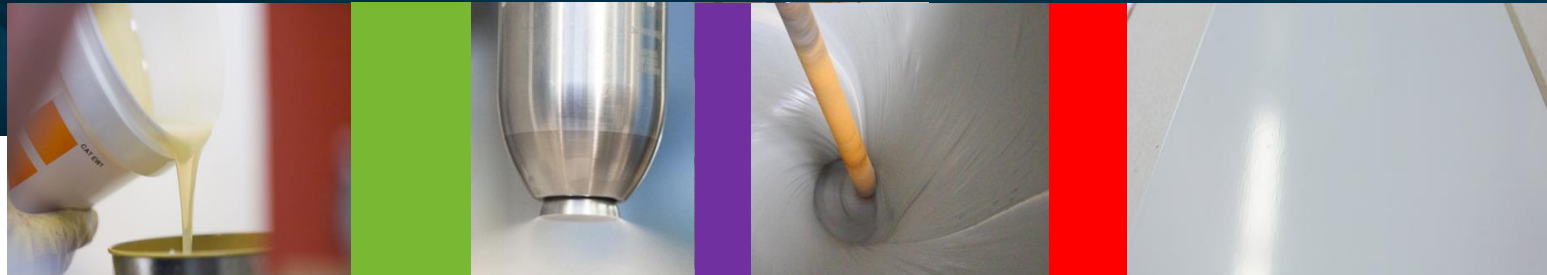


Kennzeichnungsfreie wässrige 2K Epoxy Härter Dispersionen mit Top Performance

Dr. Florian Lunzer/ Allnex Austria GmbH

Innovation Day der österreichischen Lackindustrie
Wien, 22.Oktober 2015



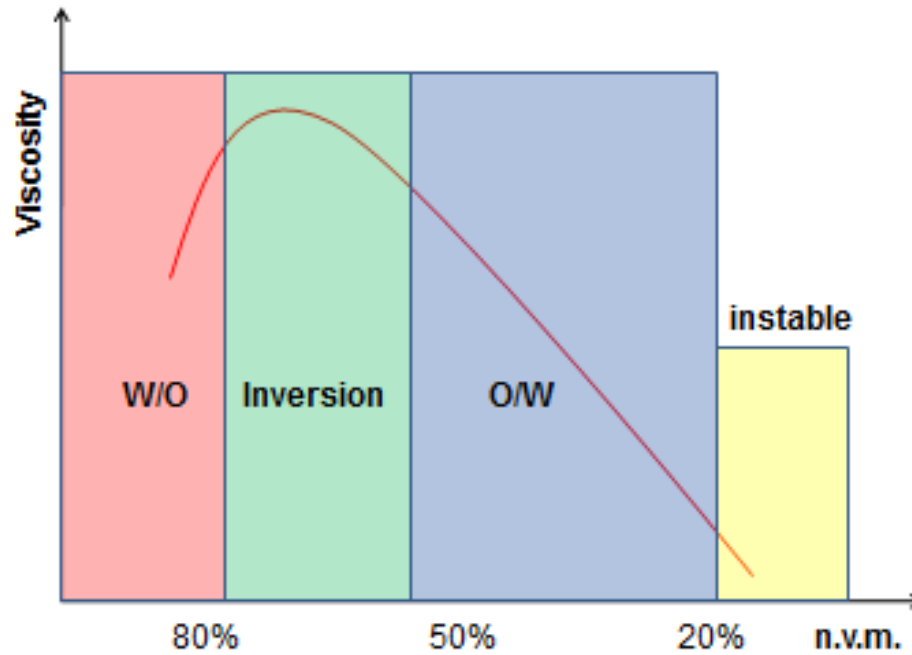
Content

- **Introduction**
- **Amine Hardener Platform Project**
- **Development for Metal Substrates**
- **Development for Concrete Substrates**
- **Conclusion**

Starting Point

- **Despite long use of waterborne epoxy systems, formulators still consider this technology difficult to formulate and apply.**
- **Very often fast drying and high performance are difficult to combine.**
- **Additionally the allergenic potential of amine hardeners is a matter of concern.**

Viscosity profile of Water-Based Adduct Hardeners



Amine Hardener Platform Project - Main Targets

- Free of monomeric amines – labeling-free
- Good balance of fast drying – high performance
- Infinite dilutability with water
- Ease of formulation and use
- System for metal and concrete applications

