



# A New Salt Measuring Strip Equivalent to ISO 8502-9

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NACE International Marine Coatings Summit

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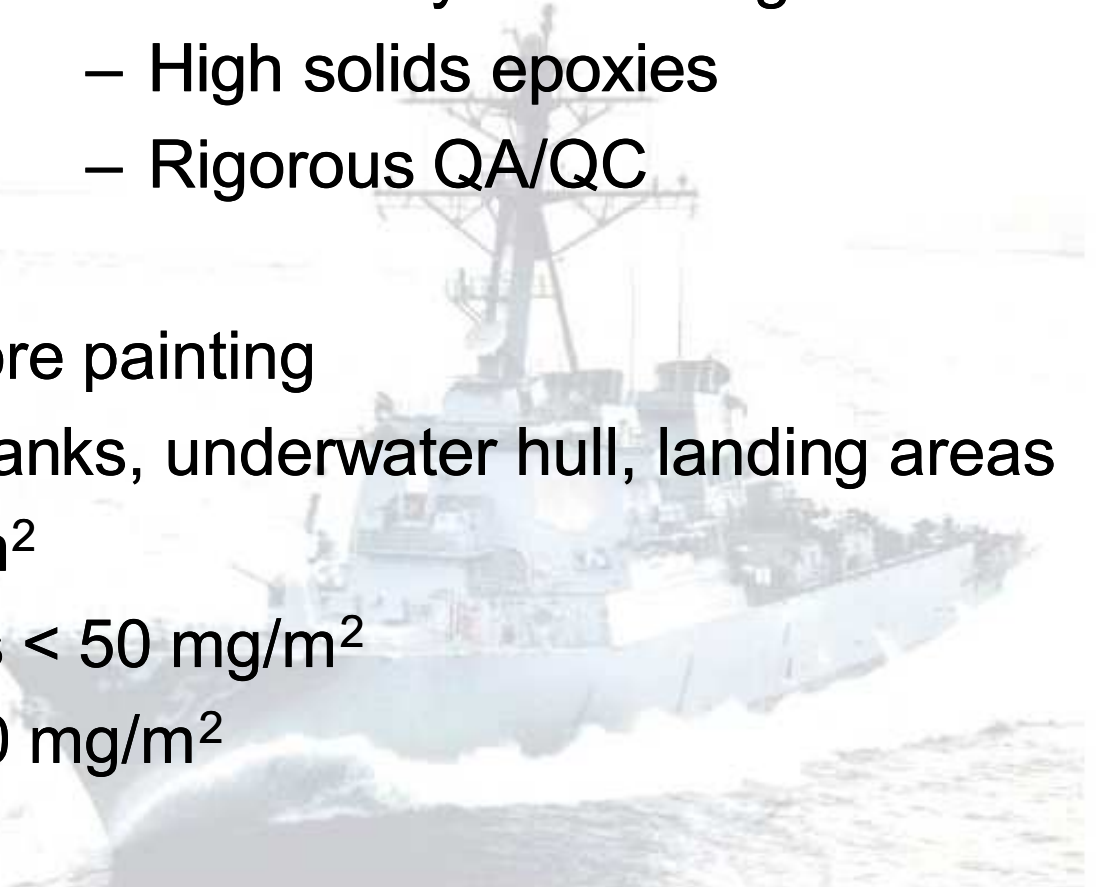
# U.S. Navy Surface Salt Testing

- Corrosion control costs US\$2.4B/yr



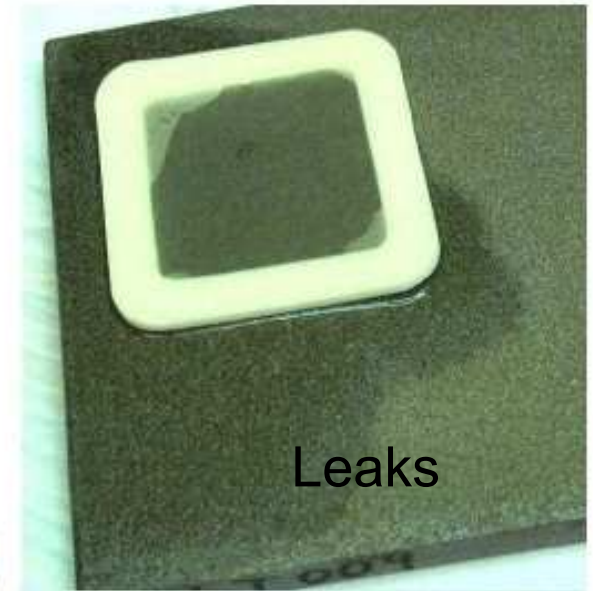
- Potential 20 year coatings
  - High solids epoxies
  - Rigorous QA/QC

- Surface salt testing before painting
  - All critical surfaces: tanks, underwater hull, landing areas
  - 5 readings per 100 m<sup>2</sup>
  - Non-immersed areas < 50 mg/m<sup>2</sup>
  - Immersed areas < 30 mg/m<sup>2</sup>
- 100,000 salt tests/yr

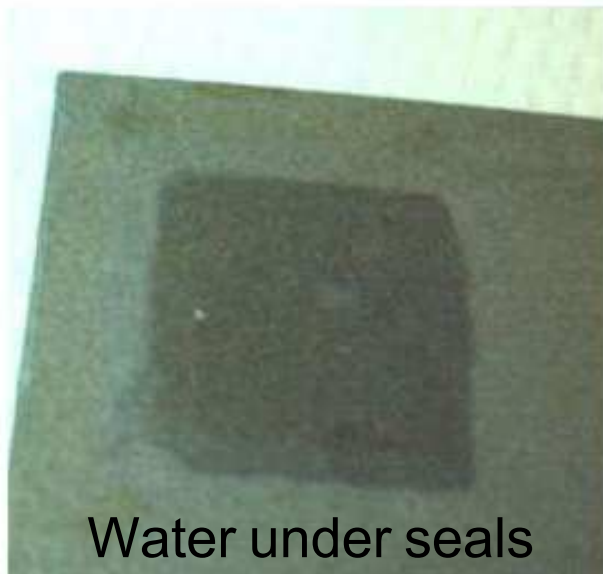


# ISO 8502-9 Test

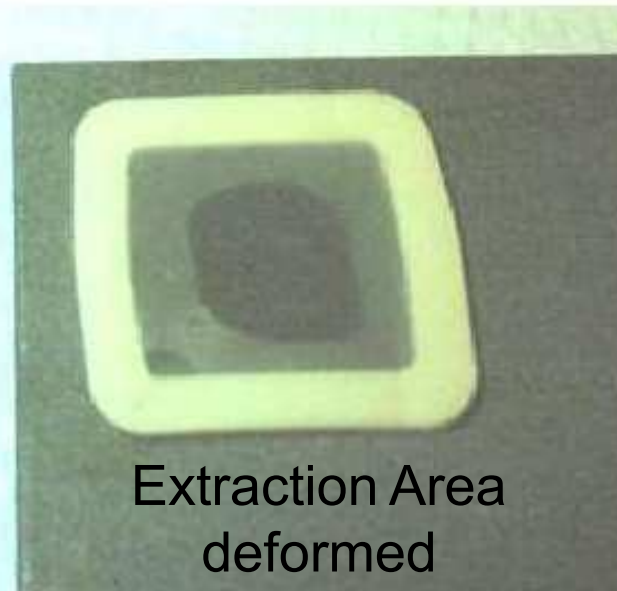
- Slow: 15 minute / test
- Not accurate
- Frequent failures



