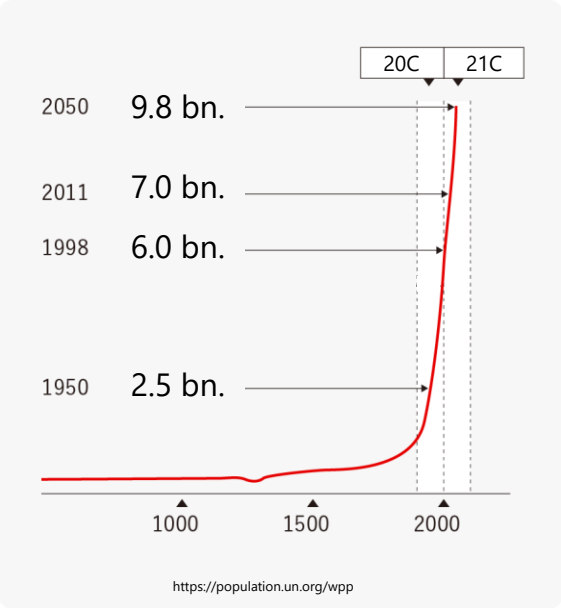
Introduction of New Material
For Next Generation Display Development

April 2022

PANASONIC INDUSTRY CORPORATION｜ELECTRONIC MATERIALS BUSINESS DIVISION｜ PLANING CENTER

1. BACKGROUND

Macro Trends ; Demographics



https://population.un.org/wpp

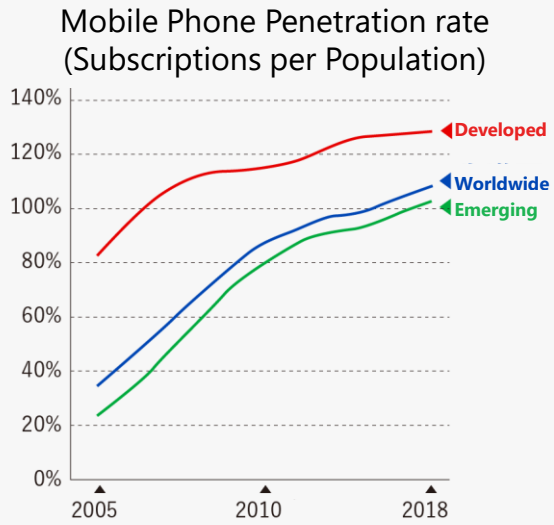
<Social Perspective>

World Population Growth

▼

Diversity in Consumer Needs

Macro Trends ; Technology



http://www.garbagenews.net/archives/1962432.html

<Behavioral Perspective>

Increasing Smartphone Penetration

▼

Growing Demand for Portable Devices

Macro Trends ; Environment

https://www.dentsu-pr.co.jp/releasestopics/news_releases/20200929.html

<Values Perspective>

Changes in Consumer Values

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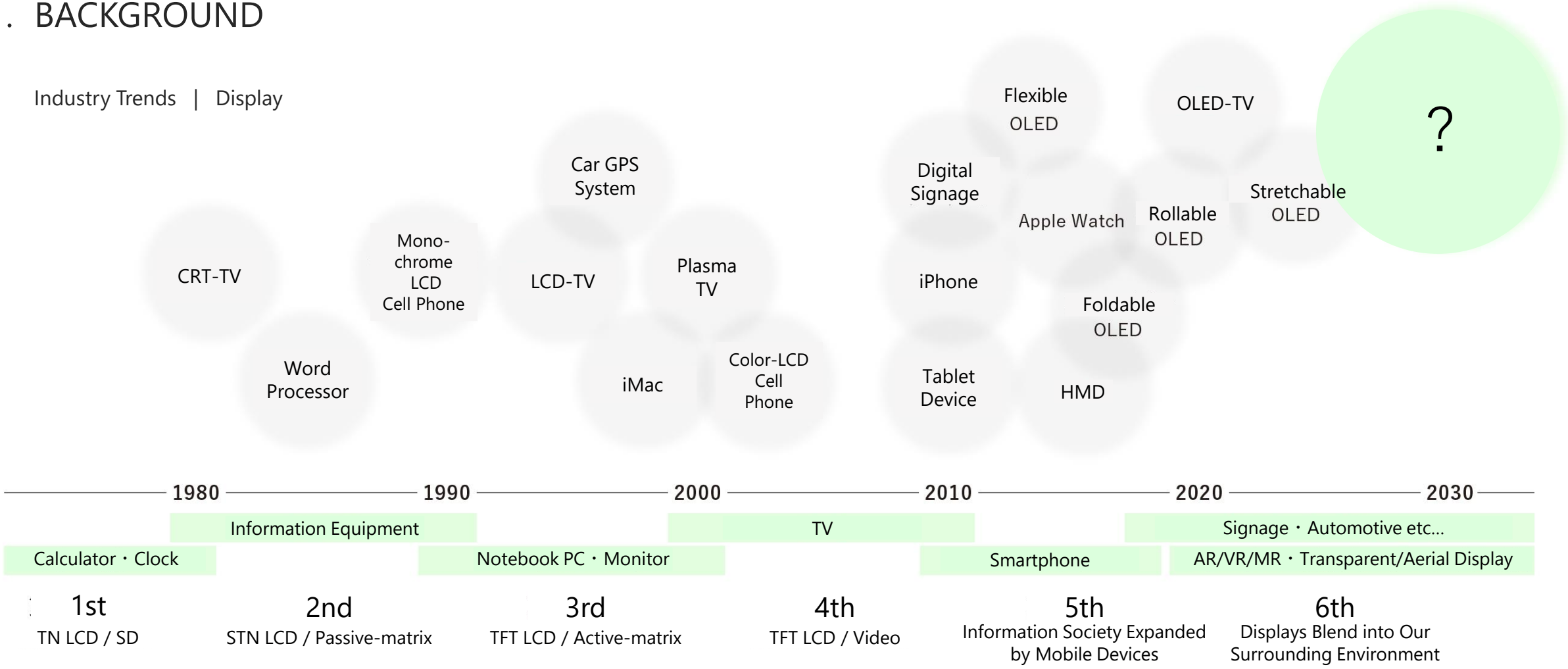
Increasing Environmental Considerations

Unprecedented values will be created.

《Demand for Environmentally Friendly Technology》

1. BACKGROUND

Industry Trends | Display



Thinner And More Free

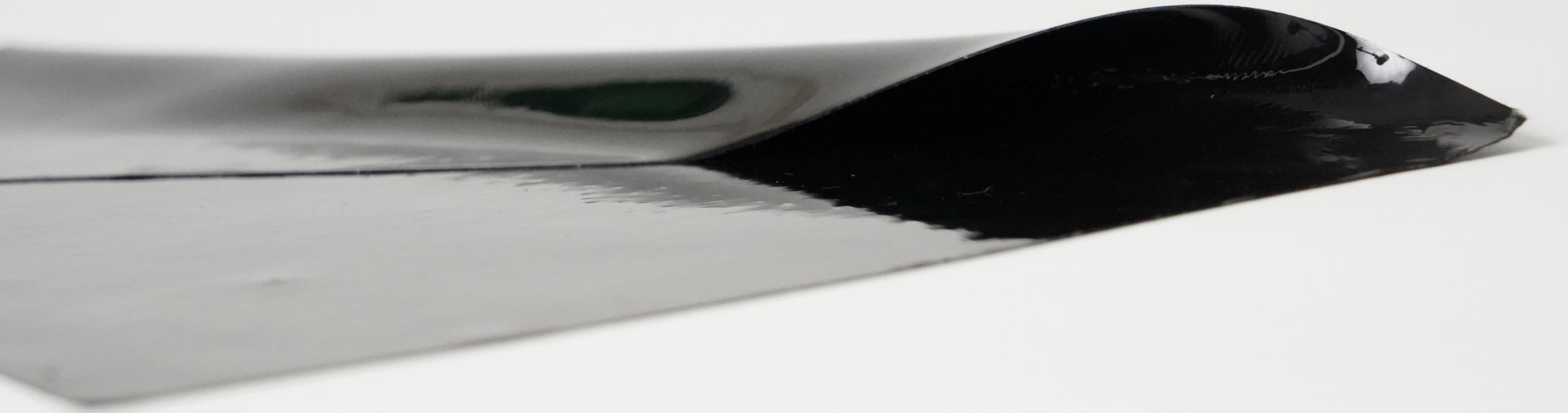
《Increasing Demand For More Freely Deformable Displays》

