Number 29

SYSTEM MAINTENANCE
TECTYL® 603
(General Motors Standard 6035M)

To ensure you are able to meet the salt spray requirements specification for GM standard 6035M on your production parts, the following procedures must be followed:

I. Review the procedural steps outlined in the GM 6035M Specification.

II. PHOSPHATE COATING

Check the weight of your phosphate coating. The coating weight of the zinc phosphate must be 26 - 32 g/m^2 (2000 - 3000 mg/ft^2) If the parts are not coated to this weight, they will not pass the salt spray requirement. Daily coating weight checks must be made. Daily panel runs is the preferred method. Avoid burnishing parts. Handling of phosphated parts must be kept to a minimum to avoid phosphate removal.

A) Maintain the temperature of the phosphating solution at 75 - 90°C (167 - 194°F).
B) The iron in solution, and acid ratio must be monitored and recorded every four hours of processing. Maximum allowable iron in solution is 1 percent or 10 grams/liter. Acid ratio should be 6 - 1 (±1).
C) Immerse parts for a MINIMUM of ten minutes.
D) To minimize abrasion, barrel speed must be within 1/2 - 2 RPM. Do not exceed 2 RPM.
E) Continuous overflowing rinses must be controlled by titration or conductivity.
F) Final rinse MUST be a hot rinse and be maintained at a minimum temperature of 75 - 90°C (167 - 194°F).
    1) If non-chrome is utilized, it must be amine free.
    2) If chrome is utilized, it must be reactive chrome system.

III. Tectyl® 603--Polymeric Emulsion Coating

A) Parts must be treated with Tectyl® 603 polymeric emulsion within 8 hours after phosphating. It is preferred that the parts be coated with Tectyl® 603 while hot from the dryer. Drying temperature should be 70 - 90°C (158 - 194°F).

B) Directions for Tectyl® 603 Polymeric Emulsion Initial Fill:
   1) Charge system with de ionized water, leaving enough room in tank to make a 20 percent emulsion (20 percent Tectyl® 603 concentrate).
   2) Begin agitation. Mechanical agitation (not air) must be used.
   3) Heat water to 60 - 71°C (140 - 160°F).
   4) Add Tectyl® 603 slowly, with agitation, to develop the 20 percent emulsion. When mixing, always add the Tectyl® 603 to the water, never the reverse.
   5) The Tectyl® 603 emulsion temperature at the time of application should be 60 - 71°C(140 - 160°F)

C) Check the Tectyl® 603 polymeric emulsion for proper ratio and pH once per shift. ALL PARTS MUST BE DRY BEFORE COATING. Dryers should be belt type. Do not use rotary drums or batch ovens. Temperature of drying oven must be between 70 - 90°C (158 - 194°F)
   1) Use concentration of Tectyl® 603 emulsion should be 20 percent minimum, 25 percent maximum (concentrate).
   2) Use De ionized water for initial emulsion and makeup.
   3) Maintain the Tectyl® 603 emulsion temperature between 60-70°C 140-160°F).
   4) Completely immerse all parts in the Tectyl® 603 Emulsion so that each part is thoroughly coated. A minimum of 30 seconds immersion is required.
   5) Continuous circulation of tanks must be maintained with mechanical mixers ONLY, air agitation is not permitted. Mechanical mixers must be of sufficient size to provide continuous movement of the liquid surface.
   6) pH should be 7.5 - 8.0. Adjustment is not normally required. If adjustment is required, contact your supplier for recommendations and procedures.
   7) Under proper and continuous agitation, skinning of the emulsion should not occur. If skins or insolubles should occur, they should be removed. Their removal will not affect the performance of Tectyl® 603.

D) BACTERIAL CONTAMINATION/ODOR
   Bacterial contamination/odor is not normally encountered in a properly maintained system.
   The following steps must be taken to prevent bacterial contamination/odor.
   1) Agitate (mechanically) at all times (24 hrs/day - 7 days/wk).
   2) Keep emulsion between 60 - 71°C (140 - 160°F) at all times and maintain proper water/emulsion ratio.
   3) Cover when not in use.
   4) If system goes rancid, call your supplier. Do not add biocides before consulting supplier.

E) RECOMMENDED SPLITTING PROCEDURE FOR TESTING THE CONCENTRATION OF A Tectyl® 603 EMULSION:
   1) Add 50 ml of Tectyl® 603 Emulsion to a 100 ml stoppered graduated cylinder.
   2) Add 50 ml of 50 percent reagent grade sulfuric acid.
   3) Slowly, carefully and thoroughly mix the stoppered cylinder. (This mixture will get hot and build up pressure. Relieve pressure by pointing cylinder away from people and removing stopper). Allow the fluid to stand until separation.
   4) Multiply the amount of milliliters of the (upper) oil phase by 2 to get the actual concentration.
   5) If the oil phase is difficult to read, dilute test emulsion 50:50 with water and multiply oil phase by 4 to get actual concentration.

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F) GM 6035M LABORATORY TEST PROCEDURE
The GM 6035M Laboratory Test Procedure is as follows:
1) Neutral salt spray testing shall be conducted according to GM 4298P.
a) Salt spray test is to be conducted after sample parts have been room temperature cured for 24 hours minimum.
b) After the above 24-hour period, parts processed to GM 6035M shall be immersed in a 5 ml/l room temperature solution prepared fresh daily of a 30 percent alkyl benzene sulfonate car wash such as Borden's Rain Dance car wash concentrate and de ionized water for 30 seconds, using a stirring device to obtain moderate agitation, followed by rinsing is a overflowing container with room temperature tap water for 30 seconds, and forced air drying. Avoid excessive handling between the above washing procedure and placement in the salt spray cabinet.
2) Phosphate coating mass per surface area may be determined by either the Standard caustic soda method or standard chromic acid method on panels or actual parts.
3) Uniformity of the zinc phosphate coating may be determined using procedure 3 or 4 of GM 9079P, Test for Evaluating Zinc Phosphate Coating, except that the oil is removed with methyl ethyl ketone prior to test and that the surface shall be all yellow except for sharp edges that may be worn due to handling and isolated blue spots that may be the result of iron dragout.

