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CONGRESS

FUNCTIONAL SILICONES FOR EASY TO CLEAN COATINGS

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OUTLINE

- **Common Stains for Architectural/Construction Coatings**
- **Functional Silicones Introduction**
- **Azelis Turkey Case Lab studies for Easy-to-Clean interior paint formulation**

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COMMON STAINS FOR ARCHITECTURAL/CONSTRUCTION COATINGS

GRAFFITI

SURFACTANT LEACHING/WATER MARKS

SCUFF

DIRT

MARKERS

ROUTES TO HELP ACHIEVE EASY-TO-CLEAN COATINGS

RESIN/BINDER	FORMULATION	ADDITIVES
• **Organic:** Acrylic, PU, etc.	• **Fillers**	• **Silicones**
• **Inorganic: Silicone, Silicate**	• **Pigments**	• **Wax**
• **Hybrid: Organic-Silicone**	• **Photoactive (self cleaning)**	• **Fluoro surfactants**
		• **Fluoro Silicones**

Complete Formulation Optimization is Needed to Achieve Easy to Clean Coatings

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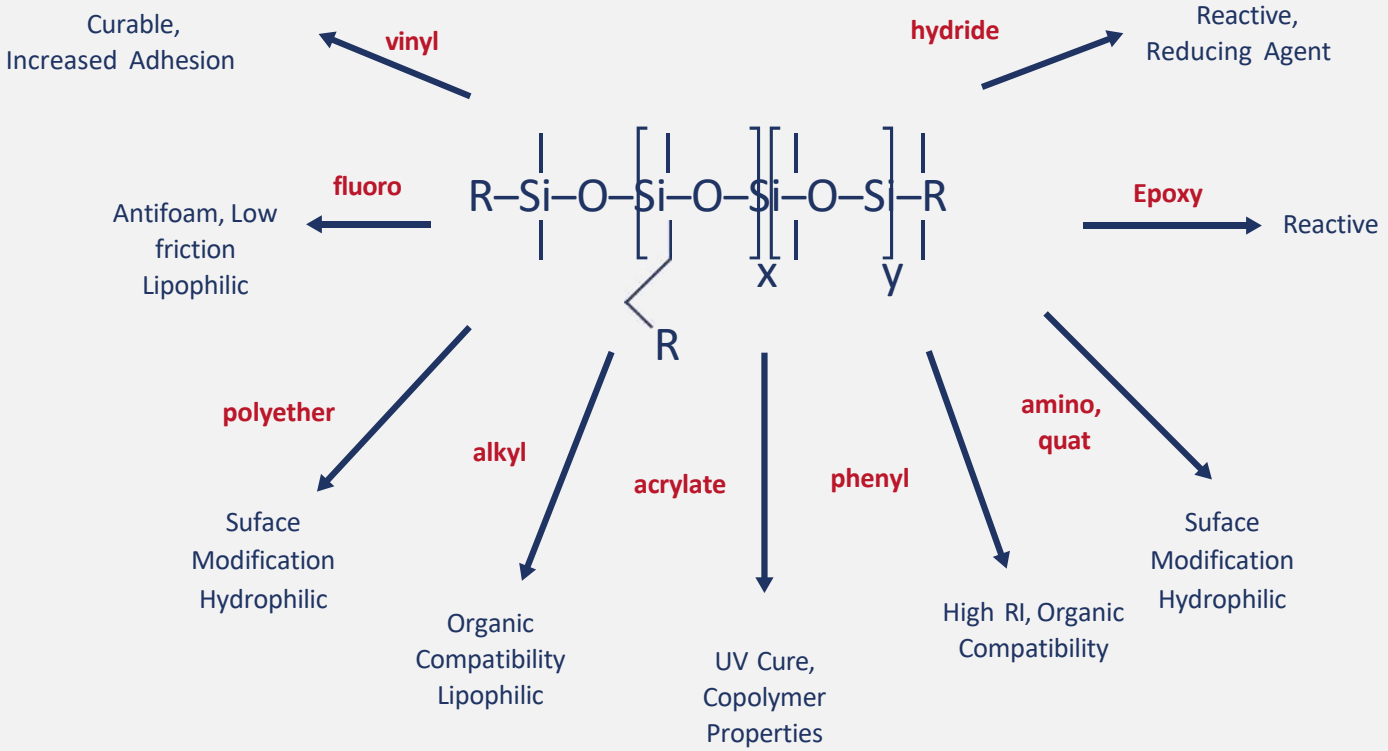
FUNCTIONAL SILICONES



