

Materials for Water Treatment Equipment

Engineering plastic solutions



Engineering Materials Division

Product Planning Team | Roselyn | Feb, 2022

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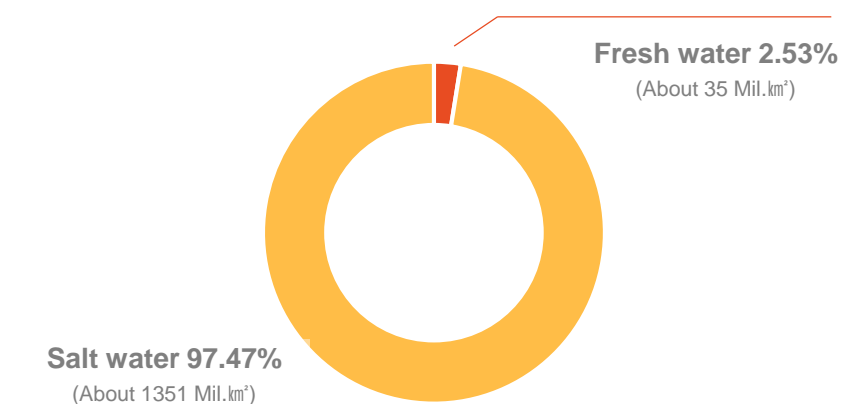
Summary

	Application	LG chem. Product	Certification	Major Customer
<p>Water Softener Tank & Cap</p>		<p>LUMILOY GP2200(K) PPE/PS+GF20</p>	<p>Germany</p> 	<p>USA</p> 
<p>Boiler and Water Pipe Connection</p>			<p>USA</p> 	<p>USA</p> 
<p>Hot Water Circulation Pump</p>		<p>LUMILOY GP2300(K) PPE/PS+GF30</p>	<p>UK</p> 	<p>Spain</p> 
<p>Water Meter & Consumer</p>			<p>France</p> 	

Market Outlook

Water Scarcity & Population Growth

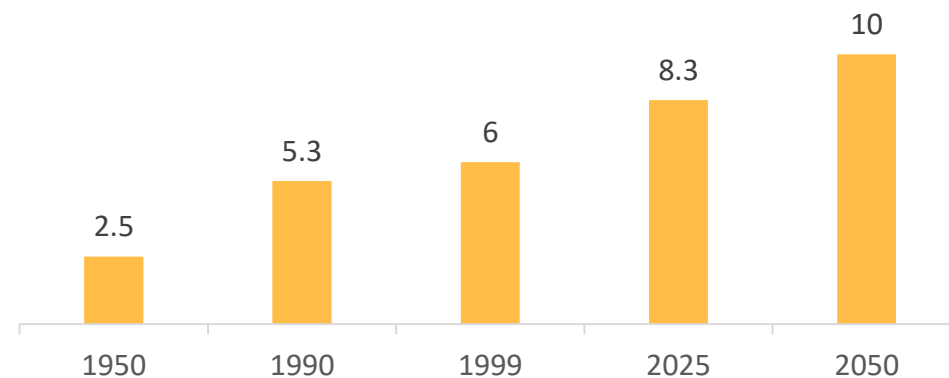
- The water shortage phenomenon has been raised for a long time.
- It is expected that the seriousness will gradually intensify in the future due to population growth, economic development, environmental pollution, and climate change.



Sources : K-Water

- The total amount of water present on Earth is about 1.4 billion square kilometers, Fresh water excluding saline is 2.53%, except for ice and groundwater.
- **In fact, the amount of water that human can use is only 0.01% of fresh water.**

World Population Growth (Unit: Bil. People)



