

SIMONA



SIMONA® PP-H AlphaPlus

The new generation of polypropylene for
industrial piping systems

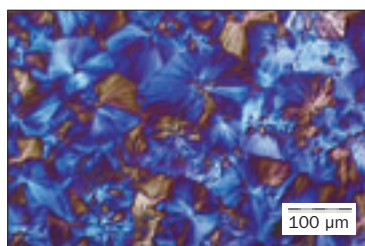
SIMONA® PP-H AlphaPlus – The new generation of polypropylene for industrial piping systems

Newly developed **SIMONA® PP-H AlphaPlus** is a homopolymeric polypropylene (PP-H) that offers a host of possibilities when it comes to designing and implementing premium-quality industrial piping systems. **SIMONA® PP-H AlphaPlus** combines a number of advantages:

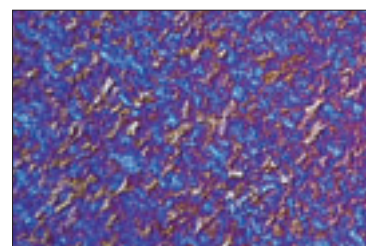
- Fine and stable alpha-crystalline structure
- Improved hydraulic properties due to lower surface roughness
- Less susceptible to incrustation
- Increased toughness and improved rigidity
- Longer service life
- Improved chemical resistance and enhanced stress crack resistance
- Lower stress potential due to reduced residual stress
- Excellent welding properties

Fine and stable alpha-crystalline structure

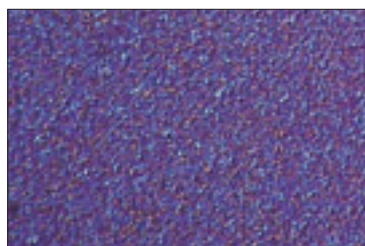
By incorporating special nucleating agents and adjusting key elements within the area of process engineering, we have developed a PP-H displaying an extremely fine crystalline structure with stable α characteristics: **SIMONA® PP-H AlphaPlus**. It delivers an extensive range of benefits, particularly when it comes to transporting critical substances and media via specialist piping systems: Indeed, pipes made of **SIMONA® PP-H AlphaPlus** display a combination of favourable properties that set them apart from other products – delivering best-in-class solutions for industrial piping systems.



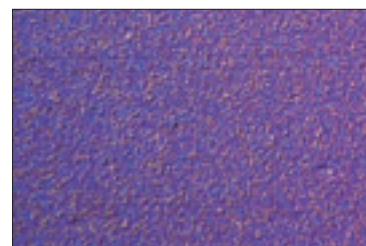
PP-H, non-nucleated



PP-H, mildly α -nucleated



PP-H, β -nucleated



SIMONA® PP-H AlphaPlus

Photographs of PP-H types taken under an optical microscope

Improved hydraulic properties due to lower surface roughness

The fine crystalline structure of SIMONA® PP-H AlphaPlus contributes directly to the reduced surface roughness of the pipe interior. The surface roughness R_a of SIMONA® PP-H AlphaPlus pipes is less than $0.4 \mu\text{m}$ – a significant advantage compared with the roughness properties of other types of PP-H, particularly in the case of larger diameters. The result is a considerable decrease in the level of pipe friction, while the pressure loss is reduced by more than ten per cent. Depending on the flow rate, a significant amount of energy can thus be saved with regard to the transport of liquid

media. Ultimately, SIMONA® PP-H AlphaPlus pipes contribute to the cost-effective operation of state-of-the-art piping systems.

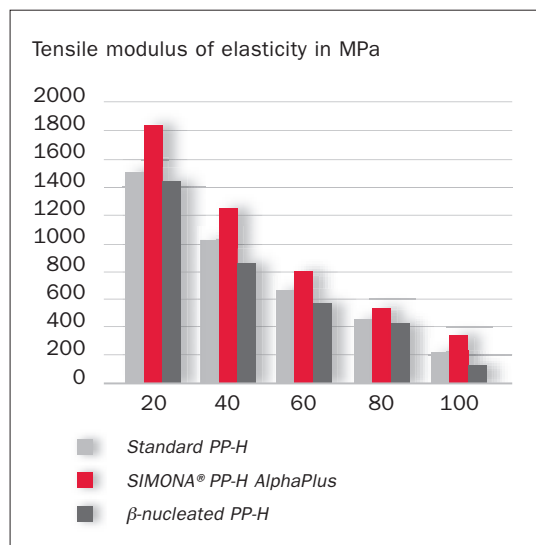
Less susceptible to incrustation

For applications in the pharmaceutical and food industries and within the field of semiconductor technology, an extremely low surface roughness is one of the key quality factors when it comes to minimising the risk of incrustation on the interior of the pipe. Rough interior pipe surfaces are more conducive to the formation of a so-called biofilm. In contrast, ultra-smooth surfaces greatly reduce the likelihood of biofilm formation and are therefore far less susceptible to incrustation.