Functionality can be Selected based on Target Properties & Formulations

Functional Silicone

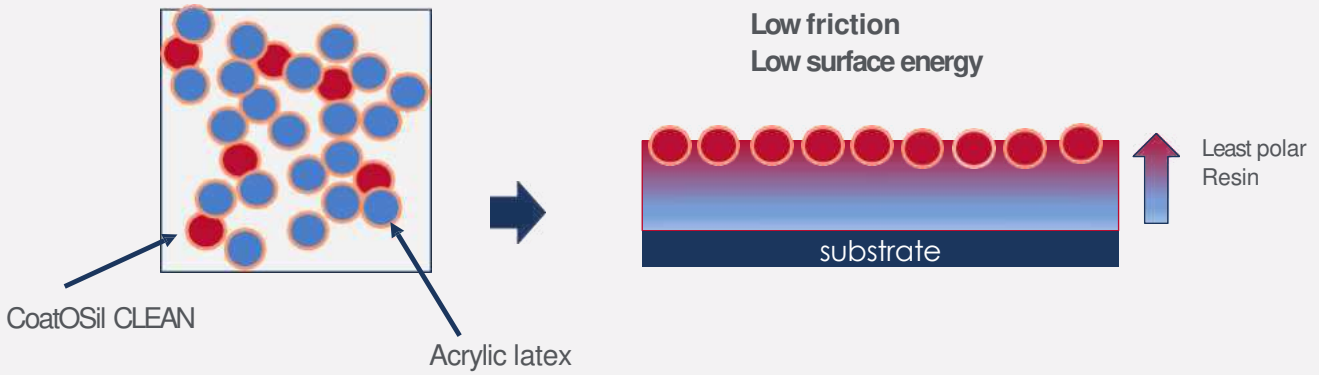
- Key Features
- How Does It Work
- Applications And Tests

FUNCTIONAL SILICONE

Unique molecular design to achieve optimal properties

- Compatibility
- Surface energy
- Coefficient of Friction
- Durability (anchoring groups)

How does it work?



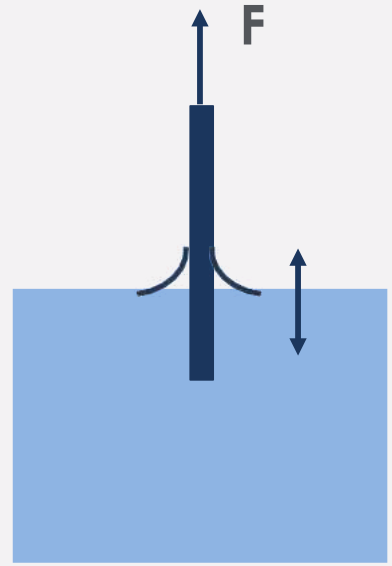
FUNCTIONAL SILICONE

Functional silicone increased both Hydrophobicity and Oleophobicity, and reduced Coefficient of Friction.

Key Features

- **Low viscosity emulsion of functional silicone**
- **Lower VOC; Lower cyclics**
  - < 7g/L VOC, ASTM D2369
  - < 1000 ppm D4, D5, D6
- **Typical properties**
  - White opaque liquid
  - ~40% solids
  - Low viscosity (< 400 cp at 25˚C)
  - Particle Size: ~300 nm
- **Compatible with acrylic latex**

Dynamic Contact Angle Measurement



FUNCTIONAL SILICONE For Interior Paints

Typical Benefits

- Scuff resistance
- Stain resistance
- Anti-blocking
- Reduced surfactant leaching
- Compatible with a wide range of latex systems

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Azelis CASE Lab Studies for Easy to Clean Interior Paint

Interior Paint Formulation

* Control was made using a commercial APEO free, zero-VOC capable, 100% acrylic latex.