Sources : U.S. Census Bureau survey



**Affected Population
by Water Scarcity**

0.7Bil.
2004 **➔** **2.8Bil.**
2025



**Affected Country
by Water Scarcity**

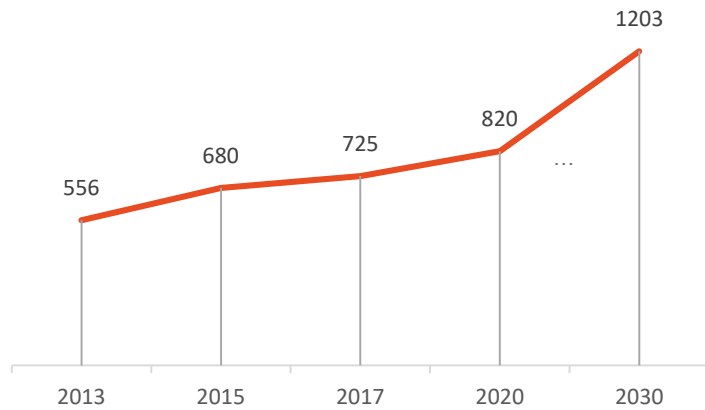
31
2004 **➔** **48**
2025

Sources : UNEP, World Bank

Market Outlook

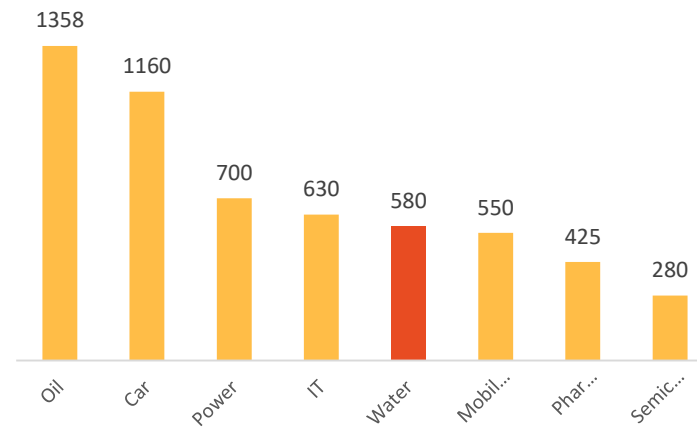
Water Industry

Global Water Industry Market Forecast
(Unit: \$ Bil.)



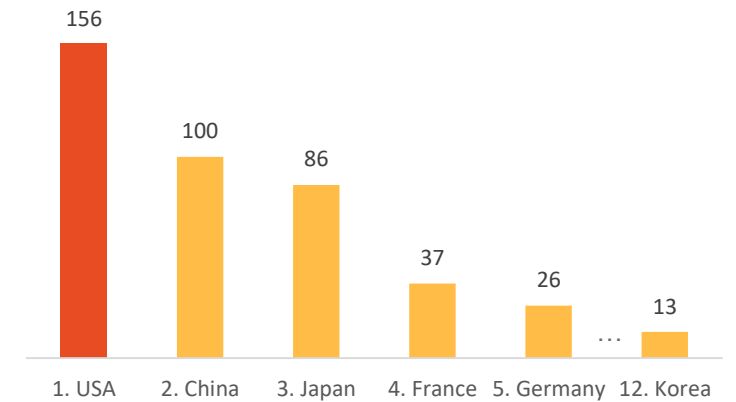
Sources : K-Water, MOLIT, GM, Shinyoung Research Center(2021)

Comparison Size of Industries
(Unit: \$ Bil.)



Sources : Export-Import Bank of Korea, Mirae Asset Daewoo Research Center(2015)

Water Market Size by Country
(Unit: \$ Bil.)



Sources : Global water market(2017)

- Water industry is generally defined as an industry that produces and supplies water necessary for living and industry, or a business that transfers and treats generated sewage and wastewater. Water industry is classified water purifiers, bottled water, wasted water and sewage.
- According to research center, the global water industry market is about \$820 Billion as of 2020. it is expected to grow to \$1.2 Trillion by 2030.
- Globally, the U.S has the largest market with \$156 Billion and China and Japan have markets worth \$100 Billion and \$86 Billion. Americans use more water per person than anywhere in the world. This is three times that of China and 15 times that of Denmark.
- According to an estimate by the American Water Works Association, the amount of important maintenance and replacement of the old water system in the United States is at least \$1 trillion over the next 25 years.