Our approach: Polymeric amine hardener dispersion

The Development for Metal Substrates

| | | |
|--|----------------------|------------------|
| Amine Dispersion Hardener 1 | Non volatile content | 41.0 % |
| | NH equivalent (fod) | 1000 g / NH-equ. |
| | Particle size | 100 nm |
| | Dyn. Viscosity | ~ 1000 m.Pa.s |

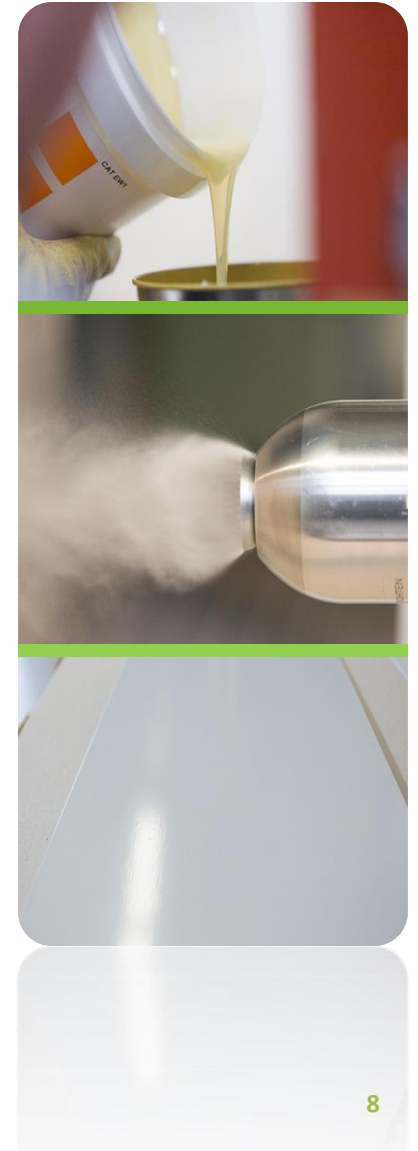
Guiding Formulation Anticorrosion primer

| Formulation 1 | | |
|-------------------------------------|--------------|--------------|
| Formulation 1 – Part A | 100.0 | 100.0 |
| Flexibilized solid Epoxy dispersion | 48.4 | |
| Unmodified solid Epoxy dispersion | | 36.3 |
| Deionized water | 1.6 | 3.7 |
| Total | 150.0 | 140.0 |

| Formulation 1 – Part A | |
|------------------------------|---------------|
| Deionized water | 11.2 |
| Wetting and dispersing agent | 3.3 |
| Mineral oil based defoamer | 0.1 |
| Talkum | 8.5 |
| Titaniumoxide | 20.5 |
| Bariumsulfate | 23.1 |
| Ironoxide yellow | 0.4 |
| Ironoxide black | 1.1 |
| Zinc iron phosphate | 4.0 |
| Zinc phtalate | 1.4 |
| Texanol | 0.6 |
| Polyurethane thickener | 0.6 |
| Amine dispersion hardener 2 | 24.2 |
| Total | 100.00 |

Performance Characteristic of Formulation 1

| | Higher flexibility | Faster drying |
|--|----------------------------|----------------------------|
| Crosslinking ration NH/EP | 0.5 | 0.5 |
| Pigment/Binder | 1.6/1 | 1.9/1 |
| VOC | Approx. 70 g/L | Approx. 40 g/L |
| Tack free time | 3 h | 1:45h |
| Block resistance | after 24 h drying degree 5 | after 24 h drying degree 7 |
| Pendulum Hardness (König) (3) | 35 s | 75 s |
| after 24 h | 105 s | 110 s |
| after 7 d | | |
| Flexibility Erichson cupping (4) after 7 d ambient drying | 3.0 mm | 1.0 mm |
| Delamination after 1000 h salt spray test (5) Substrate: cold rolled steel; DFT approx. 70 mm | 7-9 mm | 5-6 mm |



Easy Handling and Application

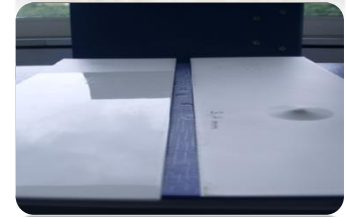
Works like a solventborne without the worry of hazardous exposure!