2. PROPOSED SOLUTION

We developed “**Multifunctional Shock Absorber**”

combines strength and softness for displays.

TOUGHTELON

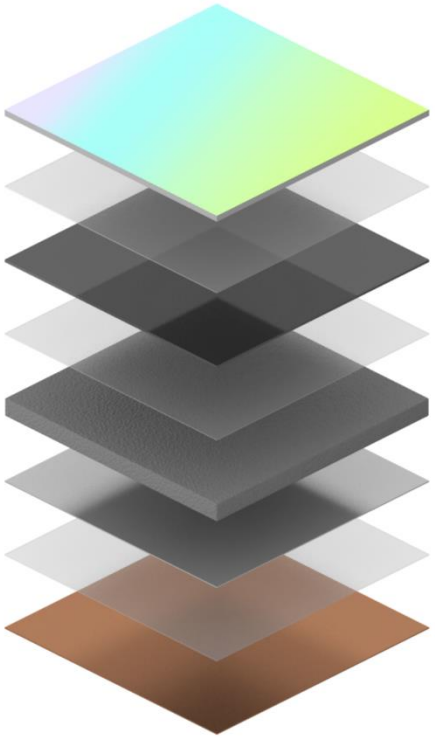


MULTIFUNCTIONAL SHOCK ABSORBER

PANASONIC INDUSTRY CORPORATION

3. FEATURE

Conventional Form



OLED

Pressure Sensitive Adhesive

Light Shielding Film

Pressure Sensitive Adhesive

Shock Absorbing Foam

Thermal Conductive Sheet

Pressure Sensitive Adhesive

Electromagnetic Shielding Sheet

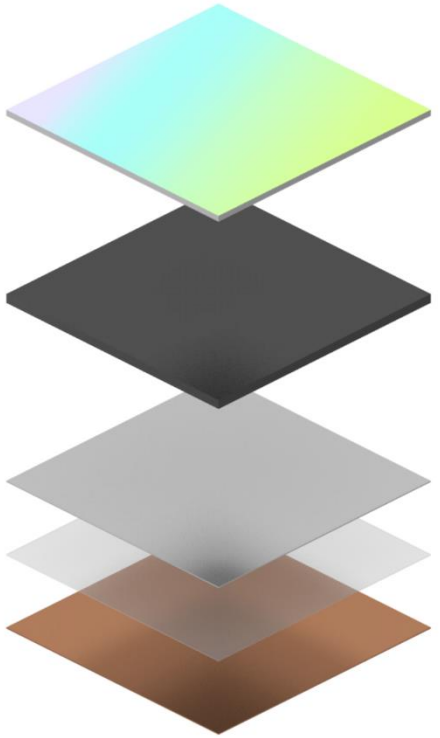
3 Functions in 1

Adhesive

Light Shielding

Shock Absorption

TOUGHTELON



OLED

TOUGHTELON

Thermal Conductive Sheet

Pressure Sensitive Adhesive

Electromagnetic Shielding Sheet

Because multiple functions are glued,
there are many processes and thickness.

Because of combining multiple layers into one film,
processes and thickness were reduced.
【Less waste / More flexibility】

Achieves both unprecedented high shock absorption and flexibility!

4. EVALUATION

01. Steel Ball Drop Test

How much impact can it withstand?

02. Pendulum Impact Test

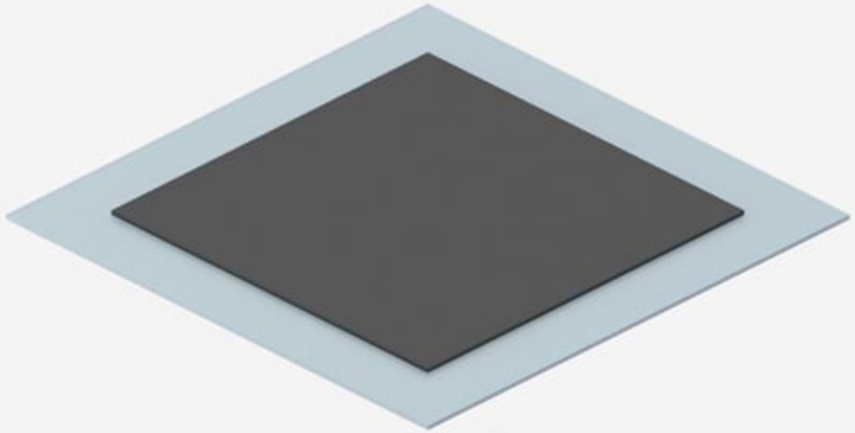
How many times can it withstand the impact?

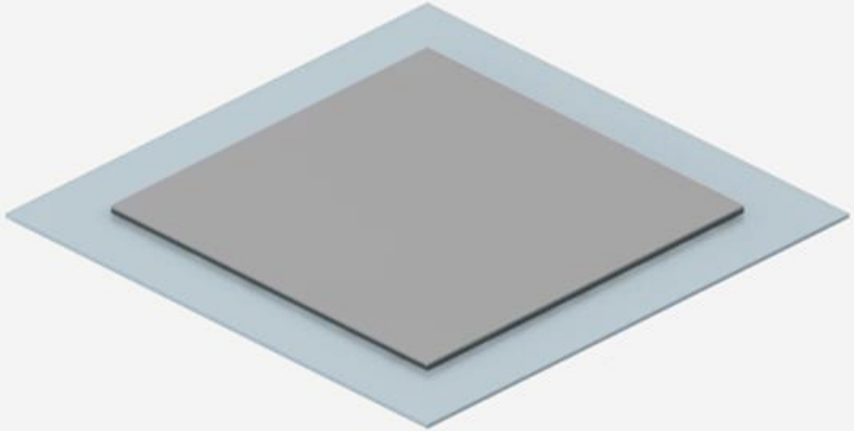
03. Folding Test

How many times can it withstand bending stress?

