

Application Development Center EMS-GRIVORY
Answer to Technical Inquiry No.: 2018-0616



Author: William Liang Date: 2021/06/23
To: Eric Guo

Company: Hikvision Automotive technology
Country: China (CN)

Material: Unknown
Application: Surveillance

Problem Description / Target of the Customer:

We want to develop surveillance industry and we got two typical equipments. We want to find out the current materials used for this application, which enables us to verify if EMS material has possible solutions to bring cost saving for customer. So we want TCS to disassemble the equipments and study each part, and then we can discuss and make the decision of judgement.

Result / Solution / Proposal:

Pls kindly check the attached file, thanks!

Proposal for Surveillance Camera

Driving Force & Requirements

■ Direct replacement

- Total cost down
- Design flexibility

■ Requirements

- UV resistance
- Good surface finish
- Dimensional stability
- Balanced strength & toughness

Proposal for Surveillance Camera

Assembly Info. of Dome Camera



		Weight/Cost			Weight/Cost
1	Aluminum	347.5g/	13	Aluminum	204.7g/
2,3	Aluminum	142.2g*2/	14	Aluminum+ Glass	229.1g/
4	Aluminum	262.3g/	15	LED lense	/
5	Pulley(POM)	10.5g/	16	Aluminum	421.4g/
6,7	Motor	405.2g/	17	Sealing	86.6g/
8	Pulley(POM)	13.1g/	18	Aluminum	658.6g/
9	Aluminum	21.2g/	19	Aluminum	1077.8g/
10	Fan	8.0g/			
11,12	Aluminum	69.2g*2/			

Proposal for Surveillance Camera

Target Parts – Front Cover

Benefit

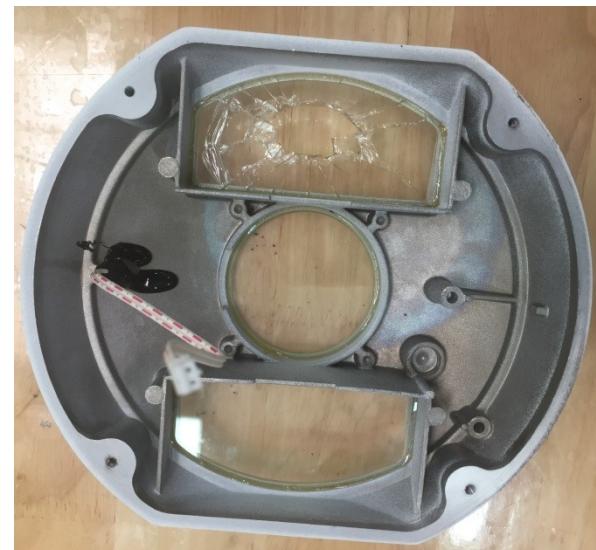
- Direct cost saving
- Parts integration
- Light weight

Material recommendation^{*1}

- Grivory GVX-5H + Grilamid TR30
- Grilamid LVX-50H + Grilamid TR90

Estimated cost & weight

- cost: 12~20 RMB^{*2}/pcs
- weight: 110g- 130g



Remark: *1 Special requirements still needs to check with the customer

*2 Cost calculated according to our experience, which included cost of material, machine, tool as well as personnel

Proposal for Surveillance Camera

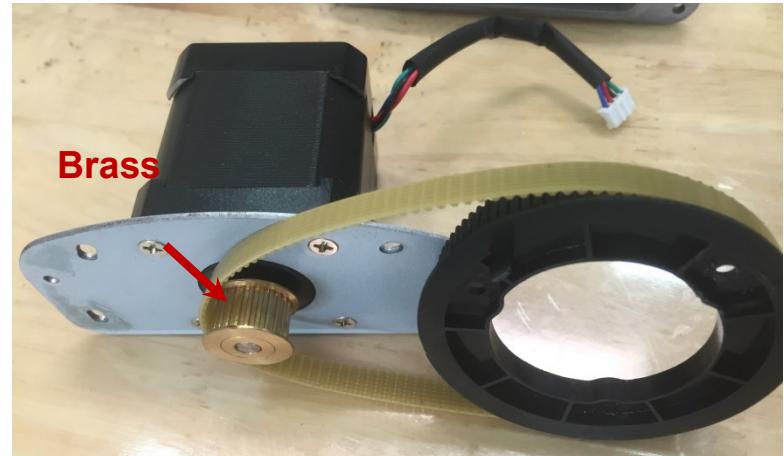
Target Parts – Motor Pulley

Benefit

- Direct cost saving
- Durable (less harm to the belt)

Material recommendation^{*3}

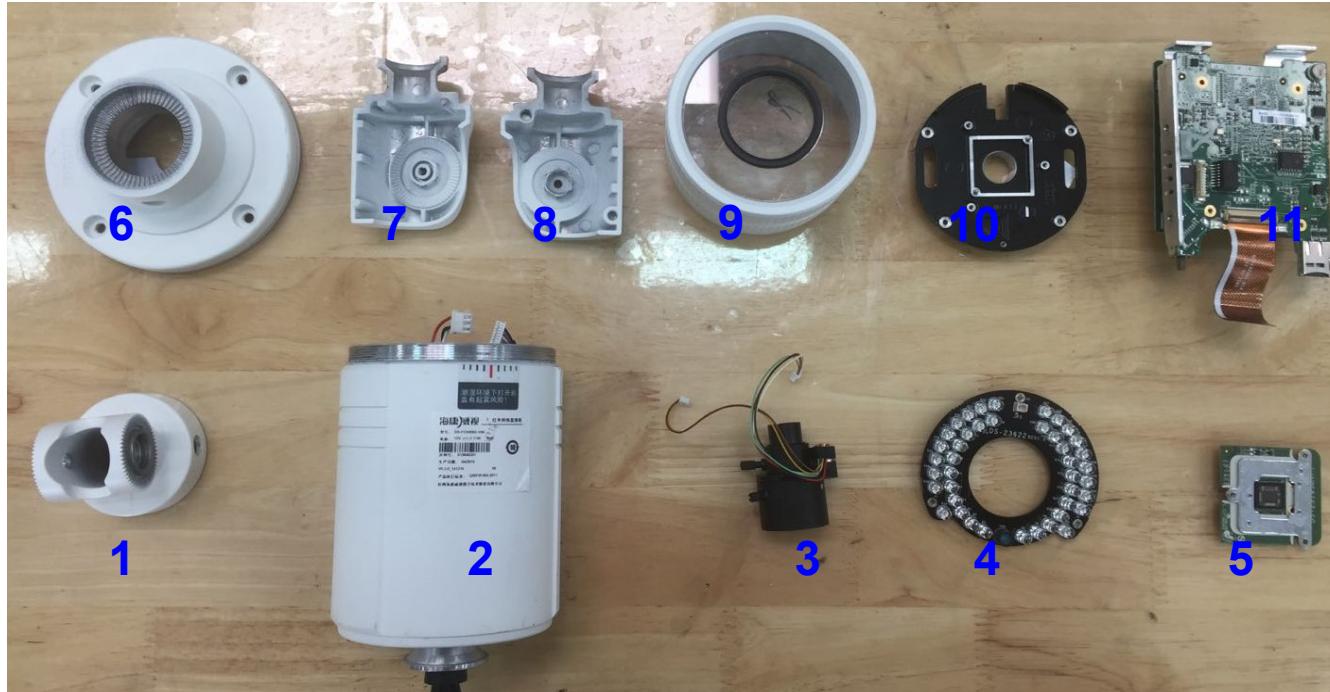
- Grivory HT2V-3H LF
- Grivory XT 3850 (GV-5H +PTFE)
- Grivory GV-5H



