SHERWIN INCORPORATED

DUBL-CHEK PENETRANT PROCESS



PSM-5™ PANEL USAGE AND MAINTENANCE

(Pratt & Whitney Tam 146040)

USAGE

GENERAL PROCEDURES

Use the Sherwin Incorporated **PSM-5™** Panel ("G" or "P" models) at the beginning of each work shift to monitor a penetrant system for any sudden changes in materials or hardware performance. Conduct the "system test" prior to accepting production parts, and record the processing variables in a log book-e.g., dwell time, pre-wash time, emulsifier immersion and drain times, oven temperature and exposure time, wash water temperature and pressure, and developing time.

Processing times for the **PSM-5™** Panel should be those least conducive to high sensitivity performance within allowable time envelopes. For example, if the allowable penetrant dwell time is 10 to 30 minutes and the wash time is 1 to 3 minutes, the **PSM-5™** Panel should be processed with the shortest penetrant dwell time (10 minutes) and the longest wash time (3 minutes).

PSM-5™ Panels are normally used in pairs. Although no two **PSM-5™** Panels have exactly the same crack patterns, there is a *very* close similarity in patterns. Upon receipt, since there is a difference in crack patterns, the panels should be processed to establish a baseline in order to record crack characteristics for reference purposes.

Designate one panel in a pair as the "working panel" and the other as the "control," or "master panel." Use the working panel to conduct routine system tests. Periodically use the control panel to validate the working panel, or to verify system anomalies revealed by the working panel. Additionally, both panels should be validated periodically against each other in a laboratory using new materials. It is also beneficial to compare periodically the working panel processed with material from the production line against the control panel processed with new materials from the laboratory. Production technicians should observe these tests.

ESTABLISH A BASELINE FOR NEW PANELS

1. Establish a baseline for new panels by processing with unused penetrant materials. Use the same materials and processing parameters as used in the penetrant system which the panel is intended to monitor. In particular, if dry powder developer is used, apply the powder in the same manner as in the actual system, e.g., dust chamber, immersion, electro-static, etc.

   Record the baseline, i.e., the number of cracks detected, their appearance, as well as background condition.

2. After establishing the baseline, clean the panel following specified procedures.

   AMS 2647-B specifies cleaning and storing according to the manufacturer's instructions, or according to AMS 2647-B paragraphs 3.3.7.1 through 3.3.7.3, which, in brief, suggest removing the developer with water and a soft bristle brush, drying, then soaking the panel in a volatile solvent, e.g., isopropyl alcohol (Sherwin DR-63), acetone (Sherwin DR-64), methylethyl ketone, etc., for at least ten minutes. Then, dry thoroughly before reuse.

   Do not store **PSM-5™** panels in an alkaline solution.

   Sherwin Incorporated's recommended post-cleaning procedures are found in the "Maintenance" section of this bulletin.





SPECIFIC USE PROCEDURES

1. A **PSM-5™** Panel must be clean and completely dry before use. Follow the procedures described in the "Maintenance" section of this bulletin.

2. Place the **PSM-5™** Panel near the center of the parts basket in as near an upright position as possible; it should not lie flat. Typically, the panel is processed with the "E" or largest crack center in the top position. The panel should be positioned the same way *every* time a test is conducted.

3. Process the **PSM-5™** Panel at the beginning of each shift. Record all processing variables in a log. The panel may be processed alone or with other parts. If it is processed with other parts, insure that the other parts do not damage the panel. Also, if the panel is processed with other parts which must be pre-cleaned, do not pre- clean the panel if there is danger to the panel of thermal shock.

4. Follow normal production procedures. If processing manually, the suggestion is to use parameters most adverse to system performance, such as...

   a. ... minimum allowable penetrant dwell time.
   b. ... maximum allowable wash, emulsifier immersion and drain times.
   c. ... maximum anticipated wash pressure and temperature.
   d. ... maximum anticipated oven temperature and exposure time.
   e. ... minimum allowable developing time.

5. Handle the **PSM-5™** Panel with reasonable care to avoid scratches, thermal shock, or other damage.

6. Clean the **PSM-5™** Panel immediately after use. See the section on "Maintenance" for cleaning procedures. Be sure the panel is completely clean and dry before each use.

SPECIAL USAGE CONSIDERATIONS

1. Use a separate set of **PSM-5™** Panels for each penetrant system. Do not use penetrants with different sensitivity levels on the same set of panels.

2. **PSM-5™** Panels should be recalibrated periodically. One major company, which mandates the use of **PSM-5™** panels, based on their experience, requires the recalibration of their own, in-house panels approximately every six months. Experience has shown that recalibration requirements will vary with how much a panel is used and with how well it is maintained. Sherwin Incorporated recommends that **PSM-**5™ panels be recalibrated, at least, annually.