4. EVALUATION PROCEDURE

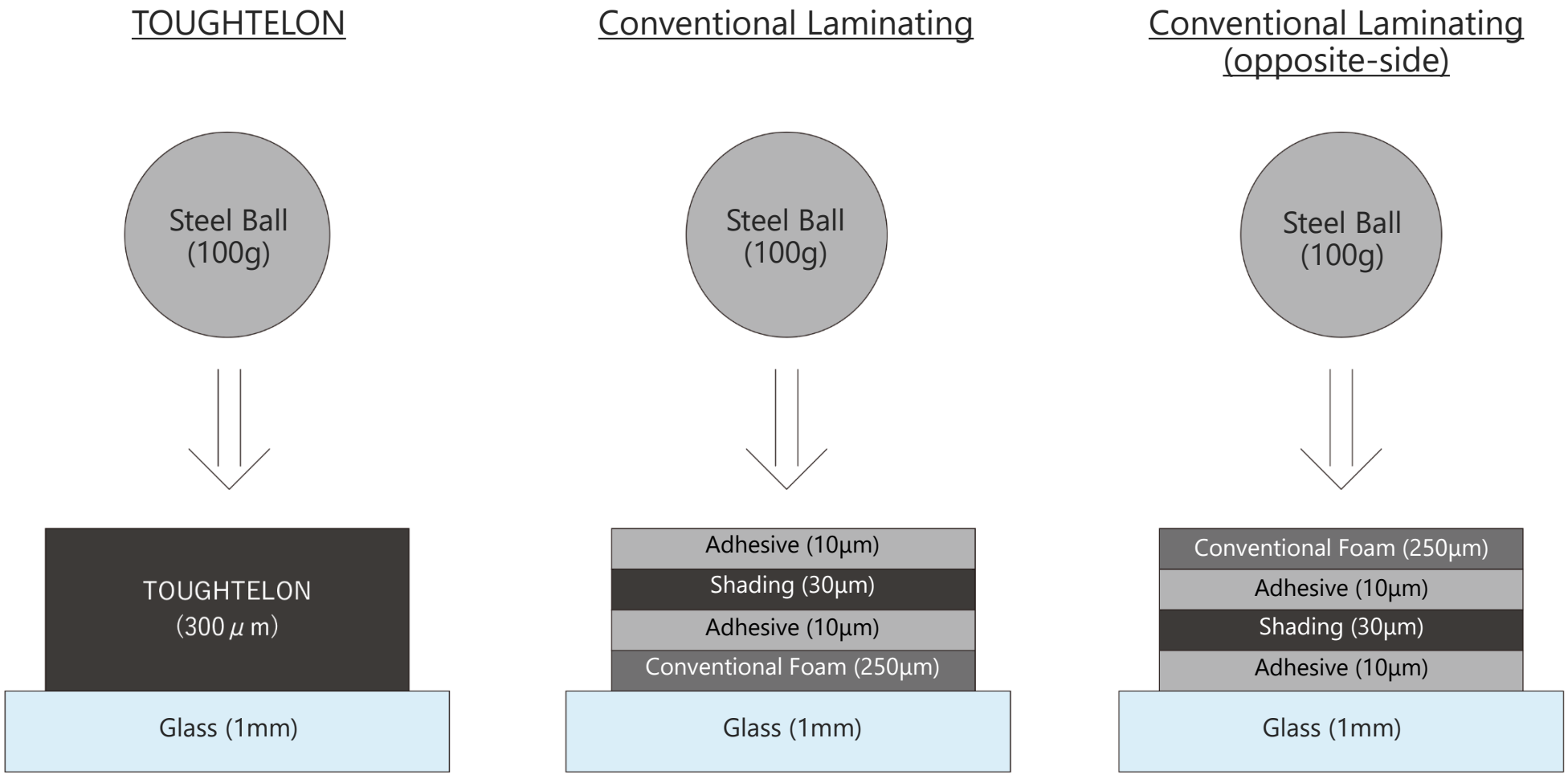
01. Steel Ball Drop Test





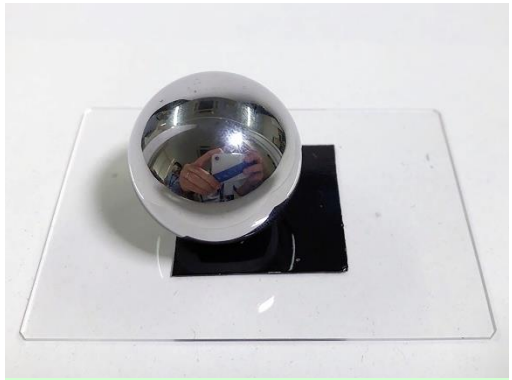
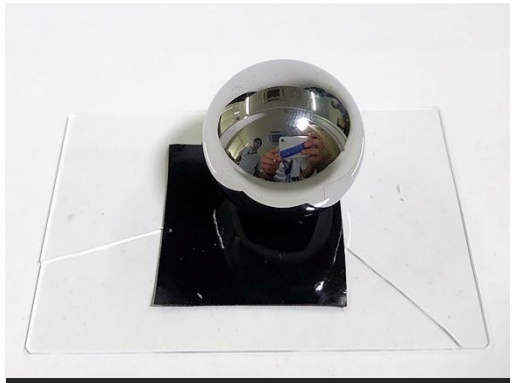
4. EVALUATION PROCEDURE

01. Steel Ball Drop Test



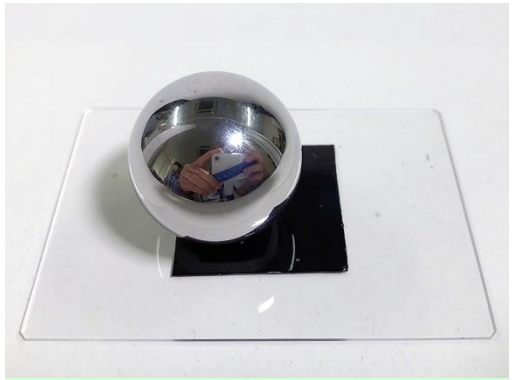
4. EVALUATION RESULT

01. Steel Ball Drop Test

Drop Height	TOUGHTELON	Conventional Laminating	Conventional Laminating (opposite-side)
20cm	 **No cracks**	 **Cracked**	 **No cracks**
50cm	 **No cracks**	No Experiment	 **Cracked**