Remark: *3 Special requirements still needs to check with the customer

Proposal for Surveillance Camera

Assembly Info. of Bullet Camera



Total: 1.6kg



		Weight/Cost			Weight/Cost
1	Aluminum	81.8g/	7	Aluminum	42.0g/
2	Aluminum	503.2g/	8	Aluminum	44.5g/
3	Camera	/	9	Aluminum + Glass	136.0g/
4	LED lense	/	10	Aluminum (ADC 12)	30.1g/
5	Chip	/	11	PCB	/
6	Aluminum	149.0g/			

Proposal for Surveillance Camera

Target Parts – Front Cover

Benefit

- Direct cost saving
- Parts integration
- Light weight



Material recommendation^{*4}

- Grivory GVX-5H + Grilamid TR30
- Grilamid LVX-50H + Grilamid TR90

Estimated cost & weight

- cost: 8-12 RMB ^{*5}/pcs
- weight: 60g- 80g

Remark: *4 Special requirements still needs to check with the customer

*5 Cost calculated according to our experience, which included cost of material, machine, tool as well as personnel

Proposal for Surveillance Camera

Action Plan

- Further confirm target part and direction with the customer
[GUOE/LIAW, Jul.2019]
- Obtain more detailed requirements and run feasibility study
[GUOE/LIAW, Jul.-Aug.2019]
- NDA ...
- Prototype tool ...



Surveillance Camera Application Development

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Content

- Requirements for Surveillance Camera
- Product Overview
- Metal Replacement with Grivory GV
- Glass Replacement with Grilamid TR



Requirements for Surveillance Camera Parts

Housing

- UV Resistance
- High Stiffness
- Low Creep
- Colourability

Fixation

- High Stiffness
- Part / Function Integration
- Fast Processing
- No Post Treatment

Transparent Parts

- UV Resistance
- Low Haze
- High Resolution
- Optical Properties

General

- Thermally Conductive
- Electrical Conductive
- UL- Registered UL-94 HB/V0
- Chemical Resistance
(disinfectants, cleaning agents)



Product Overview

Grilamid® EMS

Grilamid TR

>PA MACM12<
>PA 12/MACMI<
>PA 6I/X<

Grilamid L

>PA 12<

Grilamid 2D

>PA 612<

GRILON® EMS

Grilon A

>PA 66<

Grilon B

>PA 6<

Grilon TS

>PA 66+PA 6<

GRIVORY® EMS

Grivory GV & GVX

>PA 66+PA 6I/X<

Grivory HT1

>PA 6T/6I<

Grivory HT2

>PA 6T/66<



Grilamid 1S

>PA 1010<

Grilamid 2S

>PA 610<

Grivory HT3

>PA 10T/X<

Grilamid BTR

>PA MACM10/1010<

>...< According to ISO 1874

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How Can EMS Help HIKVISION Reduce Cost Metal Replacement with Grivory GV

Outdoor Network Camera



Shield cover: GVX-5HL



Success Factors:

- High strength
(*>5kg long-term load*)
- Excellent surface
(*no post treatment*)
- UV Resistance
- Tailored Colour

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Metal Replacement with Grivory GV

Our Metal is Grivory

A M8-steel screw was screwed into a moulded thread with following conditions:

- Normal climate (23°C / 50% r.h.)
- Grivory GV-5H threaded bush
- Screw-in depth 3xD

Question:

At which load will
this threaded joint fail ?

..... kg



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Metal Replacement with Grivory GV

Our Metal is Grivory



Metal replacement at the highest level

Threaded bush of long glass-fibre reinforced polyamide

Metal Replacement with Grivory GV

Our Metal is Grivory

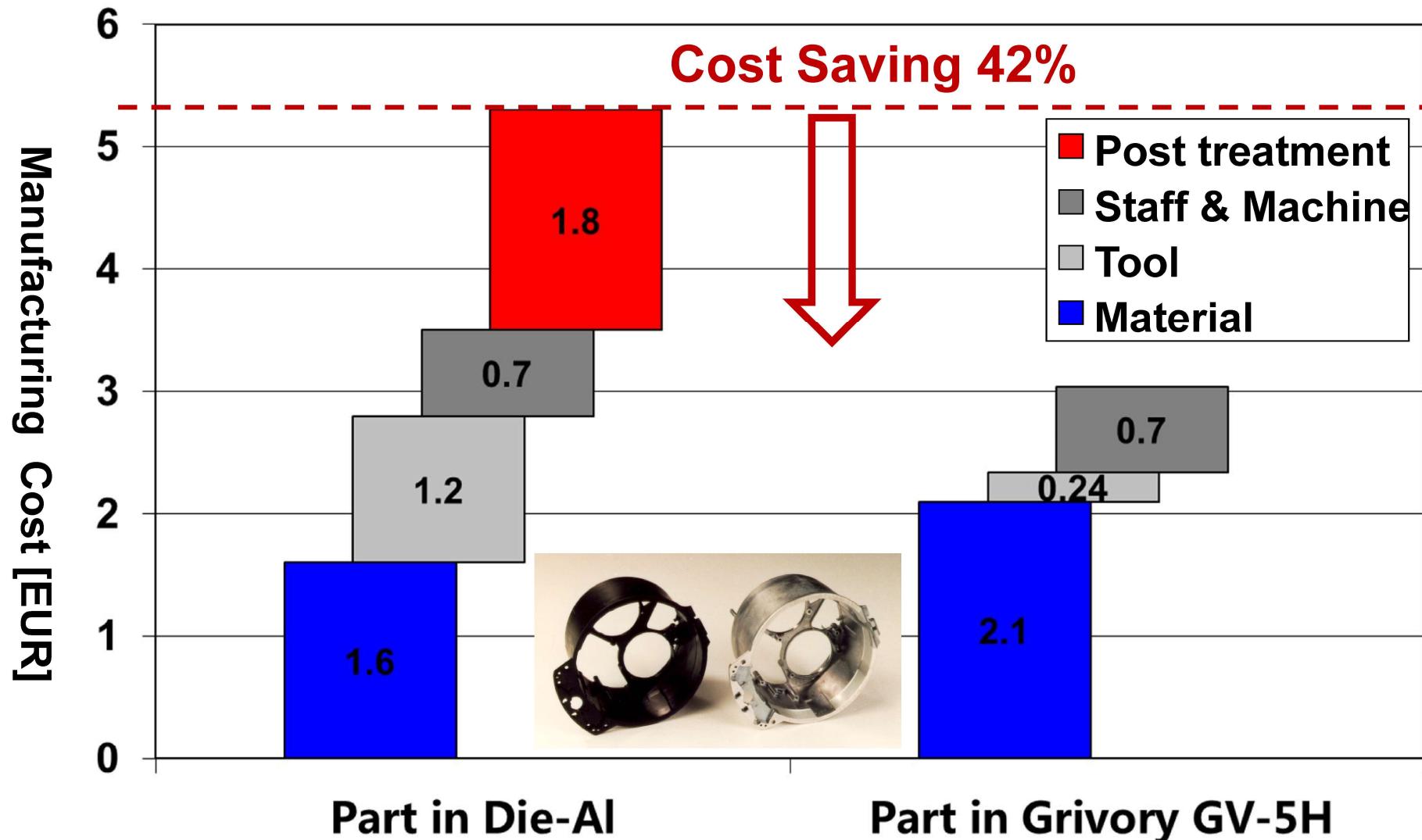
- Grivory owns higher specific strength, less material used for the same strength

