

Gardo[®] Plus and Oxsilan[®]

Flexible and eco-sound pretreatment systems for the Agricultural, Construction and Earthmoving Industry

Agricultural, construction and earthmoving (ACE) machines have to withstand tough conditions. Corrosion protection layers have to demonstrate what they are capable of. Alongside a high-quality surface finish, the cost-effectiveness and flexibility of the pretreatment technologies are playing an increasingly important role. The new systems Gardo[®] Plus and Oxsilan[®] that can be used with a variety of metals and meet the demanding market requirements.



Frankfurt/Germany, July 30 2015. Surface treatment technologies are put to the test on a daily basis in the agricultural, construction and earthmoving (ACE) industry. Off-road vehicles, construction machinery, industrial machines and agricultural vehicles must withstand sometimes harsh conditions and remain functional for many years. While extreme robustness and durability are required, on the one hand, the chassis, cross members and add-ons for economic reasons sometimes only receive a one- or two-layer coating, on the other. In addition, also the strongly varying base materials for their production must be considered. In the field of agricultural and construction vehicles, the pretreatment technologies have to generate consistently good results on thin sheets in the same way as on extremely thick sheets, hot or cold rolled steel, scaled steel or aluminum substrates. This requires a high flexibility of the pretreatment technology.

Providing the best possible long-term protection in the field

New pretreatment technologies offer a number of benefits for the global ACE industry. These systems are environmentally sound, easy to use and offer long-term corrosion protection and excellent paint adhesion. Gardo[®] Plus and Oxsilan[®], two technologies from Chemetall, meet the current requirements for a flexible pretreatment process at ACE customers as they address the most relevant market and customer demands: They enhance the quality of existing production processes while, at the same time, reducing overall production costs. The processes are multi-metal capable and free of hazardous heavy metals, such as nickel and chrome. Consequently, its application does not require a complex cleaning of baths and expensive disposal of toxic phosphate sludge.

While Gardo® Plus is primarily used as an alternative to an iron-phosphate plus sealer process, the Oxsilan® technology has become an established replacement for zinc-phosphating.

Organosilane-based thin-film technology

Silanes form the basic element of the Oxsilan® technology that is compatible with a range of different metal substrates. By hydrolysis, they combine to form polysiloxanes. Coatings of as little as 100 nm already afford a corrosion protection comparable to that of the roughly ten times thicker coatings generated with zinc-phosphating. On balance, this results in a lower materials consumption, shorter treating times and, as a consequence, higher productivity. This findings are supported by practical experience where material throughputs of the Oxsilan® plants outperform those of phosphating plants by about 30 % to 65 %. Since the silanes form a close mesh and are chemically bonded to the metal, they increase surface passivation and this way impede corrosion. In addition, they can react with functional groups of the paint, thereby ensuring a solid bond between metal, protective coating and paint.

High corrosion protection

Tests carried out by a well-known manufacturer of agricultural machineries demonstrate that Oxsilan® achieves the same corrosion protection level as traditional technologies. The neutral salt spray test results (480 hours and 1,000 hours) even showed that the Oxsilan® test panels had less creepage than the phosphated ones. In order to meet the demands of different paint systems, the Oxsilan® formulation can be modified. This has been proven by multiple testings with ACE customers and paint suppliers.

Salt spray test (ASTM B 117) after 700 h with cross hatch				
Test (as duplicates)	Set point	Oxsilan® 9810/3 pretreatment		
		Coating 1	Coating 2	Coating 3
Degree of blistering (DIN EN ISO 4628-2)	≤ 2 (S2)	0(S0)	0(S0)	0(S0)
Creepage (DIN EN ISO 4628-8)	≤ 2-3 mm	1.5-2 mm	1.5-2 mm	1.5-3mm

Salt spray test (ASTM B 117) after 700 h with cross hatch				
Test	Set point	Oxsilan® 9815 pretreatment		
		Coating 1	Coating 2	Coating 3
Degree of blistering (DIN EN ISO 4628-2)	≤ 2 (S2)	0(S0)	0(S0)	0(S0)
Creepage (DIN EN ISO 4628-8)	≤ 2-3 mm	1-2 mm	1-1,5 mm	1-2 mm

Coating 1

Coating 2

The Oxsilan® pretreatment technology has been customized for use with different paint systems. All test results are within customer specifications. The neutral salt spray tests have been carried out by ACE customers and paint suppliers.

Gardo® Plus - Modular structure for effective corrosion protection

The wide processing window of Gardo® Plus allows meeting the most diverse customer standards and specifications. Depending on customer requirements, substrate throughput, the plant equipment in place as well as the local market conditions and legal regulations, suitable and matching technologies from the Gardo® Plus system can be combined for each process step. The modular structure of this pretreatment technology allows making the process more efficient and enhancing the quality and production output.

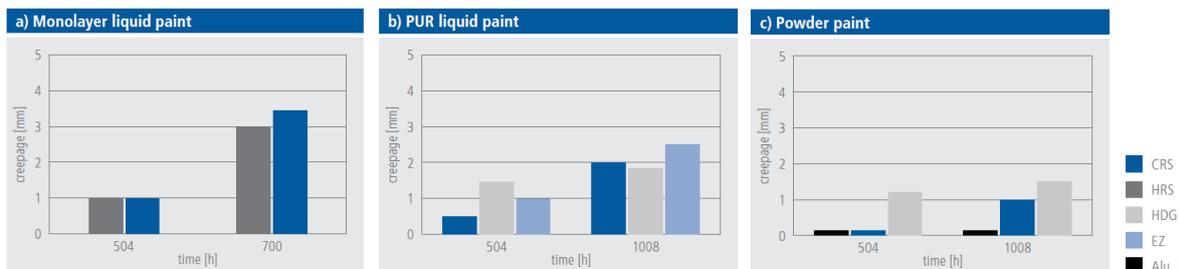
Quality equivalent to iron-phosphating combined with a sealer

The new three-stage pretreatment process affords an at least comparable quality to that of iron-phosphating plus sealer. Comparative tests on different metal substrates demonstrated the improved quality results and the higher corrosion protection of Gardo® Plus in comparison to traditional processes. Also zinc-phosphating processes on a medium quality level can be replaced by the new pretreatment system.

Test	Norm	Gardo® Plus
Adhesion Test	ASTM D3359-B	✓
Impact Resistance Test	ASTM D2794	✓
Mandrel Bending Test (Flexibility)	ASTM D522	✓
Water Resistance Test / Water Fog Apparatus	ASTM D1735 (480 h)	✓
Water Resistance Test / Water Immersion	ASTM D870 (300 h)	✓
Neutral Salt Spray Test	ASTM B117 or DIN EN ISO 9227 NSS (700 h)	✓

The new pretreatment technology Gardo® Plus meets all the standards required by the agricultural, construction and earthmoving (ACE) industry.

Gardo® Plus can be combined with all commercially available paint systems. The process is suited for powder paints like polyester, epoxy and mixed systems and also for liquid paint systems like monolayer liquid paint. The latter meet the demanding specifications of the ACE industry. Moreover, customers can choose from specifically developed technologies that are compatible with cathodic or anodic electrodeposition paint. The good corrosion protection could be demonstrated in various salt spray tests.



The neutral salt spray test shows that Gardo® Plus produces very good results when combined with a variety of paints and substrates.

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About Chemetall

Chemetall Surface Treatment, a global business unit of Albemarle Corporation, is a leading global supplier of specialty chemicals with a focus on processes for the surface treatment of metals and plastics. To learn more, visit www.chemetall.com.

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