4. EVALUATION FINDING

01. Steel Ball Drop Test

Drop Height	TOUGHTELON
20cm	 **No cracks**
50cm	 **No cracks**

TOUGHTELON

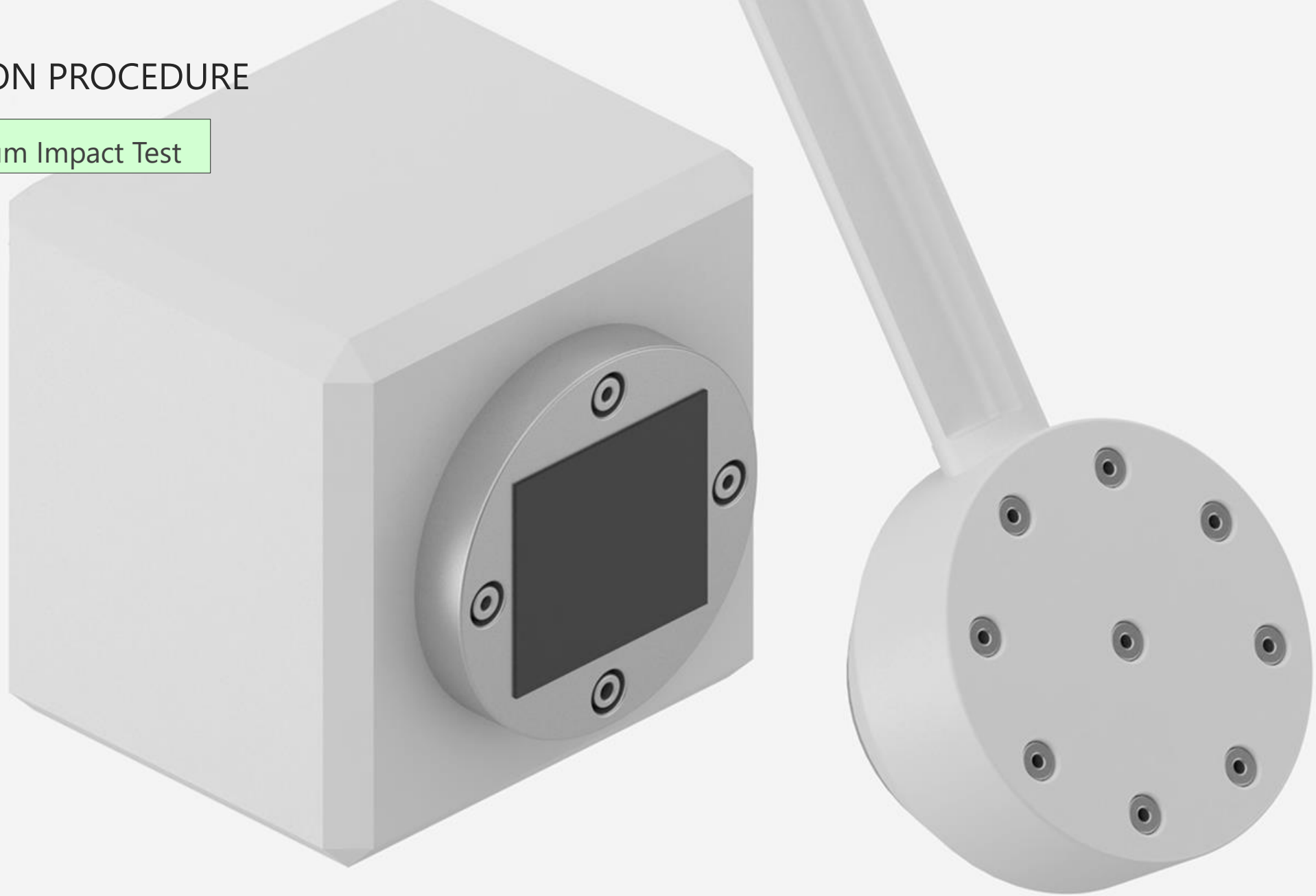
has been greatly improved its ability to protect against shocks from both the display side (the front side) and the battery and circuit board side (the back side).

SUGGESTION

Retains the capability to withstand impact from both directions.

