GM | ENGINEERING STANDARDS | Material Specification Test Method | GMN6752

Test Method To Quantify Foreign Material On Engine and Transmission Components/Assemblies

1 Scope

This document outlines a method for determining the weight of foreign material retained in metal mold castings, or in finish-machined components after final washing and just prior to assembly. This method may be used to quantify foreign material present in components, sub-assemblies and assemblies.

The method involves washing engine and transmission components deemed necessary with a specified wash fluid, collecting the rinse wash fluid, filtering solid materials from it and determining the weight of solids present.

Note: Nothing in this test method supersedes applicable laws and regulations unless a specific exemption has been obtained.

Note: In the event of a conflict between the English and domestic language, the English language shall take precedence.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 Normative. None

2.2 GM. GMW3059

2.3 Additional. None

3 Test Equipment

A list of equipment and materials which may be necessary and useful in evaluating components for sediment levels is shown in Appendix A. Specific recommendations as to equipment models and brands are listed in Appendix B.

4 Test Material

4.1 For engine components, 10-micron filter paper or nylon filter membranes shall be used. Nylon membranes have been found to absorb less fluid (thus requiring less drying time) and to facilitate qualitative analysis of sediment; however, they are more costly.

4.2 For transmission components, sub-assemblies and assemblies, 44-micron and 10-micron filters in series are required.

4.3 A 5-micron filter (or equivalent) shall be used for filtering wash fluid that is recycled to a reservoir.

4.4 Acceptable wash fluids are listed in Appendix B.

5 Test Method

5.1 Summary of Test Method

This method involves removal of sediment from production components by rinsing, collecting the sediment using suitable filtering apparatus, and weighing and reporting the total mass of sediment found.

5.2 Test Sample Preparation

Prior to sediment evaluation, test samples must not be rinsed, wiped or cleaned in any way other than what is typical for the production process. Lot numbers or other pertinent shipment information should be recorded for samples to be tested.

5.2.1 Transmission components, sub-assemblies and assemblies shall be obtained in accordance with local plant procedures as to sampling point and frequency.

5.2.1.1 When evaluating assemblies, torque converters shall be checked separately, exterior surfaces shall not be rinsed as part of the procedure, and valves shall not be removed from bores.

5.2.2 Engine components shall be obtained from the production line at final washer exit in order to monitor and control washer effectiveness.

5.2.2.1 Components may be obtained from the production process at the point of their inclusion into the engine assembly (if they are washed at the engine plant) or as shipped from a supplier (if shipped directly to the assembly line).

5.2.2.2 Test frequency should be daily by component. Sample size must be sufficient to allow for statistical control of production processes and establishment of control limits. Reduced sampling is possible based on statistical data showing process capability.

5.2.2.3 Reintroduction of test samples into the production process must occur before the final wash.

5.3 Test Procedure

5.3.1 Prepare test equipment and materials.

5.3.1.1 Oven dry the required number of filters for 2 hours minimum. Allow filters to cool for approximately 30 minutes in a desiccator prior to use. Filter drying time may be significantly reduced depending on current plant practices and production schedules.

5.3.1.2 Record the weight of filters in grams to four decimal places.

5.3.1.3 Rinse collection sink/tray with wash fluid and squeegee (optional) to remove foreign materials. Equipment and materials should be protected from environmental contamination and should be clean and dry.

5.3.1.4 Monthly wash fluid cleanliness check (for sites that recycle fluid). Collect at least 1 liter of wash fluid in a clean beaker and note the volume used. Filter the fluid with vacuum assist through a pre-dried and pre-weighed 10-micron filter. Remove filter from the funnel and expose to drying cycle (5.3.5). Determine amount of residue collected by subtracting original filter weight from weight of filter+residue. If amount of residue exceeds 0.50 mg/liter, wash fluid must be replaced with new. Wash fluid must be replaced annually regardless of test results.

5.3.2 Place component to be evaluated in the clean collection tray and rinse surfaces of interest with wash fluid. Engine Plant rinse device should include a 3.0 mm (inside diameter) spray nozzle and a pressurized wash fluid reservoir resulting in a constant 1.0 l/minute (minimum) flow rate of wash fluid onto the sample. Transmission Plant rinse device will be a hand held spray gun with 10 psi nozzle pressure (see Appendix B for specific equipment part numbers). Effort should be made to insure that all foreign material and loose debris is removed from the component. Collect all wash fluid in a clean beaker making sure to flush, squeegee (optional) and collect all sediment from the tray. Mark the beaker for identification.

5.3.2.1 Engine components with internal oil and/or coolant passages (ie engine blocks) shall be rinsed such that sediment levels are established for each type of passage. Water passages must be rinsed first. Though not required, a brush may be used to help remove sediment from a passage; however, a different clean brush should be used for each type of passage (ie oil galleries, coolant passages, etc.).

