

AUTOMOTIVE INDUSTRY SPECIFIC REQUIREMENTS RELATED CORROSION PROTECTION OF PARTS

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ABSTRACT

The automotive industry is one of the largest and most dynamic global sectors. Over 60 million new vehicle are put on the road every year. The size and dynamics of this industry have created challenges equal to very few other sectors. These range from globalization and industry consolidation to maintaining innovation and the effective use of new technologies. A globalization of relations of a worldwide known leading vehicles manufacturers is increasingly spreading in the world. Such a practice is followed by the components manufacturers and suppliers (subcontractors), who have to produce their products by meeting the demands of a highest designing, technological and quality requirements. Therefore, manufacturers of automobile parts have to provide implementation of continuous improvement in their quality assurance system and increasing of corrosion protection of their products on higher level. The coating of automobile parts enables to satisfy a storage corrosion resistance requirement, to ensure a nice presentation of the vehicle for its delivery.

Recognizing the need for a more efficient surface protection system that meets the requirements of automotive parts manufacturers and suppliers in a global world market, worldwide known surface technologies companies (such as Metal Coatings International, Henkel, Dacral Nippon Dacro Shamrock Co., etc.), as well as related associations their respective countries joint together in developing a new products for satisfying customer's needs for corrosion protection. This is answering the needs of automotive and steel industries for high performance coatings for the protection against corrosion. Over the last ten years a new technology of anticorrosion protection for brake disks using components like: GEOMET, DACROMET, DELTA TONE and ACC has appeared and has developed very quickly. A process is already in operation at Volkswagen, Peugeot, AUDI, BMW, Toyota, Volvo, Bosch etc.

In this article, products list of new surface protection technology for automotive sector and technical specifications of automakers related using of new surface protection techniques and worldwide known automakers approvals are presented.

Key words: surface protection technology, automotive industry, sector specific requirements, approvals.

1. INTRODUCTION

A globalization of relations of a worldwide known leading vehicles manufacturers is increasingly spreading in the world. Such a practice is followed by the components manufacturers and subcontractors, who have to produce their products by meeting the demands of a highest designing, technological and quality requirements. Therefore, manufacturers of automobile parts have to provide implementation of continuous improvement in their quality assurance system and increasing of corrosion protection of their products on higher level. The coating of automobile parts enables to satisfy a storage corrosion resistance requirement, to ensure a nice presentation of the vehicle for its delivery. First vehicles with Dacrotized brake discs were made in Japan. When Japanese automakers were established new surface protection

technology, they obtained six months in marine atmosphere protection of the braking surfaces during shipping and storage before delivery and they avoided of difficulties during the first braking action. This surface treatment excels the conventional paint and zinc electro-plating. Dacrotized parts are now being used by all automobile manufacturers worldwide for the surface treatment of bolts, springs, brakes and other automotive parts.

Table 1 List of GEOMET Worldwide Organizations.

Company	No. of licensees
Metal Coatings International, Inc., Chardon, Ohio, USA	21 job coaters; 8 captive users; 56 installation
DACRAL, S.A. , Creil, FRANCE	29 job coaters; 18 captive users; 91 installations; 4 representatives
Nippon Dacro Shamrock Co., Ltd., Yokohama City, JAPAN	46 job coaters; 25 captive users 122 installations; 7 representatives
Metal Coatings Brazil Ind. E Com.Ltda., Diadema-Sao Paulo-BRAZIL	6 job coaters; 7 captive users; 13 installations

Over the last six years a new technology of anticorrosion protection for brake disks using components like: GEOMET, DACROMET, DELTA TONE and ACC has appeared and has developed very quickly. The development is especially remarkable as it is the result of two simultaneous innovations. The product GEOMET implemented for the first time in 1998, and the application process for brake disks, spraying followed electromagnetic induction, which was developed in 1997. A process is already in operation at Volkswagen, Peugeot, AUDI, BMW, Toyota, Volvo, Bosch etc.

