



Epoxy systems for composites applications



energising possibilities stimulating growth



Legacy

Founded on September 05, 1947, by a legendary Indian, Mr Kasturbhai Lalbhai, Atul Ltd (Atul) is the first private sector company of the country to be inaugurated by the first Prime Minister, Pandit Jawaharlal Nehru.

About us

Atul is one of the largest integrated chemical companies in India with annual revenue of about ₹ 5,000 cr. The Company manufactures about 900 products (such as *para* Cresol and derivatives, resorcinol and derivatives, vat dyes, sulphur dyes, herbicides, fungicides, tissue cultured date palms, active pharma ingredients and intermediates, epoxy resins, reactive diluents, etc) and 400 formulations and owns 140 brands. It serves a wide range of customers belonging to over 30 industries in around 75 countries and has established subsidiary companies in Brazil, China, Ireland, the UAE, the UK and the USA. The Company offers a wide range of products and applications used in Agriculture, Adhesives, Animal Feed, Automobile, Composites, Construction, Cosmetic, Defence, Dyestuff, Electrical and Electronics, Footwear, Food, Fragrance and Flavour, Glass, Home Care, Horticulture, Hospitality, Paint and Coatings, Paper, Personal Care, Pharmaceutical, Rubber, Soap and Detergent, Sport and Leisure, Textile, Tyre and Wind Energy industries.

The production facilities of Atul and its associate, joint venture and subsidiary entities are at Ambernath, Ankleshwar, Jodhpur, Panoli, Tarapur and Valsad in India and Somerset in the UK. The first manufacturing site of the Company in Atul, Gujarat is spread over 1,250 acres. The Company has its registered office in Ahmedabad and its head office at Atul, both in Gujarat, India. Its shares are listed both at NSE and BSE.

Polymers - Performance Materials Business

Epoxy resins, reactive diluents and curing agents are manufactured and marketed under the trade name Lapox by the Polymers - Performance Materials Business of Atul. It has received ISO 9001:2008 and ISO 14001 certification and has a NABL accredited laboratory for epoxy testing and analysis. The Company is in this business since 1960.

Product range

Resins: Bisphenol-A and Bisphenol-F based resins, Modified and formulated resins, Cycloaliphatic resins, Epoxy phenol novolac resins, Multifunctional resins, Benzoxazine resins, Bismaleimide resins, Brominated resins and Dimer acid based resins

Curing agents: Aromatic amines and adducts, Aliphatic amines and adducts, Cycloaliphatic amines and adducts, Phenalkamines, Polyamides, Polyamidoamines and Sulfones - 3,3'-Diaminodiphenyl sulfone and 4,4'-Diaminodiphenyl sulfone

Reactive diluents: Aliphatic (monofunctional, difunctional and trifunctional), Aromatic (monofunctional and difunctional) and Cycloaliphatic (difunctional)

Accelerators, catalysts and flexibilisers









Filament winding | Pultrusion systems

Atul offers epoxy systems for filament winding and pultrusion processes which are compatible with variety of reinforcements. These systems provide excellent mechanical, electrical, chemical, thermal and physical properties.









Features

- excellent fibre wetting and impregnation properties
- low to moderate viscosity and variable pot life
- moderate to high Tg
- ultraviolet (UV) resistant¹ and fire retardant²
- good chemical and abrasion resistance
- good latency for easy processing
- excellent adhesion and toughness
- amine blush free system available³

Applications

- automotive drive shafts
- composite insulators rods and tubes
- composite pipes
- fibre reinforced plastic (FRP) rebars
- pressure vessels
- pressure tubes
- reverse osmosis (RO) membrane housing
- RO vessels
- storage tanks
- type-4 gas cylinders
- pultruded spar for wind blades