Ingredients	Amount (wt%)
Water	19,77
HEC	0,21
Dispersing agent	0,4
Defoamer	0,2
Ammonium Hyroxide (%20)	0,02
Opaque polymer	4
Titan	18,5
Kaolin	4
Precipitated synthetic silicate	1,5
Talc	10,2
Ultralamellar talc	4
Pure Acrylic Binder	40
Butyl glycol	3,5
Propylene glycol	2
Texanol	0,6
CoatOsilClean	0-3
PU thickener	0,65
Biocide	0,15

Binder Properties

Structure	Pure Acrylic Binder-1	Pure Acrylic Binder-2	Pure Acrylic Binder-3
Solid (%w/w)	49 - 51	48	49 - 51
Viscosity (mPa.s)	100 - 500	50 - 500	100 - 800
pH	7 - 8,5	7 - 8,5	7,8 - 8,8
MFFT (ºC)	8	2	10

Azelis CASE Lab Studies

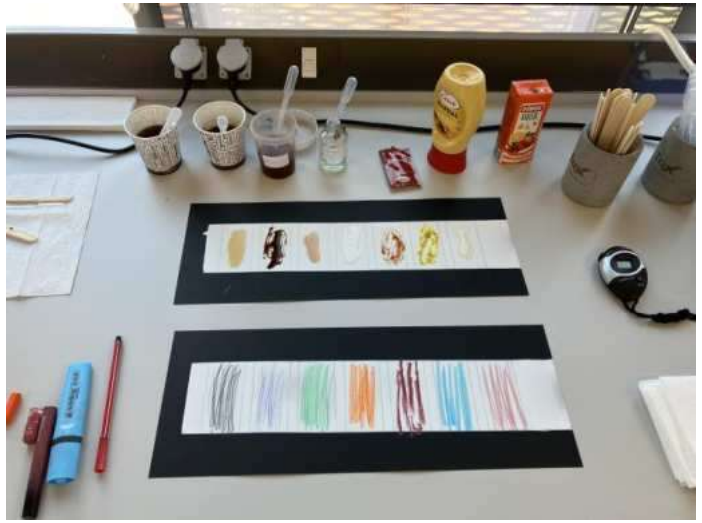
1. Pure Acrylic binder-1
1a. Pure Acrylic binder-1 + %3 Functional Silicone

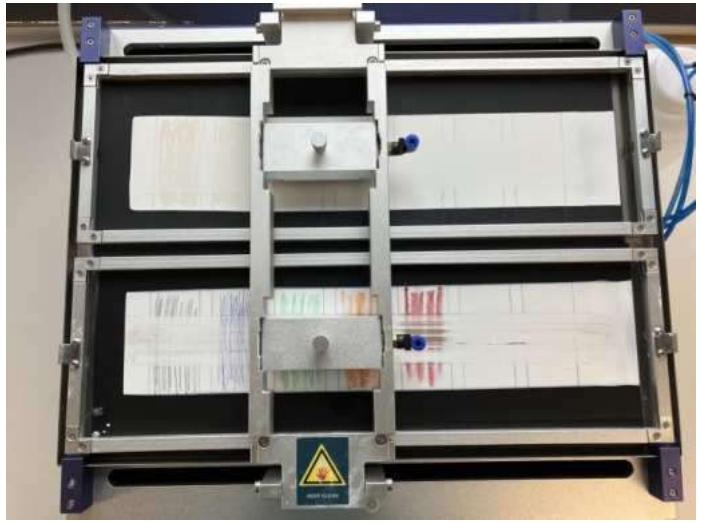
2. Pure Acrylic binder-2
2a. Pure Acrylic binder-2 + %3 Functional Silicone

3. Pure Acrylic binder-3
3a. Pure Acrylic binder-3 + %3 Functional Silicone

Stain Resistance Test with EN ISO 11998

- A 200 micron film of the wet paint sample is applied to the leneta cards.
- The filmed leneta card is left to dry for 28 days.
- After 28 days, stains are applied to the paint film. 5 min. is expected. Excess stains are wiped off with a napkin.
  Liquid (tea , coffee,wine, oil, ketchup, mustard, fruit juice)
  Markers (pencil, pen,color pens,crayon, lipstick,asetate pen)
- It is rubbed for 100 cycles using a scrubbing solution and a scrubbing pad in accordance with EN ISO 11998 test. Then it is washed with water and left to dry.
- The condition of contaminants on the drying film is checked visually.





