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What force draws penetrant into a surface crack?

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What does a small contact angle tell you about a penetrant?

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Does a narrower opening pull a wetting liquid in harder or more weakly?

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Viscosity controls what: whether penetrant can enter, or how fast?

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Why is high volatility a problem in a penetrant?

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How does a fluorescent dye make an indication visible?

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It wets the surface well and spreads. Above 90 degrees a liquid beads up and is pushed out of a fine tube instead of rising into it.

Topic: Penetrant properties, wetting and contact angle
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Capillary action, driven by surface tension along the walls of the opening, for a liquid that wets the metal.

Topic: Capillary action, driving force
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How fast. High viscosity means slow filling and a longer dwell; very low viscosity can drain from shallow openings. Cold raises viscosity.

Topic: Penetrant properties, viscosity and rate of entry
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Harder. Capillary rise varies inversely with the bore radius, which is why fine cracks can still fill.

Topic: Capillary action, rise height and opening size
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It absorbs UV-A near 365 nm and re-emits longer wavelength visible light, usually yellow-green, which shows against a dark field.

Topic: Penetrant properties, fluorescent dye response to UV-A
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It evaporates during dwell, dries on the part, resists removal and bleeds out poorly.

Topic: Penetrant properties, volatility
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What is the one rule for what PT can detect?

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Why can a machined part hide cracks from PT until it is etched?

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Should PT go before or after shot peening, plating or painting?

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Can PT find a lamination in plate?

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Does PT need a magnetic material?

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What does a PT indication reliably tell you, and what not?

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Machining can smear metal over the crack mouth. Etching removes the smeared layer and reopens it.

Topic: Detection limits, smeared metal and etching
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The discontinuity must be open to the surface being tested.

Topic: Detection limits, surface-breaking openings
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Only where it reaches a cut edge. A lamination is internal and parallel to the faces, so the faces show nothing.

Topic: Detection limits, internal discontinuities
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Before. Those operations close or cover openings. PT goes after operations that can create cracks, such as grinding or heat treatment.

Topic: Detection limits, sequence with other operations
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Location and surface length. Not depth. Tight cracks hold less liquid and give fainter indications than wider ones of similar length.

Topic: Detection limits, what an indication shows
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No. It works on almost any nonporous material: steels, aluminum, titanium, glazed ceramics and many plastics.

Topic: Applications, material types
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