- **No hazard labeling requirements**
- **Infinite dilutability**
- **Very good spraying behavior**



Improved Productivity

- **Fast Drying for Early Recoatability**
- **High Sagging Resistance**
- **Adhesion to Oily Substrate**
- **Unmatched Surface Appearance**



Intended Product Profile - Concrete

Easy Handling and Application

- Close to zero VOC & labeling-free formulation possible
- Low viscosity in form of delivery
- Stable, even in very high dilution with water
- Limited change of gloss or color over pot life
- Low odour



Intended Product Profile - Concrete

Ease of Formulation

- **Shear stability for grinding process in the hardener**
- **Compatibility with liquid epoxy resins**

Improved Productivity

- **Fast drying - two coats a day**
- **Good low temperature drying**

The Development for Concrete Substrates

| | | |
|--|------------------------|-----------------|
| Amine Dispersion Hardener 2 | Non volatile content | 45.0 % |
| | NH equivalent (fod) | 550 g / NH-equ. |
| | NH equivalent (solids) | 250 g / NH-equ. |
| | Dyn. Viscosity | ~ 1000 m.Pa.s |

Guiding Formulation Concrete

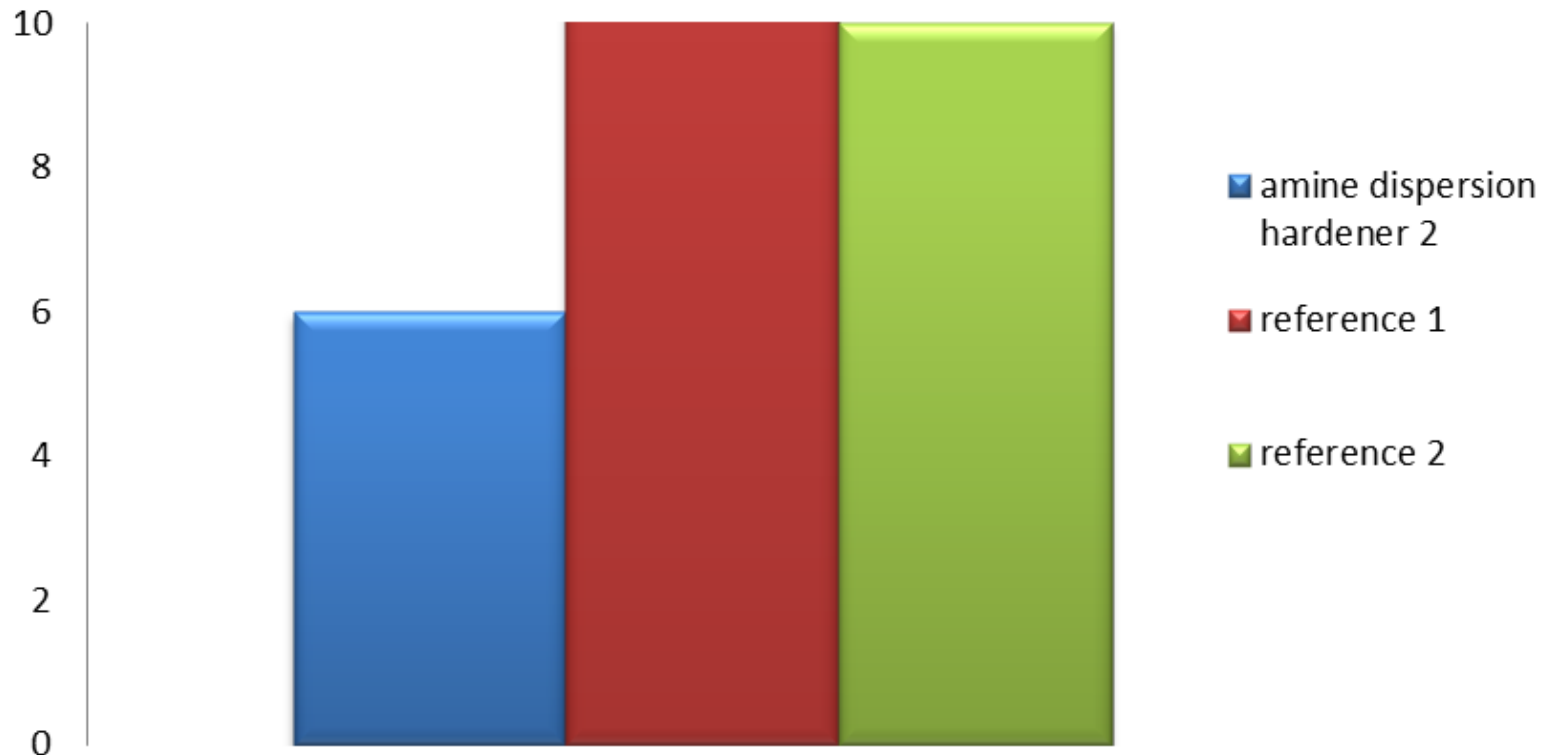
| Formulation 2 | | |
|--|--------------|--------------|
| Formulation 2 - Part A | 78.0 | 69.8 |
| Reactive diluted Type A liquid epoxy resin | 16.8 | |
| Unmodified solid Epoxy dispersion | | 59.0 |
| Deionized water | 5.2 | 2.7 |
| Total | 100.0 | 131.5 |