Materials Performance	Grivory		Die-Al	Die-Zn	Copper
	GV-5H	GCL-4H			
T.S. MPa	220	335	240~350	280~350	290~650
Density , g/cm ³	1.56	1.34	2.7	6.7	8.3
Specific Strength KN·m/kg	137	250	89~129	42~52	35~78



Metal Replacement with Grivory GV

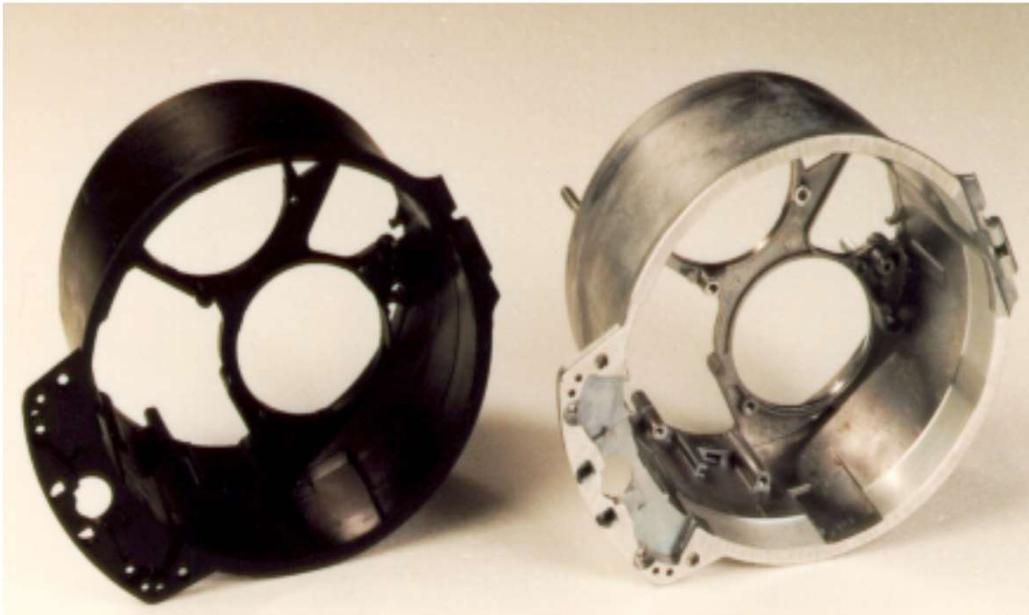
Manufacturing Cost – Die-Al vs. Grivory



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Metal Replacement with Grivory GV

Manufacturing Cost – Die-Al vs. Grivory



Material	Die-Al	Grivory GV-5H
Part Weight, kg	0.36	0.21
Material cost/pcs, EUR	1.6	2.1
Tool cost, EUR	120,000	120,000
Part Quantity, pcs	500,000	500,000
Tool life, shots	100,000	1,000,000
Number of tools	5	1
Tool cost/pcs, EUR	1.2	0.24
Post treatment, EUR	1.8	0

Die-Al vs. Grivory GV-5H

- Significant cost reduction
- 41% weight reduction
- No post treatment (milling & turning) needed

⇒ **42% cost saving** (500,000 parts in 5 years)

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Metal Replacement with Grivory GV

Part Integration – Car Cross Beam (CCB)

72 Metal parts → *1 Plastic Parts (GVL)*

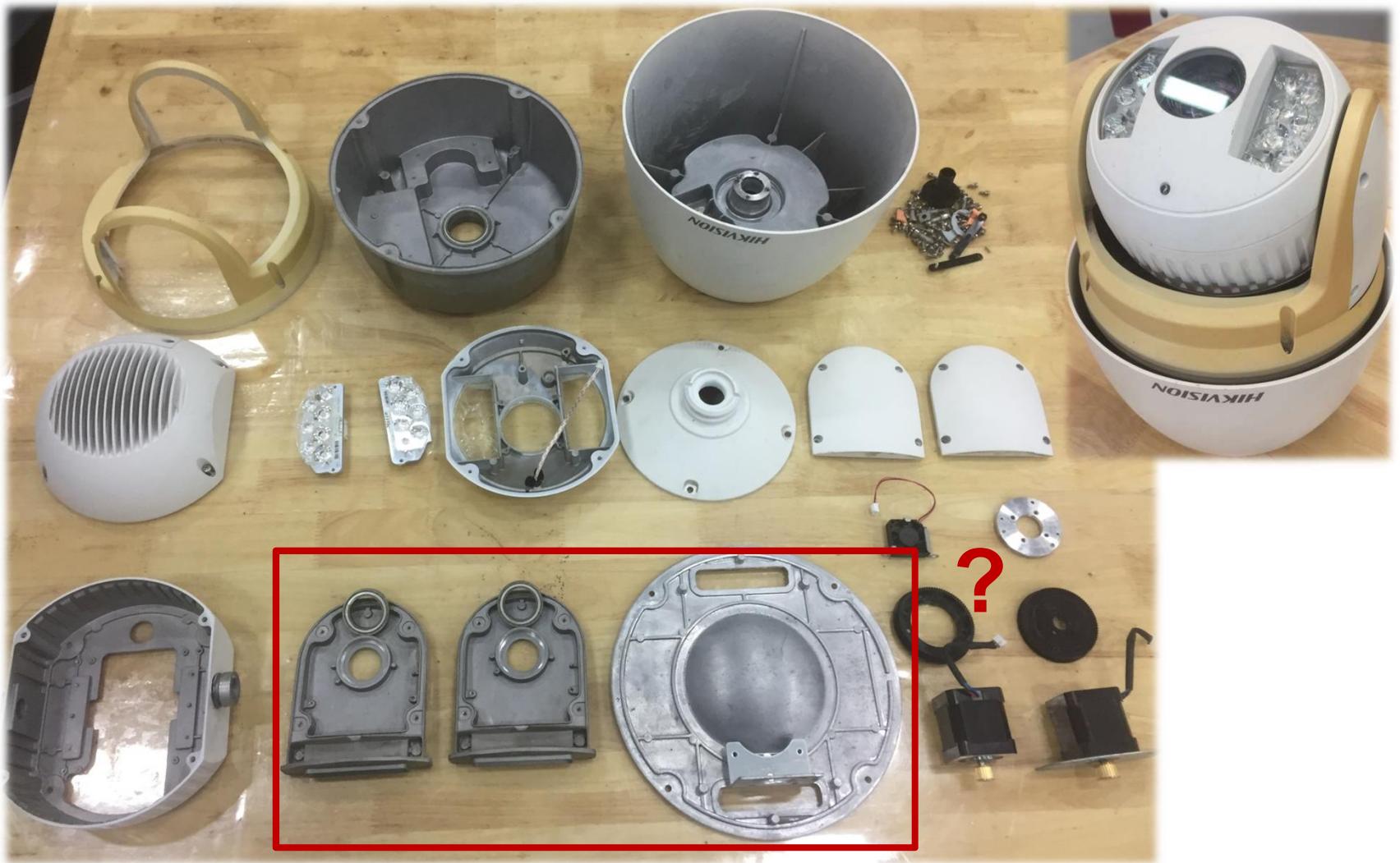


One-piece configured with functional features is more easier to be achieved with Plastic part