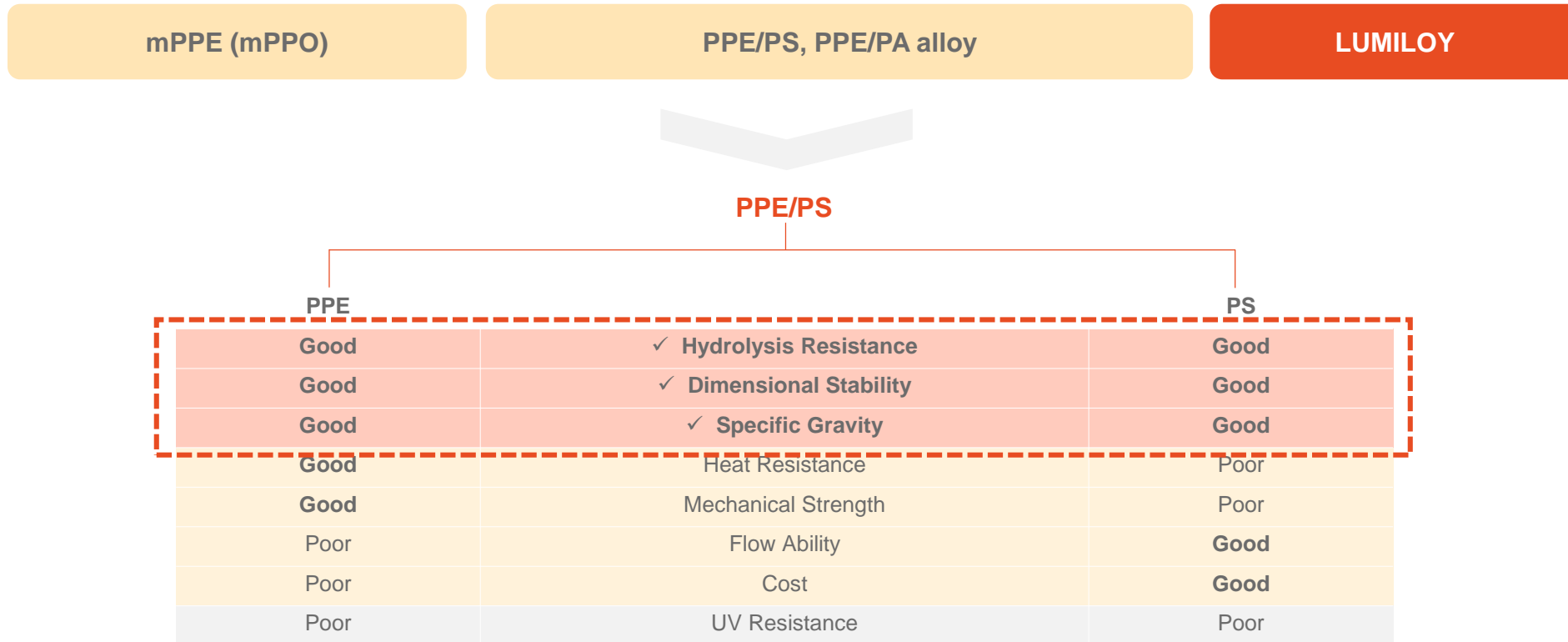
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Product Portfolio

Polycarbonate	PC PC Compound, PCABS alloy	LUPOY
Polyester	PBT, PBT Compound, PBT alloy PBT/Styrenics alloy	LUPOX LUMAX
Polyamide	PA compound, PA alloy	LUMID
TPE	TPEE (Ester Type Elastomer)	KEYFLEX BT
Olefin	PP Compound	LUPOL
mPPE (mPPO)	PPE/PS, PPE/PA alloy	LUMILOY
Styrenics	Reinforced ABS & SAN	LUPOS
Acetal	POM, POM Compound	LUCEL
Heat Resistant Resin Electro Magnetic Resin Conductive Resin		LUSEP
	Based on ABS, PS, PC, mPPE, PPS Compound	LUCON