4. EVALUATION PROCEDURE

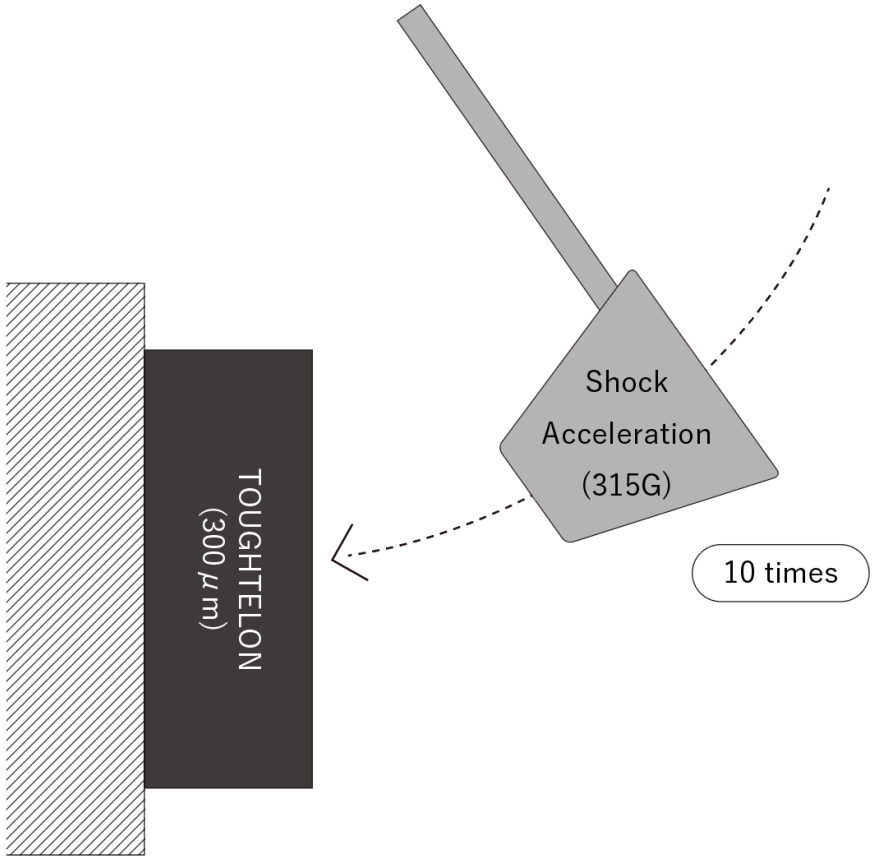
02. Pendulum Impact Test



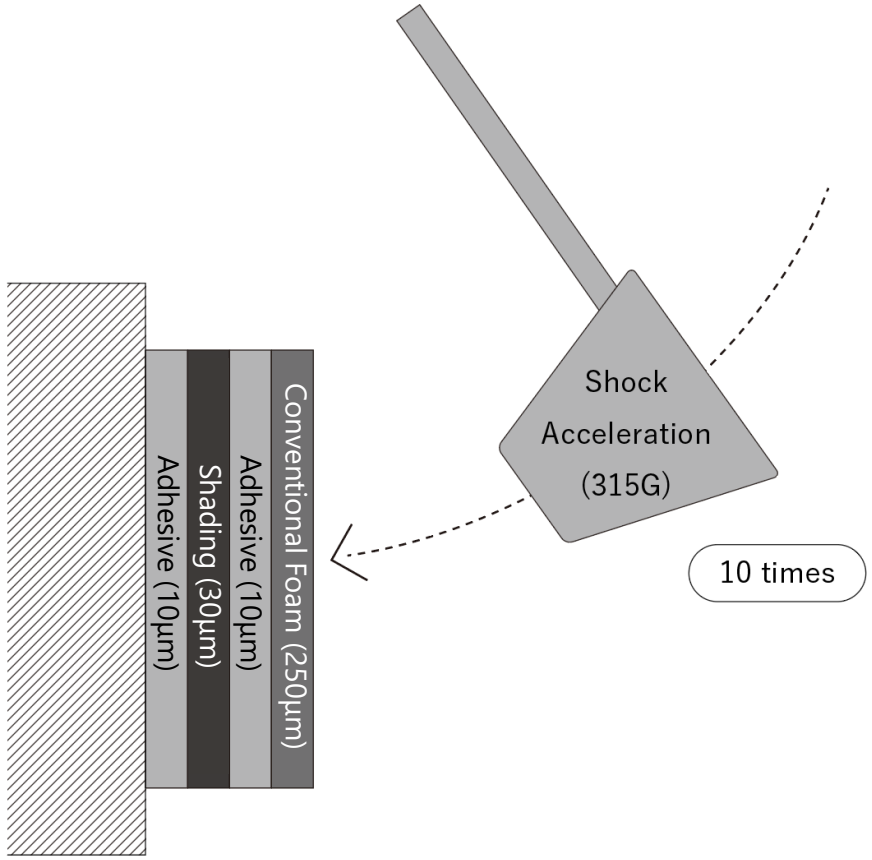
4. EVALUATION PROCEDURE

02. Pendulum Impact Test

TOUGHTELON

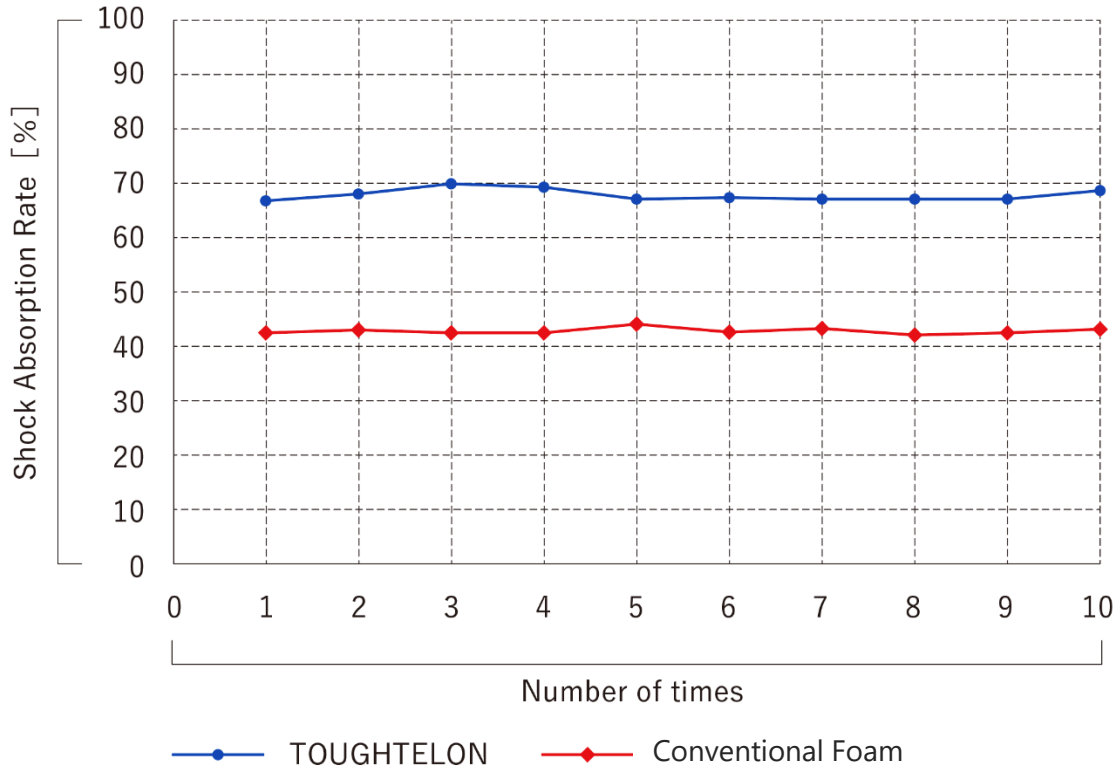


Conventional Laminating



4. EVALUATION RESLUT

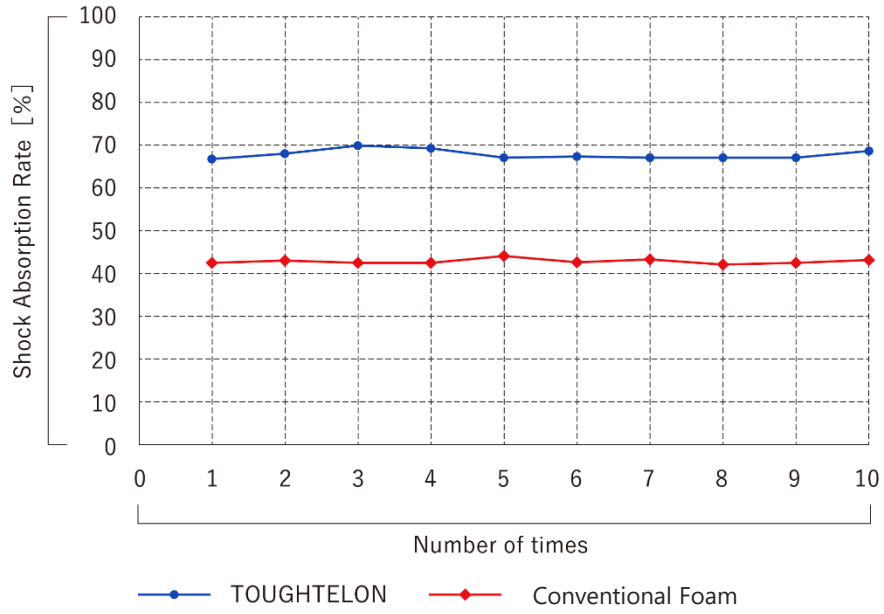
02. Pendulum Impact Test



$$\text{Shock Absorption Rate (\%)} = \left(1 - \frac{\text{Shock Value with Sample}}{\text{Shock Value without Sample}}\right) \times 100$$

4. EVALUATION FINDING

02. Pendulum Impact Test



TOUGHTELON

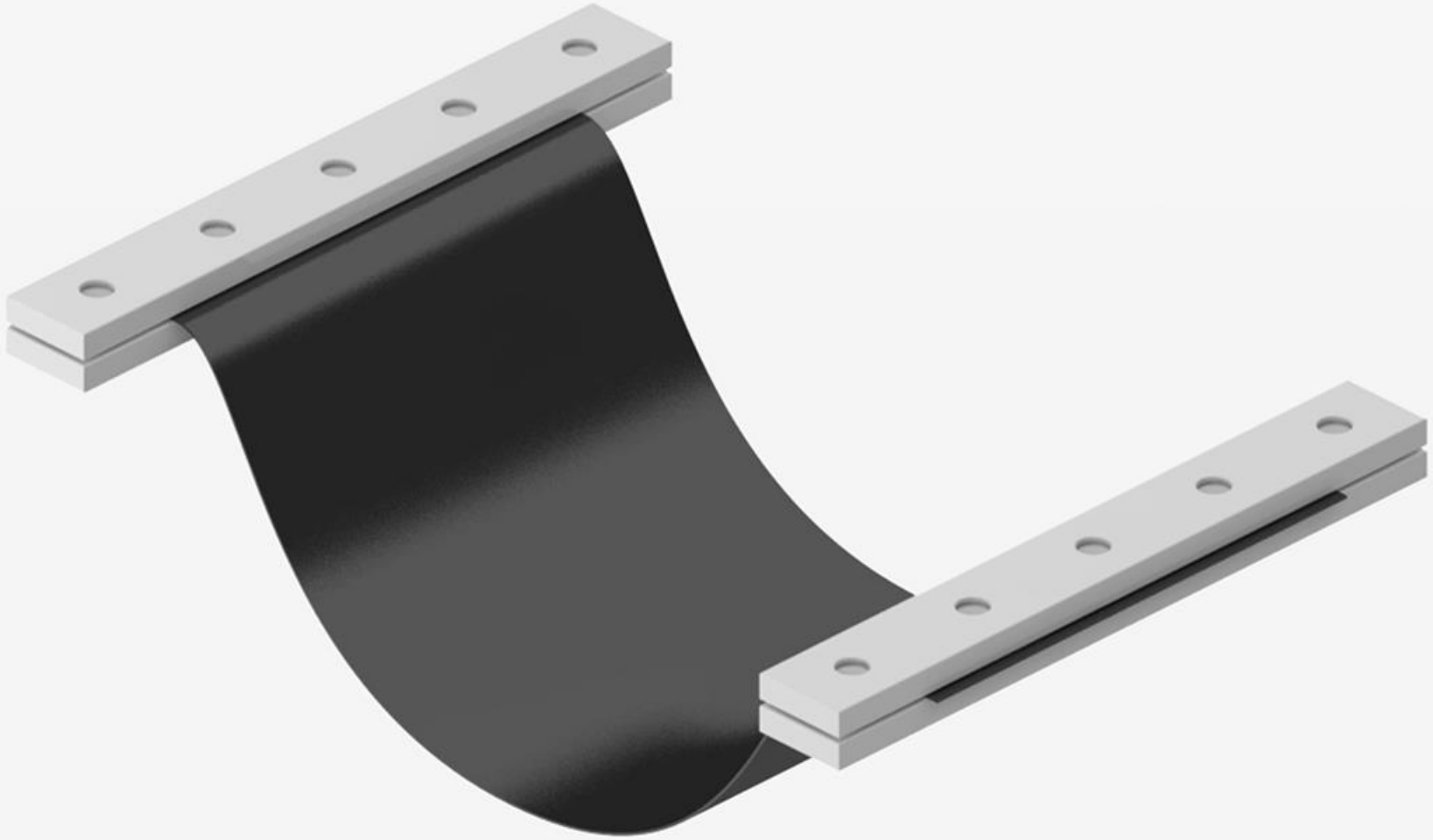
was maintained high shock absorption than the laminate used conventional foam materials at all in 10 times impacts test . (165% UP)