| Formulation 2 - Part A | |
|------------------------------|--------------|
| Amine dispersion hardener 2 | 48.0 |
| Deionized water | 4.8 |
| Wetting and dispersing agent | 2.6 |
| Defoamer | 0.1 |
| Talkum | 3.0 |
| Titaniumoxide | 8.8 |
| Bariumsulfate | 5.8 |
| Ironoxide yellow | 3.2 |
| Ironoxide black | 0.8 |
| Organic yellow | 0.4 |
| Organic Green | 0.4 |
| Texanol | 0.1 |
| Total | 78.00 |

Performance Characteristics of Formulation 2

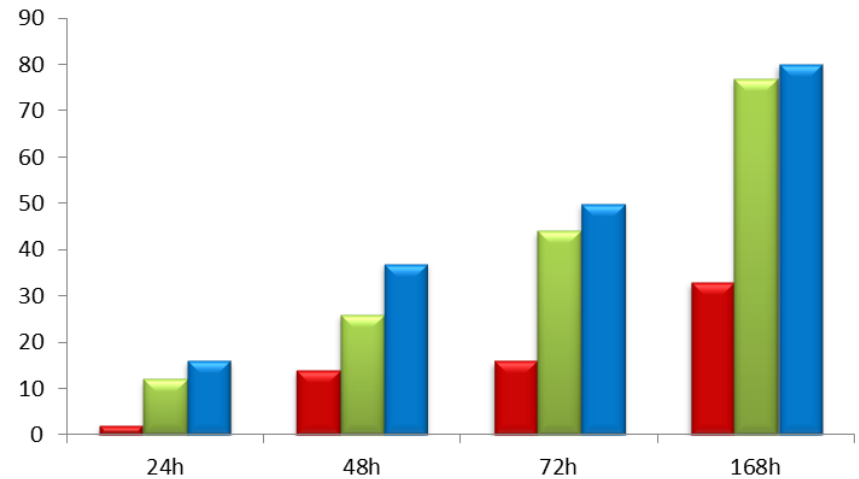
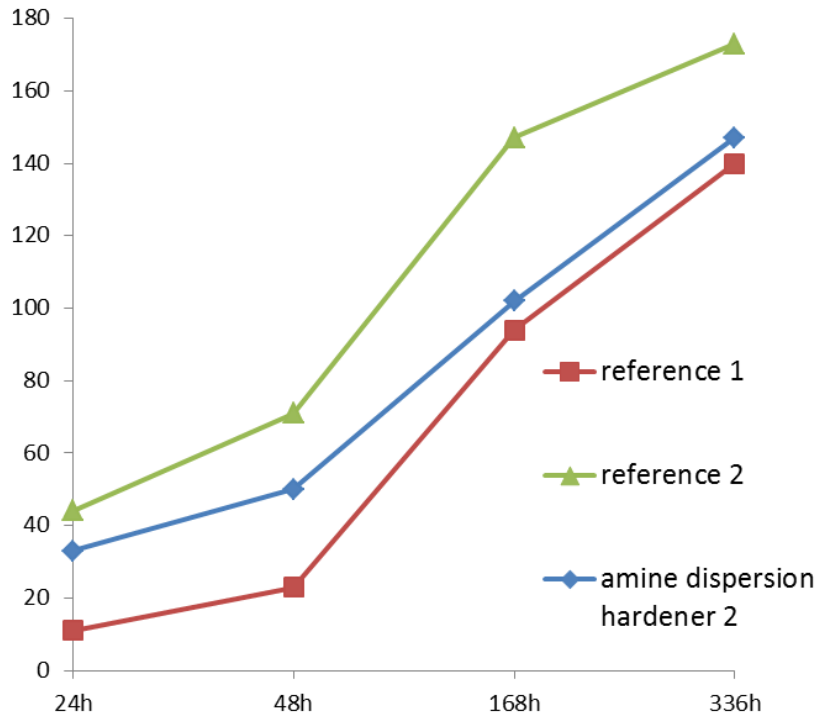
| | | |
|--|------------|------------|
| Solids content | 61% | 60% |
| Pigment/Binder ratio | 0,6/1 | 0,6/1 |
| VOC content | 20 g/L | 20 g/L |
| Viscosity | 1500 mPas | 1500 mPas |
| Tack free time | 6h | 2,5h |
| Potlife | 1,5h | 1h |
| Pendulum hardness (König) (3) 23°C 50% humidity | | |
| After 24 h | 65s | 98s |
| After 7d | 130s | 115s |

