

**P Powder
Coating
Consultants**

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Machu Test: Accelerated Salt Spray Test:

Salt spray testing, especially for applied powder coatings, takes typically between 500 and 1,000 hours, i.e. between three and six weeks' time, and sometimes even more. This can slow down the development work in R&D laboratories, or the service work in Customer Service laboratories, considerably. The Machu test offers a possibility to cram 1,000 hours of salt spray testing into a 48 hour evaluation period.

The Machu test is an excellent screening tool for rapid evaluations of coating products in all stages of research and development and it can also be used by Customer Service for obtaining quick results. Since the test conditions are quite severe, the Machu test results are slightly inferior on average to the corresponding salt spray results; i.e. if it passes the Machu test, it will most likely pass salt spray. The results correspond well on virtually all types of metallic substrates, however, for the ultimate confirmation, salt spray testing according to ASTM B117 must be conducted. This test is quite commonly used in Europe.

TITLE: Accelerated Salt Spray Test.

SCOPE: To determine corrosion resistance 20-times faster than salt spray testing (ASTM B117)

APPARATUS: (1) Laboratory scale accurate to ± 0.1 grams.
(2) Glass or plastic beaker calibrated to 1 liter (1,000 ml).
(3) Stirrer.
(4) pH meter or pH paper for acidic range and accurate to ± 0.1 pH.

REAGENTS: (1) 50 grams salt used for salt spray solutions (NaCl).
(2) 10 grams glacial acetic acid (CH₃COOH), 100%.
(3) 5 grams Hydrogen Peroxide (H₂O₂), 30% solution.
(4) Deionized or distilled water.

PROCEDURE:

1. Dissolve reagents (1) through (3) in deionized or distilled water in beaker and fill up to one liter (1,000 milliliter) calibration mark.
2. Check test solution for pH; pH should be between 3 and 3.3.
3. Immerse scribed (or unscribed) test panels in test solution, run test at room temperature (68-75°F or 20-24°C). Cover container with test solution (odor, contamination). Test panels MUST be coated front and back (immersion test), or the film will delaminate, beginning from the uncoated back of the panels, and the Machu solution will turn rusty within hours.
4. 24 hours test duration is equivalent to 500 hours salt spray (ASTM B117).
5. 48 hours test duration is equivalent to 1,000 hours salt spray (ASTM B117).
6. After 48 hours test duration, the test solution is spent and has to be discarded or replaced!

REPORT: Test panel evaluation and reporting are similar to the salt spray test method:

- (1) Machu test duration (in hours) and salt spray equivalent (in hours).
- (2) Loss of adhesion (delamination) along scribe.
- (3) Blistering and softening of film.
- (4) Gloss changes.
- (5) Other.

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- NOTES:**
- (1) Eye protection, latex gloves, and a well ventilated area are mandatory when handling reagents.
 - (2) Test panels must be completely coated (front, back, and edges), no masking with tape!
 - (3) Machu test results do not replace salt spray results!

SPECIAL INTEREST:

The Machu test can also be used for evaluating the weathering performance of weatherable (powder) coating systems. Pigment fading, film haziness, loss of gloss, and film softening after 48-96 hours test duration on unscribed panels may point out outdoor durability problems, however, the correlation with actual outdoor weathering data is only fair.