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Interior Paint Formulation with Pure Acrylic Binder-1 Results

Lab. Code	Products	% Ratio	Technical Values										
2023-CASE-132			Viscosity KU-110 / 200 rpm	Density (g/cm3)	pH	Contrast Ratio (opacity) (%)	Wet Scrub Resistance (um)	Storage Stability	Viscosity After Storage Stability KU-110 / 200 rpm	pH After Storage Stability	CIE L*a*b* (white)	Gloss	Hardness
	Pure Acrylic Binder - 1	40	129,964	1,322	7,98	98,35	4,4	OK	128,873	7,71	L:94,81	20°:1,9	1.Day:22
											a:-1,08	60°:6,8	3.Day:24
											b:0,53	85°:8,6	7.Day:27
2023-CASE-133			Viscosity KU-110 / 200 rpm	Density (g/cm3)	pH	Contrast Ratio (opacity) (%)	Wet Scrub Resistance (um)	Storage Stability	Viscosity After Storage Stability KU-110 / 200 rpm	pH After Storage Stability	CIE L*a*b* (white)	Gloss	Hardness
	Pure Acrylic Binder - 1	40	133,984	1,327	7,91	98,45	3,2	OK	131,642	7,69	L:94,85	20°:1,9	1.Day:17
	Functional Silicone	3									a:-1,07	60°:6,7	3.Day:17
											b:0,61	85°:7,9	7.Day:20

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Interior Paint Formulation with Pure Acrylic Binder-1 Results

2023-CASE-132 Pure Acrylic Binder – 1 Paint Formulation

2023-CASE-133 Added %3 Functional Silicone

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Interior Paint Formulation with Pure Acrylic Binder-2 Results

Lab Code	Products	% Ratio	Technical Values										
2023-CASE-118			Viscosity KU-110 / 200 rpm	Density (g/cm3)	pH	Contrast Ratio (opacity) (%)	Wet Scrub Resistance (um)	Storage Stability	Viscosity After Storage Stability KU-110 / 200 rpm	pH After Storage Stability	CIE L*a*b* (white)	Gloss	Hardness
	Pure Acrylic Binder-2	40	143,147	1,332	7,90	98,61	1,2	OK	148,452	7,53	L:95,35	20°:1,8	1.Day:14
											a:-1,03	60°:5,0	3.Day:16
											b:0,68	85°:6,2	7.Day:18
2023-CASE-119			Viscosity KU-110 / 200 rpm	Density (g/cm3)	pH	Contrast Ratio (opacity) (%)	Wet Scrub Resistance (um)	Storage Stability	Viscosity After Storage Stability KU-110 / 200 rpm	pH After Storage Stability	CIE L*a*b* (white)	Gloss	Hardness
	Pure Acrylic Binder-2	40	160,006	1,304	7,95	98,49	0,8	OK	161,974	7,55	L:95,39	20°:1,8	1.Day:12
	Functional Silicone	3									a:-1,01	60°:5,7	3.Day:13
											b:0,74	85°:7,7	7.Day:14

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Interior Paint Formulation with Pure Acrylic Binder-2 Results

2023-CASE-118 Pure Acrylic Binder – 2 Paint Formulation

2023-CASE-119 Added %3 Functional Silicone

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Interior Paint Formulation with Pure Acrylic Binder-3

Lab Code	Products	% Ratio	Technical Values										
2023-CASE-126			Viscosity KU-110 / 200 rpm	Density (g/cm3)	pH	Contrast Ratio (opacity) (%)	Wet Scrub Resistance (um)	Storage Stability	Viscosity After Storage Stability KU-110 / 200 rpm	pH After Storage Stability	CIE L*a*b* (white)	Gloss	Hardness
	Pure Acrylic Binder-3	40	140,417	1,344	8,11	98,75	2,4	OK	145,865	7,92	L:95,69	20°:1,7	1.Day:17
											a:-1,09	60°:4,8	3.Day:24
											b:0,79	85°:6,7	7.Day:24
2023-CASE-127			Viscosity KU-110 / 200 rpm	Density (g/cm3)	pH	Contrast Ratio (opacity) (%)	Wet Scrub Resistance (um)	Storage Stability	Viscosity After Storage Stability KU-110 / 200 rpm	pH After Storage Stability	CIE L*a*b* (white)	Gloss	Hardness
	Pure Acrylic Binder-3	40	165,041	1,334	8,09	98,76	1,7	OK	168,956	7,95	L:95,69	20°:1,9	1.Day:15
	Functional Silicone	3									a:-1,11	60°:5,6	3.Day:18
											b:0,97	85°:7,8	7.Day:20