5.3.2.2 Burrs resulting from machining operations, casting processes, etc. which remain attached after rinsing (5.3.2) shall be documented and reported to the appropriate manufacturing department. Local procedures may dictate that attached burrs be manually detached after rinsing and included in the total sediment weight.

5.3.2.3 Any plant specific procedures regarding rinsing sequence, burr reporting, etc. must be the same site-to-site for similar components.

5.3.3 Place dried and weighed 10-micron filter (engine component) or 44 and 10-micron filters (transmission components) in the filtration funnel.

5.3.4 Remove the beaker from the collection tray and filter its contents through the funnel using a vacuum assist. Rinse the beaker thoroughly and transfer the wash fluid to the funnel for filtering.

5.3.5 Carefully remove the filter from funnel and expose to one of the following drying cycles.

5.3.5.1 For transmission assemblies, filters must be dried 12 hours minimum at 60 ° C. For components and sub-assemblies, filter drying cycle will vary and depend on time required for filter weight to stabilize.

5.3.5.2 For engine components, filters must be dried a minimum of 2 hours when water-based wash fluids are used. Filter drying time may be significantly reduced depending on current plant practices and production schedules as long as there is evidence that filter weight has stabilized for that cycle.

5.3.6 After drying, the filters shall be placed in a desiccator to cool for approximately 30 minutes. Debris samples must be properly identified.

5.3.7 Weigh dried filter+sediment and record weight.

5.3.8 Return washed parts to departments from which they were taken unless surface condition

has been degraded or component has been disassembled during sediment testing. Transmission seals and clutch plates must be scrapped.

6 Evaluation and Rating

6.1 Determine total sediment weight by subtracting filter weight (5.3.1.2) from weight of filter+sediment (5.3.7).

6.1.1 The need for additional sediment analysis will depend on whether possible sources of contamination must be identified.

7 Report

7.1 Transfer engine data to SPC charts and plot the data, where applicable. Transmission data should be recorded on suitable Quality charts.

7.2 Notify Production department supervisor of any out-of-control points or otherwise undesirable conditions.

8 Safety

This method may involve hazardous materials, operations and equipment. This method does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

9 Coding system

This material specification shall be given in other documents, drawings, VTS, SSTS, CTS etc. as follows:

Test to: GMN6752

Where

GMN = Validation Area (North American)

GMN# = Base Test Method Specification

10 Release and Revisions

10.1 Release.

This test method originated in February, 2001 and was approved by PT/Matls. Engrg. in February, 2001. It was first published in June, 2001.

10.2 Revisions.

Rev	Date	Description (Organization)
	2/01	*Initial Rel. (PT/Matls. Engrg)*
A	*2/02*	*Re-write to commonize Engine and Trans. Procedures. (PT/Matls. Engrg & Plants)*

Appendix A

This test method will require the use of most of the following lab equipment.

A1 Drying oven with thermometer

A2 Desiccator

A3 Magnet

A4 Analytical balance

A5 Brushes

A6 Vacuum pump, manifold and trap

A7 Squeegee

A8 Drum pump

A9 Stainless rinse collection sink (washable, drainable)

A10 Side-arm flask, filter funnel, beakers, wash bottles

A11 Sediment wash cart

A12 Air line and hose

Appendix B

Some specific equipment that has proven useful in testing is listed below. Other brands/models may be used as long as the test procedure is not compromised.

B1 Nalgene vacuum manifold – Catalog #345-0001

B2 Jabsco drum pump – Model #16520-3350 (To be used with air pressure of 50 psi).

B3 Spraying Systems Co. GunJet – Model #31-39430 (Source: Industrial Hose and Hydraulics, Ltd., 905-688-1243).

B4 Vacuum pump – Gast 0211 Series, oiless (Pump to be set at 15 in. of Hg.); or Piab, Inc.

B5 Wash Fluids – TechSolv 331 or 336; Chemcentral SC142; Betz Permatreat 435 (4% solution); Citrikleen 3SR166 (1:10 in water); Odorless mineral spirits (Transmissions only).

B6 Nylon filter membranes – Great Lakes Filters P/N's 325-041-8000 (engines) and 321-041-8000 (transmissions). Phone #800-521-8565.

B7 Stereo-microscope.

B8 Solvent Handling System (Transmissions)

B8.1 Sanborn paint tank and sprayer #011-0798 (pressurized container).

B8.2 Whatman Gamma-12 high performance in-line filter unit.

B8.3 Whatman filter tube 12-10 (VWR #28205-349).

B8.4 Whatman filter tube 12-80 (VWR #28205-280).

B8.5 Millipore 25mm Filter-Jet solvent dispenser.

B9 Vacuum Filtration System (Transmissions)

B9.1 Kewaunee Scientific 4-foot airflow supreme hood.

B9.2 Gelman Sciences parabolic filter 4230.

B9.3 Funnel with Essig fitting.

B9.4 Gelman Sciences support screen 4235, serial #14770-00.

B9.5 5-gallon bottle.

B9.6 Hazardous waste collection drum.