BONDERITE®

Adhesion Promoter No Rinse

Upgrades Your Standards

The most economical way to improve the performance of your line with the minimum space requirements

Henkel

Adhesion Promoter No Rinse (APNR)

Contents

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2. Benefits
3. APNR step by step
4. Performance & customer references
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6. Summary

Adhesion Promoter No Rinse (APNR)

Contents

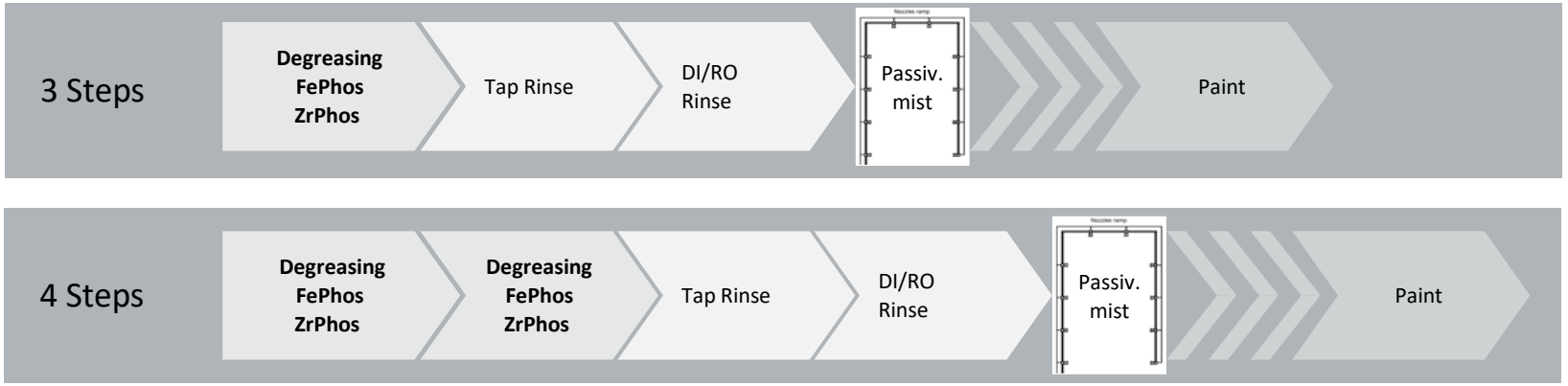
Cleaner coater process
Potential difficulties

Challenges in running 3 or 4 steps cleaner coater lines

- Material quality does not always allow the use of higher performing Zr chemistries (for example: mild steel, cast iron). Some plants can therefore only use FePhos cleaner coater.
- Using an FePhos cleaner coater means higher maintenance (sludge, phosphorus in waste water).
- Water quality: Osmotic water is rarely available: corrosion performance is therefore limited
- Line parameter monitoring
- Until now, aiming at higher corrosion performance meant investing in a 5 steps line (with conversion coating bath separated from cleaner bath).

Adhesion Promoter No Rinse

A way to improve performance on short lines



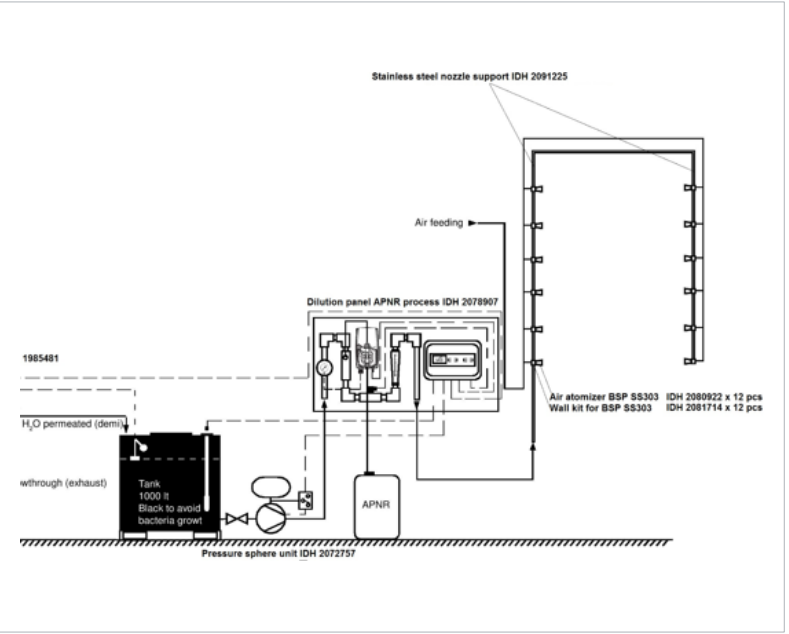
- Complete solution (passivation chemistry + misting equipment)
- Highly flexible: suitable for various processes
- Always fresh chemistry misted on parts

