Waterborne CNSL Curing Agent for Grout and Adhesive Applications

NX-8100 Series
Cardolite Corporation
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Content

- NX-8100 Series
- Typical properties
- Mixing characteristics
- Physical properties in clear system
- Adhesion to concrete
- Stain resistance
- Tile grout and adhesive formulation and its performance
- Conclusion

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NX-8101

- Cardanol based waterborne curing agent
  - Fast cure and hardness development
  - Excellent adhesion over dry and damp concrete
  - Visible end of pot life
  - Good stain resistance
- Easy to mix with water
- High compression strength in grout formulations
- Cost effective

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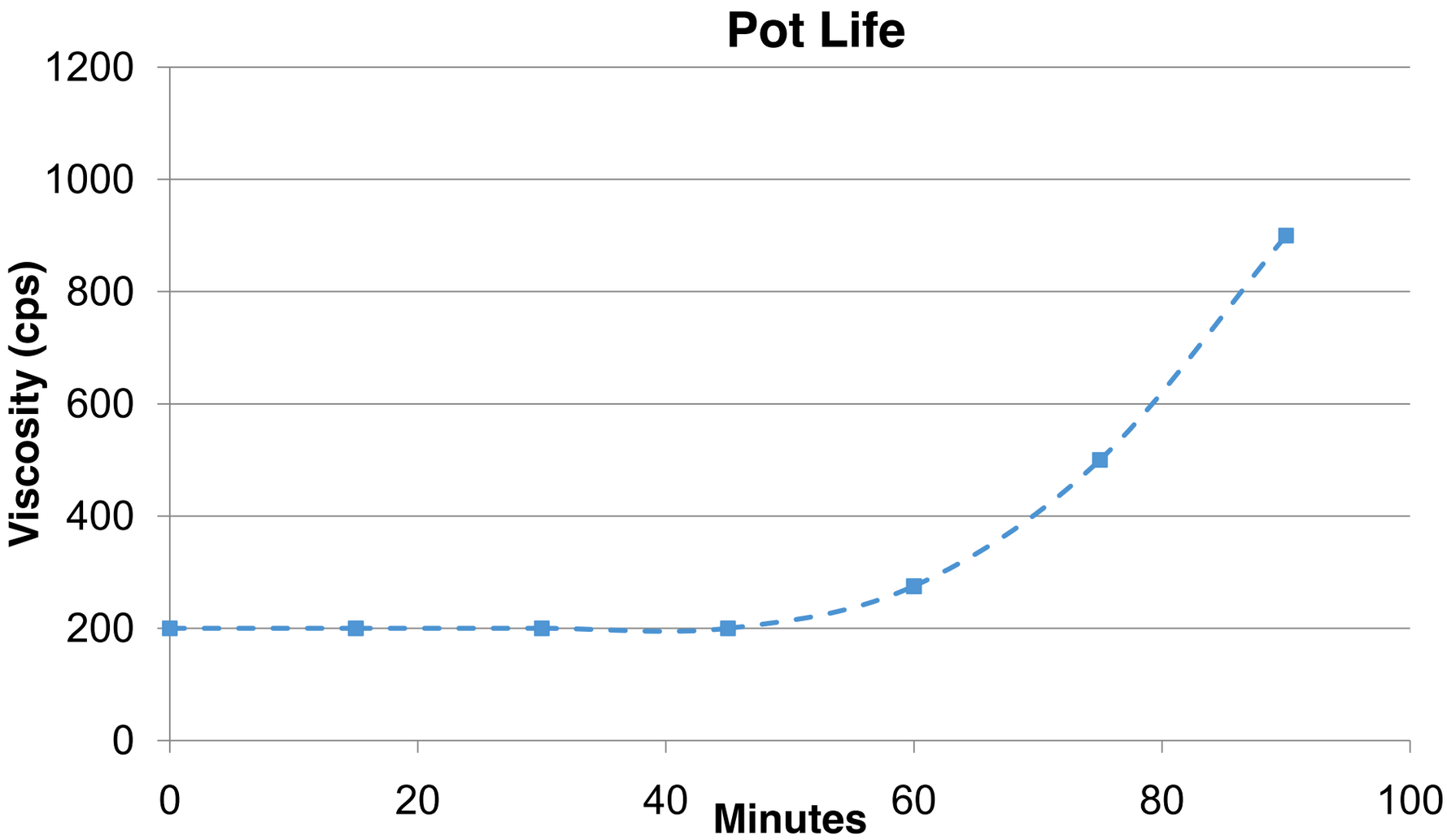
Typical Properties

Properties	NX-8101	Competitive WBCA
Viscosity @ 25°C (cPs)	20000-55000	5000-15000
Amine value (mg KOH/g)	140-180	240
Solids (%)	50	55
AHEW	270	200
Color (Gardner)	≤ 10	<5
Recommended, (phr, EEW 190)	130-155	100

NX-8101 Pot Life @ 25°C



NX-8101 provides a visible end of pot life with admix viscosity starting to increase after 1hr at 25°C

Admixed with standard liquid epoxy reduced with water – total weight solids 52%

Admix Reduction With Water

Curing Agent	Effort Required to Lower Admix Viscosity With Water
NX-8101	easy to reduce with water

