

PSM-5 Panels

The "Penetrant System Monitor", a metal panel, provides a quick means of determining the continued serviceability of a liquid penetrant inspection system, fluorescent or visible and water-washable, post-emulsifiable or pre-wash.

Specification - Pratt & Whitney TAM 146040 and others.

When it is used

The **PSM-5** panel should be processed at the beginning of each shift (and more frequently, if the system has exhibited unreliable characteristics) to verify system performance. It should also be processed whenever the penetrant system is suspect.

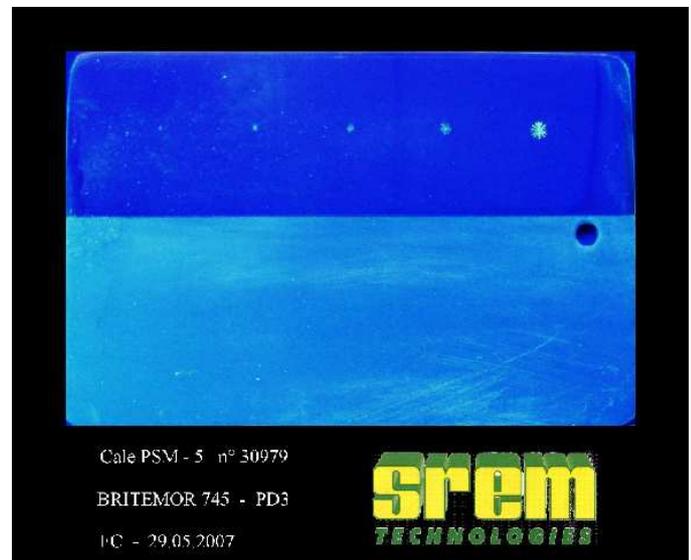
The **PSM-5** panel does not replace periodic examination of chemicals for brightness, water contamination and similar nor does it replace periodic inspection of pressure and temperature gauges, nozzle apertures, etc. A gradual change in performance, in all probability, will not be noted by use of the **PSM-5** panel. It detects the sudden change. It should not be used as a sensitivity comparison tool. It does not replace the NiCr panel.

Description

PSM-5 is a stainless steel panel, 0.090 inches thick, measuring 4x6 inches. A strip of chrome plating runs the length of one side of the panel. Five crack centres are evenly spaced in the chrome plating. The crack centres are in raised circular patterns and are arranged in order of magnitude. They take a star or sunburst appearance.

The largest is readily visible with low sensitivity materials. The smallest is difficult to observe even with high sensitivity materials. It may appear as a single or dual line rather than as a sunburst or a star. No two panels are identical. Crack patterns vary from panel to panel, as chrome plate properties and thickness cannot be precisely controlled.

Adjacent to the chrome plating is an oxide grit blasted area, considered as "medium roughness". A serial number is on the reverse side.



All specifications are subject to change without notice

What it signals

The **PSM-5** panel clues the technician to major shifts, such as listed below, which affect performance:

- ✓ Penetrant composition (by contamination)
- ✓ Emulsifier composition (by contamination)
- ✓ Hydrophilic emulsifier - too little or too much water
- ✓ Developer concentration
- ✓ Penetrant dwell time and mode
- ✓ Emulsifier dwell time
- ✓ Developer dwell time
- ✓ Wash water pressure, temperature and dwell
- ✓ Oven temperature and dwell, either under or over

Shifts in any one of the above aspects affects performance, and if significant will be signalled by a change in crack and/or background appearance. (About the only shift not clued is one occurring in the pre-cleaning stage.)

When it is used

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How it is used

The effectiveness of the **PSM-5** panel is directly dependant on the skill of the technician. He must be able to discern a "difference" in the panel appearance from one test to another, such as an increase in background fluorescence or a marked decrease in flaw indication brightness.