2. AUTOMOTIVE STANDARD AND TECHNICAL SPECIFICATIONS

Autodeposition is a way of applying an anti-corrosive paint layer to metal by means of a chemical reaction. There are as many similarities to electro-less plating as there are to conventional painting techniques. This coating technique provides many unique features that enable the coating of components other systems could not paint. Geomet is a water-based VOC compliant coating comprised of overlapping Zinc and Aluminium flake in an inorganic binder. The GEOMET coating is an innovation. Water-based zinc and aluminium flake dispersion DACROMET has been widely used for thin layer protection of brake disks for 20 years, above all in Japan and the United States, but this dispersion contains hexavalent chromium. This heavy metal is now banned under European Directive 2000/53/CE on recycling of end of life vehicles (with certain exceptions until July 2007).

Table 2. Products list from new surface protection technology for automotive sector.

Name of product	Purpose
DACROMET	For protection of preformed parts
GEOMET	Chrome-free zinc flakes coating
PLUS	Lubricated sealer for GEOMET and DACROMET
GEOMET 360/D	Chrome-free coating for brake discs
DACROLUB	For special lubrications
ZINCROMETAL/ZINCROPLEX	For the protection of precoated steels used in the automotive industry
ZINCROSEAL	For the chrome-free passivation of zinc-plated substrates
GEOPLEX	New coating for precoated steels, chrome-free and weldable
DACROFORGE	For the lubrication of metals before cold forging
DELTA TONE	For protection of threaded fasteners and spring

DACROMET is the leading inorganic coating specified by automotive companies worldwide and is a proven coating system in many industries. DACROMET is non-electrolytic water based thin-film coating for the corrosion protection of products made from steel, cast iron, or other iron metals. The coating contains zinc and aluminium flakes in a chromium binder. The coating is metallic silver in appearance. DELTA TONE is a coating system applied by dip spins or spray technology, providing excellent salt spray resistance for relatively small coating thickness. The Delta Tone is a mixture of Zinc flakes held in a suspension of organic binders and solvents.

All above mentioned corrosion protection techniques comply with the automotive specifications of leading automakers. Technical specifications and automotive approvals of a new surface protection technology are shown bellow (see table 3 and table 4).

Table 3. Technical specifications of automakers for new surface protection techniques.

Source	Technical specification		
	GEOMET	DACROMET	DELTA TONE
Akebono	AES: G 3503-U Class 1, AES: G 3503-U Class 2	-	-
Allied signal truck brake systems	-	BW-254-P	-
ASTM	-	F 1136	-
AUDI	TL 193	-	TL 233
Bendix Corporation	-	ES-1825	-
BMW	GS 90010-ZNS3; QV 34081	-	-
Borg Warner	S-1107, S-1107-P, S-1107-PL	-	-
Bosch	0 204 Y82 119 Type 1, N67F 827 04	ES-2670; ES-2979	-
British Standard	-	-	BS7371 Part II
Carrier	-	PL-115	-
Caterpillar	-	IE 1675G	-
CONTINENTAL TEVES	ATE N 106 36.31; N 106 61.00 Ob No. 1521	-	-
Cummins	-	74038; 74039; 74040; 74044	-
Daimler Chrysler	PS 5873L; PS 5873; PS 5873; PS 5873 Black; PS 9666	PS5873; PS5873L; PS- 9666	DBL 8440
Dana	ES-PS-0618, ES-PS-0618, ES-PS-0618	20415A	-
Delphi	DX551501, DX551502, DX551503, DX551504, DX551505, DX551506, DX551507, DX551508, DX551509, DX551510	DCM 5157, DX55007	-
E-Z-Go Textron	-	GS-726-132	-
Ford Motor Company	WSS M2PP178; WSS-M21P39-A1 (S438); WSS-M21P39-A2; WSS M21P39-A3; WSS-M21P36-A4, WSS-M21P36-A5; WSD-M21P13-A1, WSS-M2P178	WSD-M21P13-A1/4	WSD M11 Part B2; ESA- M21P11; WSD M21P11
FIAT	-	-	9:57512
General Electric	-	F71H1-S3	-
General Motors	GM 6173M, GMW 3359, GMW 14, GME 00 255 F	GM 6173M	-
ISO	ISO/CD10683 fZnnc-240 h-L, ISO/CD10683 fZnnc-480h-L, ISO/CD10683 fZnnc-720h-L, ISO/CD10683 fZnnc-960h-L	fZnyc-240h-L; fZnyc- 480h-L; fZnyc-720h-L; fZnyc-960h-L	-
John Deere	-	JDM F13	-
Kelsey Hayes	-	S-12599900	-
LUCAS GIRWING	-	-	T 32-21-102
MAGNETTI MARELLI	-	-	G 86043
Mercedes-Benz	GM 6173M, GMW 3359, GMW 14, GME 00 255 F	DBL 9440	-
OPEL	-	-	GM 4255
PEUGEOT	STE9642461499	-	-
Renault	01 - 71 - 002 / - - J	-	-