Hot cure

Lapox systems	Mixing ratio (resin : curing agent)	Mix viscosity ⁴ @ 25 °C	Gel time @ 120 °C	Tg⁵	Recommendations				
	parts by weight	mPa s	minutes	°C					
Standard Tg									
L-12 K-12 K-13	100 : 100 : 0.1 - 2.0	450 @ 40 °C	150 @ 80 °C	85 - 95	Fast reactive system that offers good cantilever strength.				
ARCH-11 K-3 K-13 ¹	100 : 90 : 0.5 - 2.0	200 - 500	4 - 5	105 - 115	UV resistant system for outdoor applications.				
ARL-116 AH-112 AC-18	100 : 90 : 0.1 - 2.0	400 - 600	35 - 45 @ 90 °C	105 - 125	Offers high toughness for type-4 liquefied petroleum gas and compressed natural gas cylinders.				
L-247 K-918 K-13 ²	100 : 65 : 1 - 3	1,500 - 3,000	8 - 10	110 - 120	Fire retardant system.				
Moderate Tg									
ARL-136 AH-126	100 : 90	300 - 600	4 - 6	115 - 125	Good fibre wetting and high productivity. Suitable for RO pipes and pultruded rods.				
ARF-11 K-918 K-13	100 : 85 : 0.1 - 2.0	300 - 500	8 - 11	130 - 140	Good chemical resistance and very low crystallisation tendency at low temperatures.				
L-12 K-918 K-13	100 : 85 : 0.1 - 2.0	600 - 900	10 - 12	130 - 140	General purpose composite applications. Replace K-13 with AC-18 for higher productivity and quick Tg development.				
High Tg									
L-12 AH-667	100 : 27	3,000 - 5,000	60-70 @ 80 °C	165 - 175	High chemical and abrasion resistance at ambient and elevated temperatures.				
L-12 AH-113 K-13	100 : 95 : 0.1 - 2.0	1,900 - 2,100	13 - 15	165 - 185	High temperature endurance system (170 °C).				
L-12 K-68 AC-18	100 : 95 : 0.1 - 2.0	1,900 - 2,100	7 - 9	165 - 185	High temperature endurance system with quick Tg development.				
L-12 K-5200	100 : 24	4,000 - 6,000	60 - 65	170 - 180	High thermal and chemical resistance for engineering applications.				

Ambient cure

Lapox systems	Mixing ratio (resin : curing agent)	Mix viscosity ⁴ @ 25 °C	Pot life ⁶ @ 25 °C	Tg⁵	Recommendations			
	parts by weight	mPa s	minutes	°C				
Standard Tg								
ARL-167 AH-385 ³	100 : 40	800 - 1,200	10 - 15	45 - 50	Fast productive amine blush free system. Suitable for RO membrane.			
L-12 AH-714	100 : 50	1,200 - 1,500	120 - 150	55 - 65	Offers excellent adhesion and toughness for pressure vessels.			
ARL-135 LV AH-335, AH-336, AH-337	100 : 32	200 - 650	50 - 380	75 - 85	Low viscosity with variable pot life.			
L-12 AH-315	100 : 32	500 - 800	7 - 9 hr	85 - 95	Standard system for large components.			
L-12 AH-335, AH-336, AH-337	100 : 32	400 - 1,200	50 - 380	90 - 105	Standard system with variable viscosity and pot life.			
ARL-138 AH-417	100 : 30	200 - 300	90 - 150	100 - 110	Good wetting properties and resistance to elevated temperatures.			
L-12 K-6	100 : 10	5,000 - 8,000	30 - 40	110 - 130	Fast productive standard system.			
High Tg								
L-12 AH-422	100:32	1,500 - 2,500	300 - 350	130 - 140	Long pot life, excellent chemical resistance and high thermal stability.			
L-12 AH-411	100 : 22	800 - 1,200	90 - 120	140 - 155	Low viscosity, excellent chemical resistance and high thermal stability.			
L-12 AH-681	100 : 19	2,000 - 3,000	Max. 16 hours	Min. 150	High productivity systems with slow and fast curing agents with excellent			
L-12 AH-682	100 : 24	50 - 100	190 - 230	Min. 155	chemical resistance.			

 4B rookfield viscosity | 5Tg : glass transition temperature | 6P ot life of 100 g mix mass | Mix viscosity: ASTM D2196 | Pot life: ASTM D2471 | Tg: ISO 11375-2

Resin transfer moulding | Resin infusion | Hand lay-up systems

Atul offers epoxy systems for resin transfer moulding (RTM) | resin infusion (RI) | hand lay-up (HLU) processes with variable pot life, cure time, Tg and excellent mechanical properties for manufacturing small to large components including wind turbine blades.