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Metal Replacement with Grivory GV

Part Integration



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Part Integration – Sensor Lenses/ Housing



Grivory GVX-5H

- Good Bonding with Grilamid TR30
- Good Dimensional Stability
- High Stiffness & Toughness

Grilamid TR30

- Excellent Chemical Resistance

Metal Replacement with Grivory GV Part Integration

Benefit

- Direct cost saving
- Parts integration
- Light weight

Material recommendation*1

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Estimated cost & weight

- Cost: 15~20 RMB*2/pcs
- Weight: 110g- 130g



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Metal Replacement with Grivory GV

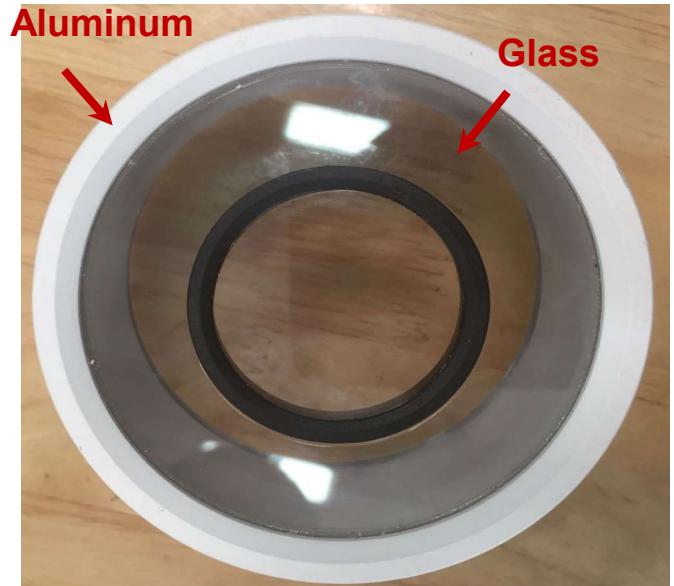
Part Integration

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How Can EMS Help HIKVISION Reduce Cost Glass Replacement with Grilamid TR

Q6055-S PTZ Network Camera



Grilamid TR



High durability

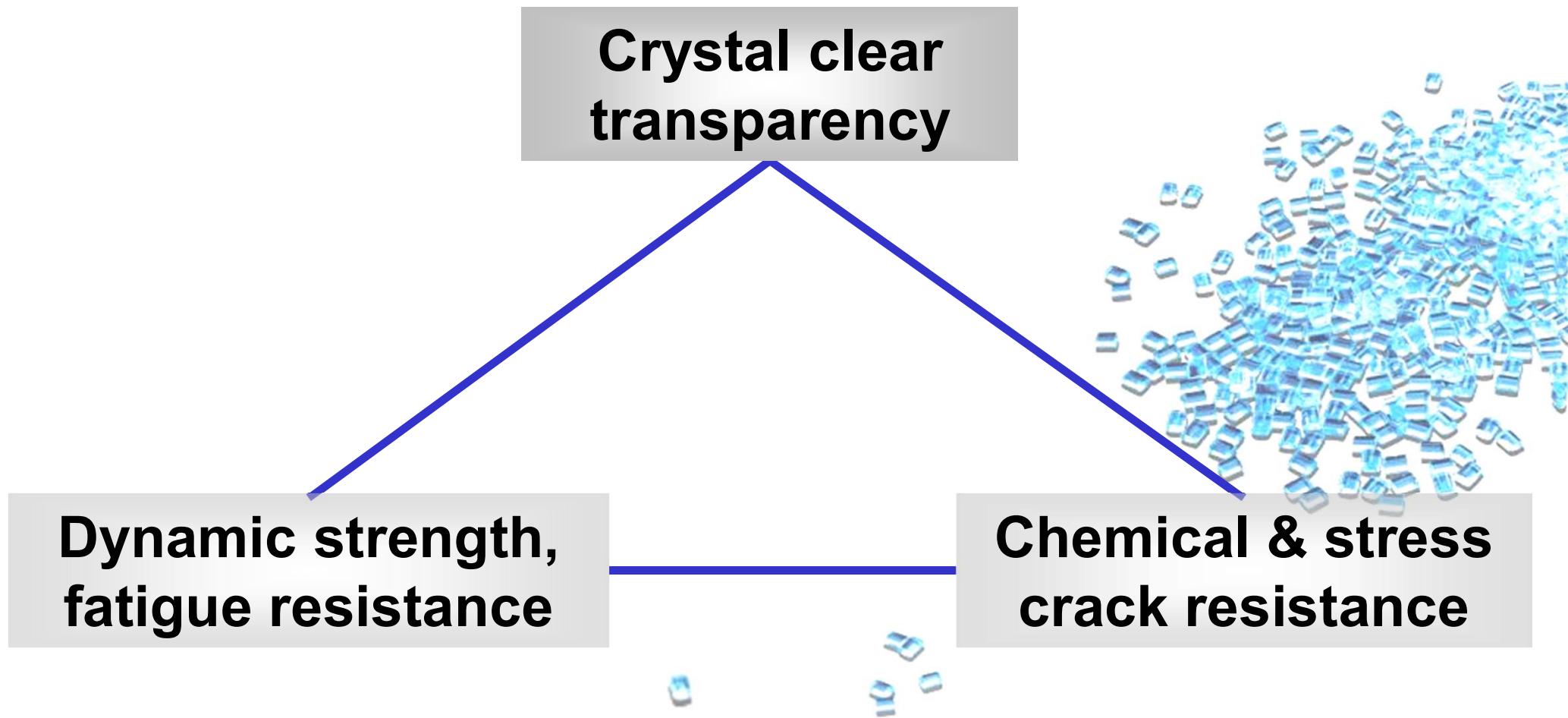
With a stainless steel (SAE 316L/V4A) casing and a nylon clear dome cover, the camera has high resistance to the corrosive effect of sea water and cleaning chemicals. The camera can operate in -30 °C to 50 °C (-22 °F to 122 °F) and its MIL-STD-810G 509.5, IP6K9K, IP66, IP67 and NEMA 4X approvals ensure protection against salt fog, high pressure and steam jet cleaning, dust, rain, snow and ice.

