



How to Maintain Penetrant Testing System Performance

Peak penetrant system performance is highly dependent on the integrity of the penetrant materials. Although penetrants are carefully formulated to withstand the abuse and rigors of the aerospace industry, any material is susceptible to contamination and degradation—and penetrant materials are no exception.

Magnaflux recommends that all users perform regular checks on in-use penetrants to comply with industry standards, ensure the conformance of penetrant materials and maintain the quality of penetrant system performance in aerospace inspections. Regular testing also helps establish the point of performance loss and material failure.

Causes of Contamination and Degradation

Some facilities apply penetrants on a one-time basis; others store penetrants in closed tanks or containers until used. However, most facilities use the immersion method, in which excess material is allowed to drain back after application to the part. With the immersion method, tanks often are open to the environment, which increases the possibility of contamination. Used penetrants should be checked periodically for color or consistency changes to ensure acceptable performance for the inspection process.

Contamination of penetrant materials can be caused by:

- **Water** Contamination from water, the most common contaminant, can result from careless rinsing, leakage from pipes or prewashed parts that are not fully dried. Water is not harmful until the water tolerance of the penetrant is met.
- **Dirt, soil and insoluble solids** Improper cleaning or allowing matter to fall into a tank can cause contamination.
- **Organic material** Oils, lubricants, paints, greases and organic solvents such as gasoline, cleaning solvents and degreasing fluid can cause contamination if not properly pre-cleaned. Although penetrants can absorb large amounts of oils and solvents, fluorescence will be decreased and washability will be affected.
- **Alkaline cleaners and acid** The most serious contaminants, alkaline cleaners and acid can destroy fluorescence upon contact. Also, some alkaline cleaners contain metasilicates, which can prevent penetrants from entering a crack.

Other causes of penetrant degradation include:

- **Heat** In some cases, heat can be used to speed up penetration. However, prolonged exposure to temperatures over 140°F (60°C) can reduce the fluorescence of penetrants. Temperatures over 250°F (121°C) will destroy fluorescence completely.
- **Evaporation** Penetrants stored in open tanks will undergo continuous evaporation, especially if they are stored in large tanks and exposed to warmer temperatures. Evaporation causes an increase in viscosity, which increases the dwell time, thus increasing labor time and inspection costs.
- **Faulty equipment** Un-calibrated or faulty equipment and accessories also can compromise penetrant systems. For example, drying oven thermostats or controls that are improperly set can lead to incorrect oven temperature readings. Also, water-pressure gauges can malfunction or output from black light bulbs can be reduced as bulbs age.

Effects of contamination and degradation will depend on the type and amount of contamination, but regular testing of penetrant materials is critical to finding problems and maintaining performance. Any changes in color or consistency should be addressed immediately to ensure consistent inspection results.