

## Atlac E-Nova: fit for the future!

**Tanks and Pipes resin product line is now complete.**

Three years after the introduction of Atlac E-Nova technology, an extensive chemical resistance testing program has now been concluded. Highlights of this study are presented in this issue of Global Solutions. The overall conclusion is that the chemical resistance performance of Atlac E-Nova FW 1045 and FW 2045 is comparable with well established grades like Atlac 430 and Atlac 590,

but with the added benefit of improved processing speed and ease.

These epoxy bisphenol A vinyl ester urethane resins, complement the product line of tanks and pipe resins consisting of: Bisphenol A UP resin (Atlac 382), standard Bisphenol A vinyl ester (Atlac 430) and Novolac Vinyl ester (Atlac 590). All tests results are published in our corrosion guide, which can be accessed via our website.



*Filament wound pipes - ready for installation.*

## Chemical resistance of Atlac E-Nova

**Atlac® E-nova Technology brings to the market a new generation of epoxy bisphenol A vinyl ester urethanes.**

2000 was a landmark year in more ways than one. It was the year that DSM Composite Resins introduced Atlac® E-Nova, a new range of epoxy bisphenol A vinyl ester urethane resins: resins that stretch the boundaries of unsaturated polyester resin technology as it is

known today. All resins in the range show liquid resin properties comparable with standard unsaturated polyesters and mechanical properties that are equal to or better than standard vinyl ester resins. In short - the best of both worlds.

*For more information see inside*

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**"Is there anything new in the field of Vinyl Esters?"**

I was asked this question during the TÜV symposium "FRP Unlimited" in Munich this November.

It is very relevant, especially as this segment of the industry is not very open to new developments. Since there is a whole range of test methods and qualification procedures to overcome, it is not easy for new materials to get adopted. Nevertheless, we don't let these hurdles stand in the way of our commitment offering the chemical resistance industry the most complete range of fit-for-purpose resins. This issue focuses on our new Atlac E-Nova resins, giving details of tests performed and illustrating typical applications with customer cases. Happy reading!

Jan Lodewijk Lindemulder  
Business Manager Tanks, Pipes & Relining

## Atlac E-Nova FW 2045 storage tanks installed at DSM

Recently two new storage tanks based on Atlac E-Nova FW 2045 were installed at DSM sites; the first in Venlo at DSM Anti Infectives and the second in Geleen at DSM Chemicals. In both cases Atlac E-Nova FW 2045 was selected for its high resistance to solvents.

Both tanks, 54 m<sup>3</sup> and 30 m<sup>3</sup> respectively, contain a mixture of chemicals including aromatic solvents like ethyl acetate or MIBK and toluene. In the case of the first tank, this meant that the top layer of the liquid contained a much higher concentration of ethyl acetate, creating an aggressive environment and a real challenge for vinyl ester resins.

Until recently, only novolac based vinyl esters like Atlac 590 were able to resist such harsh chemical environments. But with the introduction of Atlac E-Nova FW 2045, the situation has changed completely.

As well as the excellent chemical resistance properties, Atlac E-Nova FW 2045 shows clear benefits to the customer in term of processing ease. Compared to equivalent epoxy novolac vinyl ester types Atlac E-Nova FW 2045 can more easily be catalysed using standard MEK-peroxide without heavy foaming.

Impregnation and wet-out of the glass fibres are also much faster resulting in a very transparent laminate. Both tanks were produced by filament winding using a low peak exotherm formulation to control temperature in thick walled sections. The structural part of the tank, with a laminate thickness up to 9 mm, was wound in one go thanks to the relatively long gel time.



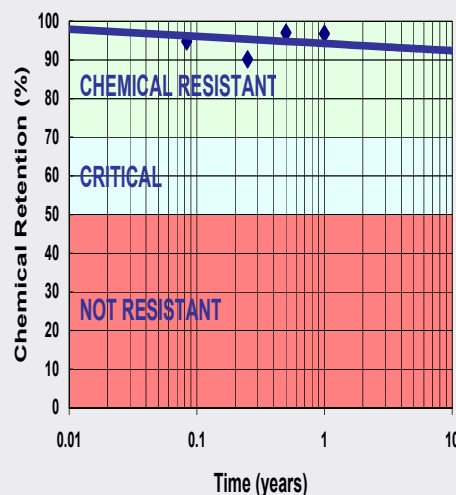
Atlac E-Nova storage tank arrives on site

## Chemical Resistance of Atlac E-Nova

**Engineers, when constructing or specifying FRP composite equipment for harsh chemical environments, need to have chemical resistance performance data at their fingertips. DSM Composite Resins therefore implemented a large in-house testing programme to benchmark the properties of Atlac E-Nova FW 2045 and Atlac E-Nova FW 1045 versus their direct alternatives: Atlac 590 and Atlac 430 respectively.**

### CHEMICAL RESISTANCE ASSESSMENT

The tests were performed according to ASTM C 581 (and EN 13121-2), in which test laminates are fully immersed in the test liquid for one year. At quarterly intervals, during exposure to a certain chemical, a sample is taken for examination on visual appearance and mechanical properties (flexural strength and flexural modulus). The results are used to determine the retention of mechanical properties or, in other words, the chemical strength. It is defined as the average value of retention of flexural strength and retention of flexural modulus. It indicates whether or not a resin is resistant to a certain environment and temperature.