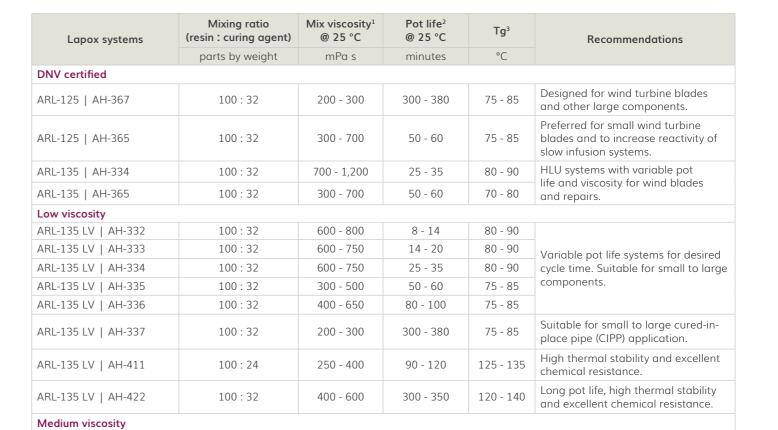


Features

- Det Norske Veritas (DNV) certified
- low and moderate viscosity for good impregnation
- variable pot life options for small to large components
- system with high Tg (up to 140 °C) available

Applications

- aerospace structural parts
- automotive body parts
- boat bodies
- composite repairs
- cooling tower blades
- sporting goods (surfing boards)
- storage tanks
- wind turbine blades and moulds



80 - 90

80 - 90

75 - 85

75 - 85

75 - 85

115 - 130

Variable pot life systems for desired

cycle time. Suitable for small to

Designed for static and dynamic

applications including aerospace, tooling and aircraft repairs.

large components.

8 - 14

14 - 20

50 - 60

80 - 100

300 - 380

110 - 160

HLU systems

L-552 | K-552

ARL-135 | AH-332

ARL-135 | AH-333

ARL-135 | AH-335

ARL-135 | AH-336

ARL-135 | AH-337

High performance

100:32

100:32

100:32

100:32

100:32

100:38

Fire retardant									
ARL-143 AH-319	100 : 15	3,500 - 5,000 18 - 25 95 -		95 - 105	Formulated for fire				
ARL-143 AH-335	100 : 15 3,500 - 5,000 85 - 95		85 - 95	95 - 105	retardant applications.				
Multipurpose									
L-12 AH-714	100 : 50	1,200 - 1,500	120 - 150	55 - 65	Offers excellent adhesion and toughness for FRP products.				
L-12 K-6	100 : 10	5,000 - 8,000	30 - 40	110 - 130	Fast reactive system for general purpose composites.				

 1 Brookfield viscosity | 2 Pot life of 100 g mix mass | 3 Tg: glass transition temperature | Mix viscosity: ASTM D2196 | Pot life: ASTM D2471 | Tg: ISO 11375-2

700 - 1,200

700 - 1,200

500 - 700

500 - 700

300 - 500

600 - 700

 $\mathbf{6}$

Prepregs | Compressed laminates systems

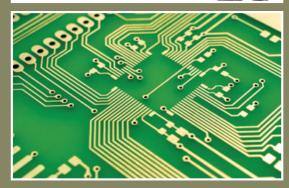
LAPOX®

Atul provides epoxy systems for B-stage prepregs with varying shelf life. They have excellent impregnation properties that are compatible with a variety of reinforcements, providing high mechanical strength and thermal resistance.









Features

- high Tg
- easy processability
- flame retardant¹ (FR)
- variable shelf life
- excellent mechanical strength
- high thermal endurance

Applications

- aircraft | drone structural parts
- automotive body parts
- defence equipment (canister and housing)
- FR-4 | G-10 | G-11 laminates
- mica tapes
- sporting goods (hockey sticks and racquets)
- wind blade parts

