LET'S TALK /
DURABILITY

5 DECADES OF RELIABLE PERFORMANCE WITH ATLAC® RESINS IN CHEMICAL PROCESS EQUIPMENT

Benny Luijsterburg

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LET’S TALK / INVITATION FOR COLLABORATION

YOU CAN BUILD ON US FOR YOUR BUSINESS TODAY
• Aliancys is quality resins, service, trust and reliability

TOGETHER WE CREATE A SUCCESSFUL BUSINESS FOR TOMORROW
• Truly understanding your markets and business drivers

SO ... LET’S TALK /
END-USE PERFORMANCE REQUIREMENTS

- Resistance to chemicals
- Heat resistance
- Low maintenance
- Strength, stiffness, toughness
- Light weight, easy installation
- Design flexibility
- Food contact (when required)

Exposure determines resin choice
Different solutions available for heat and chemicals involved. Good chemical resistance means low maintenance and peace-of-mind on performance

High mechanical strength
Selection of right resin, reinforcement, and their interaction is key

Key benefit vs. steel
Enabling technology for light weight constructions in corrosive environment

Optimized design
Shaping flexibility and part integration possibility is a key composites benefit.

Food contact
Resins made in line with GMP for good food quality and consumer safety
PROCESSING REQUIREMENTS

- Fiber wetting
- Process robustness and stability
- Low peak exotherm for making thick laminates
- Predictable cure
- Pot life

**Great laminate properties**
Excellent fiber wetting and resin/fiber adhesion is key for obtaining the right laminate strength and stiffness, and for achieving the right chemical resistance.

**Process consistency**
Chemical resistance of the finished part is highly dependent on achieving the right and consistent level of cure. In some cases, post-cure may be required.

**Pot life**
Particularly when working with open bath, resin pot life has to enable laminate production to the desired thickness before gelation.
ATLAC® RESINS BRING GREAT CHEMICAL RESISTANCE

<table>
<thead>
<tr>
<th>Description</th>
<th>Vinyl esters, Vinyl ester urethanes, Epoxy Novolac resins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key applications</td>
<td>Tanks and pipes for industrial, building &amp; infrastructure, water management, power</td>
</tr>
</tbody>
</table>
| Benefits                         | • Chemical resistance  
• Continued process operation  
• Resisting elevated temperatures  
• Low cost of ownership  
• Extensive expertise from Aliancys |

<table>
<thead>
<tr>
<th></th>
<th>Atlac® 430</th>
<th>Atlac® 580</th>
<th>Atlac® 590</th>
<th>Atlac® E-Nova FW 2045</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity (mPas)</td>
<td>440-500</td>
<td>400-500</td>
<td>208-280</td>
<td>350-500</td>
</tr>
<tr>
<td>HDT (°C)</td>
<td>105</td>
<td>115</td>
<td>140</td>
<td>145</td>
</tr>
<tr>
<td>Process-ability</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>Fiber wet-out</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>Curing (Shrinkage/ exotherm)</td>
<td>Good</td>
<td>Good</td>
<td>Good/Fair</td>
<td>Good</td>
</tr>
</tbody>
</table>
PALATAL P 4-Marken

Aufbau
Unsäuberter Polyester, geblättert in Styrol.

Einstellungen und Anwendungsgebiete
Palatal P 4 ist ein normaler Harz ohne besondere Zusätze – für Lichtplatten und Bahnen, Profil, Boote, Kassetten, Pred- und Fensterbänke, Gießkörpfe und Einbettungen.

Palatal P 4 L
enthält einen Lichtstabilisator – für Lichtplatten und Bahnen.

Palatal P 4 FL
enthält einen Lichtstabilisator – für Lichtplatten und Bahnen.

Allgemeine Eigenschaften

M 2094 d
81538 (923) September 1963 (2 Neubearbeitung)
ATLAC® RESINS SUCCESSFULLY USED OVER 5 DECADES IN CHEMICAL PLANTS

ATLAC RESINS WITH PROVEN PERFORMANCE
ATLAC® RESINS HAVE A TRACK-RECORD OF PERFORMANCE

SEVERAL RECENT CASE STUDIES PRESENTED TODAY

- Atlac® 5200FC: Food-contact tank containers
- Atlac® 430: Wet electrostatic precipitators
- Atlac® New: Firewater pipe system
- Atlac® 580: Pressure-filters for sea water filtration
- Atlac® 430 + Atlac® 580: In-situ chemical storage tank installation
INCREASED PAYLOAD AND LOWER FUEL COST IN COMPOSITE TANK CONTAINERS (ATLAC® 5200 FC)
MANUFACTURING TANK THROUGH FILAMENT WINDING IN ONE GO (NO SEPARATE END-CAPS)
INTEGRATION OF STAINLESS STEEL COMPONENTS INTO COMPOSITES
OVER 250 UNITS SOLD, 200+ IN USE BY BASF THROUGH HOYER
ATLAC® 5200 FC RESIN INCREASED PAYLOAD AND REDUCED FUEL COST

- 31 m² container weighs only 2200 kg (40 % reduction)
- Allows for 2 m³ extra payload
- Freight cost reduced by 5-10 %