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Product Portfolio

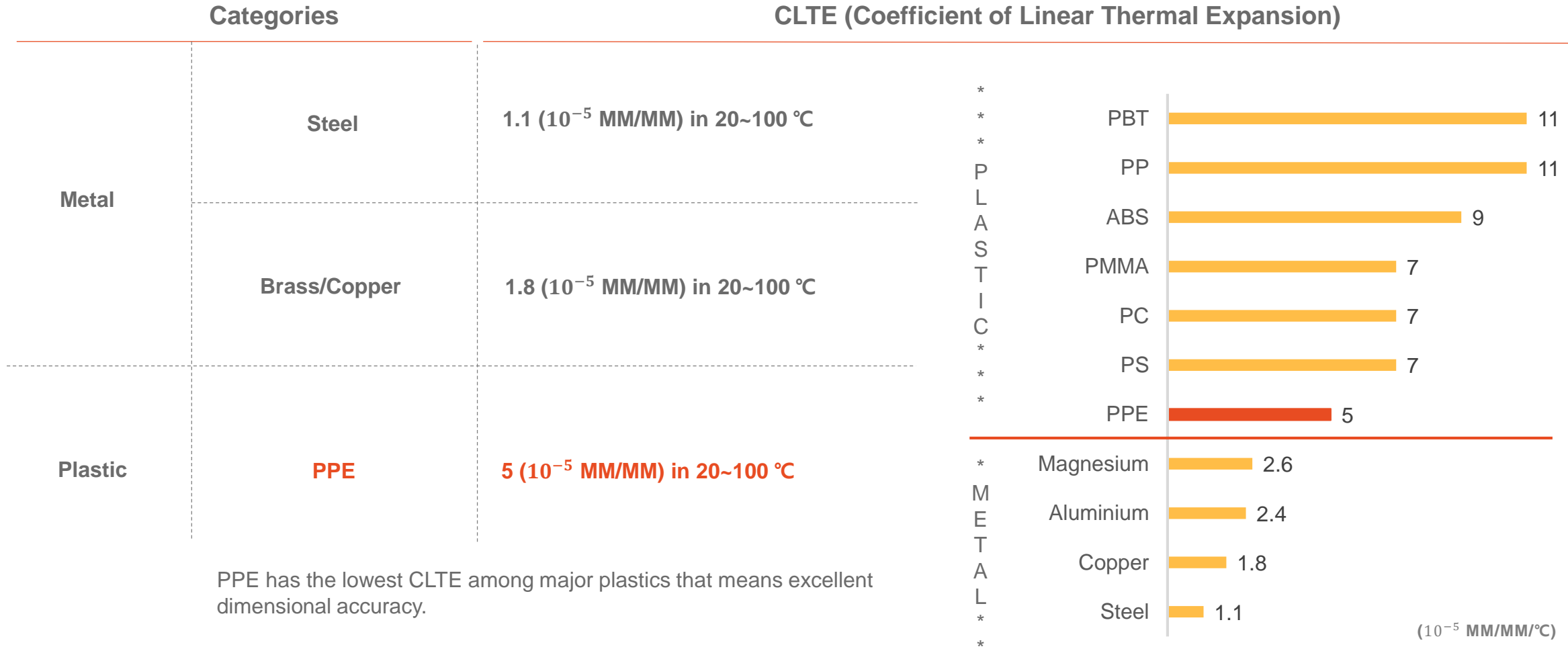


- mPPE is an alloy product produced through a series of extrusion processes after mixing various types of resins, such as PS/PP/PA, to compensate for the shortcomings of PPE.
- For water treatment usage, LUMILOY (modified PPE) is the suitable because, Excellent hydrolysis resistance, dimensional stability in HOT/COLD water and also low water absorption, light weight and good processability.