Lapox systems	Mixing ratio (resin : curing agent)	Gel time ² @ 120 °C	Tg³	Recommendations					
	parts by weight	mPa s	°C						
Compressed laminates									
ARPN-36 K-10 K-86	100 : 40 : 1 - 3	7 - 12	205 - 2104	Suitable for mica paper impregnation.					
ARPN-36 K-86	100 : 3 - 6	8 - 12	240 - 2454	Suitable for filled paper impregnation.					
L-12 K-5	100 : 27	8 - 10	150 - 160	Suitable for manufacturing G-10 and G-11 laminates.					
L-12 K-10 K-86	100 : 35 : 1 - 3	19 - 21	150 - 160	Suitable for G-11 laminates. B-staged prepreg offers long shelf life.					
L-67 K-66 K-13	100 : 23 : 0.1 - 3.0	7 - 9 @ 150 °C	130 - 140	Suitable for G-10 laminates.					
L-68 K-66 K-13	100 : 32 : 1 - 3	7 - 9 @ 150 °C	130 - 140	Suitable for FR-4 laminates.					
Hot melt									
ARL-159 AH-357 AC-22	100:30:1-3	4 - 8	155 - 165	Offers extended shelf life of prepregs.					
ARL-159 AH-619	100 : 40	30 @ 150 °C	180 - 200	Designed for aerospace, defence and engineering applications.					
ARL-160 AH-357 AC-22	100 : 15 : 1 - 3	8 - 9	110 - 120	Moderate Tg ideal for sporting goods, defence, infrastructure and general engineering applications.					
Solvent based									
ARL-162 AH-380	100 : 1.5	14-18	90-100	System for sporting goods - hockey sticks and racquets.					

Lapox systems	Appearance	Softening point	Viscosity⁵ @ 25 °C	Recommendations
	visual	°C	mPa s	
Benzoxazines				
ARBZ-10¹	Yellowish solid	Yellowish solid 60 - 80		Bis-F based high Tg resin. Provides excellent moisture resistance, good dimensional stability and flame retardancy in advanced composites.
ARBZ-10 A 75 ¹	Yellowish liquid	74 - 76% (solid content)	100 - 400 ⁷	ARBZ-10 solution in acetone with 75% solids.
ARBZ-11	Yellowish solid	60 - 80	50 - 500 ⁶ @ 125 °C	Bis-A based high Tg resin. Provides excellent moisture resistance and good dimensional stability in advanced composites.

²Method: Gel time - DIN 16945 | ³Tg: glass transition temperature; Tg: ISO 11375-2 | ⁴HDT value at 200 °C | ⁵Brookfield viscosity | ⁶Viscosity by CAP 2000 (ASTM D4287) | ⁷Viscosity by ASTM D2196

Tooling systems

Atul offers gel coats in white, grey and blue colours as well as tintable gel coat. The laminating systems have high Tg, variable pot life and viscosity. These are suitable for HLU and RI processes to manufacture small to large moulds | patterns | prototypes.









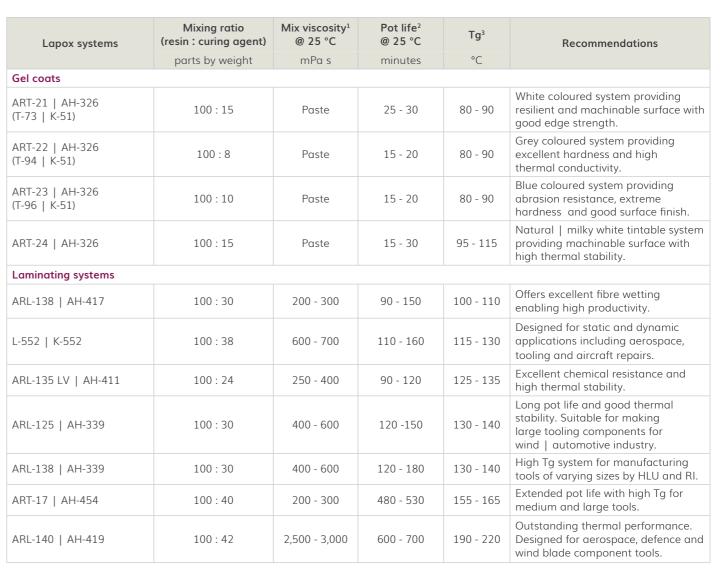
Features

- excellent hardness and surface finish
- good abrasion resistance
- high thermal stability
- variable pot life and viscosity

Applications

moulds and tools

- automotive
- boat body
- casting
- defence equipment
- general assemblies
- wind blade



LAPOX®

¹Brookfield viscosity | ²Pot life of 100 g mix mass | ³Tg: glass transition temperature | Mix viscosity: ASTM D2196 | Pot life: ASTM D2471 | Tg: ISO 11375-2

10 11

Adhesive systems

Atul presents a variety of epoxy adhesives with variable viscosity and pot life for joining similar | dissimilar substrates. These adhesives provide excellent bonding strength to meet high performance requirements.