AXIS Q6055-S is also designed to be filled with nitrogen—a colorless, non-reactive and non-combustible gas that makes up 78% of Earth's atmosphere. Nitrogen in a sealed environment provides benefits such as preventing internal condensation.

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Glass Replacement with Grilamid TR

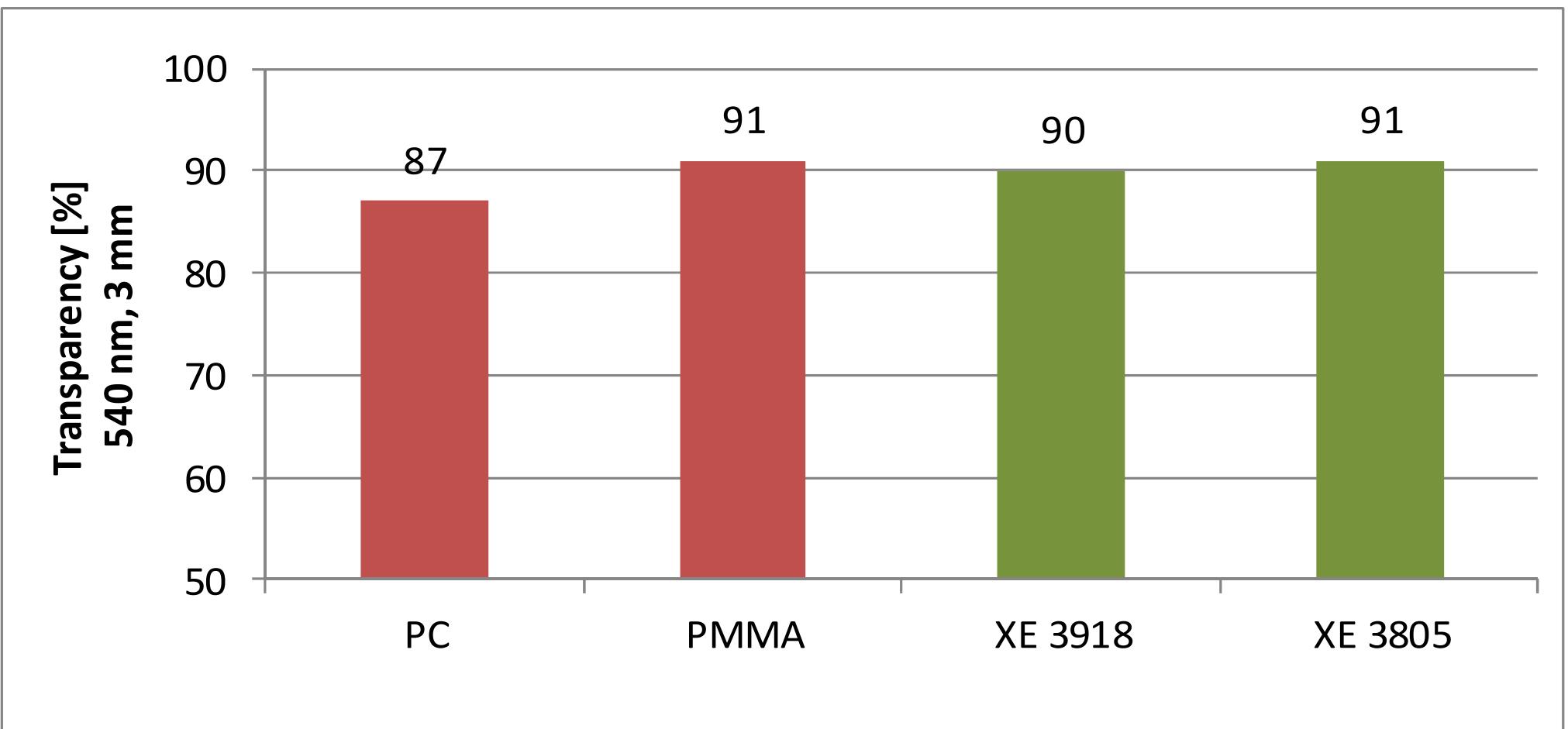
Grilamid TR – Key Properties



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Glass Replacement with Grilamid TR

Crystal Clear Transparency

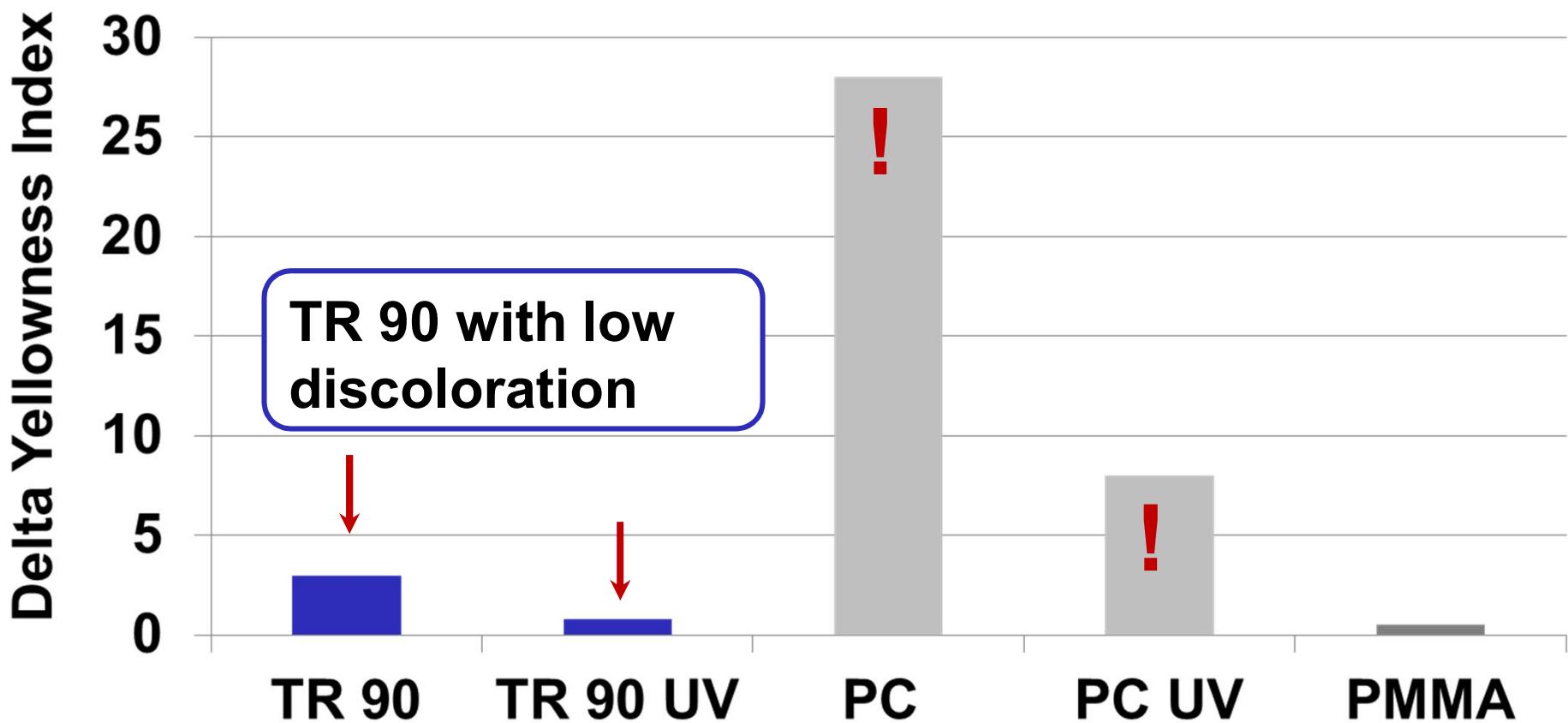


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Glass Replacement with Grilamid TR