Tack Free Time (h)

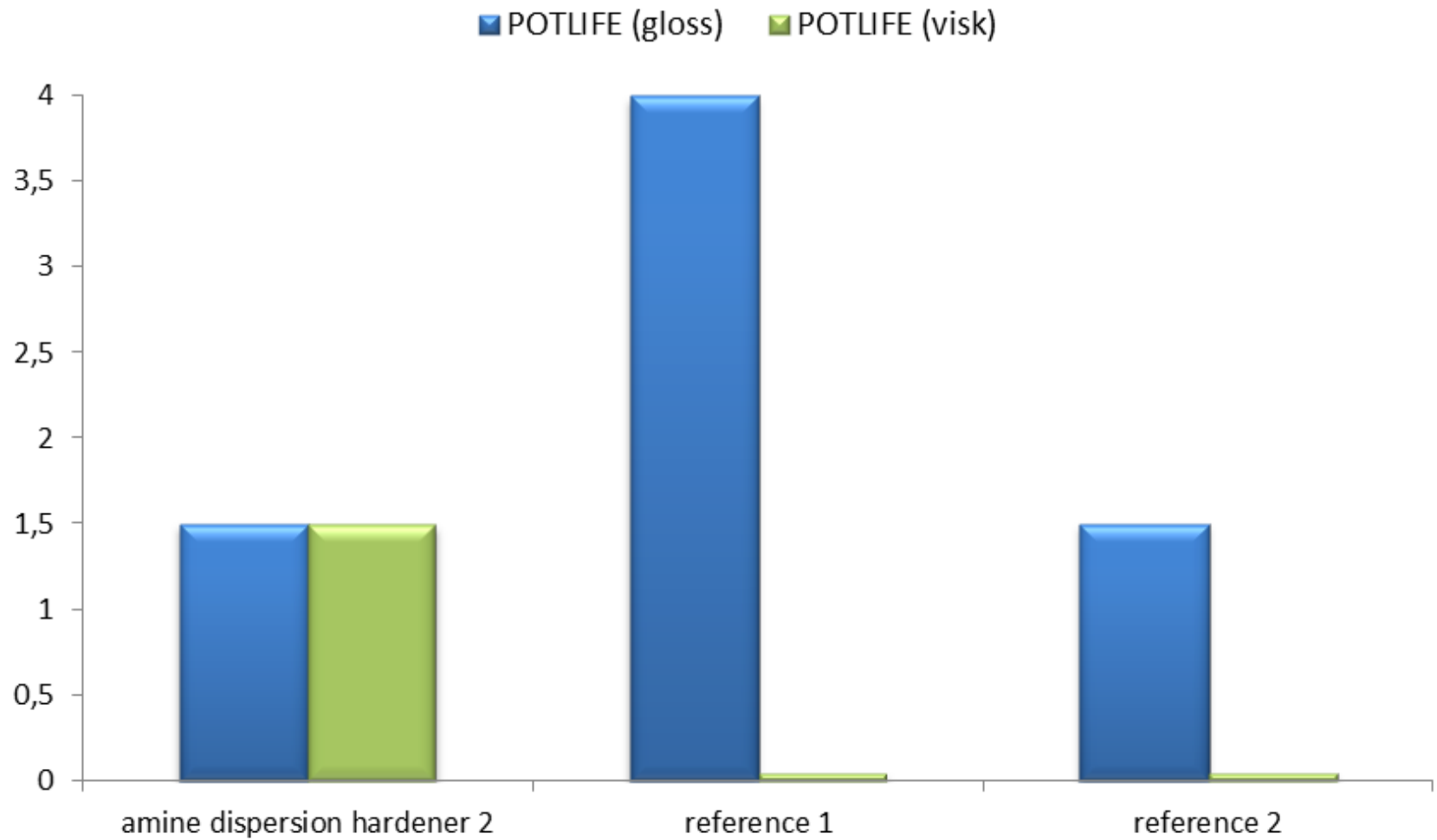


Hardness Development (s)