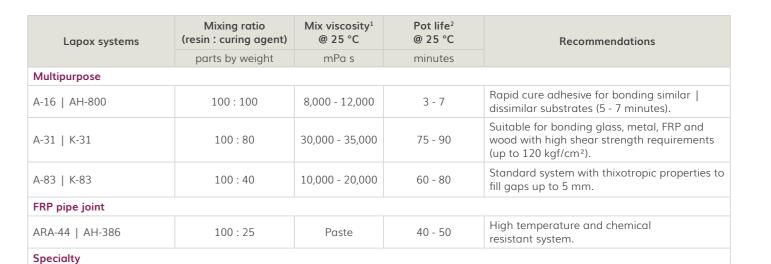


Features

- thixotropic and non-sagging
- slow and fast curing
- excellent adhesion to metal, non-metal and composite substrates
- resistant to shock, impact and vibrations
- high lap shear strength

Applications

- automotive components
- engineering applications
- FRP pipes
- flexible cable joints
- wind turbine blades



LAPOX®

 1 Brookfield viscosity | 2 Pot life of 100 g mix mass | 3 DNV certified system | Mix viscosity: ASTM D2196 | Pot life: ASTM D2471

60,000 - 75,000

2,500 - 5,000

300 - 400

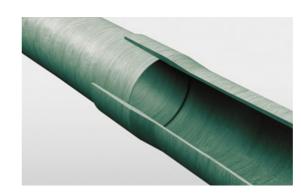
300 - 400

100:50

100:100

100:45

100:45



ARA-41 | AH-448

XR-110 | XH-68

ARA-32 | AH-733

ARA-32 | AH-735³

Wind blade



20 - 30

30 - 45

55 - 65 @ 30 °C

120 - 180 @ 30 °C | shell bonding.

For FRP-FRP and FRP-metal bonding.

Thixotropic structural adhesives with high lap shear strength suitable for blade

For flexible cable joints at

ambient temperature.

12

Product selection guide

			Proc	esses					Ap	plicatio	ns		
System	Filament winding	Hand lay-up	Pultrusion	Prepreg	Resin infusion	Resin transfer moulding	Adhesives	Aerospace and Defence	Electro-composites	Pressure vessels and Pipes	Sports and Leisure	Tooling	Wind blades
L-12 K-12 K-13	•		• •			•			••	•			
ARCH-11 K-3 K-13	•		• •						••				
ARL-116 AH-112 AC-18	• •		•							• •			
L-247 K-918 K-13	•		•			•		•	• •				
ARL-136 AH-126	• •		•			•			۰	• •	•		
ARF-11 K-918 K-13	•		•			•		•	•	•			
L-12 K-918 K-13	• •		• •			•			• •	•			
L-12 AH-113 K-13	• •		• •			•			••	•			
L-12 AH-667	• •		•			•				••			
L-12 K-68 AC-18	• •		• •			•			••	•			
L-12 K-5200	•	• •	•			•		•				••	
ARL-167 AH 385	• •		•							••			
L-12 AH-714	•	••	•						•	•	•		
ARL-135 LV AH-335	•	• •	•		•	•		•		•	•	•	••
ARL-135 LV AH-336	•	••	•		•	•		•		•	•	•	••
ARL-135 LV AH-337	•	• •	•		•	•		•		•	•	۰	• •
L-12 AH-315	•	۰	•			•					• •		
L-12 AH-335	•	۰	•								• •		
L-12 AH-336	•	٠	•			۰					• •		•
L-12 AH-337	•	•	•		•	•					• •		•
ARL-138 AH-417		•			•	•						• •	•
L-12 K-6	•	• •						•		•		•	•
L-12 AH-422	•	•	•			•		•			•	•	
L-12 AH-411	•	•	•			•		•		•		•	
L-12 AH-681	•		•							••			
L-12 AH-682	•		•							••			
ARL-125 AH-367 ¹	•	•	•		••	•		•			•	•	••
ARL-125 AH-365 ¹	•	•	•		••	•		•			•	•	••
ARL-135 AH-334 ¹		••			•	•		•			•	•	••
ARL-135 AH-365 ¹	•	••	•		•								••
ARL-135 AH-332		• •			•	•		•			•	•	• •
ARL-135 AH-333		••			•	•		•			•	•	••
ARL-135 AH-335	•	••	•		•	•		•			•	•	••
ARL-135 AH-336		•			•	•		•			•	•	•
ARL-135 AH-337	•	•	•		••	•		•			•	•	••
ARL-135 LV AH-332		••			•	•		•			•	•	•