SUGGESTION

Maintains shock absorption performance that can be used with confidence for a long period of time.

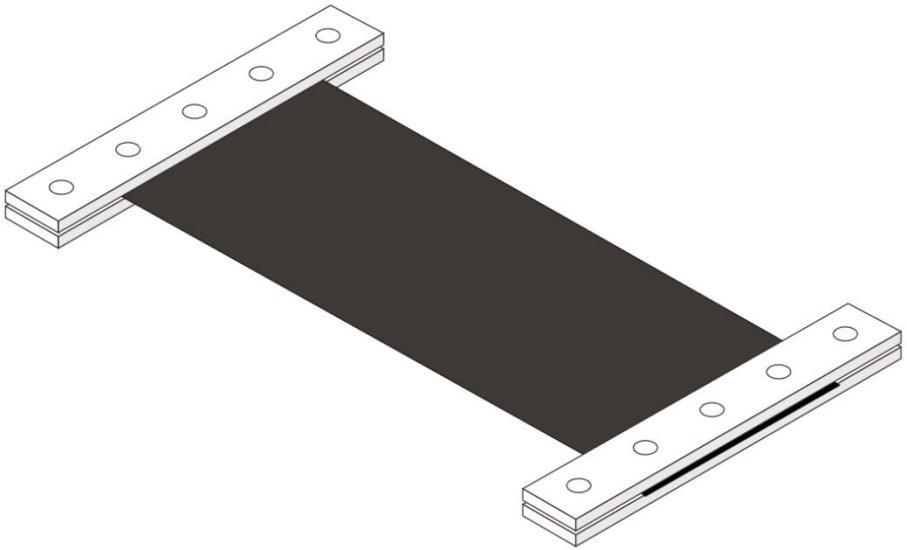
4. EVALUATION PROCEDURE

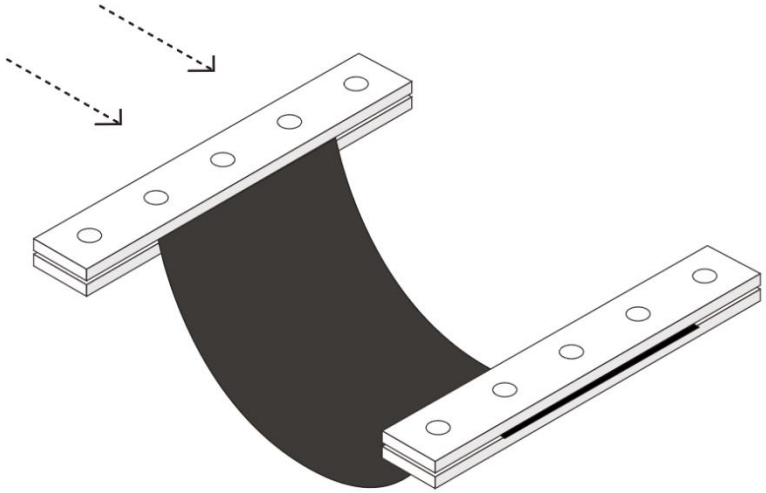
03. Folding Test



4. EVALUATION PROCEDURE

03. Folding Test





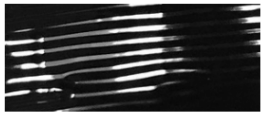
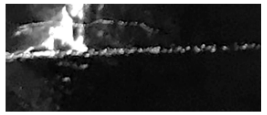
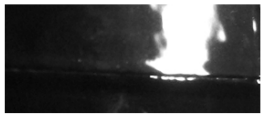
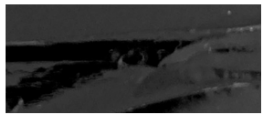
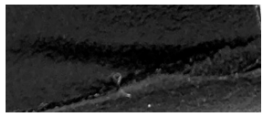
10000 times

Bending radius：5mm

Operating speed：≧30rpm

4. EVALUATION RESULT

03. Folding Test

Temperature	TOUGHTELON		Conventional Laminating	
High 60ºC 90% RH	Inside : Slightly Wrinkled (Restored later)		Inside : No Abnormality	
	Outside : No Abnormality		Outside : No Abnormality	
Room Temperature	Inside : Wrinkled (Restored later)		Inside : Creased	
	Outside : No Abnormality		Outside : No Abnormality	
Low -20ºC	Inside : Creased		Inside : Creased	
	Outside : No Abnormality		Outside : Cracked	

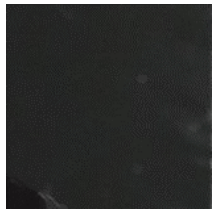
4. EVALUATION FINDING

03. Folding Test

Multifunctional Shock Absorber

Conventional Laminating

▼ 24 hours later ▼



TOUGHTELON

was maintained flexibility even in a wide range temperature environment. It's better than foam material at low temperature environment. Additionally, wrinkles will be restored.

SUGGESTION

It can be used in any environment.

It is tougher and more sustainable material.

4. EVALUATION

01. Steel Ball Drop Test

How much impact can it withstand?