Reading crack centers

Crack centres should be examined for "how", as well as "if" they are shown. For example, if the developer system is not in operation, crack centres of a given magnitude may still be revealed but they will not be as bright as normal. A change from sharp, bright indications to blurred, dull ones is a malfunction signal. The eye of the experienced technician is required to read the panel and to recognise that something is wrong.

Reading background fluorescence

Some penetrant systems, especially high and ultra sensitive, leave a fluorescent background on the grit blasted area of the panel. Other systems may give virtually zero background. Neither condition, in itself, is cause for alarm, provided it is not a sudden change in background appearance. A change in the background is a signal that something is wrong. For example, a higher level of background than normal in a hydrophilic emulsifier system might index over dilution of the emulsifier, shortened emulsification times, absence of the pre-wash etc. A lower level might indicate failure to dilute the emulsifier, over-extended emulsifier dwell, inadequate developer application, etc.

The panel monitors background level; it does not establish it. Acceptable background level is determined on actual production parts and will not be the same for every penetrant system. Even the chrome plate, itself, is revealing. Failure of aqueous developer to wet the chrome may mean solution strength is low or the wetting agent has biodegraded. Appearance of heavy spots on the chrome may have significance for some penetrant systems.

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Some things to observe

- ✓ Hold panel at angle, so mirror like chrome surface does not reflect ultra-violet light directly at the eyes or you will not observe lower power luminescent indications!
- ✓ Minimum developing time, usually ten minutes, is essential. Do not expect indications to appear instantaneously as with cracked aluminium blocks.
- ✓ Dry panel after post-cleaning. Solvent residues repel and retard penetrant flaw entry. Use separate panels for each penetrant system.
- ✓ Maintain operation parameters. Do not short-cut panel processing, such as substituting a hand wipe for an oven dry.
- ✓ Clean immediately after test; observe instructions in "PSM-5 Panel Maintenance" bulletin.

System sensitivity rating with PSM-5 panel

- ✓ The largest crack centre has a diameter of about ¼ inch, the second largest 5/32, the third 3/32, the fourth 1/16 and the smallest about 1/32.
- ✓ The ultra sensitive penetrant, e.g. Fluorescent Penetrant, should show all 5 cracks if all aspects are functioning properly.
- ✓ The high-sensitive penetrant, e.g. Fluorescent Penetrant, should reveal 4 cracks and, on occasion, the fifth and smallest crack.
- ✓ The medium-sensitive penetrant, e.g. Fluorescent Penetrant, should show the 3 largest crack centres and, on occasion, the 4th crack.

However, there will be medium sensitivity penetrants in given penetrant systems which will consistently show all 5 cracks on a given **PSM-5** panel. This is not necessarily a condemnation of the system, the materials or the panel. It may simply mean that ultimate performance is being obtained. A cause for concern, the alarm signal in this instance, would be a sudden change where only 3 cracks show and not the anticipated 5.

The purpose of the **PSM-5** panel is to alert the inspector to a sudden change. It is not a sensitivity evaluation tool. It does not replace the NiCr sensitivity panel.

Ultra Sensitive penetrant failure to indicate smallest crack

This failure is often result of a build-up of penetrant and developer residues from previous processing. The crack is clogged. Residues interfere with both penetration and rebleed. If the small crack is revealed bright and clear one day, but fails to show the next, the materials and system are suspect. However, if the smallest crack indication becomes less pronounced gradually, the first assumption must be crack clogging. See "PSM-5 Panel Maintenance" bulletin.

Separate panels for separate systems

Panel cleaning is difficult. Using the same panel in both high-sensitive and ultra-sensitive system, for example will result in false, misleading readings of system integrity.

Panel verification - the master panel

Not an infallible instrument, failure to detect the smallest crack, for example, may be the result of crack clogging and not penetrant system failure. Or excessive background on the grit blasted section maybe caused from grease or other contamination on the panel rather than inadequate penetrant system washing. For that reason, two panels, one to use on a daily basis and one retained as a "master" to be used only when necessary to verify the other panel, are usually a requirement.

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