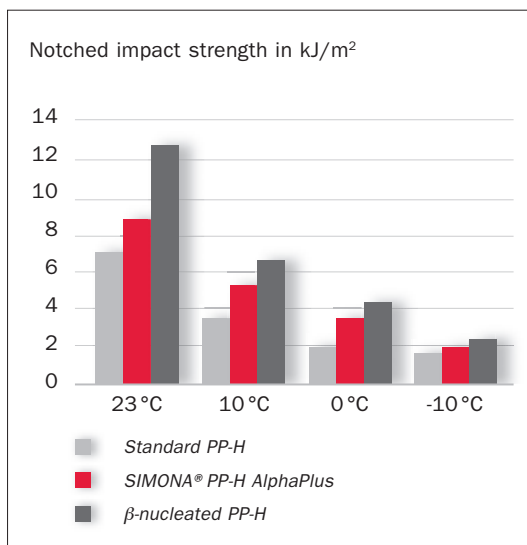
As a result, the intervals between cleaning can be extended and costs can be scaled back.

Increased toughness and improved rigidity

SIMONA® PP-H AlphaPlus offers users considerably improved rigidity, in addition to increased toughness. At 100°C rigidity is twice as high as in the case of β -nucleated PP. At low temperatures, in particular, SIMONA® PP-H AlphaPlus displays higher impact resistance than standard PP-H, thus combining greater functionality with improved safety.



Modulus of elasticity in tension of different type of PP (single analysis on pressed discs)



Notched impact strength according to Charpy method

SIMONA® PP-H AlphaPlus – Exceptional material properties

Longer service life

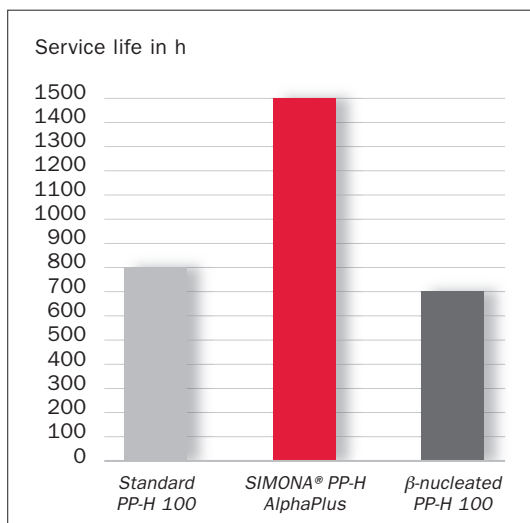
The superior safety properties of SIMONA® PP-H AlphaPlus are reflected in its greatly improved resistance to slow crack growth. Compared to a mildly α -nucleated standard PP-H with a useful life of between 700 and 800 hours, SIMONA® PP-H AlphaPlus is capable of achieving a service life of more than 1500 hours during Full-Notch Creep Tests (FNCT). In contrast, β -nucleated PP-H is usually associated with a maximum life of 700 hours. These benefits are also demonstrated as part of creep-depending-on-time tests under internal compression. At 95°C and a pressure/stress

of 4.4 MPa, the useful life of SIMONA® PP-H AlphaPlus was in excess of 3000 hours. Compared with the minimum requirement of 100 hours, this provides additional safety reserves.

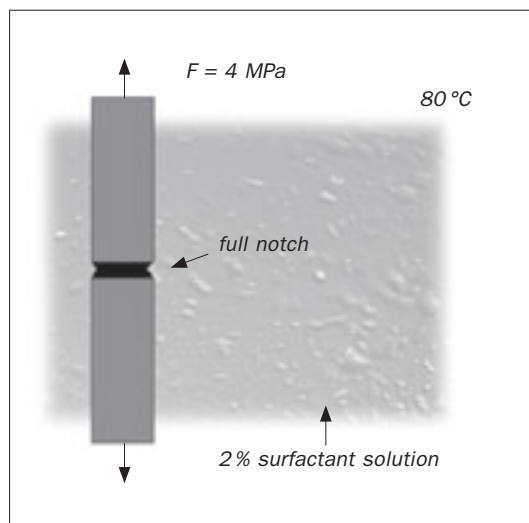
Improved chemical resistance and enhanced stress crack resistance

The high degree of toughness as well as the stable morphology of SIMONA® PP-H AlphaPlus have a positive effect on the chemical resistance of this material. Alongside the material's improved service life, tests have shown that the surface is much less susceptible to chemical

attack. Again, one of the key factors is the fine and highly stable crystalline structure associated with SIMONA® PP-H AlphaPlus, which helps to reduce material-related stress. Particularly in critical zones such as weld seams and anchor points, which are subjected to internal stress or stress from external sources, the resistance when exposed to stress-crack-inducing chemicals is extremely high. This contributes directly to operational reliability and safety.