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Product Portfolio

✓ Dimensional Stability

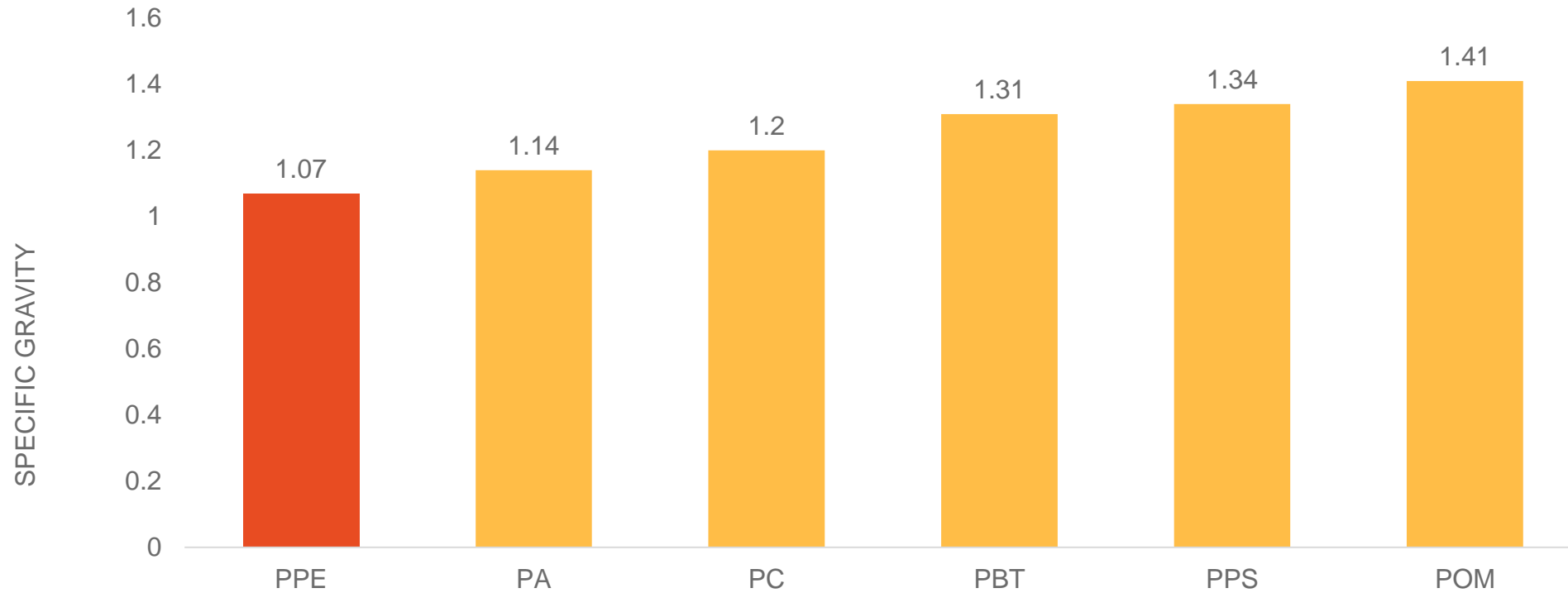


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Product Portfolio

✓ Light Weight (Specific Gravity)

- PPE has the LOWEST specific gravity among engineering plastics.



Features of LUMILOY

Product Application

Application	Application	LG Chem Product	Technical requirements
<p>Water Softener Tank & Cap</p>		<p>GP2200(K) PPE/PS+GF20/30</p>	<ul style="list-style-type: none"> ▪ Drinking water certificate.
<p>Boiler and Water Pipe Connection</p>		<p>GP2300(K) PPE/PS+GF30</p>	<ul style="list-style-type: none"> ▪ Dimensional stability in water. ▪ Hydrolysis resistance at 85°C.
<p>Hot Water Circulation Pump</p>		<p>GP2300(K) PPE/PS+GF30</p>	<ul style="list-style-type: none"> ▪ Weld line high strength. ▪ Resistance to corrosion.
<p>Water Meter and Consumers</p>		<p>GP2200/2300(K) PPE/PS+GF20/30</p>	<ul style="list-style-type: none"> ▪ Color stability in water.

Features of LUMILOY

LUMILOY GP2300K Properties (Measured value)