Easy to Clean Studies with Pure Acrylic Binder-3 Results

2023-CASE-126 Pure Acrylic Binder – 3 Paint Formulation

2023-CASE-127 Added %3 Functional Silicone

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SUMMARY

- **İnterior paint with Pure Acrylic Binder-1**

In Azelis formulation; except tea and coffee stains, we observed good results for liquid stains but We did not see good results for some of the solid stains. When functional silicone was added to the Azelis formulation, there was a slight improvement for markers except tea and coffee stains.

- **İnterior paint with Pure Acrylic Binder-2**

In Azelis formulation; It was observed that there were good results for other stains except tea,cofee stains. When functional silicone was added to the Azelis formulation, there was an improvement in tea and coffee stains and other liquid stains and markers

- **İnterior paint with Pure Acrylic Binder-3**

In Azelis formulation; It was appread positive for other stains except tea and coffee stains. When functional silicone was added to the Azelis formulation, there was a slight improvement coffee and markers except tea stain.

Azelis CASE Turkey Laboratory and Test Methods

- Wet Scrub Resistance
  - ASTM D 2486
  - ISO EN ISO 11998
- Stain Resistance
- Levelling (ASTM D 2801-4494)
- Sagging (ASTM D 2801-4494)
- Solids Content (DIN EN ISO 3251,06.2008)
- Viscosity (DIN 1342-3)
- pH-value (DIN EN 1262)
- Density (DIN ISO 2811-1:2011)
- Pendulum Hardness (DIN 53 157; ISO 15 22)
- Gloss (DIN 53 778/DIN EN 13 300)
- Karl Fischer Titration Tester
- Solvent Rub Resistance Tester (ASTM D 4752)
- Conical Mandrel - (EN ISO 6860 and ASTM D 522-93A)
- Impact Tester (ISO 6272-2)
- Cross-Cut (ISO 2409)
- Salt Spray
- Alkali Resistance