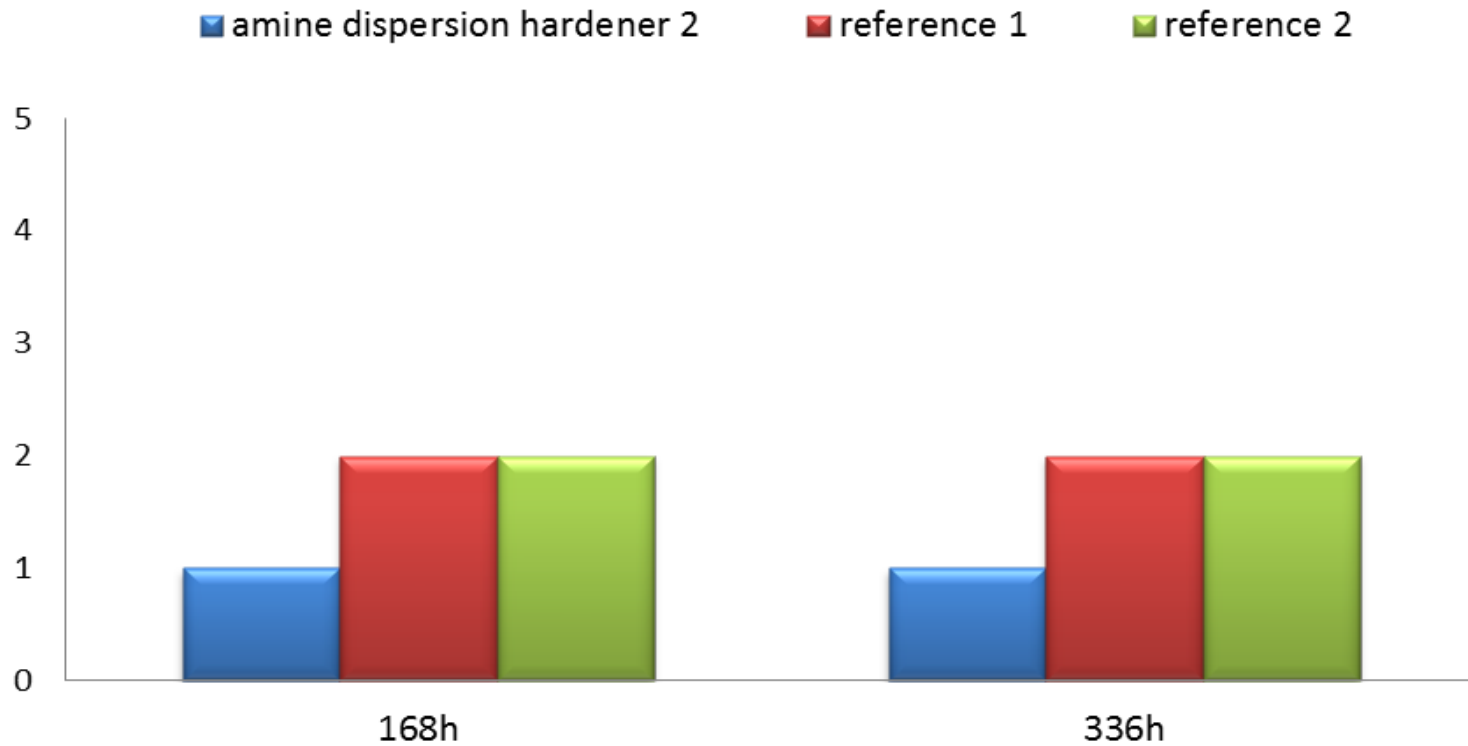
Pendulum hardness 23°/50% humidity & 10°C/85% humidity