Leaks



Water under seals



Extraction Area deformed



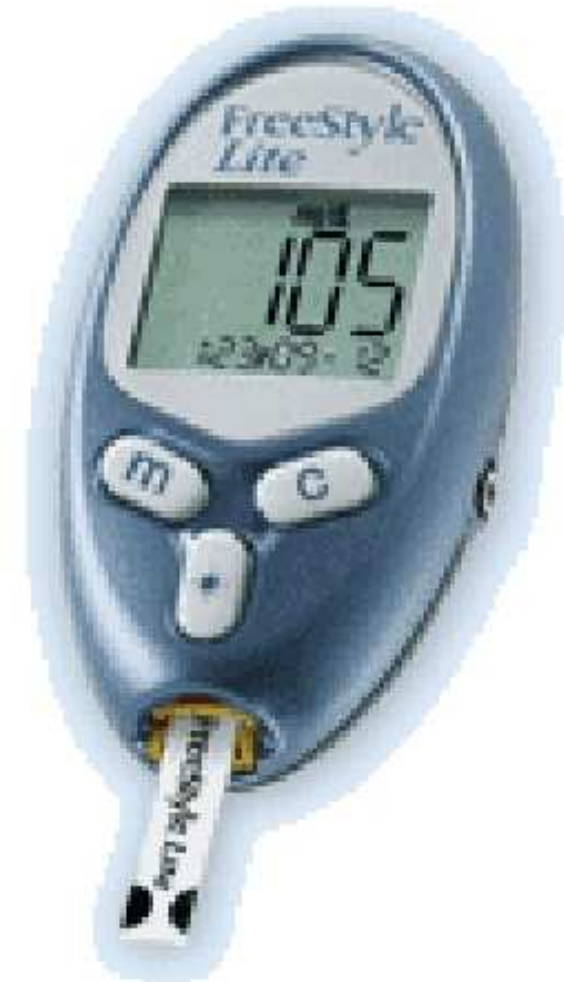
Foam stuck to steel

# Salt Test Wish List

Analytical	<ul style="list-style-type: none"><li>• 10% at 50 mg/m<sup>2</sup></li><li>• Detection limit below 20 mg/m<sup>2</sup></li><li>• Insensitive to operator technique</li><li>• No cross contamination</li></ul>
Field Utility	<ul style="list-style-type: none"><li>• Fast - don't delay coating application</li><li>• Reliable</li><li>• Compact, rugged, safe</li><li>• Test flat or curved surfaces</li><li>• No residue</li><li>• Auditable result</li></ul>

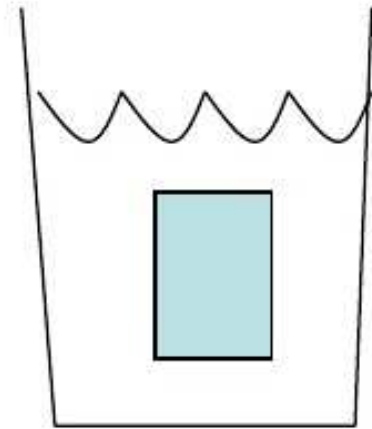
# Field Conductivity Analyzer

- Blood Glucose Meter
  - High stakes analysis
  - Low operator training
- Disposable strip
  - Holds sample
  - Integrated sensor electrodes
  - No contamination
- Compact field reader



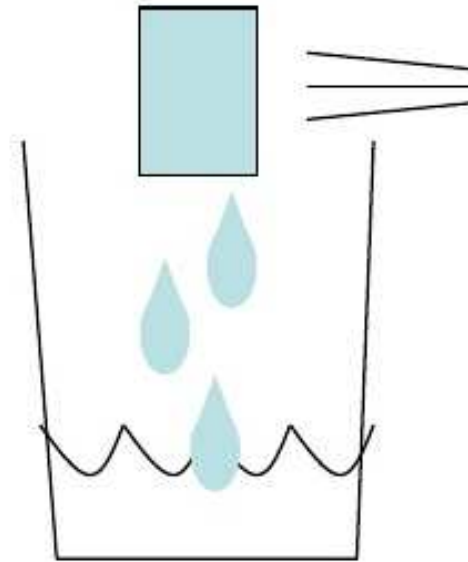
# Batch vs. Flow Extraction

- Batch Extraction
  - Bath
  - ISO 8502-9 Patch



< 85% salt extracted  
3.0 mL H<sub>2</sub>O

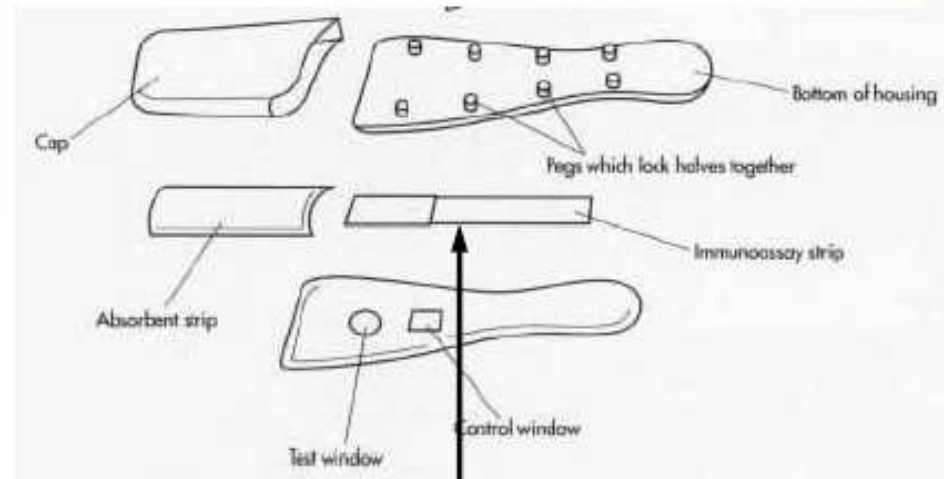
- Flow Extraction
  - Shower
  - Water jetting