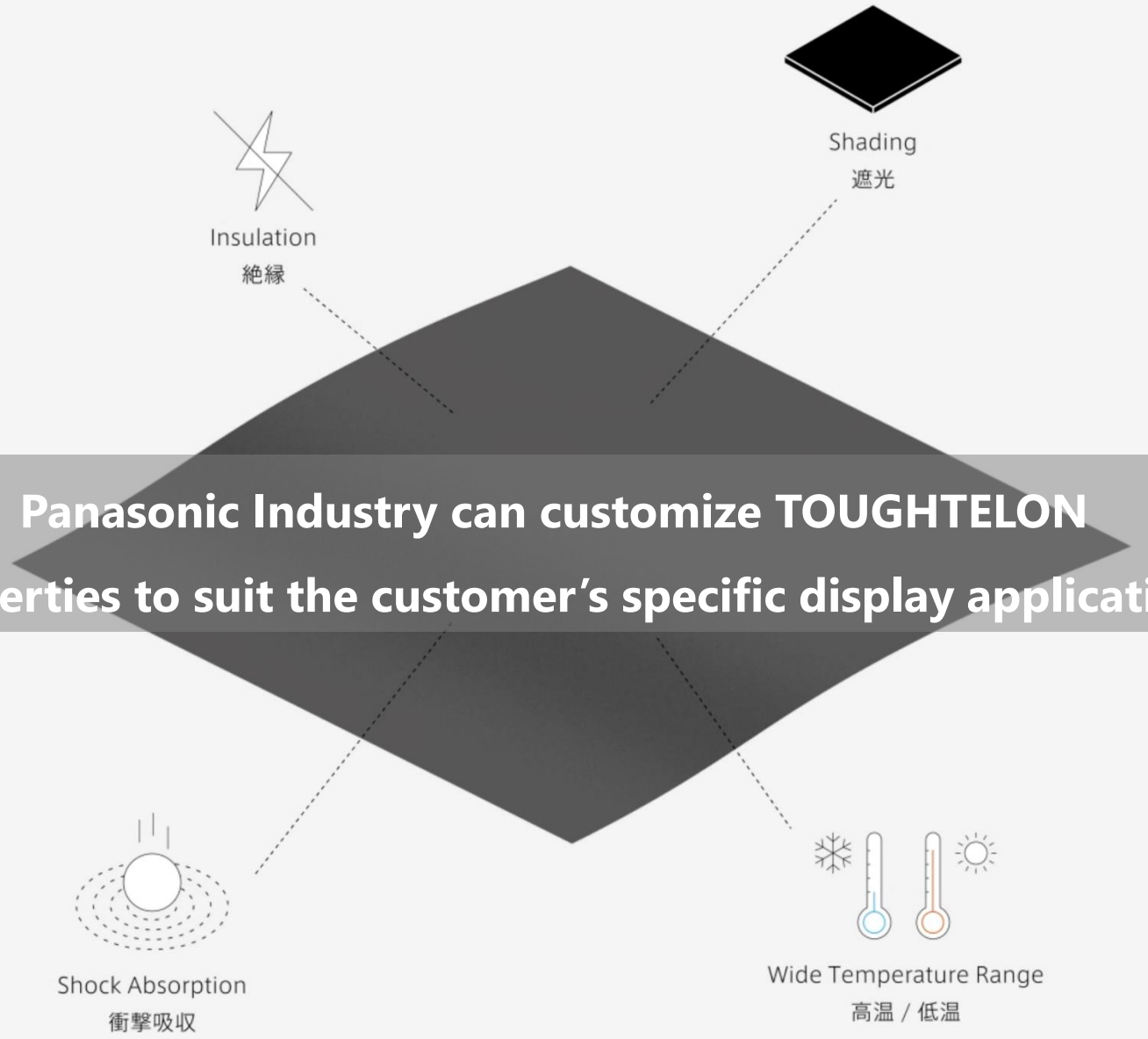
02. Pendulum Impact Test

How many times can it withstand the impact?

03. Folding Test

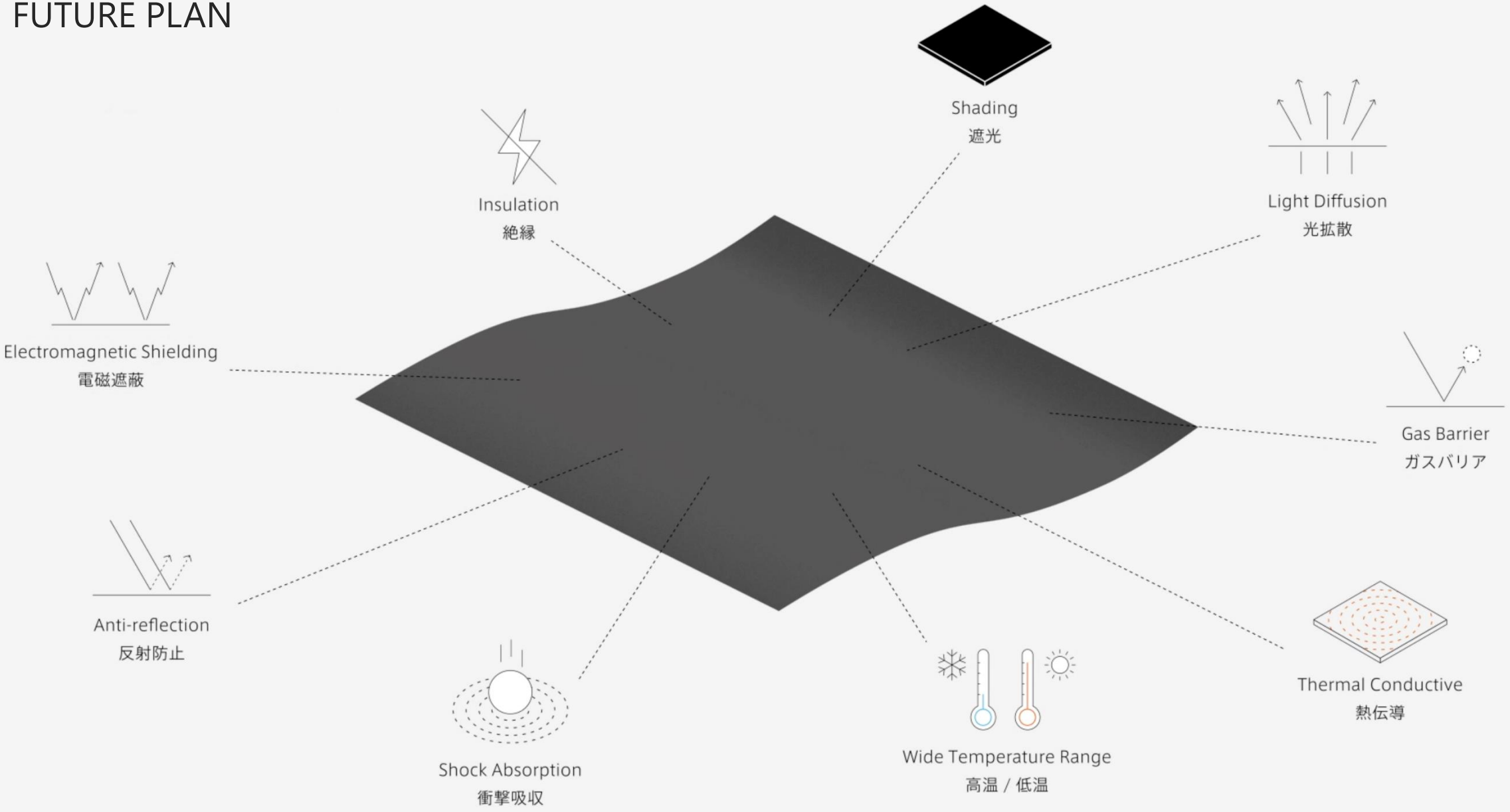
How many times can it withstand bending stress?

5. FUTURE PLAN



Panasonic Industry can customize TOUGHTELON properties to suit the customer's specific display application.

