

Process Issues

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Nondestructive Evaluation

Process Issues

- **What is the Process?**
- **FPI Process Issues**
- **Qualified Personnel**

What is the Process?

Fluorescent penetrant inspection is a nondestructive PROCESS that uses suitable liquids that penetrate discontinuities open to the surface of solid, nonporous materials and, after appropriate treatment, indicate the presence of discontinuities by emitting visible light when illuminated by black light radiation.

FPI is an AREA inspection tool.

FPI

Patented October 14, 1941

#2,259,400

By R. C. Switzer

Exclusive license to

Magnaflux

February 1942

“ZYGLO”

July 1942

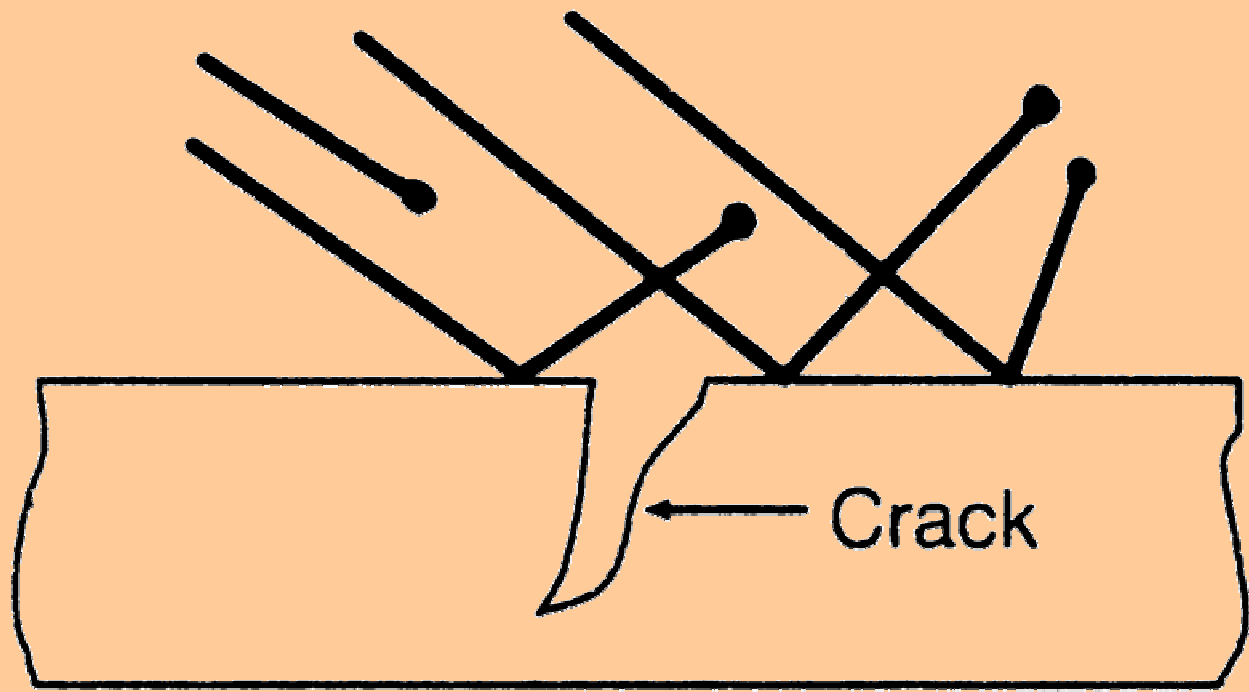
Early Lesson, (1942)

- **Many variables present**
- **Consistent inspection results required
consistent control of the process**