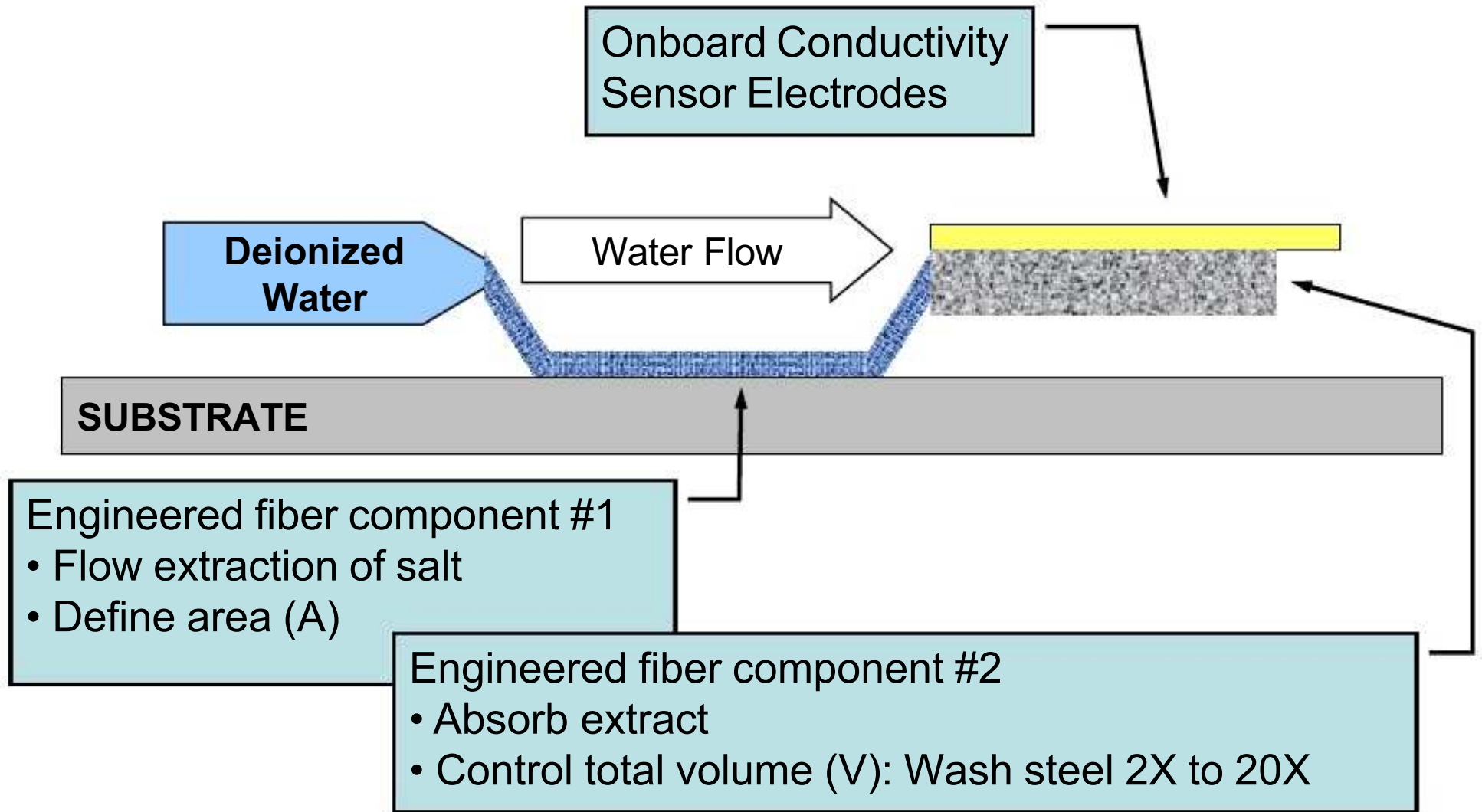
> 99% salt extracted  
0.6 mL H<sub>2</sub>O

# Precision fluid management

- Pregnancy Test Strip
  - Robust
  - Reliable
- Engineered fiber membranes
  - Fluid contained
  - Flow metered
  - Volume controlled