5. FUTURE PLAN



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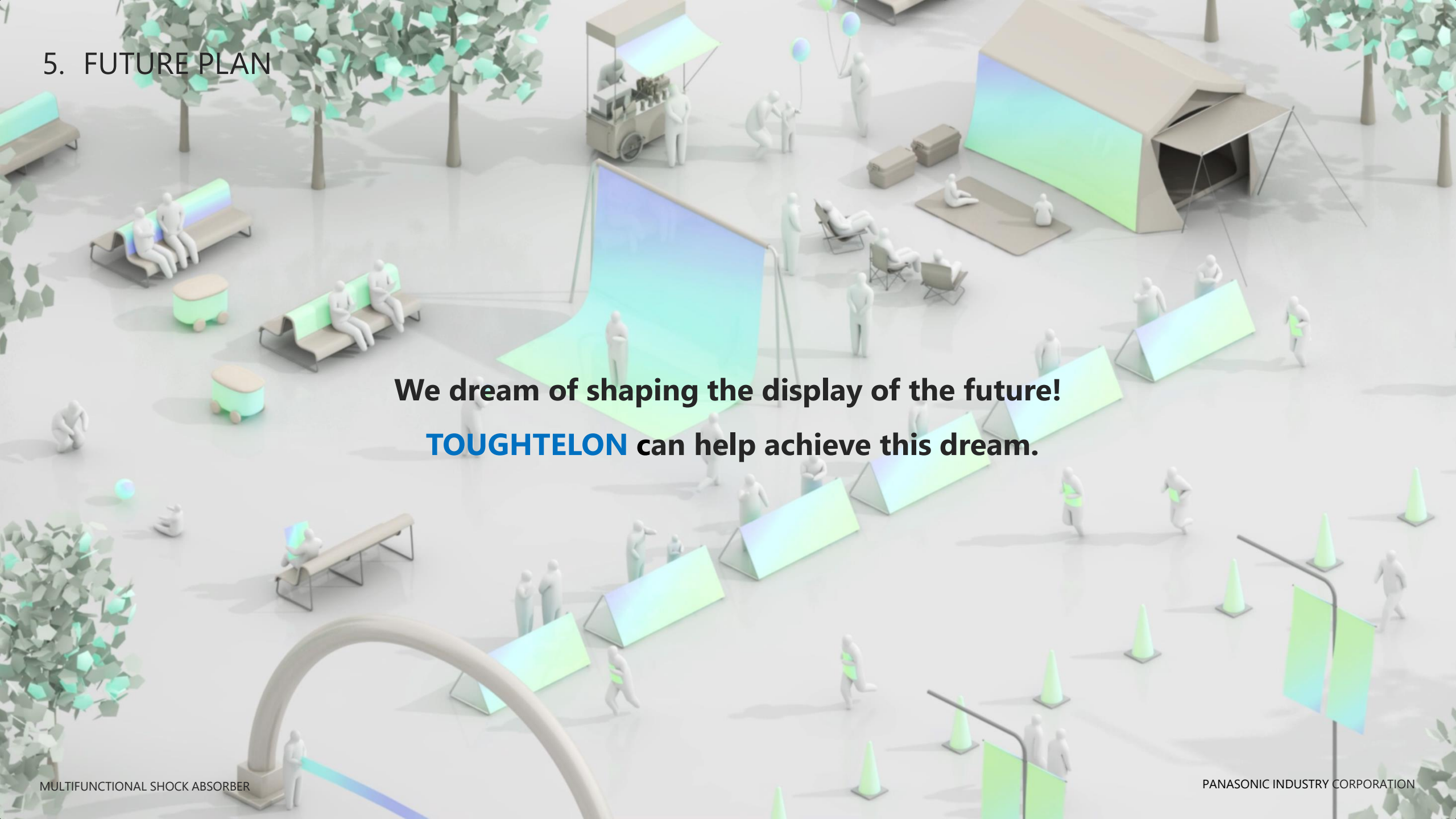
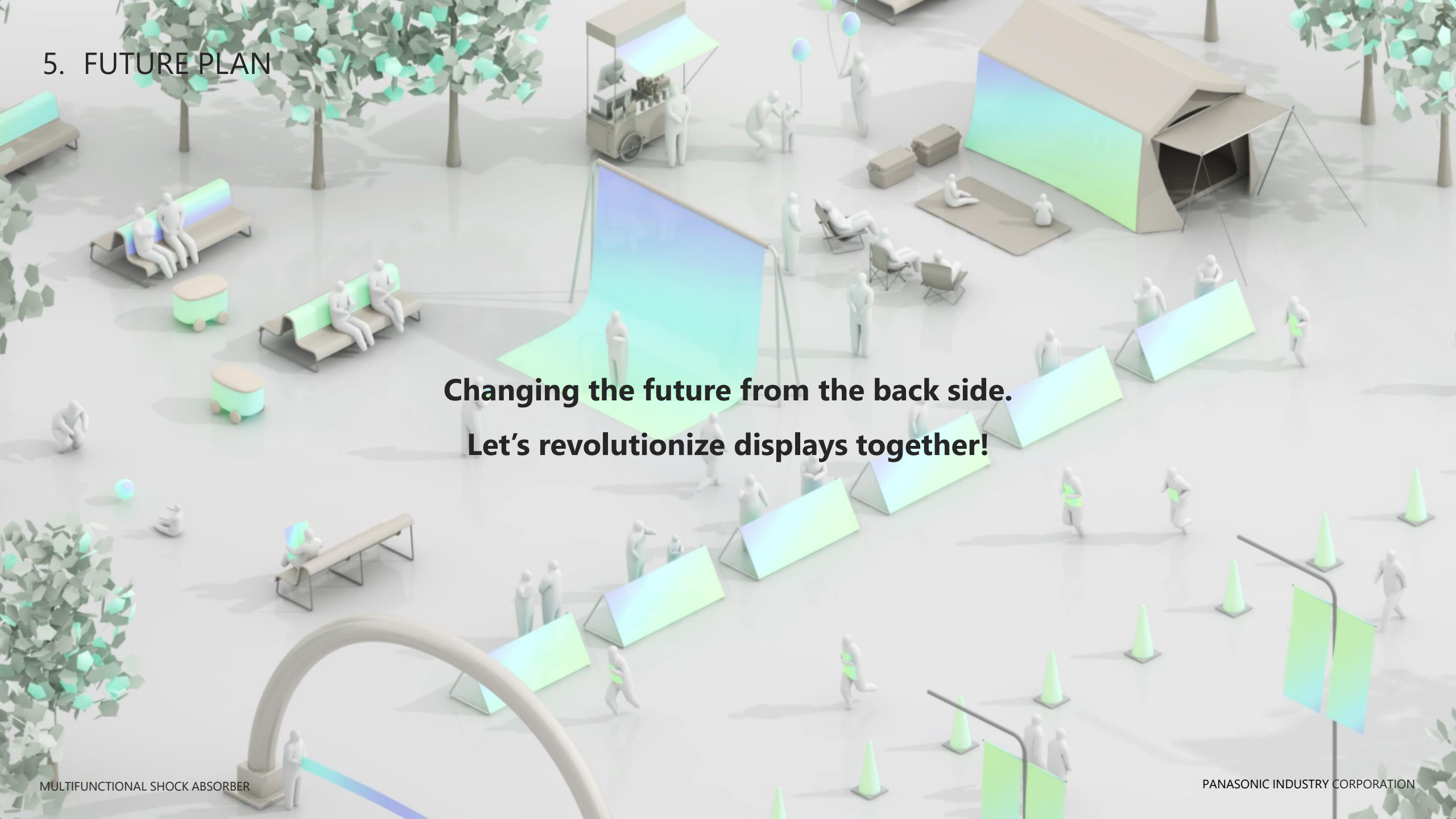


We dream of shaping the display of the future!

TOUGHTELON can help achieve this dream.

5. FUTURE PLAN



Changing the future from the back side.

Let’s revolutionize displays together!