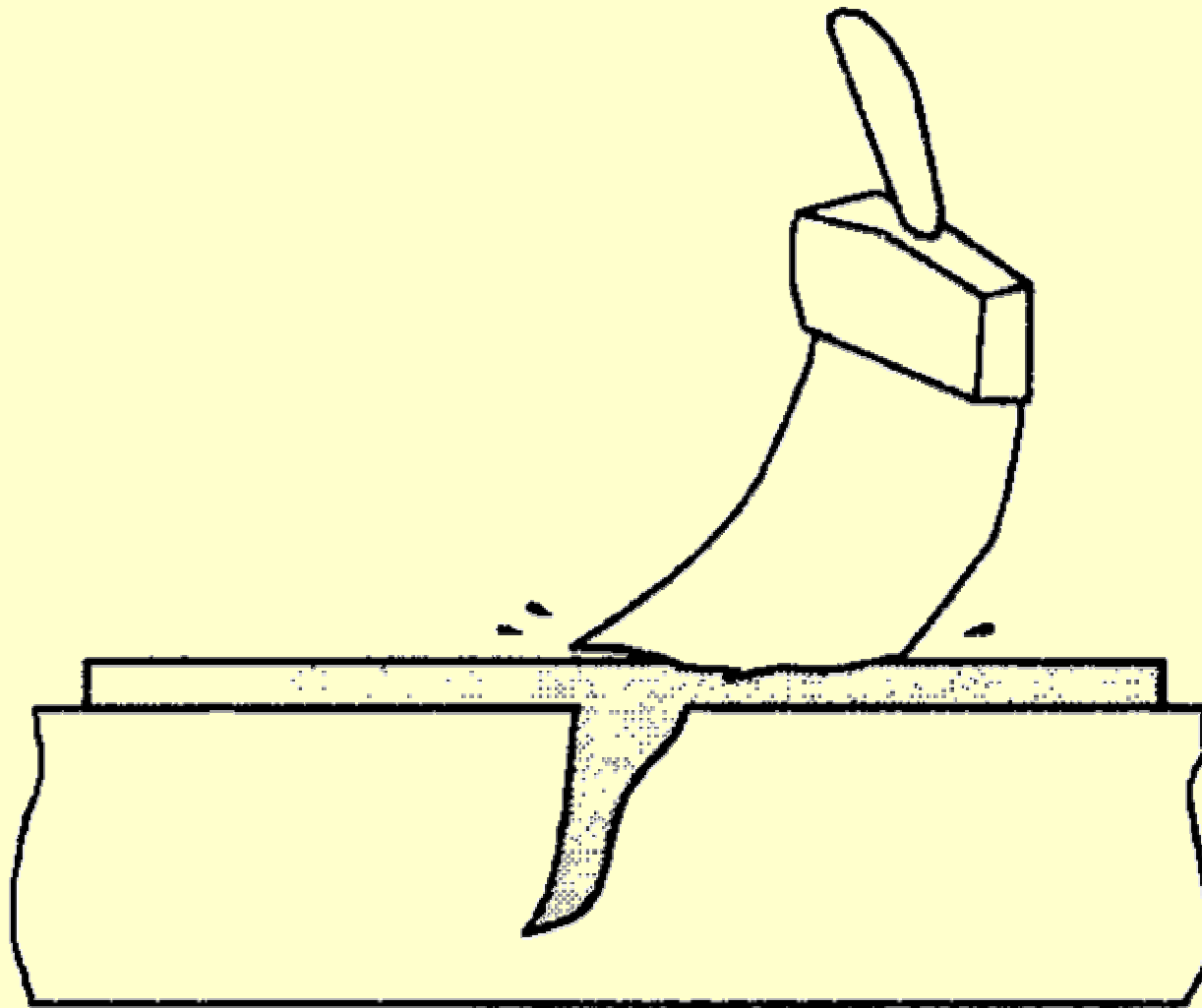
Automation efforts in place early!