When admixed with standard liquid epoxy, NX-8101 is easily reduced with water

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Clear System

Test items	Epon828/NX-8101	Epon828/Competitive WBCA
Lap shear strength(MPa)	9.8	9.9
Shore D	74.3	75.7
Compressive strength at yield point (Mpa)	33.0	35.7
Tg(°C)	65.5	-
PHR	141	100
Pot life	60min	35-50min
Mixed Viscosity at 25 °C (cps)	1500	15,720
Solid content (%) :mixed liquid and WBCA	70.8	77.5
Comments	Cured 9days at RT	

Adhesion to Concrete

Adhesion to **Dry Concrete**:

- Used 25 mil drawdown applicator to apply primer on concrete paver and cured film for 7 days before adhesion test.

Adhesion to **Damp Concrete**:

- Concrete pavers fully immersed in water. After 72 hrs freestanding water on the top removed by blotting with paper towels.
- Pavers were ½ immersed in water and primer was applied with a 25 mil drawdown applicator
- Coated pavers were cured for 7 days before adhesion test.

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Adhesion to Concrete

Curing Agent	Dry Concrete (psi/MPa)*	Wet Concrete (psi/MPa)*
	Direct to concrete	Direct to concrete
NX-8101	650 / 4.48	620 / 4.27

*Mode of failure: in the concrete

NX-8101 shows excellent adhesion to dry and wet concrete. (failure mode = concrete)

Chemical / Stain Resistance

MEK Resistance 7 day cure @ 25°C (200 double rubs)

	Marring	Break-through	Softening
NX-8101	Yes	No	Slight

24 hour Spot Test @ 25°C

	NX-8101
Mustard	Slight stain
Ketchup	No Effect
3% Acetic Acid	No Effect
Bleach	No Effect
Coffee	No Effect
Ethanol	No Effect
Xylene	No Effect

NX-8101 shows good stain resistance.

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Tile Grout/Adhesive Formulation

Part A	Wt
NPEL128	7.3
XY748	1.3
NX-2026	1.7
A501	0.03
Betone 27	0.17
Cement	23.2
Total wt	33.7

Part B	Wt
NX-8101	10.93
A501	0.17
DI water	7.3
Silverbond602	36.8
100# sand	13.2
Total wt	68.4

Part B	Wt
Competitive WBCA	7.7
A501	0.17
DI water	7.3
Silverbond602	36.8
100# sand	13.2
Total wt	65.17

NPEL128: Liquid epoxy(EEW=190)
NX-2026: Cardolite Cardanol
XY748: Aliphatic glycidyl ether
Cement: Portland cement (P.O 42.5R)
100# sand:100mesh Silica sand
A501: Air Release additive.

Tile Grout and Adhesive: Test Results

Test items		NX-8101	Competitive WBCA
Compression strength, MPa		53.7	20
Hardness development at 25 °C (Shore D)	1 day	77	63
	2 day	78	66
	7 day	80	75
Hardness development at 10°C (Shore D)	1 day	44	50
	4 day	71	62
Working time at 25 °C (minute)		>40	<25
Viscosity at 25 °C		Paste	Paste

In the Tile grout formulation, NX-8101 exhibited excellent compression strength and faster hardness development with extended working time

3K Waterborne Tile Grout for Large Joints Formulation

Part A	wt
NPEL128	19.9
XY748	3.7
NX-2026	4.5
A501	0.1
Total wt	28.2

Part B	wt	Part B	wt
NX-8101	30	Competitive WBCA	21.1
DI Water	11	DI Water	19.9
Total wt	41	Total wt	41

Part C	wt
Silverbond 602	28.7
100#sand	93.8
Cement	57.5
Total wt	180

NPEL 128: Liquid epoxy(EEW=190)
NX-2026: Cardolite Cardanol
XY748: Aliphatic glycidyl ether
Cement: Portland cement (P.O 42.5R)
100# sand:100mesh Silica sand
A501: Air Release additive.

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3K Waterborne Tile Grout for Large Joints: Test Results

Test items		NX-8101	Competitive WBCA
Compression strength, MPa		35.6	24.8
Hardness development at 25 °C (Shore D)	1 day	74	59
	2 day	79	65
	7 day	81	74
Hardness development at 10 °C (Shore D)	1 day	40	40
	4 day	74	54
Working hour at 25 °C (minute)		>70	<25
Viscosity at 25 °C		Paste	Paste

In 3K waterborne tile grout formulation, NX-8101 exhibited higher compression strength and faster hardness development at 25 °C and 10°C with much longer working time

Formulation Guidelines

- Standard liquid epoxies can be used (based on Bisphenol A or F)
- No additional emulsifiers are required
- Reactive diluents (mono or di-functional, UL-513) and NX-2026 (Cardanol) can be used without additional emulsifiers
- Temperature of NX-8101 should remain below 40°C during the pigment dispersion phase

Conclusion

- NX-8101 is a CNSL based waterborne curing agent
- Benefits of NX-8101
  - Easily reduced with water
  - Long and clear pot-life
  - Excellent stain resistance
  - Good concrete bond strength
  - Fast hardness development
  - Longer working time
  - Excellent compression strength

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