Graph to assess chemical resistance.

For approval status a ten year logarithmic extrapolation is required, which indicates a chemical strength staying above 70%. Below 50% chemical strength and the resin is classified as non resistant. When the chemical strength, after extrapolation, is between 50-70%, resistance is assessed as critical so other criteria have to be used to determine the degree of chemical resistance. These criteria are: a minimal retention of 50% of the Barcol Hardness after 12 months, and appearance aspects like glass fibre visibility, blistering, cracking and delamination.

## Atlac E-Nova versus standard Atlacs

Atlac E-Nova easily competes with standard Atlacs on corrosion resistance.

### RESULTS AND CONCLUSIONS:

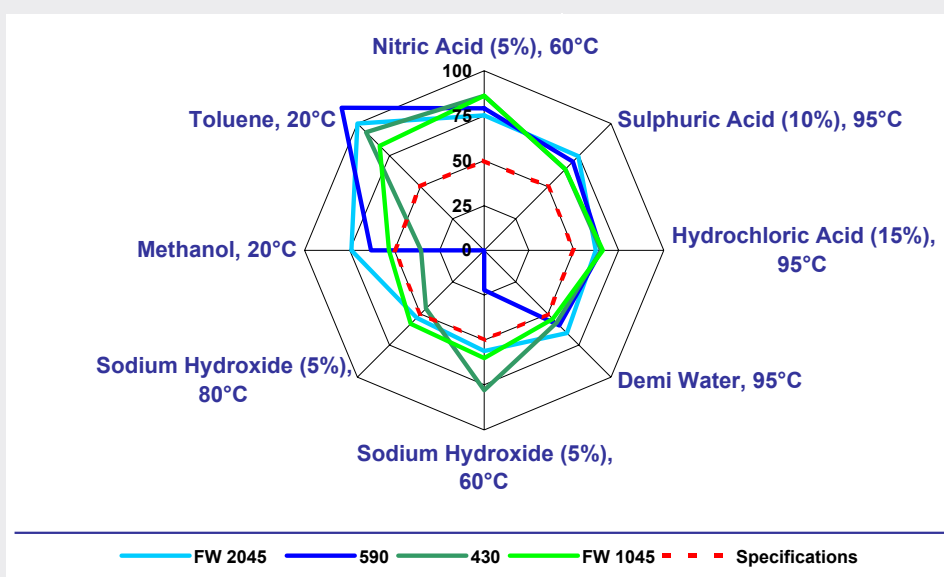
*Results:* All tested resins show comparable chemical resistance behavior in acidic and neutral environments. Differences are observed with organic solvents and alkaline media. In

respect to organic solvent resistance, Novolac vinyl ester (Atlac 590, Derakane 470) are recognised in the market as the best resins. These results show that Atlac E-Nova FW2045 can easily compete with them. All tested resins are resistant to Toluene, but a tougher test of solvent resistance can be seen in the test results for Methanol. Atlac 590 and Atlac E-Nova FW2045 are both qualified as resistant to Methanol, whereas Atlac 430 and Atlac E-Nova

FW1045 are not. The overall performance of Atlac 430 results in retention of chemical strength below 40%, which is unacceptable and therefore classified as not recommendable. Atlac E-Nova FW1045 performs better compared to Atlac 430 in relation to chemical strength, but due to the softening of the material, is not considered good enough (Barcol Hardness of 8) and is therefore evaluated as non-resistant.

Sodium hydroxide is very aggressive for almost all resins. Our laboratory tests show that a chemical retention of 80% at 60°C can only be achieved with Atlac 430. However, the Atlac E-Nova resins also show good performance in alkaline environment. At 80°C a significant decrease in performance is noticed for Atlac 430. We can clearly deduce that Atlac 590 is not the best choice or alkaline conditions.

*Conclusions:* Atlac E-Nova FW2045 can easily compete with novolac based vinyl esters like Atlac 590, its direct alternative in applications. Both show excellent resistance to organic solvents. Atlac 430 and Atlac E-Nova's perform well in an alkaline environment. Atlac E-Nova's are as reliable as traditional Atlacs on corrosion resistance.