   Panels may be returned to the factory for cleaning, re-grit blasting, crack measurement, and recertification. Obtain quotes from Sherwin Incorporated.

3. **PSM-5™** Panels should be protected from scratches, thermal cracking, over-rubbing of grit blasted surface, and exposure to corrosive materials.

4. With usage, there is a tendency for the smallest cracks to clog with residue and for the grit blasted area to lose its roughness. Please refer to the "Maintenance" section of this bulletin.

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MAINTENANCE & CLEANING

Sherwin Penetrant System Monitor Panels (PSM-SG and PSM-5P) are fabricated from chrome plated stainless steel for long service, and. while not as easily damaged as a NiCr Sensitivity Panel or as subject to corrosion as a cracked aluminum block, PSM-5™ Panels should be handled properly to avoid:

1. Scratching the chrome or grit blasted sections.
2. Excessive heat that might crack the chrome plating.
3. Excessive rubbing or brushing that might diminish the grit blasted roughness.
4. Over exposure to corrosive materials that might pit the chrome plating.
5. Contamination and clogging of cracks.

Common sense and careful handling will guide users in avoiding most risks to a panel's utility. Cleaning requires a little more care.

POST CLEANING IS MOST IMPORTANT

Post-cleaning is essential in order to delay or prevent clogging of the small cracks which the PSM-5™ Panel contains. The Panel should be cleaned immediately after each test. Do not allow penetrants to dry or oxidize in the cracks.

Clean after every use– Extended soaking - at least 4 hours in a volatile solvent, such as isopropyl alcohol (Sherwin DR-63 Cleaner/Remover), is recommended. Prior to soaking, it is advisable to remove developer particles from the panel surface with a weak detergent solution (e.g., ER-83A, 1-5% solution) and a soft bristle brush, followed by a plain water rinse. There is no need to dry the panel before alcohol immersion (CAUTION: isopropyl alcohol is a flammable solvent.) Ultrasonic cleaning with a volatile solvent is preferred post-cleaning method, providedthe selected solvent meets safety and health requirements. (A water-based detergent solution used in an ultrasonic cleaner is also beneficial, but it should be followed by a soak in isopropyl alcohol, or similar solvent.)

Clogged cracks–There is a tendency for the smallest crack (.015-.031" diameter by .003" deep) to clog with residues, such as developer particles and hard water minerals (calcium/magnesium) and become undetectable. This can be minimized if post- cleaning includes removing developer particles with a mild detergent solution, as recommended above, and using de-ionized or distilled water when processing the panel, especially in the final rinse.

One way to unclog cracks is to place a drop of a mild acidic material, such as a household mineral remover (e.g., "Lime Away") directly on the crack for about three minutes. Then rinse thoroughly with water. Use de-ionized or distilled water if the next step is to dry the panel.

Dry Before Re-Use–Solvent or water in PSM-5™ Panel cracks will interfere with tests and must be evaporated before using the Panel. Allow the Panel to dry completely before conducting any test. If dryness is doubted, oven dry the panel. Prevent cracking by allowing the Panel to cool before applying penetrant.

Periodic Thorough Cleaning–Despite routine post-cleaning, penetrant residue will accumulate in the cracks. Therefore, a more thorough cleaning followed by close inspection using a developer should be a periodic step in maintaining the PSM-5™ Panel.

Allow the panel to soak overnight in solvent. After it is dry, apply a heavy coat of nonaqueous developer, such as Sherwin Incorporated Dubi-Chek D-100. Next, place the panel in a 180°F oven for ten minutes. The developer and heating will draw- dissolved penetrant residue to the surface. Allow the panel to cool, and, without removing the developer, examine it under a black light. if the cracks are readable, continue applying developer, heating and examining the panel until the cracks are no longer readable. For especially contaminated panels, additional soaking as well as ultrasonic cleaning may be required.

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Panel Life– Several factors affect the PSM-5™ Panel's life. Excessive thermal cracking, gouges, scratches, and rough handling shorten the panel's life. Also, the induced cracks propagate naturally with temperature cycling and general usage. Tight cracks may resist cleaning. The grit blasted section may become smooth with wiping and handling. Eventually, a panel will have to be replaced.

Recertification — One major company, which mandates the use of PSM-5™ panels, based on their experience, requires the recalibration of their own, in-house panels approximately every six months. Experience has shown that recalibration requirements will vary with how much a panel is used and with how well it is maintained. Sherwin Incorporated recommends that P5M-5™ panels be recalibrated, at least, annually.

Panels may be returned to the factory for thorough cleaning, re-grit blasting, and crack measurement. If a PSM-5™ Panel can be restored to conform to the original Pratt-Whitney drawing, it will be recertified. The fee for recalibrating and recertifying a PSM-5™ panel will be quoted on request. Allow approximately ten working days for shipping and processing.