IV. IMPORTANT REMINDERS

A) All parts MUST be properly cleaned. Check parts carefully to make certain that no metal working fluid residue remains on the surface.
B) Parts should be examined after phosphating to assure that a uniform phosphate coating has been disposited. Lubricants used in the forming of parts must be compatible with the cleaning system in your phosphating process. Improper cleaning and pickling can result in an inconsistent spotty phosphate coating which will perform poorly in salt spray.
C) Burnishing of the parts indicates improper handling during or after phosphating, and normally results from excessive rotation. Corrective action must be taken.
D) All parts coated with Tectyl® 603 polymeric emulsion must be fully cured within 24 hours. Radiant or forced air curing (200°F or lower) is preferred. Bulk drying is not recommended. Parts should be examined after 24 hours. If any parts show a white emulsion, they have not been sufficiently cured and should not be packaged for shipment.

GM 6035M Trouble Shooting Chart

Tectyl® 603 Emulsion Troubleshooting Chart

Problem	Cause	Solution
1. Tectyl® 603 Emulsion shows very high concentration	1. Evaporation of water from bath	1. Maintain liquid level in tank (checking concentration)
2. Tectyl® 603 Emulsion with heavy creamy layer on surface	1. Improper mixing 2. pH too low 3. Contamination	1. Maintain turn over of tank for homogeneous solution 2. Maintain pH 7.5-8.0 3. Contact supplier
3. Tectyl® 603 Emulsion Excessive Foaming	1. Level of tank low causing introduction of air through mixer 2. Using air agitation	1. Maintain level of tank at predetermined level at all times 2. **Use mechanical agitation only**
4. Tectyl® 603 Emulsion skinning	1. Inadequate mixing and maintenance	1. a) Improve Agitation b) Physically remove skin
5. Foul odor	1. High bacteria count	1 Agitate (Mechanically) 24 hrs/day (7 days/week) 2. Keep emulsion between 60-71° C (140-160°F) at all times and insure proper emulsion water ratio 3. Cover when not in use 4. If system goes rancid, call your supplier. Do not add biocides before consulting supplier.

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	Problem		Cause		Solution
I.	Incomplete or spotty phosphate coating	*1.	**Improper cleaning**	1.	a) Stronger cleaning solution b) Longer duration of time in cleaning solution c) Increase temperature on cleaning solution
		2.	Improper pickle	2.	a) Bring pickling acid solution to correct concentration (sulfuric acid only) b) Longer immersion time c) Increase temperature on pickling solution
II.	Premature salt fog failure	*1.	**Improper phosphate coating**	1.	a) Check phosphate coating weight (see section III.) b) Check for spotty phosphate coating (see section I)
		2.	Improper concentration of Tectyl® 603 Emulsion	2.	Check Tectyl® 603 emulsion and adjust to 20-25% concentration
		3.	Improper handling during processing	3.	Burnishing may be occurring during processing. Check handling and drum rotation (should be 1/2-2 RPM) to minimize abrasion after phosphating stage.
		4.	Parts not dry prior to treating with Tectyl® 603 Emulsion	4.	a) Increase drying temperature b) Decrease mass of parts to increase air contact c) Slow belt conveyor to increase dry time d) Temperature range of final rinse to aid evaporation should be 75-90°C (167-203°F)
		5.	Final rinse not a proper concentration	5.	Maintain concentration to suppliers standard
		6.	Improper storage prior to treatment with Tectyl® 603 Emulsion	6.	Dry and coat parts with Tectyl® 603 within 8 hours of phosphating
		7.	Incomplete curing of Tectyl® Emulsion	7.	Lengthen air cure time of Tectyl® 603 emulsion to 24 hours
		8.	Drying temperature too high	8.	Maintain drying oven at 60-70°C (140-160°F) lower
	* Most probable cause inconsistent salt fog results within a given batch	9.	Improper drying causing: a. overheating b. wet parts	9.	a) Decrease to prevent air temperature dehydration of phosphate b) Increase air flow or temperature for mass of parts being dried

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	Problem	Cause	Solution
III.	Phosphating coating weight low	1. Improper pickle	1. a) Correct concentration of acid bath b)Hot sulfuric acid is recommended
		2. Concentration of phosphate bath low	2. Maintain proper free to total acid ratio
		3. Free iron too high in phosphate bath (over 1 g/liter)	3. Recharge tank
		4. Contamination due to improper rinsing	4. Overflow rinse tanks
		5. • Inadequate immersion time	5. • Increase immersion time
IV.	Parts rusting before treatment with Tectyl® 603 Emulsion	1. Improper concentration of final rinse	1. Maintain concentration to suppliers standard
		2. Improper dry and or storage	2. a) Decrease mass of parts to increase air contact b) Slow belt conveyor to increase dry time c) Temperature range of final rinse to aid evaporation should be 75-90°C (167-203°F) d) Increase air drying temperature e) Coat parts with Tectyl® 603 within 8 hrs. of phosphating
		3. Incomplete or light phosphate coating	3. See section I. and section and section III.