Equipment Group Surface Treatment Europe
LINEGUARD APNR

Panel Version

- CE certification for single component
- Installation and use manual
- Cost competitive
- Multicomponent

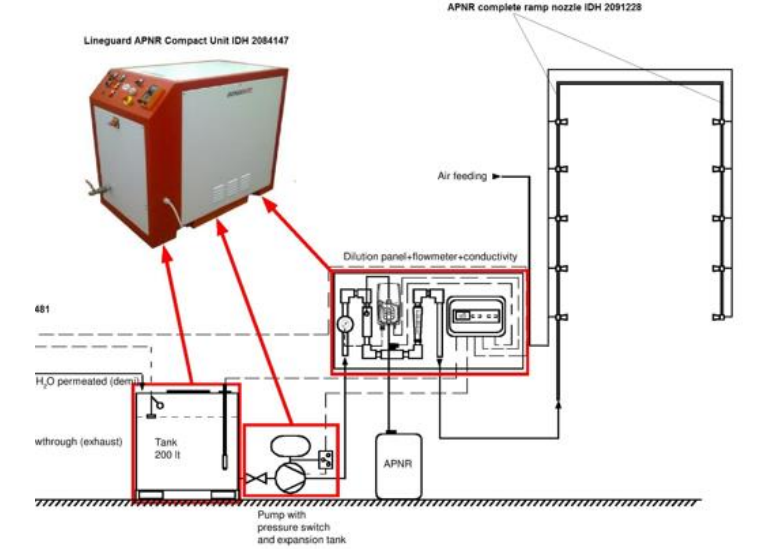
Light protected water storage tank supplied by the customer.



Equipment Group Surface Treatment Europe
LINEGUARD APNR

Top Version

- CE Certificate
- Installation and use manual
- PLC on board
- Easy «plug & play» installation
- Compact



Innovation: Bonderite® Adhesion Promoter No-rinse
LINEGUARD APNR





Adhesion Promoter No Rinse (APNR)

Contents

Adhesion Promoter No Rinse
Benefits

BONDERITE

Pretreating with APNR

- A solution for every challenge. Many configurations available to fit to different needs
- Lineguard APNR added to a RO or DI line improves paint adhesion and corrosion performance without space constraints (APNR ramps can be installed in existing lines)
- Lineguard APNR allows the most effective implementation of New Generation Coatings (NGC) in short lines by adding to the process an additional conversion coating step.
- No bath monitoring: Always fresh chemistry is misted on parts

Adhesion Promoter No Rinse (APNR)
Benefits

BONDERITE

Pretreating with APNR

- Corrosion resistance of the painted parts depends on many factors (substrate, pretreatment, water quality, paint quality, polymerization etc.).
- APNR normally improves quality when compared with iron-phosphate technology. The above mentioned factors could minimize or amplify the differences among treatments but at least the corrosion resistance improvements that can be easily achieved, are about:
- Iron phosphate (IP) + APNR = 3 to 4 times higher than IP
- Zirconium Phosphate + APNR = 3 to 4, even 5 higher than IP

Furthermore (after PD/TCS approval of line layout):