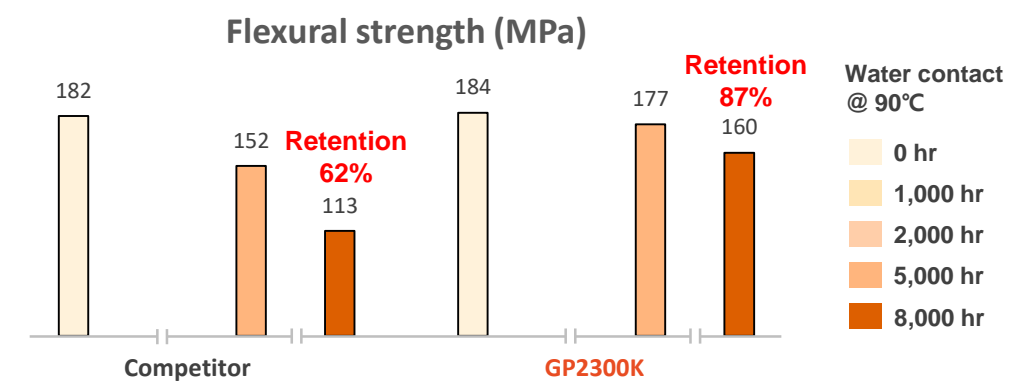
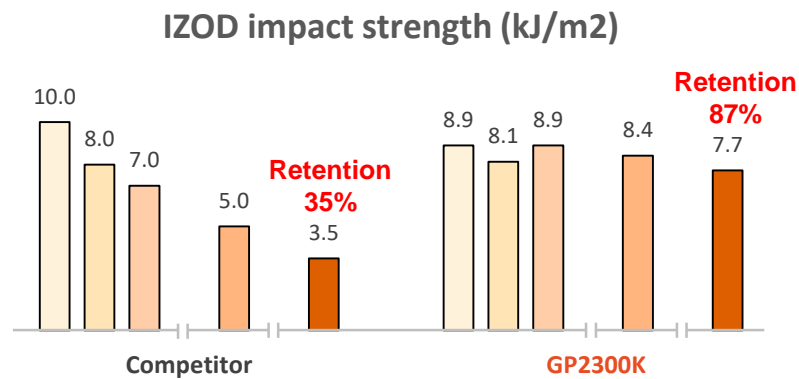
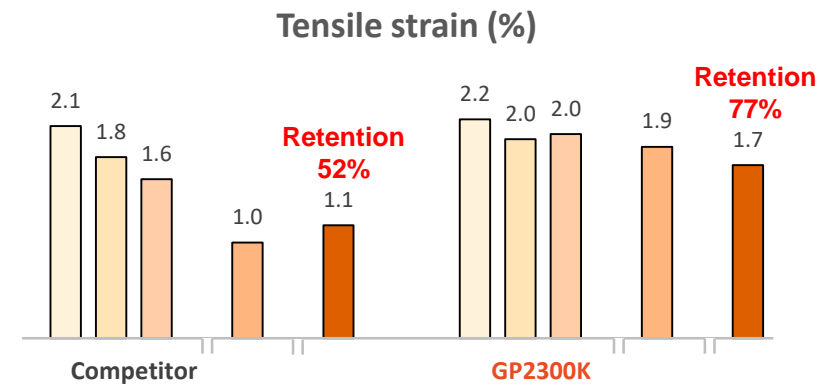
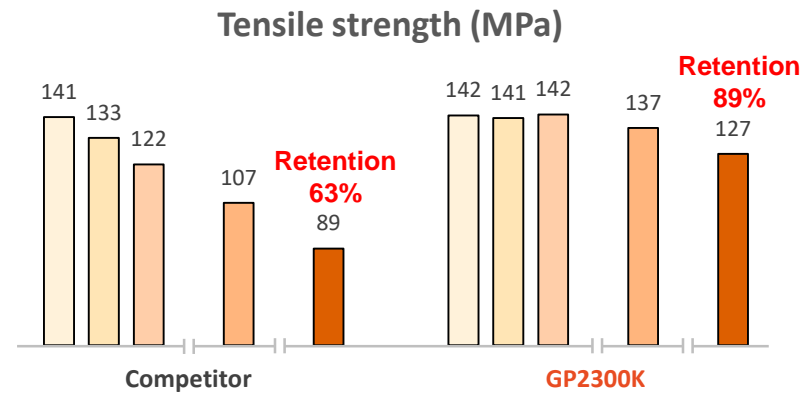
Properties		Test standard	Unit	Competitor	LG Chem (LUMILOY) GP2300K
Density		ISO 1183	g/cm ³	1.30	1.29
MFR	300°C, 5kg	ISO 1133	g/10min	13.8	16.8
Tensile strength		ISO 527	MPa	135	135
Flexural modulus		ISO 178	MPa	7,500	7,600
Flexural strength		ISO 178	MPa	182	184
Charpy Imp.	Notched, 23°C	ISO 179	kJ/m ²	9.3	10.0
HDT	1.8MPa	ISO 75	°C	144	145
Ejecting force		LG Chem method	N	1,470	1,440

Features of LUMILOY

LUMILOY GP2300K Properties

✓ Hydrolysis Resistance

- For long-term stability, hot water resistance test at 90°C.
- After 8,000 hours, tensile and flexural modulus are similar to the initial value.
- LUMILOY GP2300K has good retention of properties up to 8,000 hours and it's better than the competitor.