Basic Steps

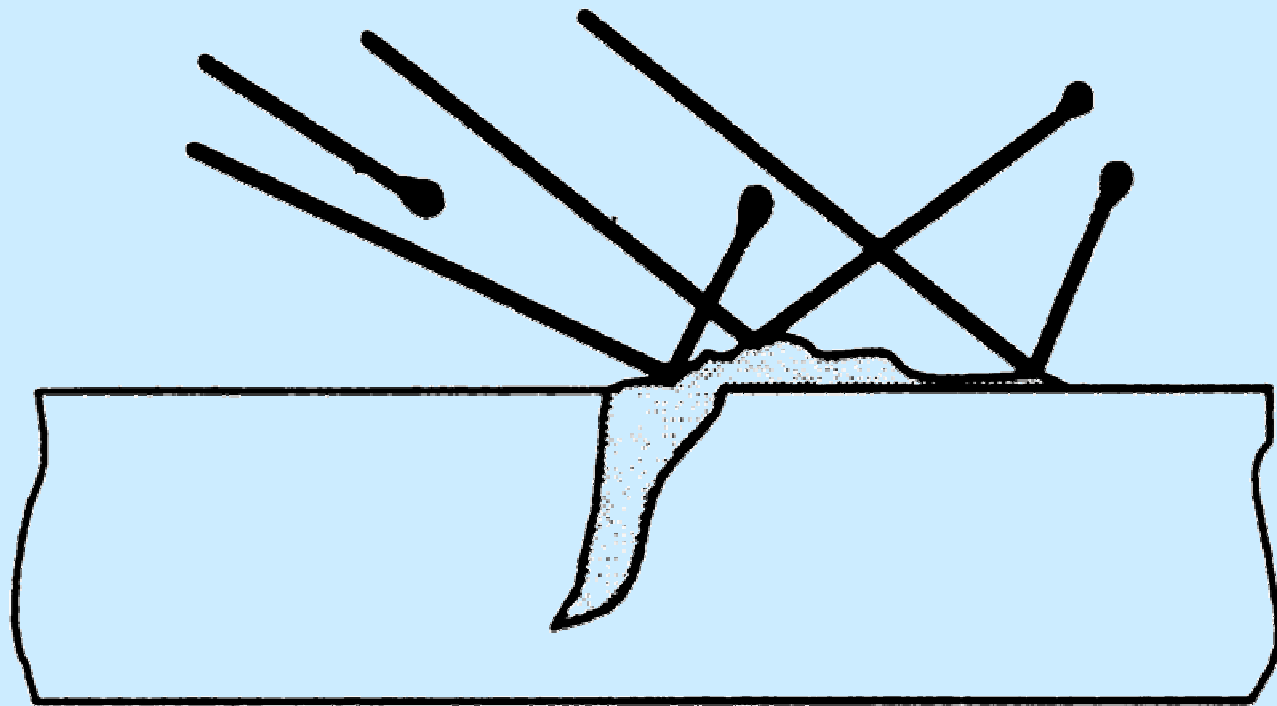
- **Preclean**
- **Apply penetrant**
- **Remove excess penetrant**
- **Apply developer**
- **Examine under black light**
- **Post clean**



