

# Dye Penetration Test Procedure

An Instructional Document

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## **Abstract**

This document describes how to test microfracture fatigue of non-porous materials using dye penetration testing.

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# 1 Introduction

## 1.1 How It Works

Dye Penetration Testing uses dye to penetrate microfractures in order to see surface cracks in smooth non-porous materials that would normally be naked to the visible eye. This test only tests for surface microfractures and cannot guarantee that the part is not fatigued below the surface.

## 1.2 General Steps

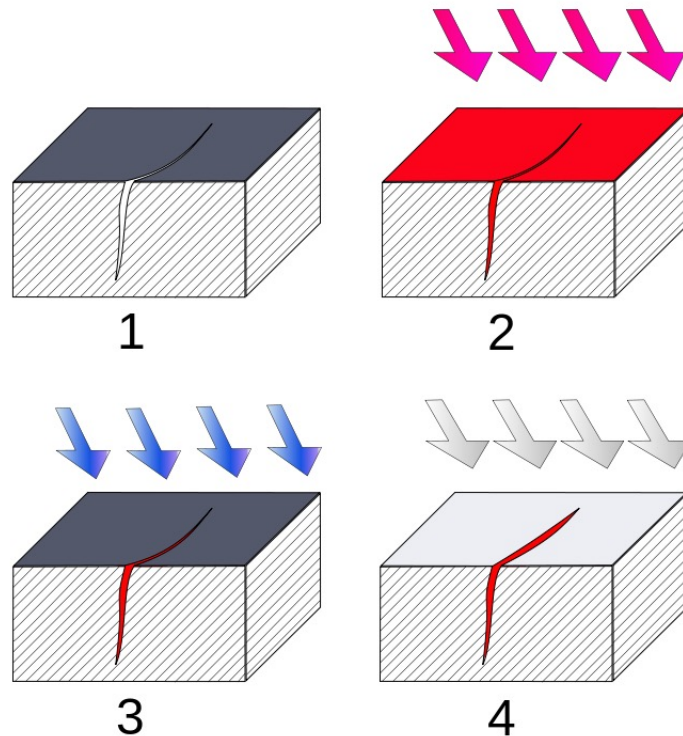


Figure 1.1: Dye Penetration General Steps — Source: wikipedia

1. Microfracture that is not visible to the naked eye (The gray is the raw surface material)
2. Penetrant is applied to the surface
3. Excess penetrant is removed

4. Developer is applied, rendering the crack visible

## **1.3 Tools and Materials Needed**

- Penetrant (spray can)
- Developer (spray can)
- Water bottle
- Soap
- Tooth Brush
- Shop Towels
- Stand to prop the part up

## 2 Detailed Instructions

### 2.1 Preparing the Part

1. Remove the part from the car because we will be spraying it with a colored aerosol
2. Clean the part using soap and a clean brush
3. Prop the part up leaving the faces in question easily accessible

### 2.2 Applying the Penetrant

1. Take the spray can and spray lightly until the part is **completely** covered (drips are fine)
2. Wait 10 minutes

### 2.3 Clean Off Excess Penetrant

1. Clean off all of the penetrant you can by dripping water on it  
**Do not spray water on the part or you will remove the penetrant in the cracks**
2. Wait for the part to dry very completely, you may lightly pad the part **Ensure no lint is produced**

### 2.4 Apply The Developer

1. Spray the developer very lightly until the part is completely covered  
**Ensure there are no drips**
2. Wait 15 minutes

When you apply the developer, the die gets pulled out of the crack onto the surface so as to be a lot more visible, note the figure below.