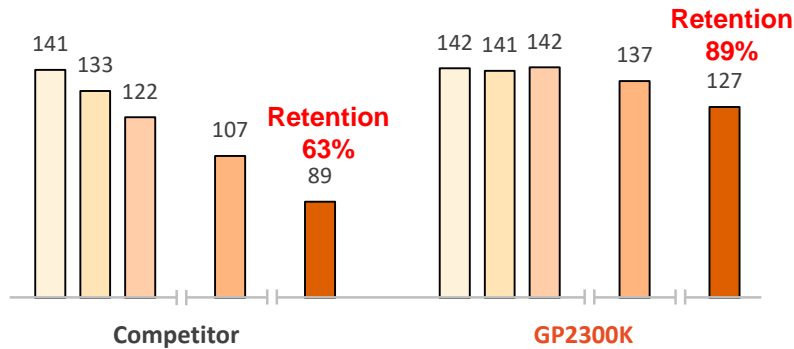


Features of LUMILOY

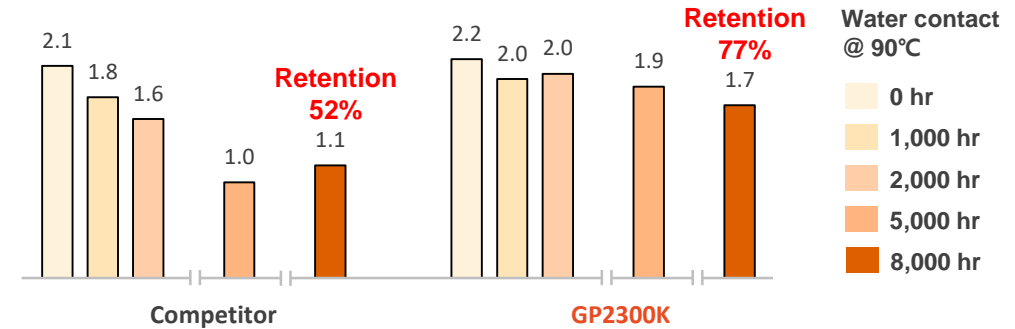
LUMILOY GP2300K Properties

✓ Hydrolysis Resistance

Weld line Tensile strength (MPa)



Weld line Tensile strain (%)



Properties	Test standard	Unit	Competitor	GP2300K
Weld line tensile strength at 23°C	ASTM D638	MPa	64	66

- Generally, weld line of the part is regarded as the most susceptible position in the water pressure test.
- In order to assess it, we did weld line strength test by the double-gated tensile specimen having weld line at the center.
- All of 3 materials have very similar strength (64~66 MPa) at 23°C. But as long-term stability of properties of hot water resistance test at 90°C shows that **LUMILOY GP2300K has good retention of properties up to 8,000 hours and its performance is better than the competitor.**