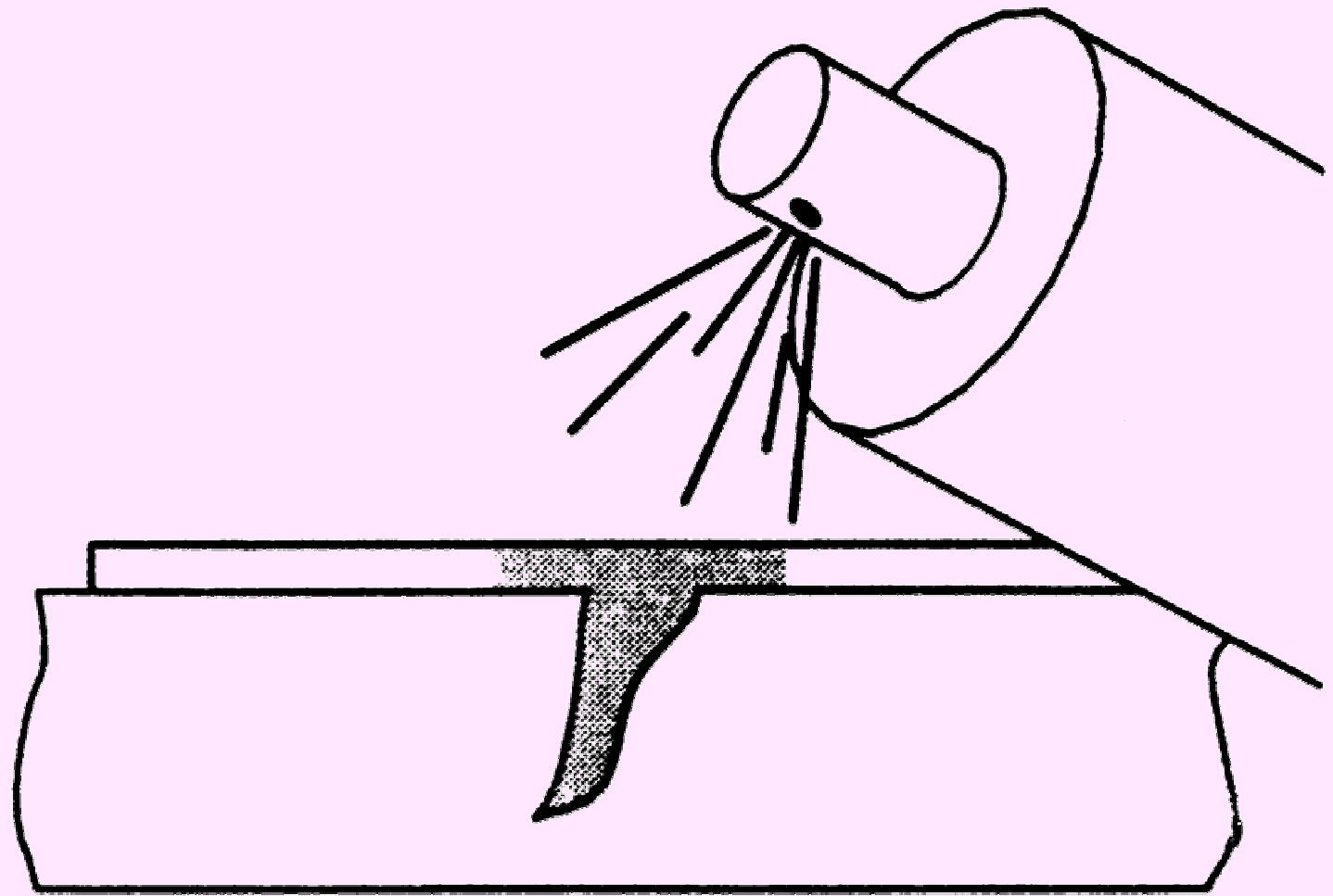
Prepare surface



Apply penetrant

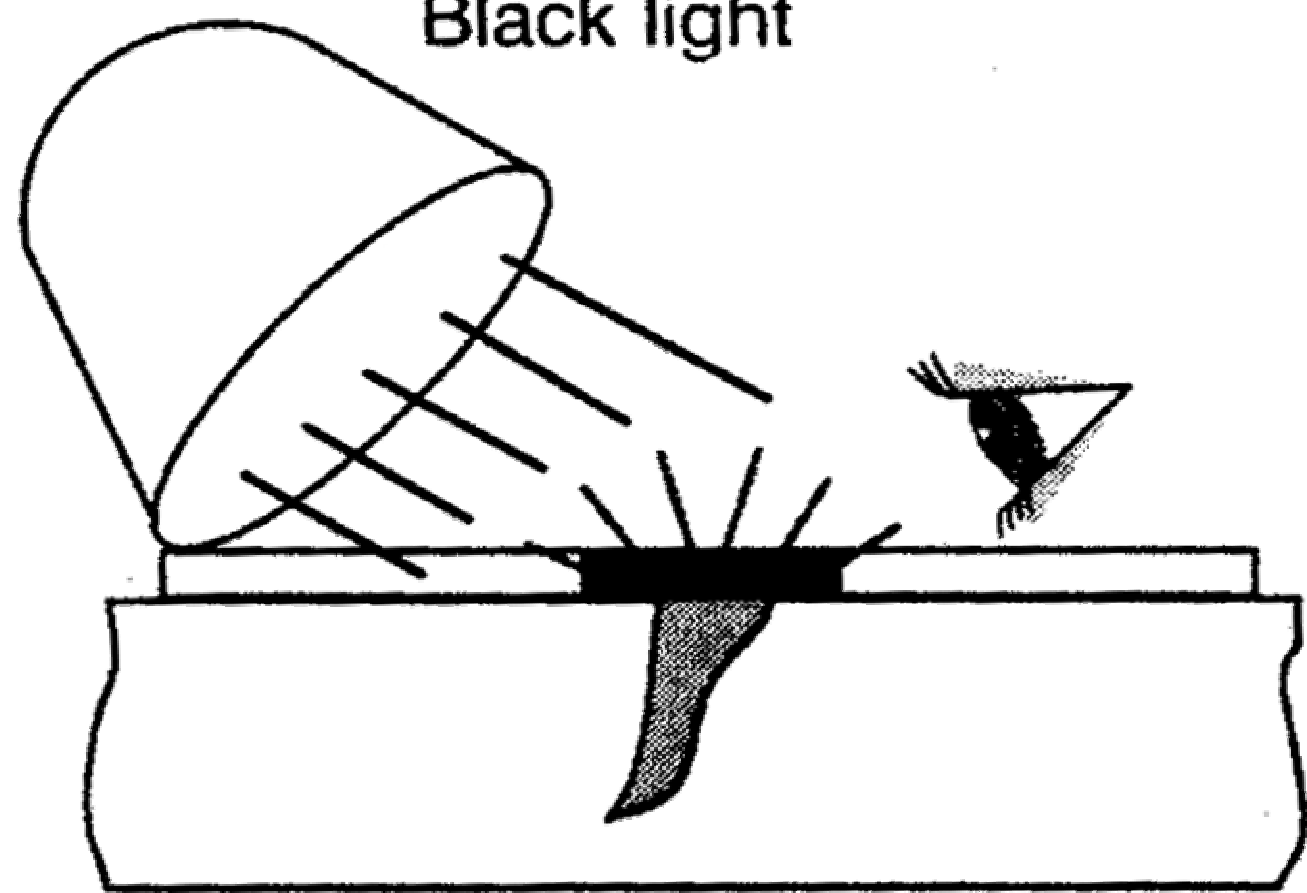


Remove excess penetrant



Apply developer

Black light



Fluorescence

Advantages of FPI

- **Sensitive to small cracks and defects**
- **Inspection performed rapidly and at low cost**
- **Inspects complex shapes, large areas, many material types**
- **Indications produced directly on surface of the part providing a visual image of the discontinuity**

Limitations of FPI

- **Requires a nonporous material**
- **Paint and other coatings can adversely affect sensitivity**
- **Post cleaning is necessary**
- **Only detects surface breaking defects**
- **Sensitivity of method depends on the process chosen--postemulsifiable method is the most sensitive**

Limitations of FPI (Cont.)

- **Surface must be accessible to inspector or visual aids**
- **Surface finish and roughness can interfere with test sensitivity**

Reliability

90 - 95

Simple Geometry

Around 0.2" Long and 0.1" Deep

Mini-Maxi

Process

Control

- Temperatures
- Pressures
- Times

Dwell

Minimum 20 Minutes

If Exceeds 2 Hours, Repeat