Weathering & Color Change

Artificial Weathering WOM
(ISO 4892-2 / 1 mm), 2000 h, Δ Y-Index

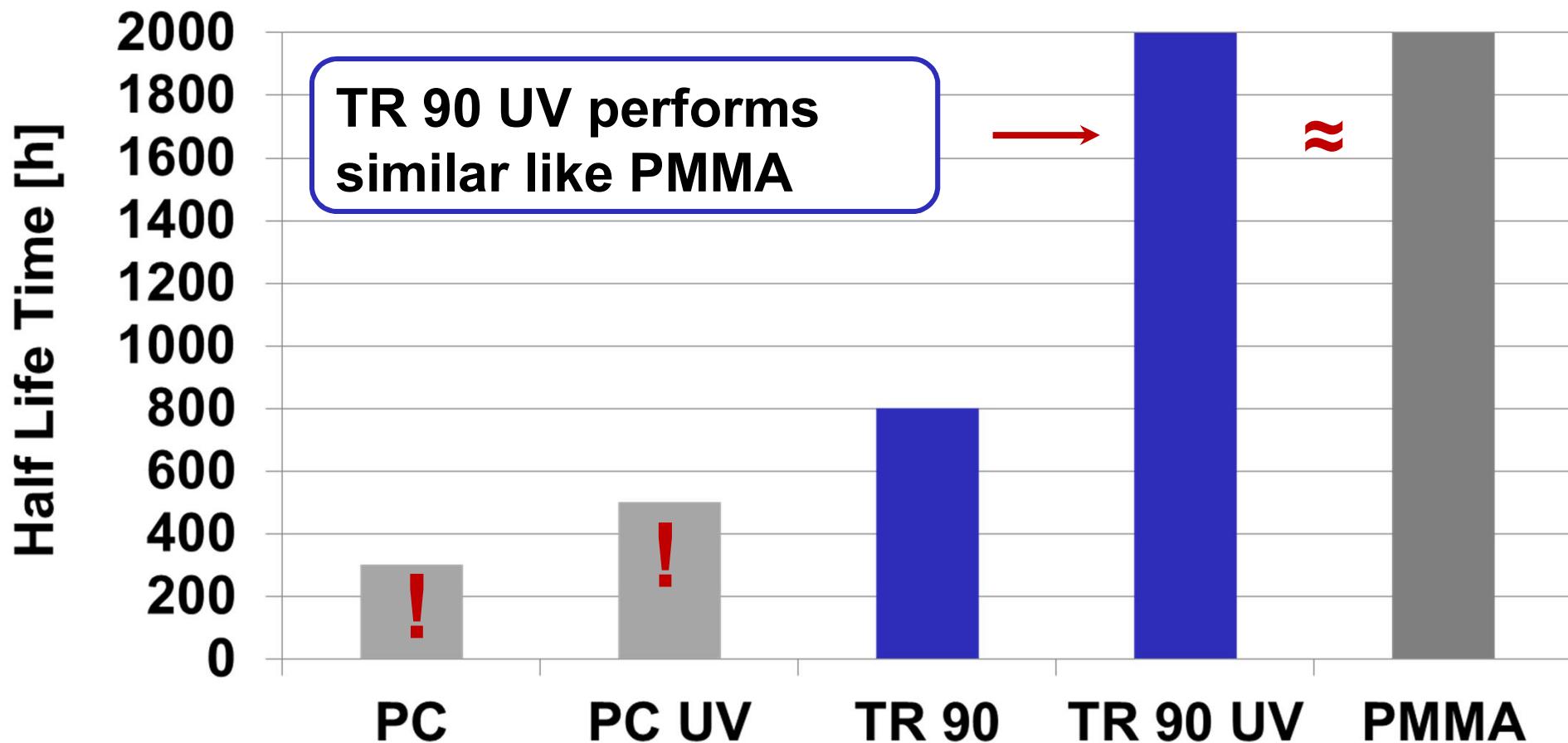


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Glass Replacement with Grilamid TR

Weathering & Mechanical Property

Tensile Impact Strength Half-Life Time after Weathering



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Glass Replacement with Grilamid TR