Retention of chemical strength after 1 year exposure - comparison of different Atlac resins.

## Atlac E-Nova used for floating roofs

**DM tanksystems of the Netherlands are using Atlac E-Nova vinyl ester resin in the production of light-weight, fire resistant composite floating roofs.**

The resin was chosen for its high solvent resistance performance which, in combination with its easy processing, resulted in a fit-for-purpose solution for the company.

In this application, Atlac E-Nova FW 2245, gives the required end-use properties, processing characteristics and optimal price/performance ratio. Producing the floating roofs in diameters from 20 to 40 metres requires a large scale, on-site hand laminating operation. Atlac E-Nova FW

2245 is pre-accelerated and designed so that it can be processed easily and cured by standard medium activity methyl ethyl ketone peroxide (MEKP), without the development of foam during catalysation in the spray-up application. This results in void-free laminates.

The patented DM DeckMaster system consists of a sandwich of 4mm thick laminate of Atlac E-Nova FW 2245 with glass veil and chopped strand mat, encapsulating a 60mm thick polypropylene honeycomb core: a construction method that gives much greater rigidity than steel with superior chemical resistance.

Mr Wil Moeling of DM Tanksystems is very pleased with the results: "this resin works very



The worker indicates the size of this floating roof.

easily in the large hand lay-up operations that we undertake around the world."



## DIBt approval for Atlac E-Nova Resins

After intensive chemical resistance testing at independent institutes in Germany, Atlac E-Nova FW 1045 and FW 2045 received from the DIBt (Deutsches Institute für Bautechnik) the "Bauaufsichtliche Zulassung für Herstellung von Bauteilen für Lagerung von Chemische Werkstoffen", (general approval for parts to store chemicals). This approval has great significance, especially in Germany, in the selection of resin types for structural applications in chemical resistant applications.

## Atlac E-Nova FW 2045 for AZN quenchers

*A high temperature application for Atlac E-Nova FW 2045.*

As well as the easy processing properties - like fast impregnation and fibre wet-out, and excellent chemical resistance properties - Atlac E-Nova FW 2045 also shows high temperature resistance. This makes the product suitable for high temperature applications in corrosive environments.

Recognising this benefit, ASC (Belgium) have produced four quenchers since the middle of 2004 (see picture opposite). The quenchers, based on Atlac E-Nova FW 2045, have been installed in the waste incinerator plant of AZN NV in the Netherlands.

The dry gas at the inlet of the quenchers has a temperature between 160°C and 180°C with possible peaks of up to 200°C. All quenchers were made of two similar parts: 1600mm

diameter, 1375mm height, with two flanged connections.

Both parts were entirely hand laminated with Atlac E-Nova FW2045, using C-Glass veils, Advantex®-Glass Mats and Powerfill®-Glass woven roving. The upper part of each quencher includes a removable skirt, which thermally protects the shell of the unit.

This protective skirt is made from Atlac E-Nova FW2045, with heat conductive and chemically inert additives, and is reinforced with Advantex®-Glass.

According to ACS, this design increases the working life of the quenchers .

ACS has been using Atlac E-Nova FW2045 since 2002, mainly in high temperature applications.

In this particular application, Atlac E-Nova FW2045 was selected for its very good resistance to high temperatures and acidic environments.

## EVENTS CALENDAR

<b>PIPELINE REHABILITATION &amp; MAINTENANCE</b>	22-26 January 2005, Bahrain	<a href="http://www.pipeline-rehab.com">www.pipeline-rehab.com</a>
<b>3. DEUTSCHE SCHLAUGLINER TAG</b>	17 March, 2005, Oberhausen, Germany	<a href="http://www.ta-hannover.de">http://www.ta-hannover.de</a>
<b>JEC COMPOSITES SHOW 2005</b>	5-7 April 2005, Paris, France	<a href="http://www.JECcomposites.com">www.JECcomposites.com</a>
<b>REINFORCED PLASTICS 2005</b>	24-26 May, 2005: Karlovy Vary (Czech Republic)	<a href="http://home.tiscali.cz/svkcr">http://home.tiscali.cz/svkcr</a>
<b>INT.CONF.&amp; EXHIB.ON FIBROUS MATERIALS</b>	23-28 May, 2005, Saint-Petersburg, Russia	<a href="http://www.sutd.ru/interconf-fm-XXI.html">www.sutd.ru/interconf-fm-XXI.html</a>
<b>CCC 2005, COMPOSITES IN CONSTRUCTION</b>	April 11-13, 2005, Lyon, France	<a href="http://www.univ-lyon1.fr">www.univ-lyon1.fr</a>

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