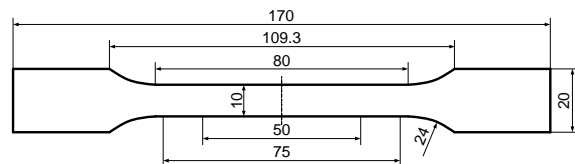
Features of LUMILOY

LUMILOY GP2300K Properties

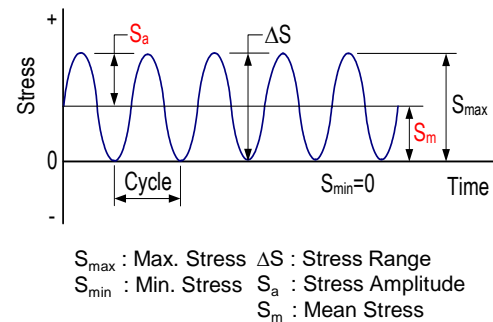
✓ Fatigue Resistance



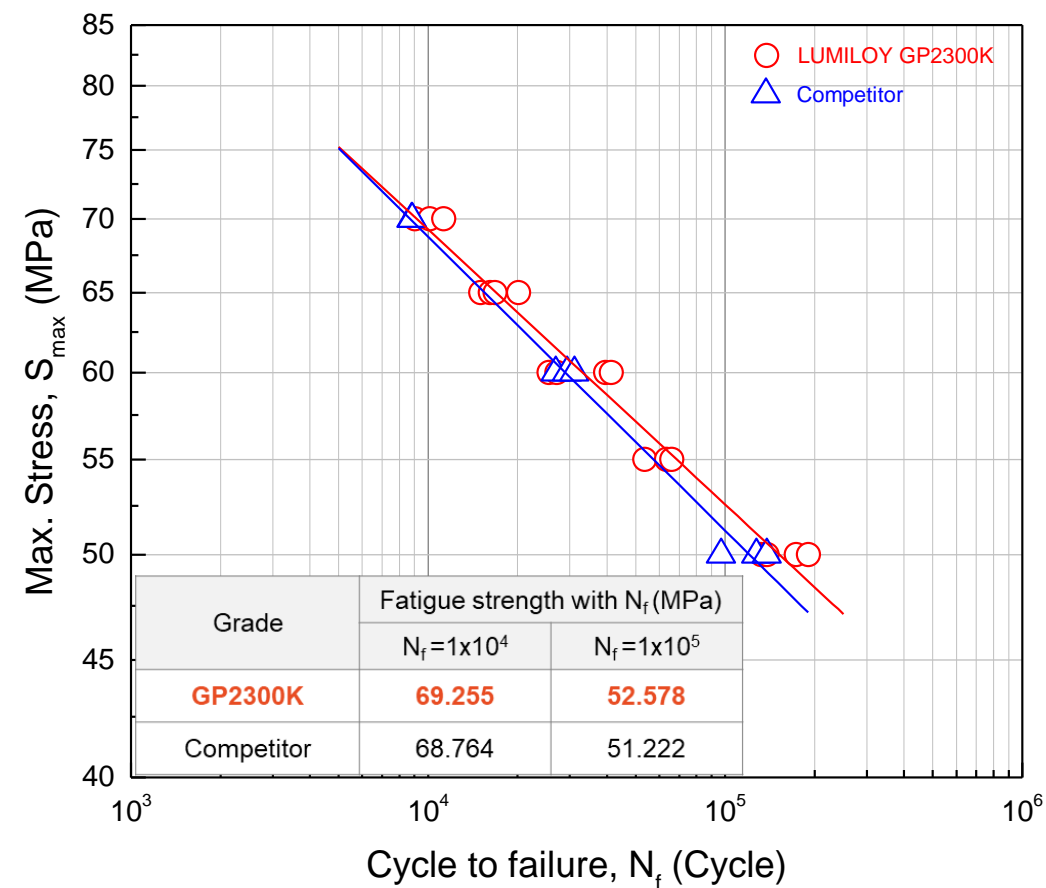
Electrodynamic fatigue testing system
Model : ElectroPuls E10000 (Instron)
Load / Stroke : 10 kN / 60 mm



Test method & condition	
Control	Constant load
Specimen	ISO 527 Type 1A
Load type	Tension - $\neq 0$
Load wave	Sine
Stress Ratio (R) $R = S_{\min} / S_{\max}$	0.01
Frequency (f)	5 Hz
Temperature (T)	23 °C







$S_{\max} - N_f$ curve



Certification for Water Treatment

Certificate for any product or accessory for use in contact with drinking water intended for human consumption

			USA	UK	France	Germany
						
As is	GF20%	GP2200	Certified	Certified	Certified	-
		GP2200K	Certified	Certified	Certified	Certified
	GF30%	GP2300	Certified	Certified	Certified	-
		GP2300K	-	-	-	-
To be ('22.10)	GF20%	GP2200	Updated	Updated	Updated	-
		GP2200K	Updated	Updated	Updated	During the Test
	GF30%	GP2300	Updated	Updated	Updated	-
		GP2300K	Updated	Updated	Updated	During the Test

*Certified Updating: Each certificate has expires 2-4 years that need to be updating for human health.

*To be Certified: New product.

*-K: Satisfies KTW certificate.

THANK YOU
