

# The Penetrant Professor from **Met-L-Chek®**



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## FAA PENETRANT STUDIES

The March 2007 "Penetrant Professor" gave some preliminary insight to a study that was conducted regarding old vs new penetrant. This as well as other studies will be summarized in this month's issue.



The FAA has sponsored certain research efforts at the CASR (FAA Center for Aviation Systems Reliability) at Iowa State University and at Sandia laboratories.

Some of the results of this work were discussed at a special meeting of CASR in Orlando, Florida, in conjunction with the Spring meeting of ASNT, and some of the work was the subject of technical papers at the ASNT meeting.

## DEVELOPER STUDIES

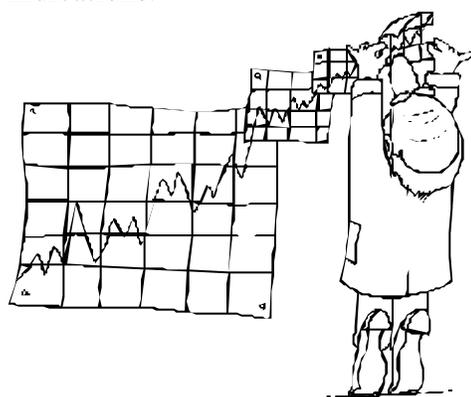
Two studies were made. The first of these concentrated on the use of dry developer in cloud chambers, and the second concentrated on a comparison of the several forms of developer. The results of the first study echoed what most inspectors already know, or what might be intuitive, but the study quantified this information. In summary, the brightest indications were achieved by the "dip and drag" method. When a dust chamber is used, indications are brighter when the parts are oriented in the chamber with the cracks on top, less bright when the cracks are on the side, and the least bright when the cracks are on the bottom. This is logical, because the developer powder can settle on the top of the part, but gravity prevents the powder from settling on the bottom or sides of the part. In addition

to these findings, it was found that the several dust chambers tested were designed in such a way that there were areas in each where the developer coverage was poor. Discussions about this suggested that a scientific study of dust chamber design should be made, in order to determine how to build a more efficient chamber. Application of the developer by electrostatic means was not investigated, but will be pursued in the future, since this application may achieve similar results to the dip and drag method.

The second study compared the relative indication brightness resulting from the use of different



forms of developer. CASR is continuing to evaluate the results of this portion of the work, but in generalities the conclusions are that when compared to form "a" dry powder developer applied by dip and drag, form "b" soluble developer gives almost equivalent results when used at the manufacturer's recommended concentration, form "c" suspensible developer gives superior results when used at the manufacturer's recommended concentration, and form "d" alcohol based aerosol developer (Met-L-Chek® D-70) gives the best results by a wide margin. Form "d" acetone based developer does not give as good results as the alcohol based. In comparison to form "a" dry powder developer used in a dust chamber, applying the form "a" developer by manual spray or by puffer bulb improves the results, but forms "b", "c", and "d" still give far brighter indications.



### EMULSIFIER STUDIES

The use of hydrophilic emulsifier was studied, testing variations in emulsifier strength and variations in dwell time. It was found that variations in emulsifier strength had

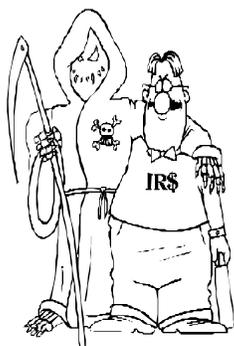
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almost no effect when the variations were within plus or minus 5 percent. As would be expected, it was found that the longer the dwell time, the less bright the indications would be.

### OLD vs. NEW PENETRANT

This study addressed the question of whether the use of old penetrant gave different results than fresh samples of the same penetrant. The study was performed at Sandia, and ten year old sealed samples of Type I Method A level 4 penetrant from three manufacturers (A, B, and C) were tested against fresh samples of the same penetrant. For manufacturers A and B, there was found to be no difference. For manufacturer C it was found that the old penetrant gave brighter indications than the new penetrant. It was also found that the penetrant from manufacturer C gave less bright indications than the materials from the other two manufacturers. No surprise, Met-L-Chek® is not manufacturer C.



Once again, this investigation focused on a subject that almost everyone knows to be true – that prolonged exposure to UV-A results in faded indications, and that the higher the intensity of the UV-A, and the longer the exposure, the more fade that will occur. More work will be done on this subject, so that the relation of the higher indication brightness that is achieved by higher UV-A intensities can be put into context with a comparison with the brightness at the standard UV-A intensity as a function of time. This will aid we folks who are writing specifications on ASTM Committee E-07 and AMS Committee K.

### DRYING AFTER CLEANING

After a part is pre-cleaned, it must be dried. Testing was done to compare oven drying with flash drying, to see if there was a difference between the two as far as getting the water out of the cracks. It was found that under the test conditions, there was no difference

### The Penetrant Professor