- Alkaline cleaning + APNR = 3 to 4, even 5 higher than IP also improving paint adhesion on galvanized material

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Adhesion Promoter No Rinse
Various chemistries to cover all needs

- APNR system allows the application of different products depending on the requirements and on line configuration

	Bonderite M-NT 50001*	Bonderite M-NT 5923
pH	3,8	3,8
Compositon	Zr polymer	CrIII
Conc.	0,5-1%	1-2%
Main property	Top paint adhesion	Top corrosion resistance
Typical application	All lines All metals	HDG/Al Ok on steel as well

* Water conductivity < 10 mS/cm to avoid product precipitation and nozzles clogging

Adhesion Promoter No Rinse (APNR)

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APNR - Step by step considerations
First step

- FePhos can be a must when acid cleaning is required and ZrPh can't be considered as alternative or rinse is not enough for C-AK
- C-AK offers top quality and top adhesion on galvanized steel assuming rinse and cleaning are always perfect. Water break free surface is absolutely necessary for the correct APNR application while not rinsed alkalinity can lead to paint adhesion failures. Strong cleaners would give good cleaning but they are much more difficult to rinse.
- ZrPh can offer high quality standards. Easier to rinse off; less sensitive to cleaning quality than C-AK

APNR - Step by step considerations
Rinsing step

- Low conductivity rinse is necessary prior APNR application
- In case of alkaline cleaning, APNR is allowed only after a good rinse to get rid of any contamination that would affect coating formation
- Best opportunity for short zero discharge lines with RO unit can be ZrPhos + M-NT 50001 whose chemistry is compatible with ZrPhos bath solution

APNR - Step by step considerations

APNR step

- Always fresh solution applied
- No bath monitoring
- Room temperature application
- M-NT 50001 chemistry is compatible with the majority of chemistries used in the cleaning step
- APNR system should be fed with low conductivity DI water (< 10 mS/cm)

Adhesion Promoter No Rinse (APNR)

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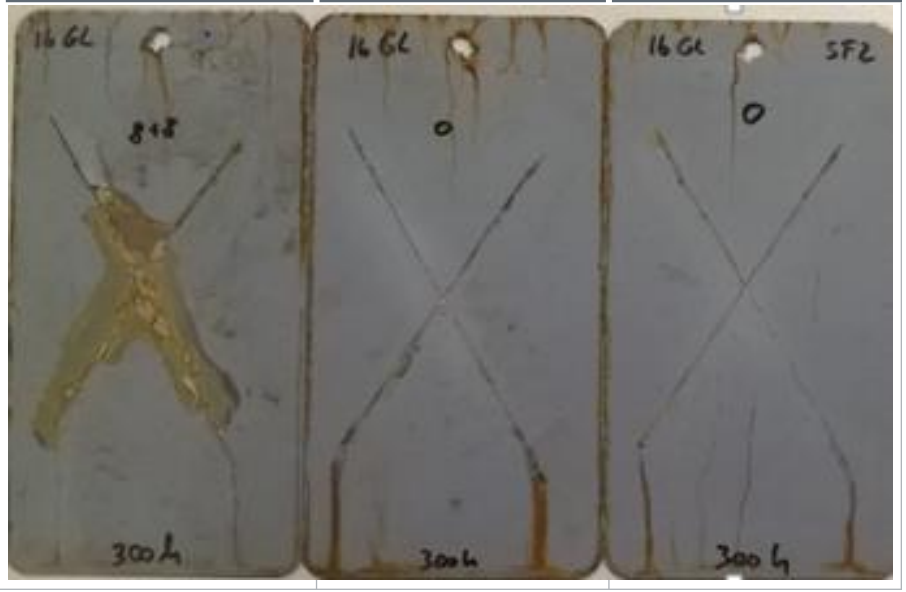
APNR technologies – Performance
Test #1 NSS 300 h

APNR	DI water	M-NT 50001	M-NT 5923
First step: Low coating weight iron phosphate (old bath) **APNR:** 3 options tested: DI Water as reference M-NT 50001 M-NT 5923 **Material:** CRS			