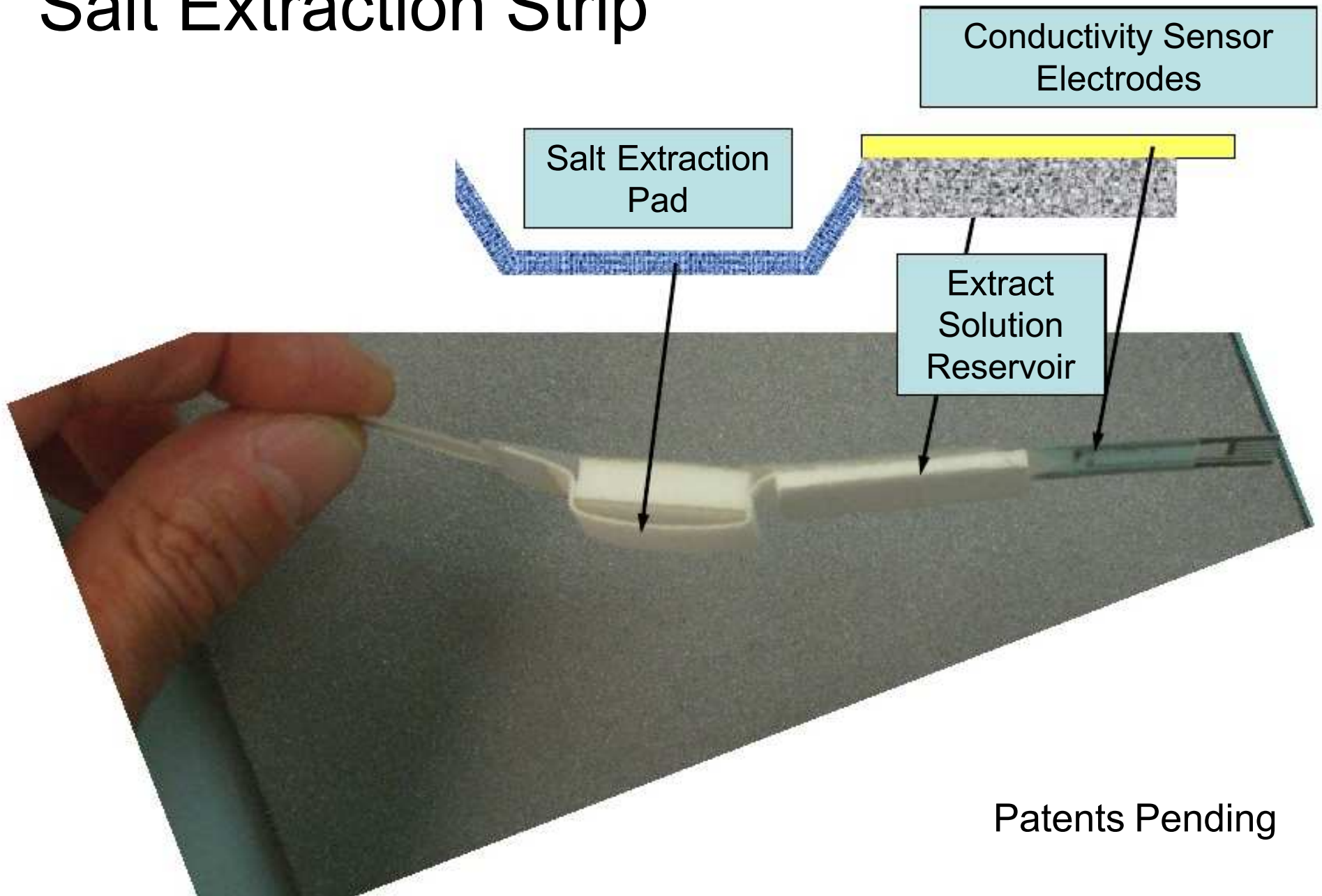


# New Concept for Salt Testing



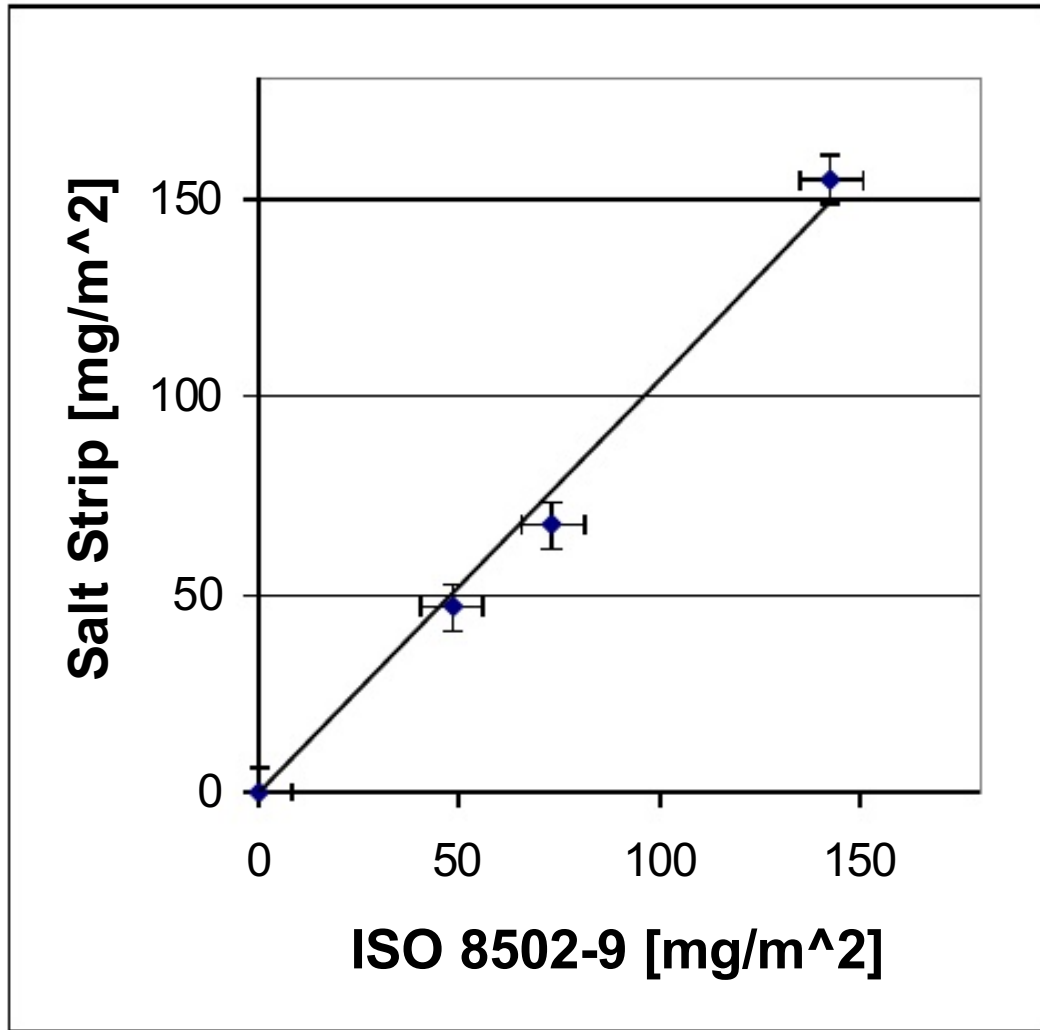


# Salt Extraction Strip



Patents Pending

# Salt Strip Performance on Steel



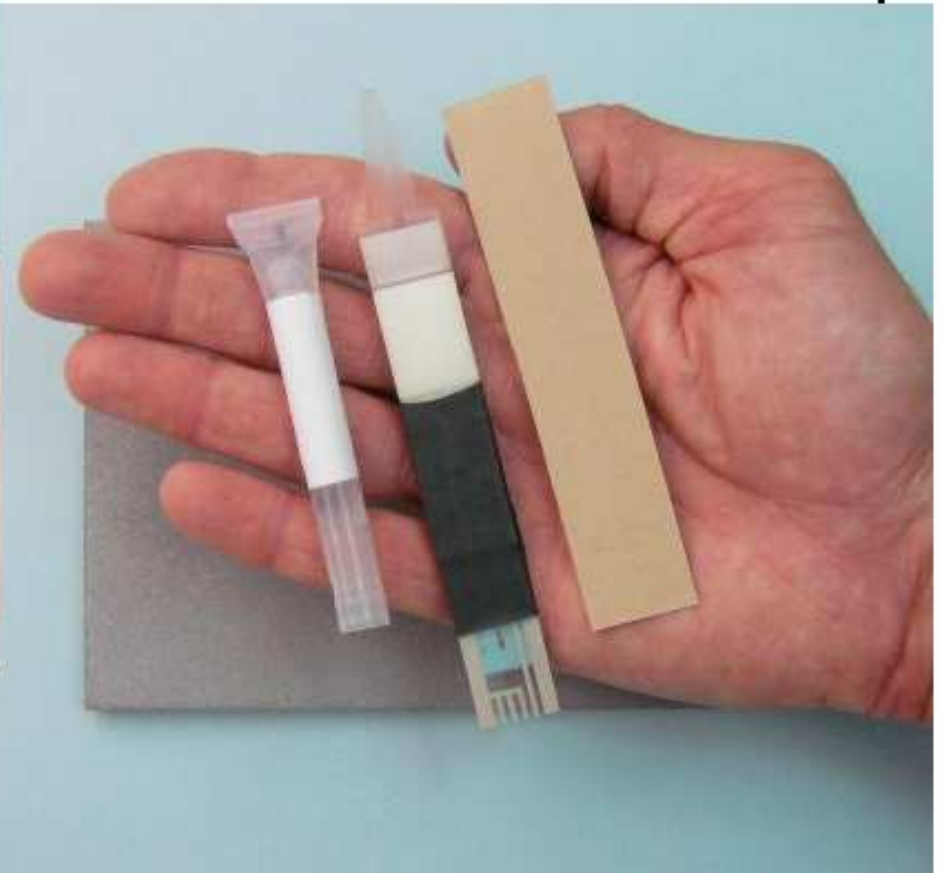
## Design Performance

- at 50 mg/m<sup>2</sup>, 7%
- at 20 mg/m<sup>2</sup>, 13%

# Strip Work Flow

1. Unwrap Package

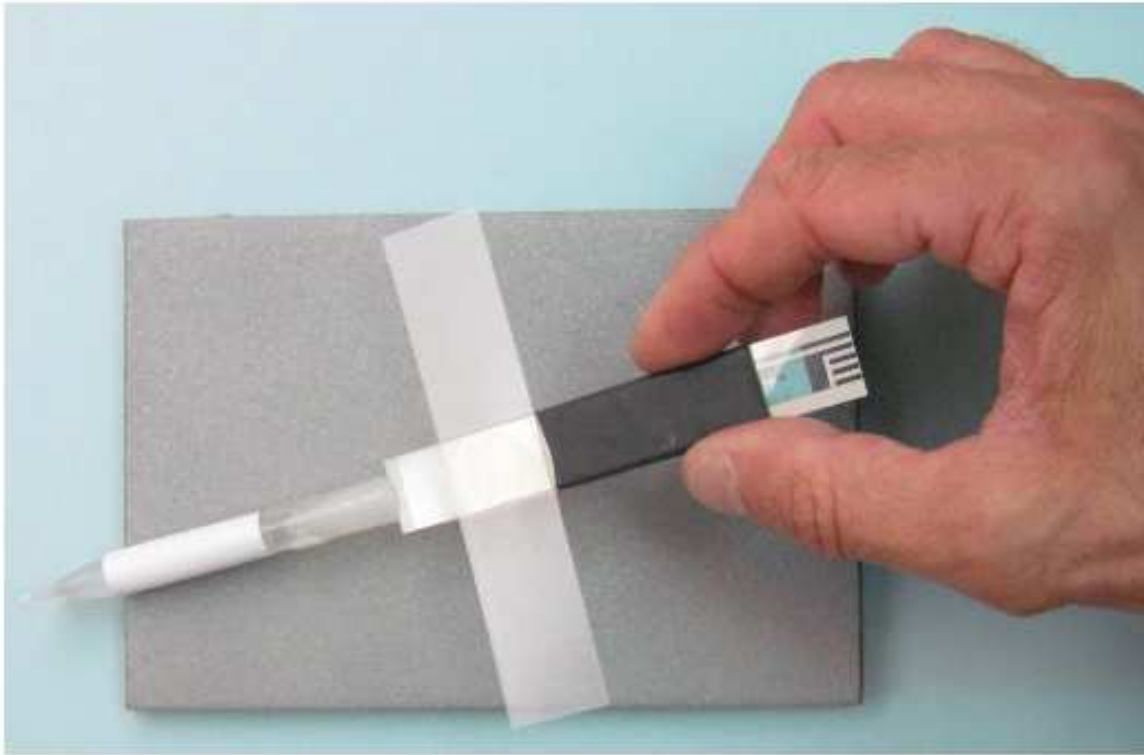
0:05



# Strip Work Flow

## 2. Assemble Strip

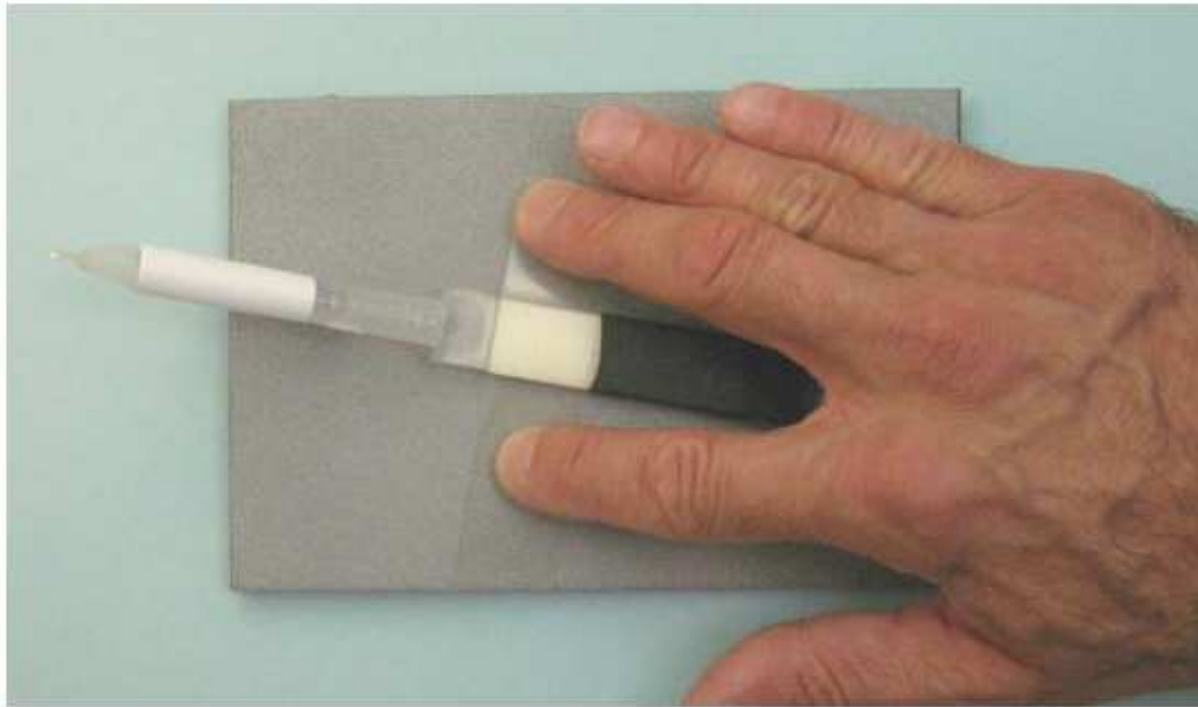