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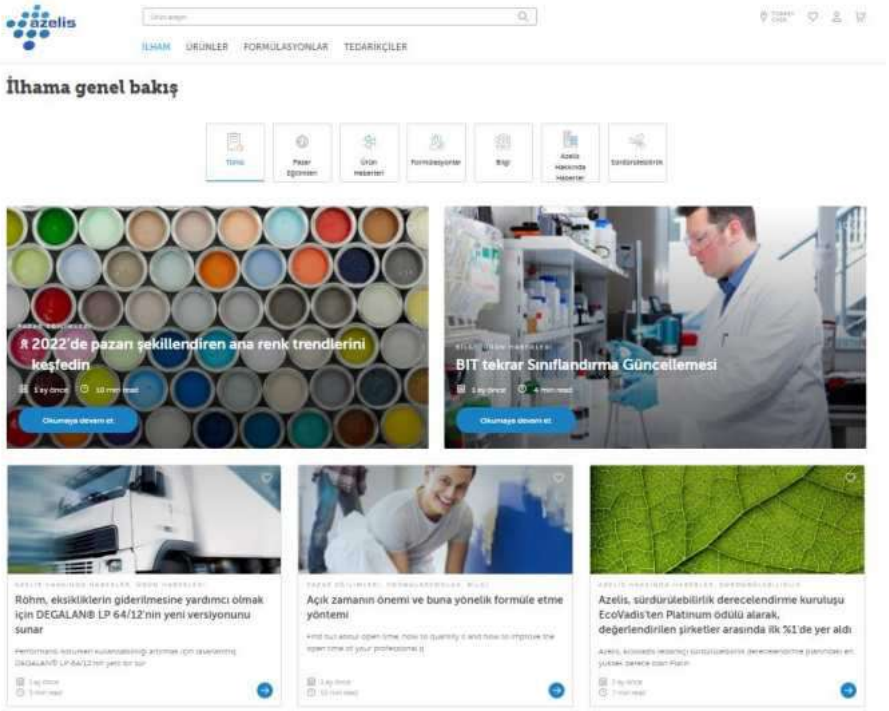
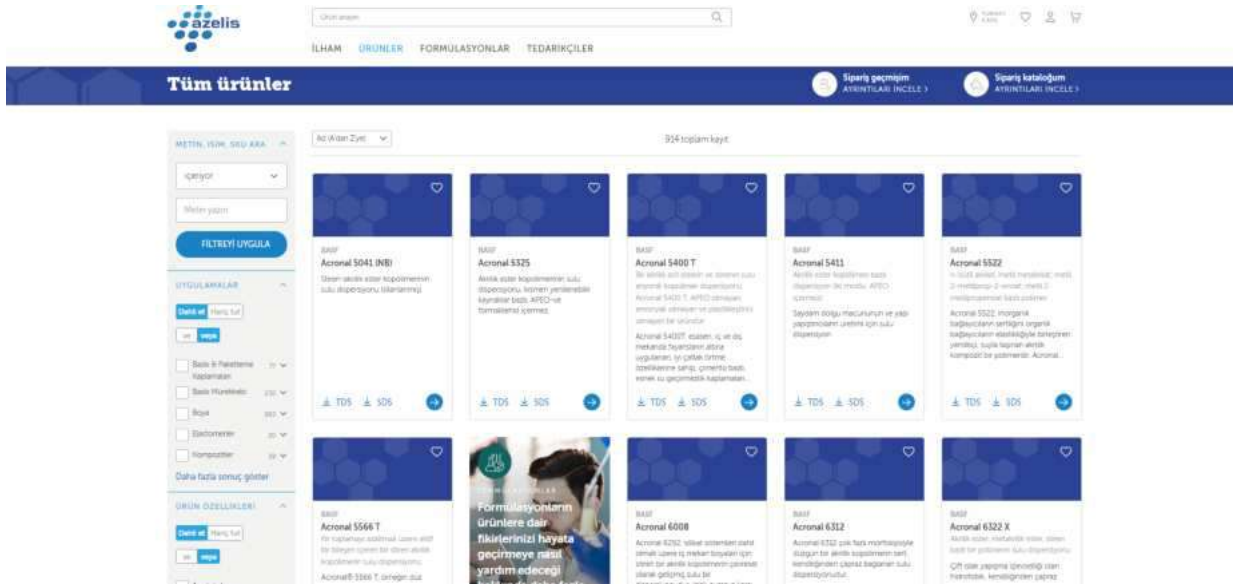
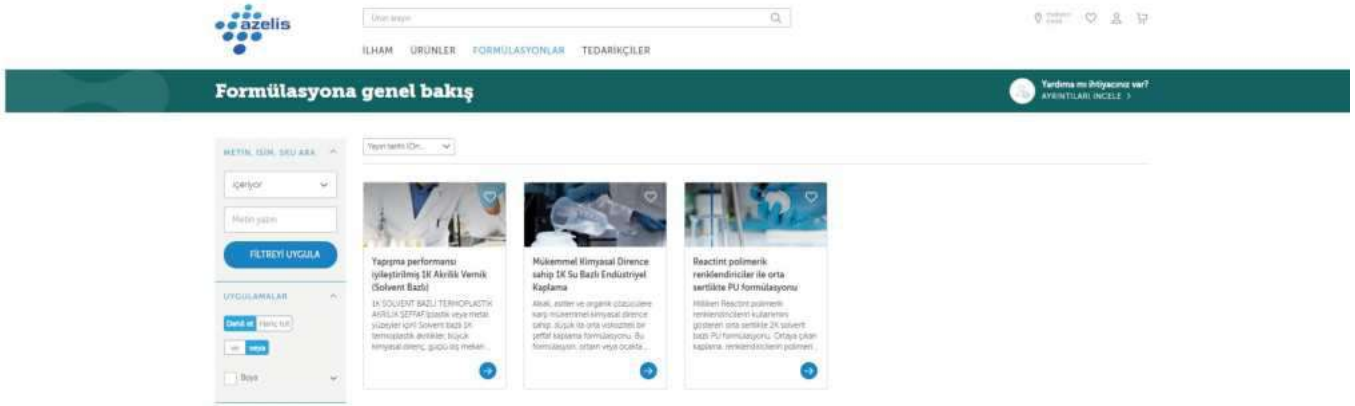
Azelis CASE Turkey Customer Portal







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