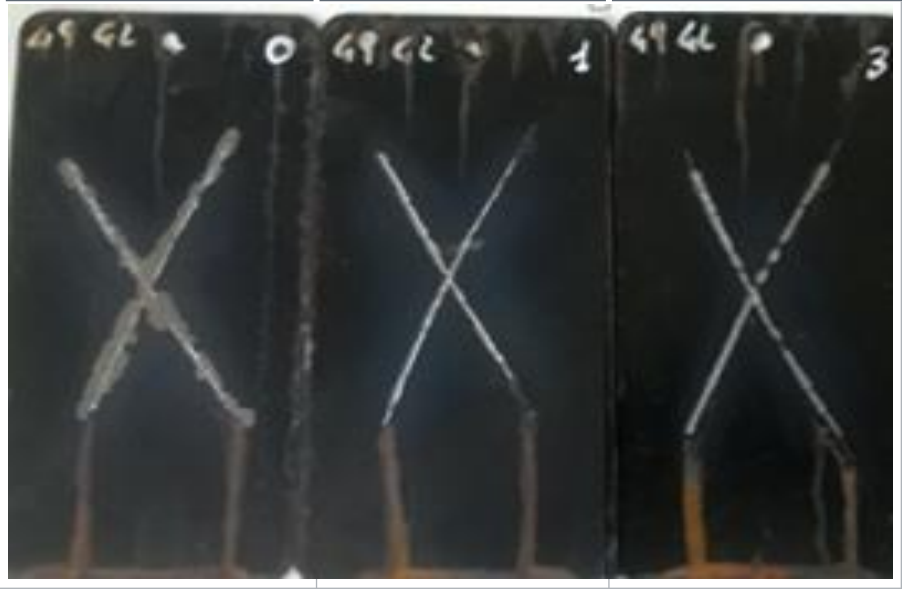
APNR technologies – Performance
Test #1 NSS 300 h

APNR	DI water	M-NT 50001	M-NT 5923
First step: Zirconium Phosphate (aged bath) **APNR:** 3 options tested: DI Water as reference M-NT 50001 M-NT 5923 **Material:** CRS			

APNR technologies – Performance
Test #2 NSS 500 h

APNR	DI water	M-NT 50001	M-NT 5923
First step: Zirconium Phosphate (aged bath) **APNR:** 3 options tested: DI Water as reference M-NT 50001 M-NT 5923 **Material:** HDG			

APNR technologies – Performance
Test #3 NSS 500 h

APNR	DI water	M-NT 50001	M-NT 5923
Cleaning step: High coating weight iron phosphate - cleaner coater (aged bath) **APNR:** see above panels **Material:** CRS **Paint:** Cathodic E-coat			

APNR technologies – Performance
Test #3 NSS 500 h

APNR	DI water	M-NT 50001	M-NT 5923
First step: High coating weight iron phosphate -cleaner coater (aged bath) **APNR:** see above parts **Material:** Steel **Paint:** Cathodic E-coat			

APNR
Reference list

Celant	50001 after ZrP (40043/0508 LF)	Running
Verniciatura Spinese	50001 after ZrP (40043/0508 LF)	Running
Mecplast	50001 (5923 on Mg) after C-AK 2918	Running
Visnova	50001/5923 after full line configuration (C-AK 2918/M-NT 2040/M-NT 1)	Running
Pennati & Pizzagalli	M-NT E after IP (Mo based)	Running
Univer 2000	50001/5923 after IP (Mo based)	Running
Unilak	50001 after ZrP (40044/0508 LF)	Running
Lomet	50001 after Neutral cleaning (C-NE 919)	Running
Lomet (RO)	50001 after Neutral cleaning (C-NE 919)	Running
Nord Laser	5923 after C-AK 2153 (50001 for steel)	Running
Deimos	5923 after C-AK L10 (50002 for steel)	Running
Eredi Piana	50001 after IP	Running
VIV	50001 after IP	Running