0:13



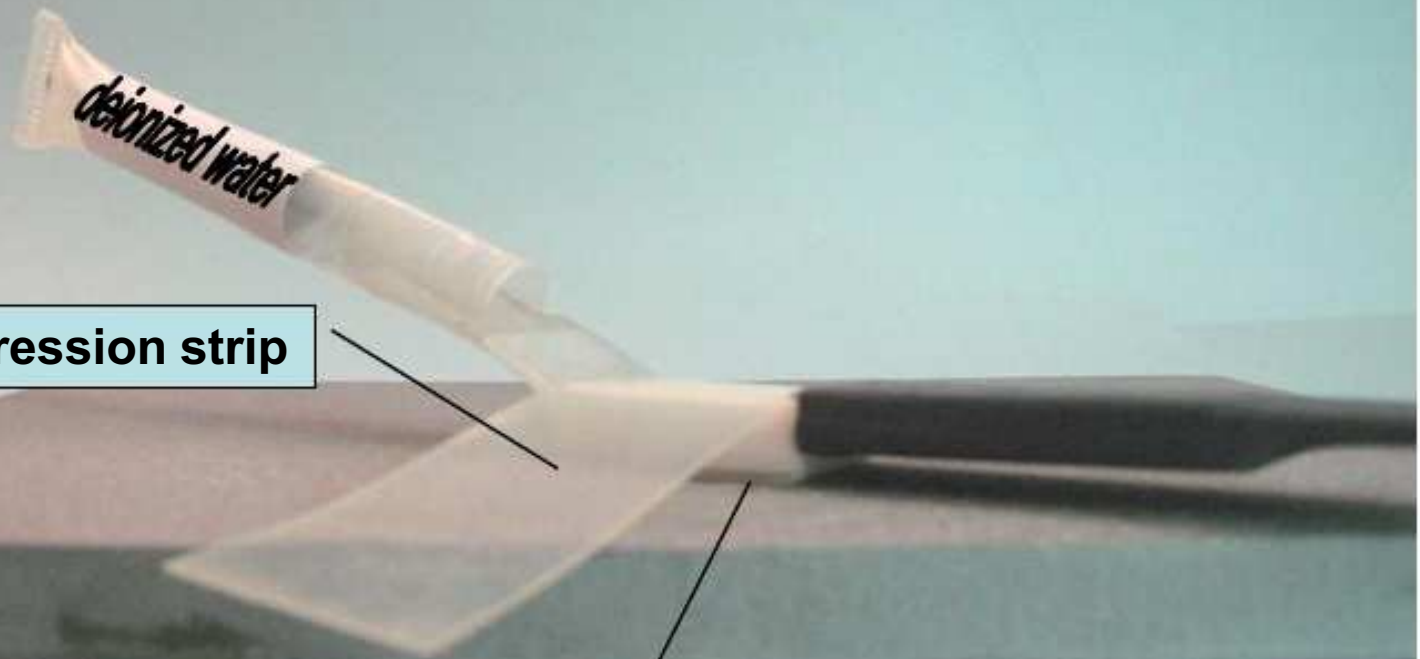
# Strip Work Flow

3. Tack onto surface

0:15



# Strip Extracting Salt



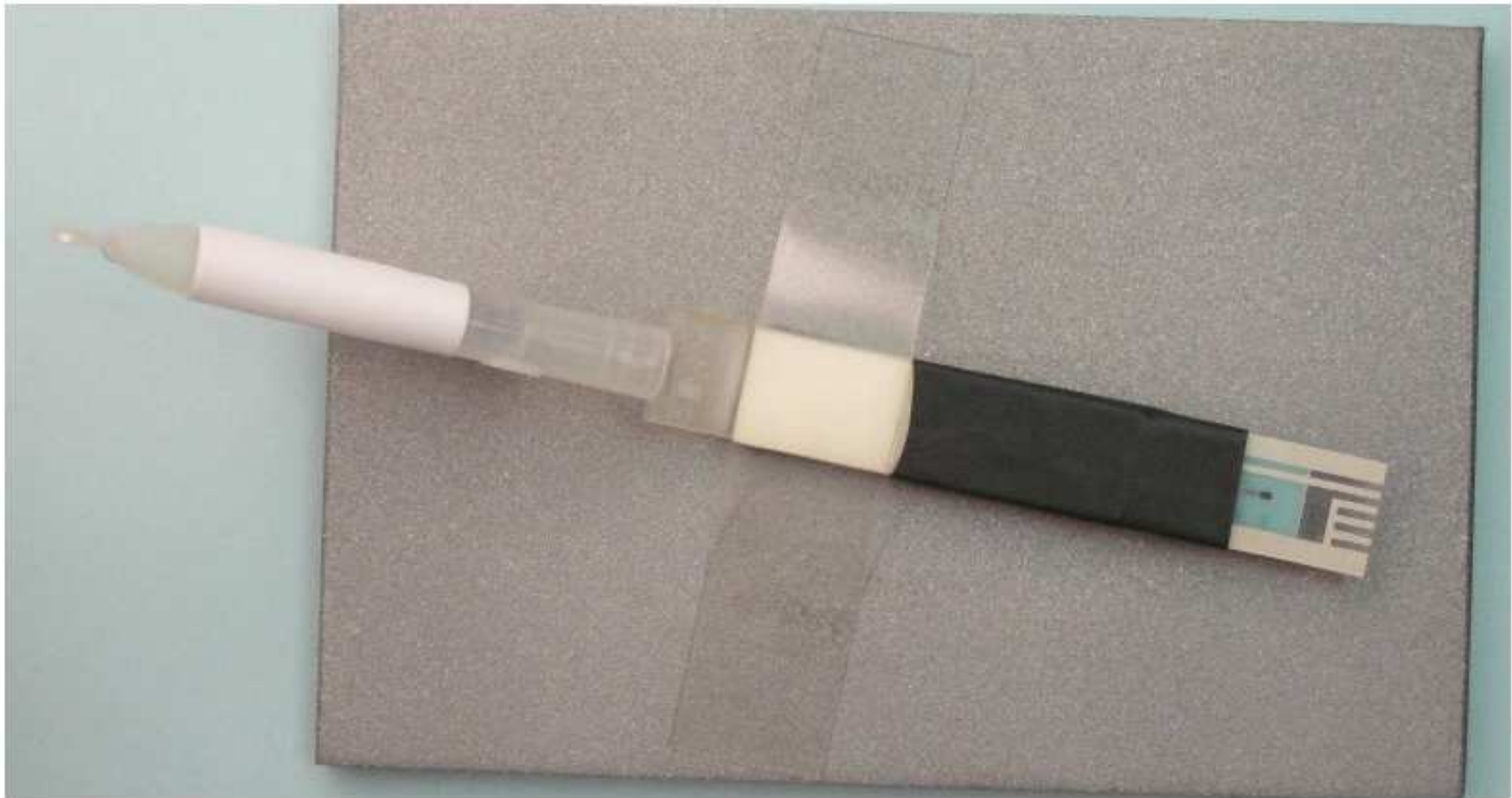
**Adhesive compression strip**

**Defined extraction pad area  
compressed against steel**

# Strip Work Flow

4. Extract Salt into Reservoir

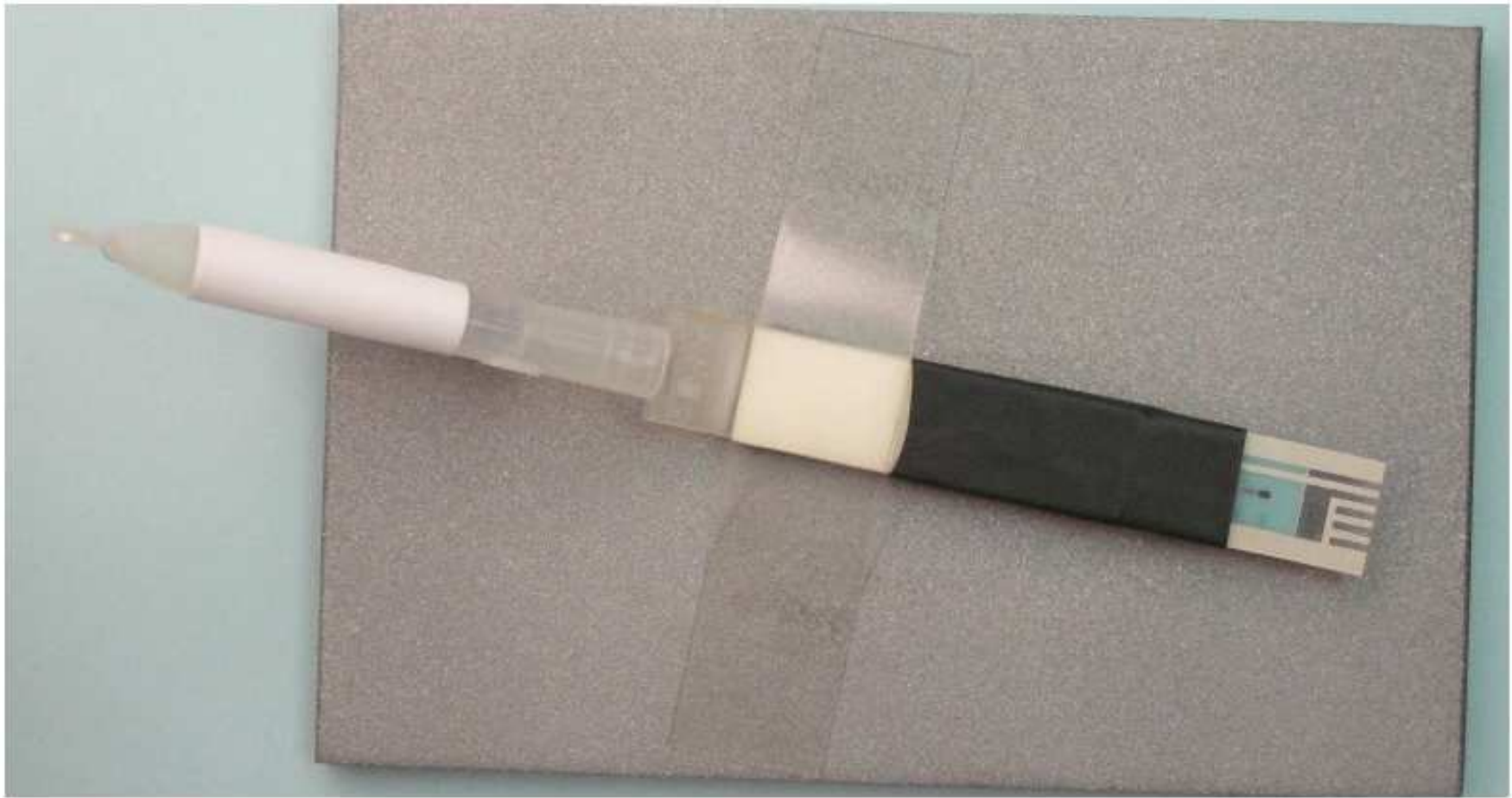
1:15



# Strip Work Flow

4. Extract Salt into Reservoir

2:15

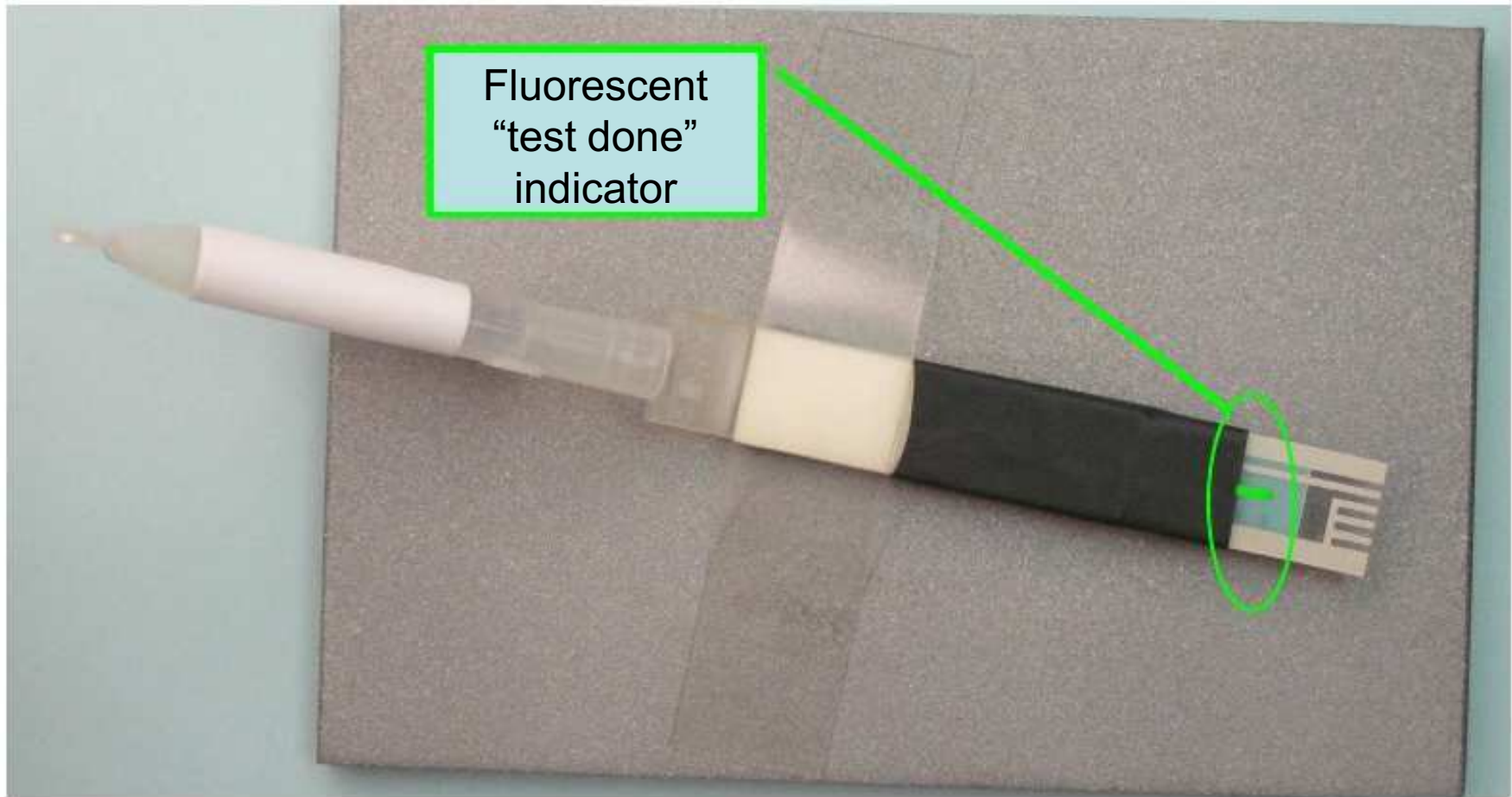




# Strip Work Flow

4. Test Done

