PDR-OPS-046: QUALITY CONTROL FOR COLD-RESISTANT COATINGS

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Version: 3.2

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Next Review Due: January 15, 2025

1. PURPOSE AND SCOPE

1. This Standard Operating Procedure (SOP) establishes the quality c

2. This document applies to all manufacturing facilities, quality control

2. DEFINITIONS

1. "Cold-Resistant Coating" means the Company's proprietary formula

2. "Critical Surface" means any external or internal surface of an AMR

3. "Quality Control Test Suite" (QCTS) means the comprehensive set

3. RESPONSIBILITIES

1. Quality Control Department

-

Perform all required testing procedures

Maintain testing equipment calibration records

-

Document and report all test results

-

Issue Certificates of Conformance

2. Production Department

-

Ensure proper application of coatings

-

Maintain coating application equipment

-

Document environmental conditions during application

3. Quality Assurance Manager

-

Review test results and compliance reports

-

Approve or reject coating batches

-

Maintain quality control records

-

Update testing procedures as required

4. TESTING REQUIREMENTS

1. Physical Properties Testing

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Adhesion (ASTM D3359)

- Impact resistance (ASTM D2794)
- Flexibility (ASTM D522)
- Thickness measurement (ASTM D1186)

2. Environmental Testing

- Temperature cycling (-40 C to +25 C)
- Thermal shock resistance
- Humidity resistance (ASTM D2247)
-

Salt spray resistance (ASTM B117)

3. Performance Testing

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Abrasion resistance (ASTM D4060)

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Chemical resistance

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UV stability

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Coefficient of thermal expansion

5. TESTING PROCEDURES

1. Sample Preparation

Test panels shall be prepared using production-equivalent substrates

- Minimum of three test panels per batch
- Standard panel size: 4" x 6" x 0.125"
- Coating application per Technical Specification TS-CS-001

2. Testing Conditions

- Temperature: 23 C 2 C
- Relative Humidity: 50% 5%

Air flow: ≤ 0.3 m/s

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Light exposure: Standard laboratory illumination

6. ACCEPTANCE CRITERIA

1. Physical Properties

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Adhesion: Minimum 5B rating

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Impact resistance: 160 in-lb minimum

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Flexibility: Pass 1/8" mandrel bend

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Thickness: 3.0-4.0 mils DFT

2. Environmental Performance

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No visible defects after 1000 hours of testing

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Maximum 5% gloss reduction

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No delamination or cracking

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Color change E < 1.0

7. DOCUMENTATION AND RECORDS

1. Required Documentation

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Test results for each batch

Calibration records

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Non-conformance reports

-

Corrective action reports

-

Certificate of Conformance

2. Record Retention

-

All quality control records shall be maintained for 7 years

-

Electronic copies stored in Company's QMS database

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Physical copies archived in fire-resistant storage

8. NON-CONFORMANCE HANDLING

1. Any coating batch failing to meet the acceptance criteria shall be:

- Immediately quarantined
- Marked with red "HOLD" tags
- Documented in the non-conformance system
- Investigated for root cause

2. Disposition options:

Rework

-

Reject

-

Use-as-is (with engineering approval)

-

Scrap

9. REVISION HISTORY

Version | Date | Description | Approved By

---|---|---|---

2 | 2024-01-15 | Updated testing parameters | J. Barrett

1 | 2023-06-20 | Added new test methods | E. Frost

0 | 2023-01-10 | Major revision | M. Chen

10. APPROVALS

Quality Assurance Manager: Date:

Chief Robotics Officer: _ Date:

VP of Operations: _ Date:

11. CONFIDENTIALITY NOTICE

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