Full process details available upon request

APNR – Application examples
Cast alu anodic E-coat + PE powder

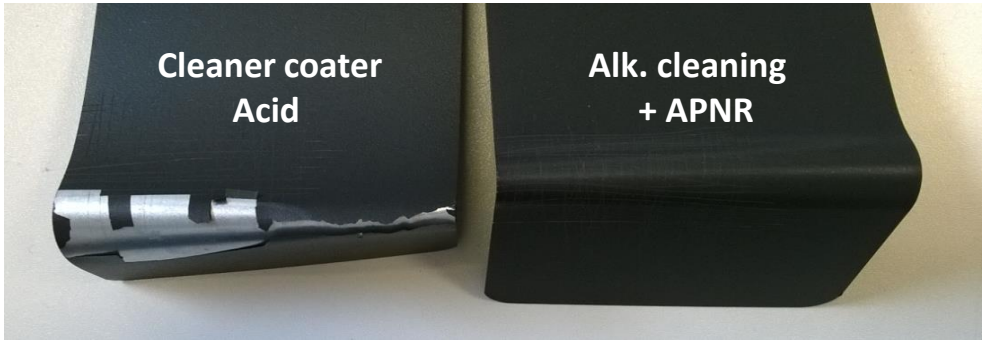
Bonderite C-NE 919
Bonderite C-AD 0508 LF

Bonderite M-NT 50001
DIP + APNR

Cross cut = pass
NSS 96 = pass
No drops at the edges

Customer comments:
«Giant step...»
Improving paint adhesion and bath maintenance

APNR – Application examples
Jobber multimetal: powder paint after alk. cleaning

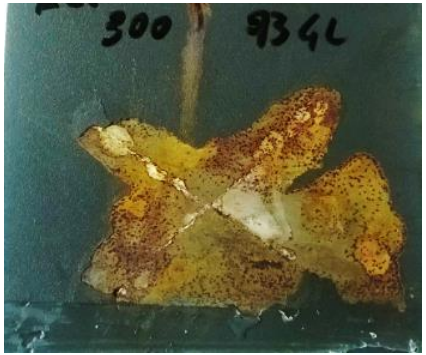


Bonderite C-AK 2918 + Bonderite C-AD 0508 LF

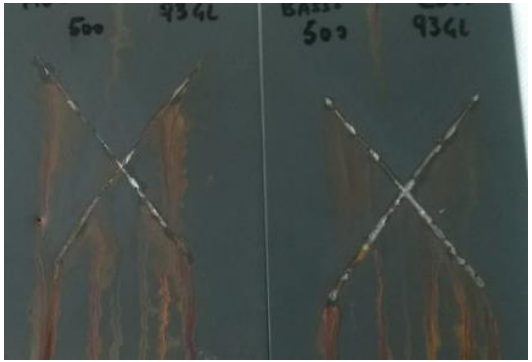
APNR
Bonderite M-NT 50001 for HDG and cast alu
Bonderite M-NT 5923 for Mg

APNR – Application examples

Jobber multimetal: powder PE paint after iron phosphate CRS DC04 - NSS 300 - 500 h



Low coating weight FePhos 300 h NSS
APNR = DI water



Low coating weight FePhos 500 h NSS
APNR = M-NT 50001

APNR – Application examples

Nord Group – multimetal: powder paint after alk. cleaning

HDG CRS
Test: 500h NSS

Bonderite C-AK 2153 + Bonderite S-FN 6304
APNR: Bonderite M-NT 5923 1,5-2%
Starting Qualisteelcoat approval

Adhesion Promoter No Rinse (APNR)

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APNR – Health & Safety

- APNR aerosols should not be breathed. The customer has to ensure a proper exhaust and ventilation system in order to evacuate any excess of APNR mist.
- As shown in the example below, a proper exhaust system allows to work in good H&S conditions.