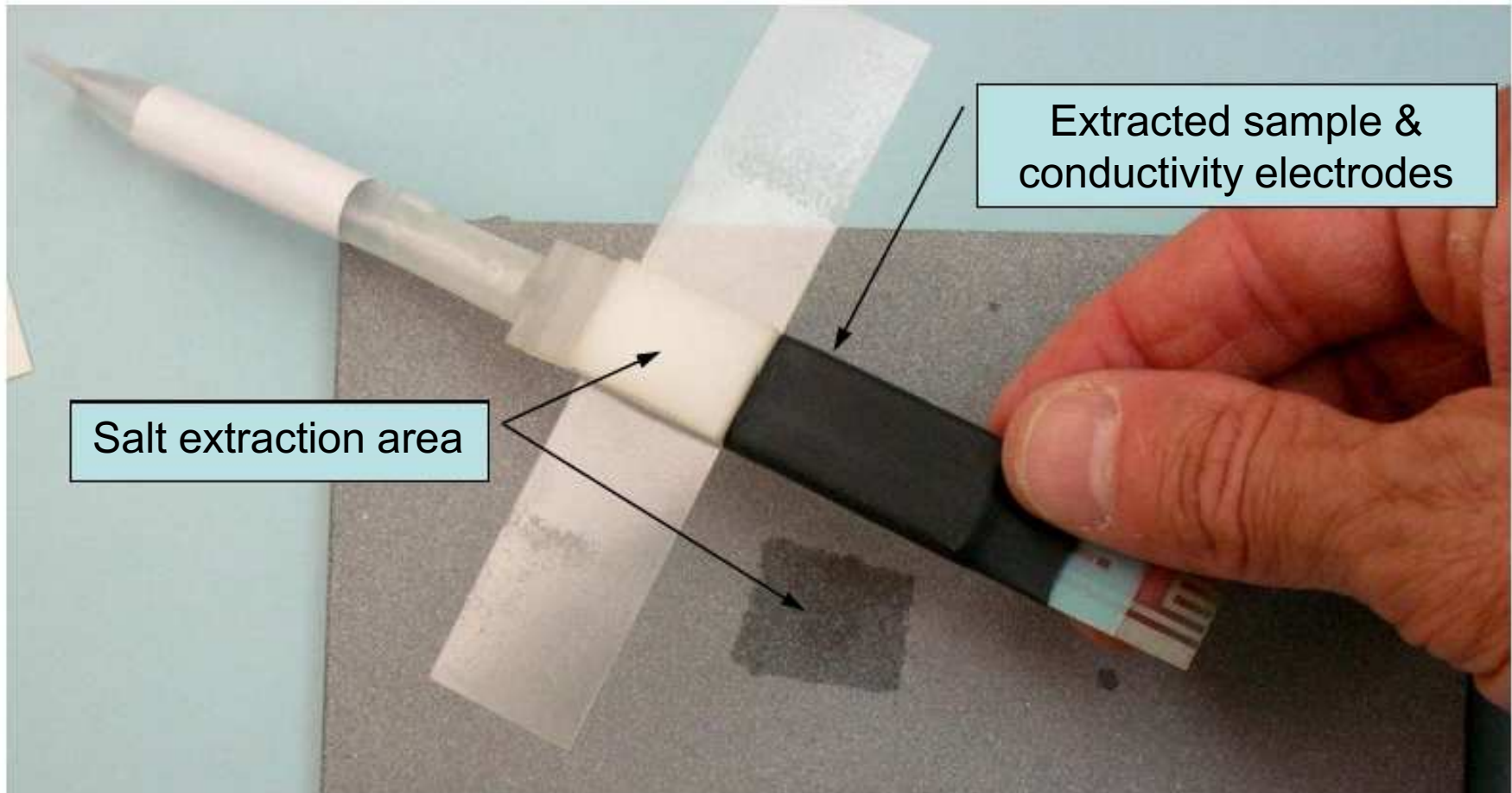
3:15



# Strip Work Flow

5. Remove Strip from Steel

3:15



# Strip Work Flow

6. Insert Strip into Reader

3:20



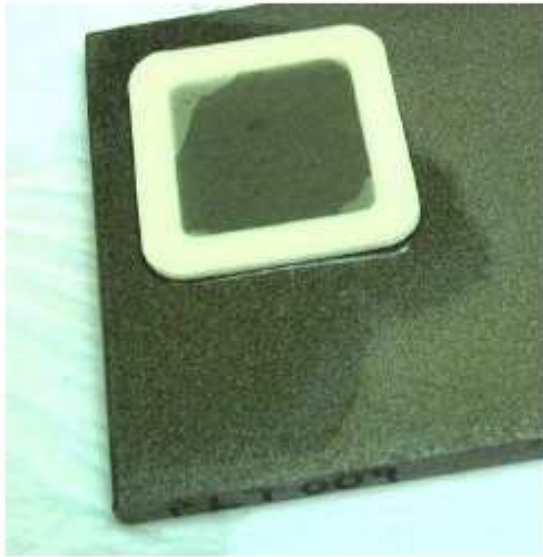
# Strip Work Flow

## 7. Read & Save Result

- Strip reader adapter
  - Fits off-the-shelf meters
  - Replaces standard conductivity probe
  - Temperature compensated
- Calibrate with dry calibration strip
  - No calibration fluids



# Cycle Time – 400 m<sup>2</sup> Tank



ISO 8502-9

- 15 minutes / test
- 20 tests in 4 hours



Salt Sensor Strip

- 4 minutes / test
- 20 tests in 12 minutes
- Labor savings
  - US\$ 285 / tank (400 m<sup>2</sup>)
  - US\$ 30,000 / Navy CVN overhaul
- Paint cycle time = dry dock time

# Salt Strip Field Utility

- Fast
- Accurate
  - Minimum training
  - Insensitive to technique
  - Re-wet strip to audit results
- Robust
  - Any substrate curvature or orientation
  - No leaks
  - 30 min. hold time after extraction until analysis
- Safe, Clean, Easy
  - Compact
  - No needles, bottles, solvents, calibration solutions
  - No residue on steel
- Cost Effective
  - Cost approx ISO 8502-9 Patch
  - 20X faster
  - Adapter for off-the-shelf conductivity meters

# Interested in Testing?

- Production started
- U.S. Navy field testing underway
- Strips available for qualification testing
- Adapters for conductivity meters
  - Jenway Model 4150
  - Jenco Model 3150
- email: [SaltStrip@nstcenter.com](mailto:SaltStrip@nstcenter.com)