Product selection guide

			Proce	esses					Ap	plicatio	ns		
System	Filament winding	Hand lay-up	Pultrusion	Prepreg	Resin infusion	Resin transfer moulding	Adhesives	Aerospace and Defence	Electro-composites	Pressure vessels and Pipes	Sports and Leisure	Tooling	Wind blades
ARL-135 LV AH-333		••			•	•		•			•		•
ARL-135 LV AH-334		••			•	•		•			•	•	•
ARL-135 LV AH-411	•		•		•	•		•			•		
ARL-135 LV AH-422	•		•		•	•		•			•	•	
ARL-143 AH-319		••							•				
ARL-143 AH-335		••							•				
L-552 K-552	•	•				•		•			•		
ARPN-36 K-10 K-86				••					• •				
ARPN-36 K-86				••					• •				
L-12 K-5	•	•	•	••					•	•	•		
L-12 K-10 K-86				• •					• •				
L-67 K-66 K-13				• •					• •				
L-68 K-66 K-13				• •					• •				
ARL-159 AH-357 AC-22				• •				•			۰		
ARL-159 AH-619				• •				•			•		
ARL-160 AH-357 AC-22				• •				•			۰		
ARL-162 AH-380				• •							• •		
ARBZ-10				• •				• •					
ARBZ-11				• •				• •					
ARBZ-10 A 75				• •				• •					
ART-21 AH-326		• •										• •	
ART-22 AH-326		••										• •	
ART-23 AH-326		••										••	
ART-24 AH-326		••										••	
ARL-125 AH-339		•			•							••	
ARL-138 AH-339	•	•			•	•						••	
ART-17 AH-454		•			•							••	
ARL-140 AH-419	•	•				•						••	
A-16 AH-800		•					••						
A-31 K-31		•					••						
A-83 K-83		•					• •						
ARA-32 AH-733		•					••			•			• •
ARA-32 AH-735		•					• •			•			• •
ARA-41 AH-448		•					• •			•			
ARA-44 AH-386		•					• •			• •			
XR-110 XH-68		•					••						

¹DNV certified system | •• Highly recommended | • Recommended



INDIA

Head office

Atul 396 020, Gujarat India

(+91 2632) 230000

contact@atul.co.in
www.atul.co.in

www.facebook.com/AtulLtd

In linkedin.com/company/atul-limited

Registered office

Atul House _ G I Patel Mara Ahmedabad 380 014, Gujarat

& (+91 79) 26461294 | 3706 ■ shareholders@atul.co.in

Mumbai office

⋈ polymers@atul.co.in

Floor 15, C wing, Lotus Corporate Park Western Express Highway Goregaon (East) Mumbai 400 063, Maharashtra India (+91 22) 62505200

Mumbai office

Atul House 310 B, Veer Savarkar Marg Dadar (West) Mumbai 400 028, Maharashtra India (+91 22) 62559700

Atul Brasil Quimicos Ltda

Avenido Ipiranga, 318 Conjunto 1.001 Bloco A - Bairro República São Paulo (SP), CEP 01046-010 & (+55 11) 910091984

☑ contact@atulbrazil.com

Atul China Ltd

Room number 806 Building 2E 686 Wuzhong Road Shanghai 201103 & (+86 21) 64753255

☑ contact@atulchina.com

Atul Europe Ltd

Atul House 10, Oak Green Earl Road, Cheadle SK8 6QL United Kingdom (+44 1625) 539209

oxdim contact@atuleurope.com

Atul Middle East FZ-LLC

Office number 43 Floor 3 Nucleotide Complex Dubai Science Park, Emirates Road Al Barsha South, Dubai PO Box 500767 United Arab Emirates □ contact@atuluae.com

Atul USA Inc

6917 Shannon Willow Road, # 400 Charlotte, NC 28226 United States of America & (+1 704) 540 8460 ☑ contact@atulusa.com



Lalbhai Group