- ADR, RID, CSC and IMO4 approved

Additional benefits
- 40 % better thermal insulation
- Improved smoothness of inner tank surface (no pitting)

Manufactured by Tankwell
AIR POLLUTION SERIOUS ISSUE

- Beijing on a bad day
- Major problems with smog and haze
QUICK FIX NOT AVAILABLE
ATLAC® 430 FOR REDUCING SMOG IN CHINA
TOUGH SERVICE ENVIRONMENT

- Saturated wet flue gas, 50~80 °C
- Containing $\text{SO}_2$, $\text{SO}_3$, $\text{NO}_x$, $\text{Cl}^-$, $\text{F}^-$ and other corrosive media.
- Highest concentrations in flue gas:
  - $\text{SO}_3$ is 100 mg/m$^3$
  - HCl (Cl$^-$) is 10 mg/m$^3$
  - HF (F$^-$) is 10 mg/m$^3$
- Composition of collected liquids
  - Highest concentration of Cl$^-$ is 20000 ppm, pH: 1-3
- Service life: designed for 30 years
HONEYCOMB USED IN EQUIPMENT CORE
ATLAC® 430 RESINS USED IN WESP FOR REDUCING SMOG IN CHINA

- Wet Electrostatic Precipitators (WESP)
- Typically installed after wet flue gas desulfurization system
- Honeycomb used in equipment core
  - Sub-micron aerosols captured
  - Using electrically conductive composites
NEW TWO-LAYER TUNNEL PROJECT IN NETHERLANDS
FAST INSTALLATION OF RELIABLE FIREWATER PIPE SYSTEM
CUSTOMER-SPECIFIC ATLAC® RESIN FOR ROAD TUNNEL FIREWATER PIPE SYSTEM

- Installation in new tunnel construction underneath Maastricht (Netherlands)
- DN 125
- Length of 4.2 km
- Installation by Versteden in 2015
- Reliable supply of firewater
- Increased reliability, cost-effectiveness, availability vs. stainless steel
HORIZONTAL PRESSURE CARTRIDGE FILTERS (ATLAC® 580)
ATLAC® 580 FOR HORIZONTAL PRESSURE CARTRIDGE FILTERS

- Installation at sea water desalination plant in Iraq
- Working pressure 10 bar, tested up to 15 bar
- Design temperature 50°C
- DN 500 and DN 600
- Installation in 2015
- Manufactured by Selip
VERTICAL PRESSURE BACKFLUSHING FILTERS (ATLAC® 580)
ATLAC® 580 FOR VERTICAL PRESSURE BACKFLUSHING FILTERS

- Installation at sea water plant in Middle East
- Working pressure 10 bar, tested up to 13 bar
- Operating temperature 45°C
- DN 1200, H 2.9 m
- Installation in 2008
- Manufactured by Selip
ATLAC® 430 AND ATLAC® 580 PERFORMING WELL IN THE HEART OF GERMAN DEMOCRACY
EASY INSTALLATION IN EXISTING BUILDING (ATLAC® 430 AND ATLAC® 580)

- 10 m³ double-wall chemical storage tank for AdBlue® chemicals
- Part of back-up power supply system in cellar of Reichstag building
- Limited accessibility in existing building infrastructure requires *in-situ* installation by Haase
5 DECADES OF RELIABLE PERFORMANCE WITH ATLAC® RESINS IN CHEMICAL PROCESS EQUIPMENT
**NOVEL ATLAC® 610 ACT RESIN FOR REDUCED STYRENE EMISSION**

**LOW STYRENE VINYL ESTER RESIN**

<table>
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<th>Description</th>
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<td>Key applications</td>
<td>Tanks and pipes, tank repair</td>
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</table>
| Benefits                     | • 90 % lower styrene emissions vs. styrene-containing equivalents (contains only 4 % styrene, as well as LSE system)  
                              | • Better working environment for operators        
                              | • Continued process operation in confined areas   
                              | • Easy application through fast surface cure, fiber wetting   
                              | • Low cost of ownership though material durability, because of high chemical resistance and mechanical properties |
ALIANCYS PROVIDES ADVICE ON CHEMICAL RESISTANCE TO CUSTOMERS

- Excellent track record of use Atlac® resins in Industrial markets
- Extensive experience in chemical resistance testing, laminate build-up for maximizing chemical resistance
- “Chemical Resistance Advice” as official document for reference
- Experienced Technical Service team to support in troubleshooting and continuous process improvement
CHEMICAL RESISTANCE ADVICE SERVICE

- Aliancys can help in making the best resin selection for your application
- To make accurate recommendations we need to know:
  - Chemical environment, composition, concentrations, pH values, storage conditions
  - Service temperature, temperature profiles, maximum temperatures
  - Mechanical exposure, pressure, static and cyclic loading
  - Type of composite material/ build-up used (fiber volume, chemical resistance layer)
  - Equipment and process
- Available in several languages
MORE INFORMATION

- Product and case study information on [www.aliancys.com](http://www.aliancys.com)
- Please contact your Aliancys Technical Service representative for more detailed information and for our Chemical Resistance information service
ACKNOWLEDGMENTS

- Thomas Falkenbach & Heike Pohl (Haase Tank)
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LET'S TALK /