Working environment monitoring
Environmental analysis 21.04.2016
Bonderite M-NT 5923 2%

		Parameter		
Employee / position	Function	Cr (mg/mc)	Cr^{6+} (mg/mc)	F^- (mg/mc)
Plant n° 2 – Tunnel exit, west side	-	<0.002	<0.001	<0.03
Employee	Loading/Unloading	<0.002	<0.001	<0.03
Plant n° 2 – Tunnel exit, east side	-	<0.002	<0.001	0.04
ACGIH limits. TLV-TWA (mg/mc)		**0,5**	**0.05**	**2,5**

Conclusion: chemical exposure monitoring shows no H&S issues for this specific customer line set up

APNR – Health & Safety

Cr^{3+} vs. Cr^{6+}

Cr^{3+} BONDERITE M-NT 5923		Cr^{6+} Bonderite M-CR 5004	
▪ Not carcinogenic		▪ Carcinogenic	
Classification (CLP):		**Classification (CLP):**	
Skin irritation	H315 Causes skin irritation	**Acute toxicity**	H301 Toxic if swallowed. H310 Fatal in contact with skin. H330 Fatal if inhaled.
Serious eye irritation	H319 Causes serious eye irritation.	**Skin corrosion**	H314 Causes severe skin burns and eye damage.
		Respiratory sensitizer	H317 May cause an allergic skin reaction. H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
		Skin sensitizer	H335 May cause respiratory irritation.
		Mutagenic	H340 May cause genetic defects.
		Carcinogenic	H350 May cause cancer.
		Toxic to reproduction	H361f Suspected of damaging fertility.
		And more (see msds)	H372 Causes damage to organs through prolonged or repeated exposure. H411 Toxic to aquatic life with long lasting effects

Cr^{3+}, general information

- Cr^{3+} salts has usually lower toxicity level for CLP Regulation (EC) No 1272/2008
- Cr^{3+} salts are **not carcinogenic, mutagenic or reprotoxic** for humans
- Trivalent chromium (Cr^{3+}) is required in trace amounts for **sugar metabolism** in humans (Glucose Tolerance Factor) and its deficiency may cause a disease called chromium deficiency
- It's contained in several kind of food (until 1.5 -1.7 mg/Kg) like: **milk, wheat, potatoes** etc.
- Chromium ($^{3+}$) oxide is used as a **colorant in cosmetics** (FDA approved)

Adhesion Promoter No Rinse (APNR)

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APNR vs. Conventional New Generation Coatings
Pros and cons

	APNR	Conventional NGC
Bath management	Always fresh solution on the parts	Key parameters monitoring, specific replenisher is often necessary to minimize reaction products influence
Metal surface	APNR needs perfect cleaning for a correct application	Mechanical action often helps cleaning in the NGC bath
Coating weight	Low but constant coating	Coating weight depending on material reactivity and bath conditions
Space required	Very little space requirement: dilution panel and misting ramp	Requires 1 more conversion step and 1 more rinse step
Capital investment	Very economical: a few thousand Euros	From 10 to 20 times more than for APNR

Adhesion Promoter No Rinse
Summary

- Allows quality improvement with minimal investment
- Free from Cr^{6+}, Ni, toxic heavy metals and highly reactive substances
- Easy to install. Easy to use...

Thank you!

Back up

NGC vs. traditional pretreatment

BONDERITE

Health and safety 	▪ Reliable replacement for traditional Ni and CrVI containing technologies (carcinogenic). ▪ Based on components whose toxicology is well known, easy to monitor in the working environment with standard systems
Easy to use 	▪ Effective on most metals used in the market. Wide application parameters makes them easier to use than traditional Zinc Phosphate
Energy 	▪ Conversion coating step is at room temperature
Maintenance 	▪ Minimal sludge formation, strong scale reduction ▪ No spray nozzles clogging ▪ Better heat exchanging (Cleaner Coater)
Water treatment and wastes 	▪ Less water consumption ▪ Fit for 0 discharge lines ▪ Less chemicals used for water treatment ▪ Less sludge production ▪ Lower impact on sludge composition/classification (no heavy metals, no/low PO4, Low BOD/COD….)