Service life of various types of PP in FNCT (Full-Notch Creep Test) at 80°C and 4.0 MPa



FNCT-test specimen



Standard PP-H



SIMONA® PP-H AlphaPlus

Lower stress potential due to reduced residual stress

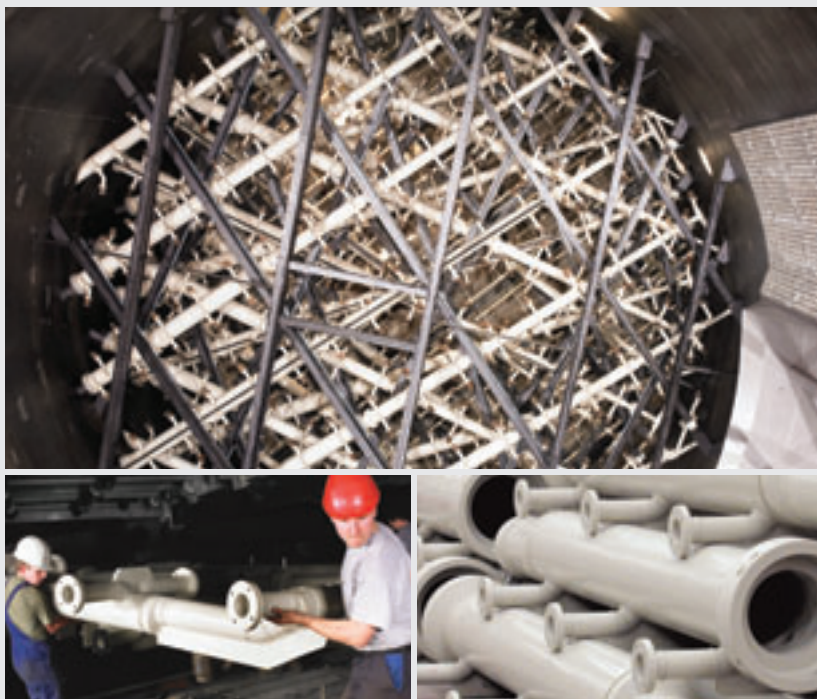
Internal stresses created as part of the manufacturing process can be minimised by means of annealing. For this reason, all SIMONA® PP-H AlphaPlus pipes undergo a process of inline annealing. Studies have shown that a limit value of 2.5 MPa must be maintained in order to avoid stress cracks to the largest extent possible in the case of chemical exposure. By annealing SIMONA® PP-H AlphaPlus, residual stresses can be reduced to below 1.4 MPa.

Excellent welding properties

Welding methods applied within the area of plastics processing can often result in changes to the morphology of a specific material. This has a significant impact on the properties of welded joints and thus also on the overall quality of plastic parts and assemblies, particularly in the case of polypropylene. A prime example is heated-tool butt welding, which generally produces welding beads in the joint zone. In this case, a notch is formed in the area of

the weld seam, potentially causing stress concentration under increasing mechanical loads. In turn, stress concentration in the notch root of a weld seam can induce stress cracks under tensile loading or when exposed to chemicals. The ultra-fine structure of SIMONA® PP-H AlphaPlus pipes is thermodynamically stable and remains intact during welding; this feature applies to a range of different welding methods. The thus resulting intrinsic toughness significantly reduces the level of stress concentration in the notch root. Technological bend tests have shown a considerable increase in the bend angle achievable with this material.

Outstanding in theory – proven in the field



The project:

RWE Energie AG had to renovate a flue gas desulphurisation system at its power plant in Niederaußem.

The solution:

As part of extensive tests, high-grade steel, GRP (glass-fibre-reinforced plastic), modified GRP surfaces as well as SIMONA® PP-H AlphaPlus were assessed as to their suitability within this field of application.

SIMONA® PP-H AlphaPlus was rated as the perfect construction material for this specific task, as it is resistant to the hydrochloric and sulphuric acids present in the absorption scrubber units. In parallel, pipes made of SIMONA® PP-H AlphaPlus are extremely durable, displaying a high wear resistance to interior and exterior abrasion. Over a construction period of two weeks the pre-fabricated spray nozzles (specially designed support and assembly

components) were installed at four different levels. Having completed this stage, the special droplet separators, i.e. demisters, were added. The scrubbing unit was put back into service after an interruption of just three weeks. In SIMONA® PP-H AlphaPlus, RWE found a suitable material to replace the rubberized steel pipes formerly used for these applications – and a solution that delivers a number of other tangible benefits.