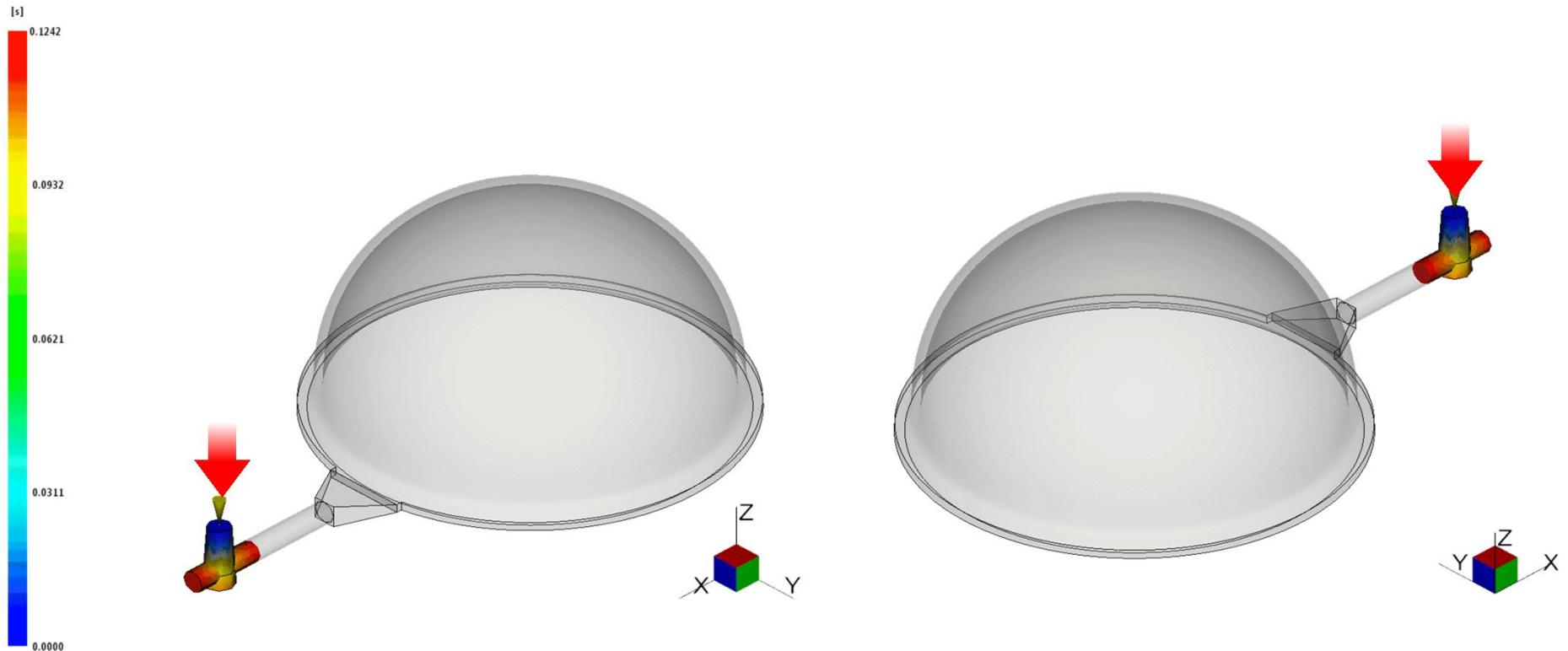
CATs Support – Moldflow Filling Study



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Glass Replacement with Grilamid TR
CATs Support – Moldflow Filling Study

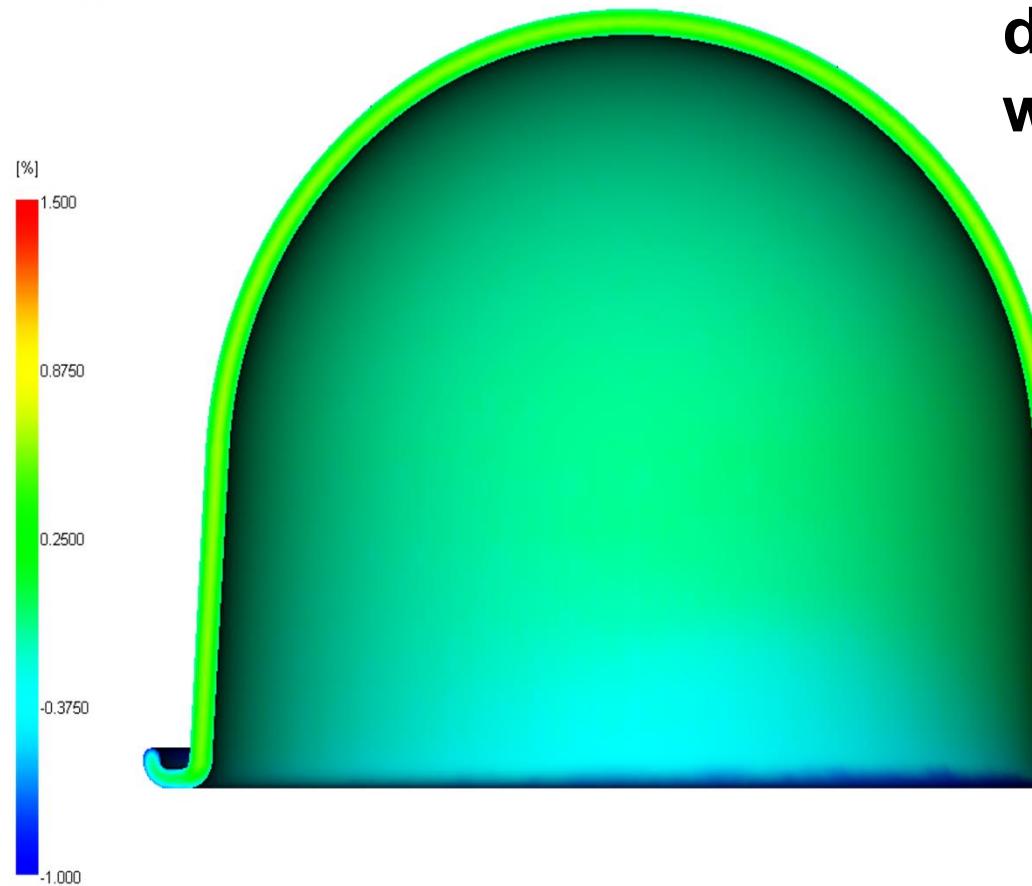
Filling



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Glass Replacement with Grilamid TR CATs Support – Volume Shrinkage

Volumetric shrinkage
Time = 47.74[s]



More homogenous distribution with lower shrinkage

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Other Concerns – Thermal Conductivity

Base Resins

Material	Thermal Conductivity W / (m·K)
PP	0.24
HDPE	0.26
PS	0.08
PVC	0.15
PMMA	0.18
ABS	0.17
PC	0.20
PA	0.25
PET	0.15-0.4
PPS	0.3
PEEK	0.29
PSF	0.2
EPOXY	0.18 ~ 0.75

Thermal Conductive Fillers

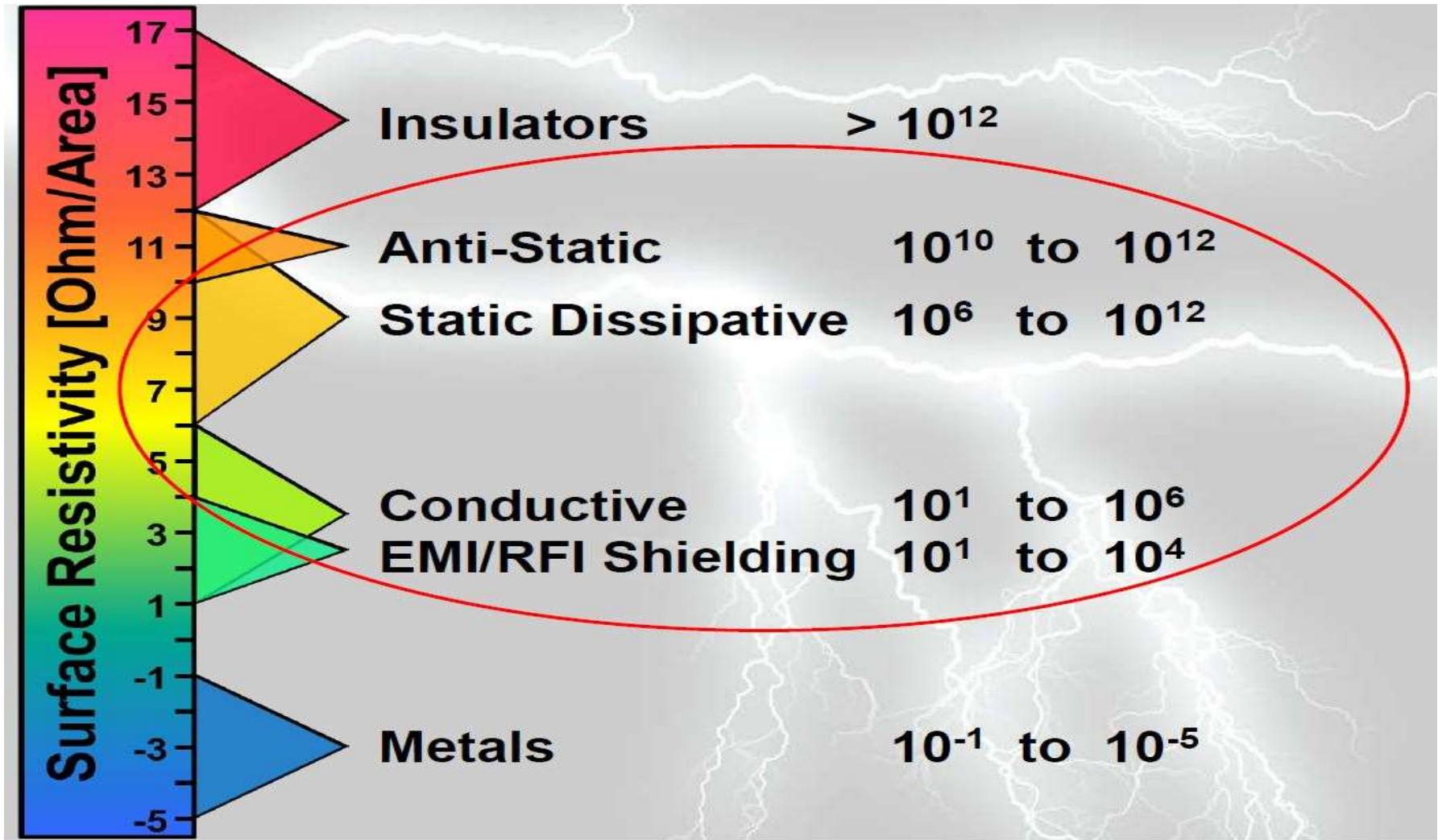
Material	Thermal Conductivity W / (m·K)
Cu	380
Al	190
Si ₃ N ₄	86 ~ 120
BN	29 ~ 300
AIN	150 ~ 220
SiC	85
Al ₂ O ₃	38 ~ 42
SiO ₂	1.5 ~ 1.6
BeO	300
Carbon Fibre	400~700
C: Nano-tube	2800~4000
C: diamond	1500 ~ 2000
C: graphite	150~1750
C: graphene	3000~5000