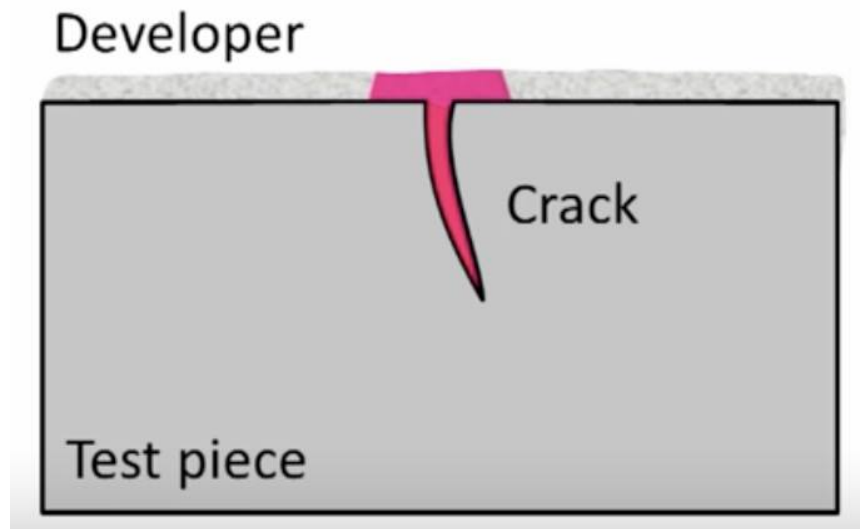


Figure 2.1: Die Getting Pulled Out of the Crack

## 3 What To Look For

### 3.1 Nonfatigued Part

- Completely white

### 3.2 Fatigued Part

- Colored lines, darkness does not quantify how deep the cracks are

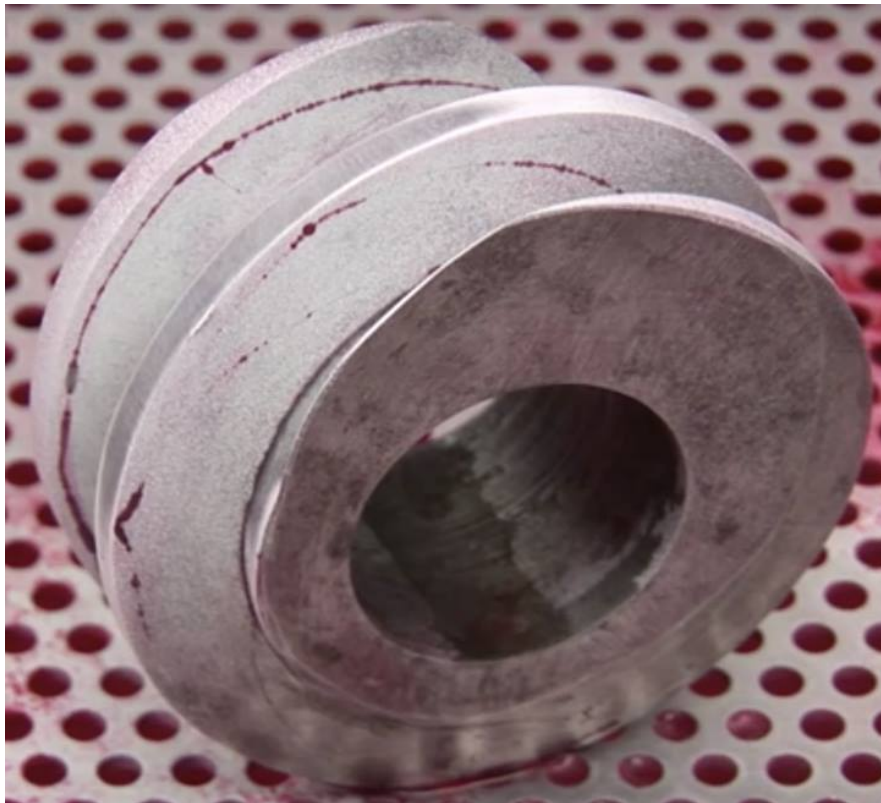


Figure 3.1: Microfractured Part

### 3.3 Misc.

- Patches of color means you did not clean the part well enough
- Pink cracks mean you did not wait long enough