Pre-Rinse

**Maximum on one area -- 90 seconds
water temperature 50 - 100°F**

Maximum water pressure 40 psi

Filtered shop air oil-water 25 psi

Suction device. OK

Under UV

Emulsifier

- **Least minimal time for acceptable background**
- **Not to exceed 2 minutes**
- **Spray or dip application**
- **Concentration important**
- **If immersion - mild agitation**
- **Under UV**

Post Rinse

- Immersion or spray
- Water temperature 50 to 100°F
- Maximum water pressure 40 psi
- If hydro-air, max. 25 psi added air spray distance less than 12 inches
- Time not to exceed 90 seconds
- Remove water, reposition, drain suction
- Filtered shop-air (oil-water) 25 psi

Dry

- **Maximum temperature 160°F**
- **Minimum time to dry parts**

Developer

- Usually dry
- NAWD when specified
- Minimum 10 minutes
- Avoid buildup
- Inspect within one hour or reprocess

Inspect

- Usually 100% (?)
- Dark Area (2 ft. - candles maximum)
- Blacklight
- Rebleed!
- Index/Mark
- Search Pattern

Post Clean

Excellent Free Video Available From:

**Sherwin, Inc.
5530 Borwick Ave.
South Gate, CA 90280**

562 861 6324 Phone

562 923 8370 Fax