Rover Group	-	-	RES 21 ZS 05
SAAB	-	-	GM 7111
SEAT	TL 193	-	TL 233
Tenneco	PS-152.09, PS-152.09A	-	
TRW	TS 2-25-60- Class C, TS 2-25-60- Class D, TS 2-25-60- Class E, TS 2-25-60- Class F	-	-
VISTEON	VE1S7W-1125-B3C	-	-
Volkswagen AG	TL 245 t620, TL 193	-	VW TL 233
VW Group	TL 193	-	-
VOLVO	VCS 5737,29 (Car) Y200-3, VCS 5737,29 (Truck) Y200-4	-	V00B 416
WABCO	-	-	JED 232; ZFB998

Table 4 Autophoretic approvals for ACC by worldwide known automakers.

Automaker		Autophoretic Approvals
Ford	Autophoretic specific specifications Ex-USA	ESB-M 64J 27 A1-A4 ESB-M 2P 133-A
	Conforms to the current Ford Europe chassis specification	WSK-M2P-153-A1 to A6 (all variants)
G.M	Autophoretic specific specification	9984132
	GM Delco	DM 6081 (Booster Housing) TMR AA 001 (Leaf Springs)
	GM IFG	MG-14A (Steel Parts)
Chrysler	Autophoretic specific specification	PS-6061
General Electric		F5 OLD 6
Rover		Conforms to Rover RES 22-OF-02
Peugeot Citroen / Renault		Currently approvals are being sought by Licensee CFPI in Paris
German Auto Industry		Currently ACC 866 panels are on test by Mercedes-Benz Sindelfingen

4. CONCLUSION

On the basis of presented information, following can be concluded:

- Environmental regulations and specifications of all major OEM's have restricted the use of Cadmium, Chromium and Organic Solvent. These materials, whether by themselves or a component of a finishing system, contribute to corrosion protection, but they have been linked to varying degrees of health concerns.
- The development method is a water-based, chromium free coating for parts ranging from fasteners to disc brake rotors.
- Approved by all major OEM's a new corrosion protection method offers consistent lubricity, bimetallic compatibility with Aluminum, solvent resistance, conductivity and heat resistance in a total film thickness of 10-14 microns.
- The following are some of the standards that set the exposure limits of hazardous materials that are used in application and assembly facilities (DaimlerChrysler CS-9003, General Motors GMW 3059, Ford WSS-M99P9999-A1, EC Directive on End of Life Vehicles etc.).

5. REFERENCES

- [1] Alagić I.: "New Technology for Corrosion Protection of Automobile Parts - Visible Quality", 3rd International Conference «UPS 2004», Proceedings, University of Mostar & DAAAM International Vienna Mostar, B&H, 2004.
- [2] Dacral S.A. Creil, GEOMET-Corrosion protection for brake discs, France, 2005.