Potlife (h)

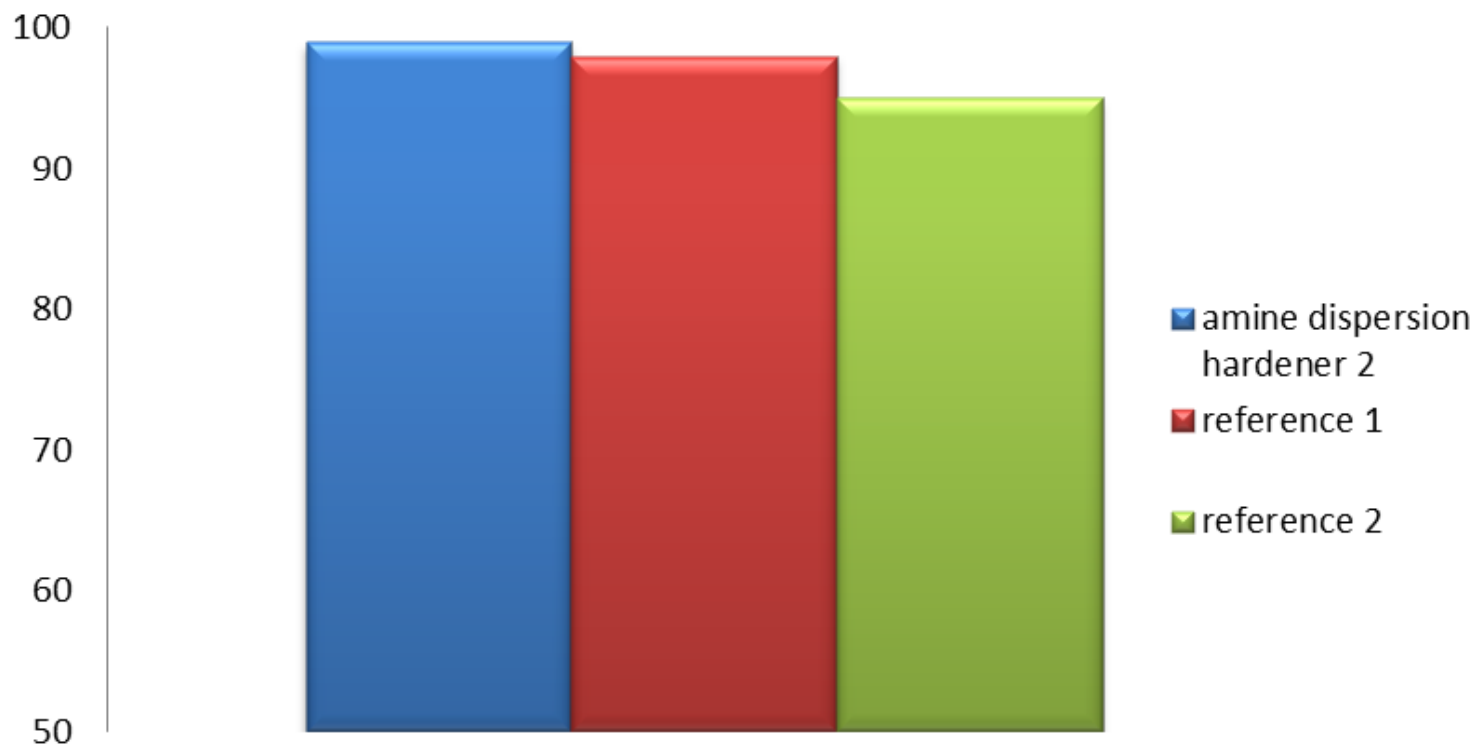


Water Resistance 24h Immersion

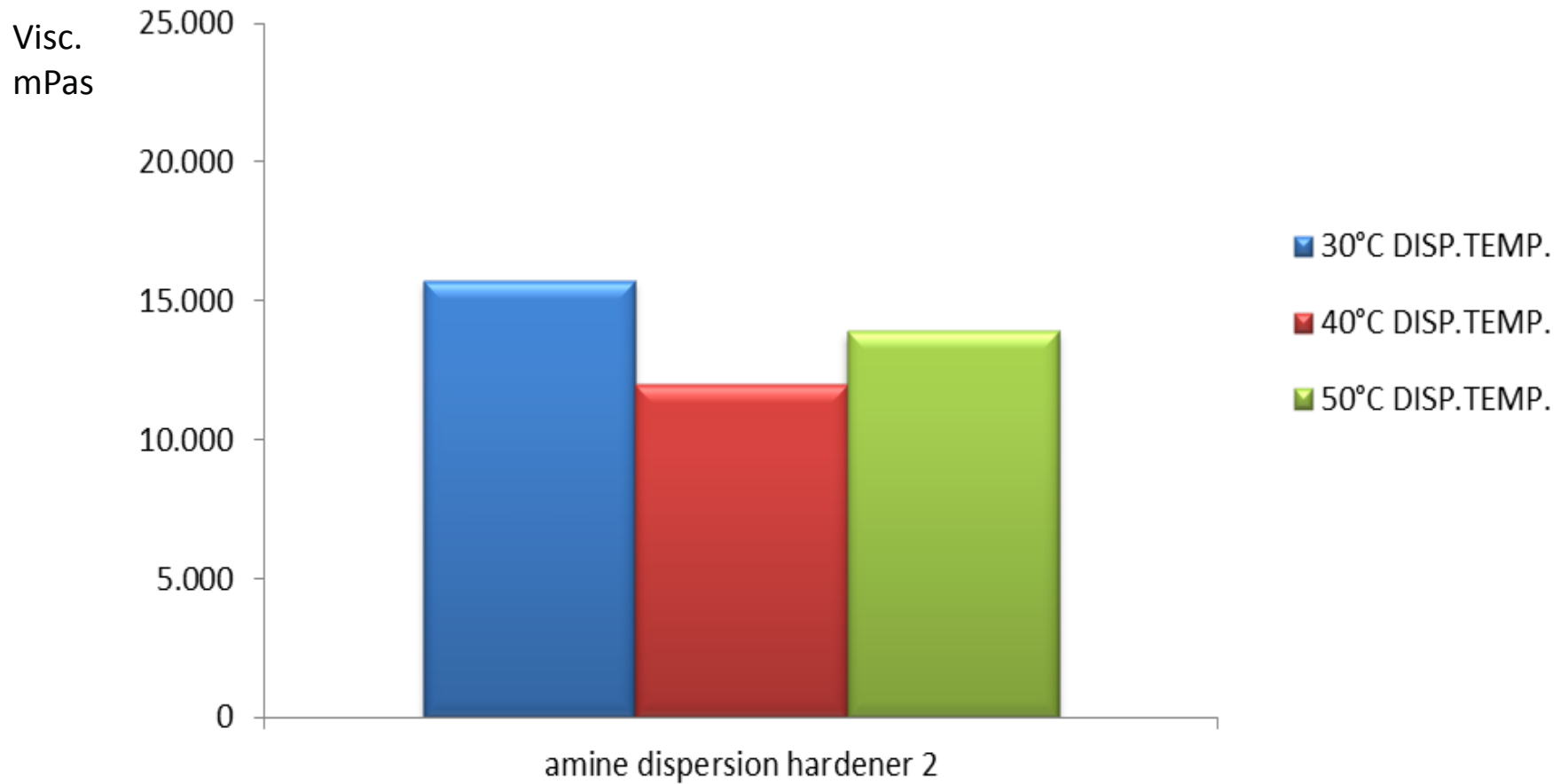


0= very good, 5= very bad

Gloss @ 60°



Grinding Stability



Conclusion

The newly developed family of waterborne amine hardener dispersions will set future standards for waterborne 2K epoxy formulations for metal and concrete substrates.

Key benefits:

- Fast drying – high performance
- Free of labeling and monomeric amines
- Ease of handling and use

disclaimer

Notice: Trademarks indicated with the ®, ™ or * are registered, unregistered or pending trademarks of Allnex IP Sàrl or its directly or indirectly affiliated Allnex Group companies.

Disclaimer: Allnex Group companies (“Allnex”) decline any liability with respect to the use made by anyone of the information contained herein. The information contained herein represents Allnex's best knowledge thereon without constituting any express or implied guarantee or warranty of any kind (including, but not limited to, regarding the accuracy, the completeness or relevance of the data set out herein). Nothing contained herein shall be construed as conferring any license or right under any patent or other intellectual property rights of Allnex or of any third party.

© 2015 Allnex Belgium SA. All Rights Reserved

Thank you



www.allnex.com

Allnex
All About Resins