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Other Concerns – Electric Conductivity



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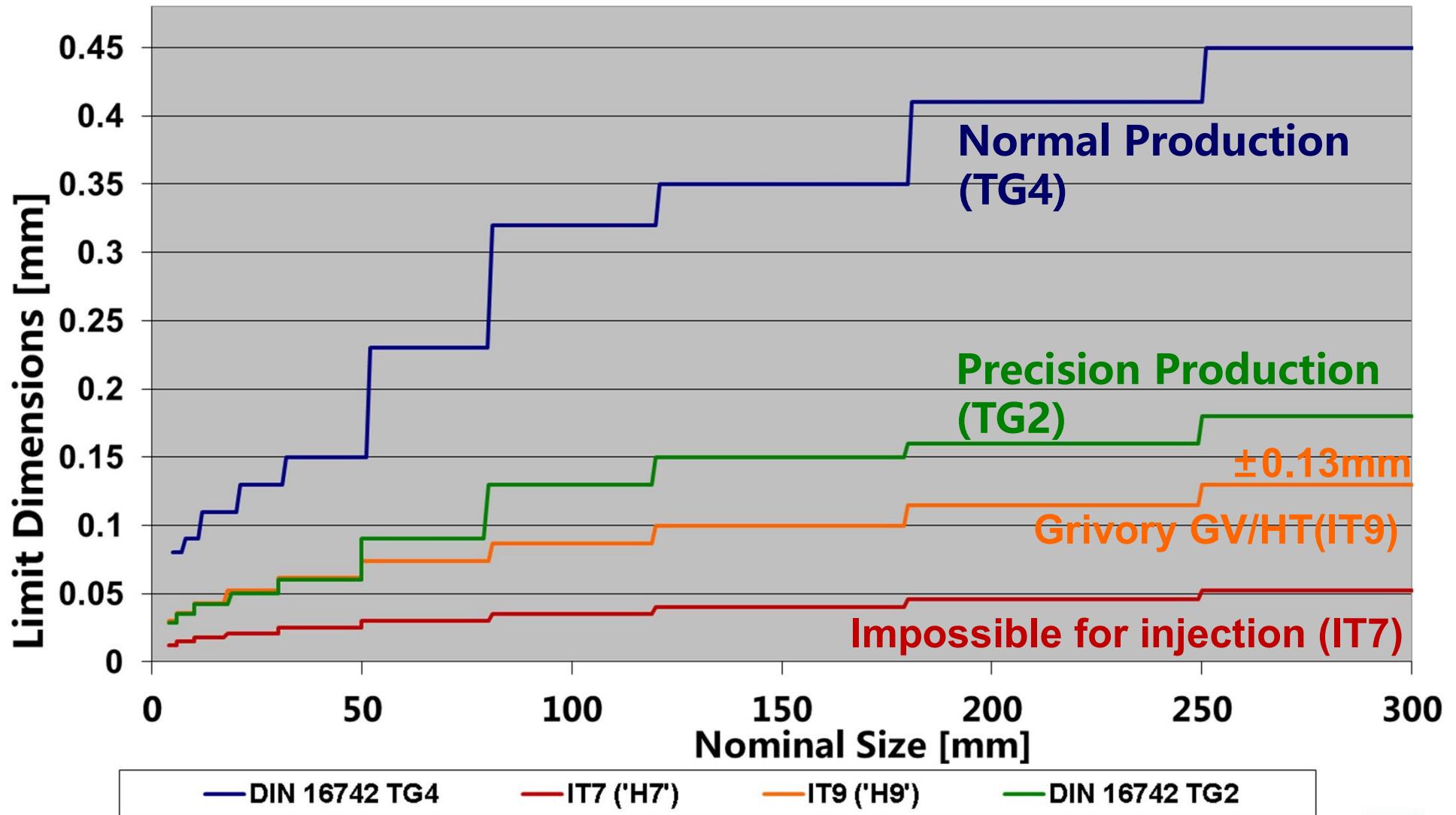
Other Concerns – Electric Conductivity

Additive	Modification	Grilon B (PA6)	Grilon TS (PA66+6)	Grilamid L (PA12)	Grivory G (PA66+6I/X)	Grivory HT2 (PA66/6T)	Grivory HT3 (PA10T/X)
Carbon Fibres	Carbon Fibres	✓	✓	✓	✓	✓	✓
	+ Glass Fibres			✓		✓	
	+ PTFE		✓			✓	
	+ Impact Modified		✓				
	+ mineral	✓					
	Long Carbon Fibres			✓	✓		
	+ Long Glass Fibre		✓		✓		
Carbon Fibrils	Carbon Nano Tubes (Extr)			✓			
	+ Impact Modified (Extr.)			✓			
	+ Glass Fibres			✓			
Carbon Black	Conductive Carbon			✓			
	+ Glass Fibres			✓			
Steel Fibres	Stainless Steel Fibres	✓					
	+ Glass Fibres	✓					



How Can EMS Help HIKVISION Reduce Cost

Other Concerns – Injection Tolerance



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Summary

- Leading high performance polyamide supplier
- Decades experience in metal replacement
- Grilamid TR tailor made for lenses (dome)
- Professional development partner



Q & A



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Committed To success!



**Your Innovative
Development Partner for
Cost and Weight Saving
Solutions**



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