Your benefits at a glance

SIMONA® PP-H AlphaPlus pipes offer a range of benefits:

- Considerable reduction in pressure loss due to improved hydraulic properties
- Significantly lower risk of particle deposits and bacteria due to ultra-smooth surfaces
- Potential cost-savings as a result of extended intervals between cleaning
- New fields of application thanks to temperature range of between 0 °C and +100 °C
- Safe installation and assembly of pipes due to improved impact strength, even at low temperatures up to 0 °C
- Longer service life due to enhanced chemical resistance and minimised risk of stress cracks
- Greater safety margin due to improved weld quality
- Higher degree of safety when welding pipes in locations that are difficult to access
- Full compatibility with other PP pipe materials



Material specifications SIMONA® PP-H AlphaPlus

Properties	Test standard	Test method/ Test specimen	Unit	SIMONA® PP-H AlphaPlus
Mechanical properties				
Density	ISO 1183	Procedure C	g/cm ³	0.915
Melt mass-flow rate (Melt Index)	ISO 1133	MFR 190/5	Group	006
Tensile test	DIN EN ISO 527	Type 1B		
Yield stress			MPa	33
Elongation at yield			%	8
Elongation at break			%	70
Tensile modulus of elasticity			MPa	1700
Impact bending test	DIN EN ISO 179			
Impact strength		80 x 10 x 4 mm	kJ/m ²	no break
Notched impact strength		V-notch	kJ/m ²	9
Surface hardness				
Ball indentation hardness	DIN EN ISO 2039-1		MPa	70
Shore hardness	DIN EN ISO 868	Procedure D	–	72
Thermal properties				
Crystalline melting range	DIN 53736	DSC	°C	160–165
Mean coefficient of linear thermal expansion	DIN 53752	Procedure A	K ⁻¹	1.6 · 10 ⁻⁴
Thermal conductivity	DIN 52612	PIC. 500 x 500 x 20 mm	W/m · K	0.22
Temperature range			°C	0 bis +100
Electrical properties				
Dielectric strength	VDE 0303-21		kV/mm	52
Volume resistivity	DIN IEC 93		Ohm · cm	> 10 ¹⁶
Surface resistivity	DIN IEC 167		Ohm	10 ¹⁴
Tracking resistance	DIN IEC 112	Procedure KC	Grade	> 600
Other properties				
Flammability	DIN 4102		Class	B2
Water absorption	DIN 53495	Procedure C	%/24 h	< 0.01
Physiologically safe	Recommendation	BfR/KTW		yes
Chemical resistance	DIN 8078 Supplement			fulfilled ^①


^① Please refer to SIMCHEM CD-ROM

Product range – Pipes, fittings, valves


Diameters in mm, unless otherwise stated

SIMONA® PP-H AlphaPlus^①


Pipes

	Pressure pipes	10 – 1000
	Ventilation pipes	180 – 800


Fittings with elongated spigots for IR/butt welding

	Elbows 90°, 45°, injection-moulded	20 – 315
	Bends 90°, injection-moulded	20 – 315
	Bends 90°, 60°, 45°, 30°, seamless	32 – 315
	Bends 90°, 60°, 45°, 30°, welded	90 – 800
	Stub flanges, injection-moulded	20 – 315
	Tees, injection-moulded/welded	90/50 – 630/450
	Tees, injection-moulded/welded	20 – 1000
	Branches 45°, injection-moulded	63 – 110
	Branches 45°, 60°, injection-moulded	110 – 630
	Reducers, concentric, injection-moulded	25/20 – 315/280
	Reducers, eccentric, injection-moulded	25/20 – 250/225
	End caps, injection-moulded	20 – 400
	Unions, adaptors	20 – 63

Fittings with short spigots for butt welding

	Elbows 90°, injection-moulded	20 – 400
	Stub flanges, injection-moulded/machined	20 – 1000
	Tees, injection-moulded	20 – 500
	Reducers, concentric, injection-moulded/machined	25/20 – 800/710
	End caps, machined	250 – 800


Electrofusion fittings/Special fittings

	Electrofusion sockets	20 – 225
	Special fittings	Double-containment piping systems, shafts, inspection tees, etc.

Flanges

	Fittings for flange assemblies, PP piping systems	PP/steel loose flanges, blind flanges, profile loose flanges, special flange assemblies, gaskets/seals, accessories
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Valves

	2-way, 3-way ball valves	20 – 110
	Diaphragm valves, sediment strainers	20 – 110
	Butterfly valves	50 – 315
	Ball check valves	20 – 63
	Check valves	20 – 90

^① For operational reasons, certain dimensions are also produced in PP-R 80.

SIMONA worldwide



We look forward to assisting you

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