

QWIKSEAL[®]

Pre-Sealed Aerospace Fasteners

ASETSDefense

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Overview

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

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 - *QwikSeal* Solution
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 - Current Status
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- Barrier Coat
- PCI
- ESTCP Program Update
 - Schedule/Tasks
 - Qualification
 - Barrier Coat Optimization
- Integration
 - Production Trials
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Problem

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

Current fastener “Wet-Installation” method:

- Mix or thaw sealant
 - *Limited shelf and work life*
- Apply to each fastener
 - *Operator dependent variation*
- Install fastener
- Clean up residual sealant with solvent wipes
 - *Excessive hazmat waste disposal*

This process is messy, time-consuming, and inconsistent



The fastener sealing process must be taken out of the critical path!

QwikSeal Solution

Background

Sealant

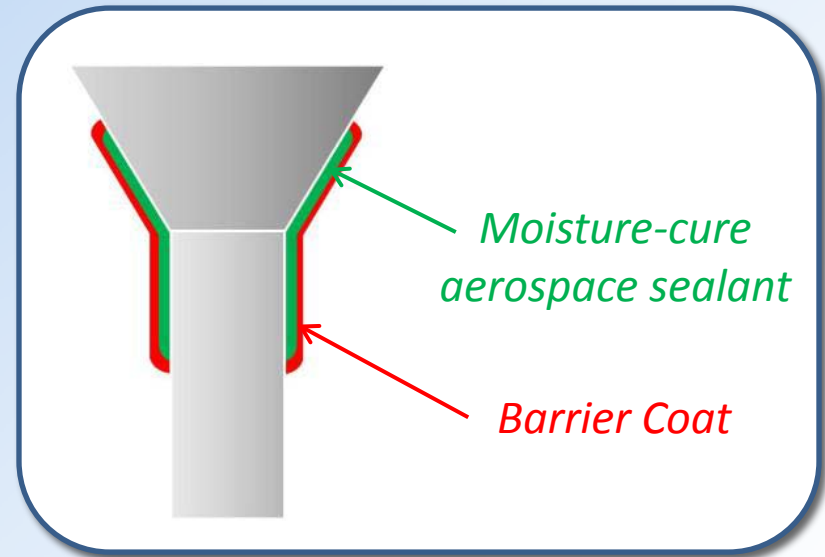
Barrier Coat

PCI

ESTCP Program

Integration

- *QwikSeal* sealant is a moisture-curable variant of polythioether-based aerospace sealant developed by SMRC and PPG Aerospace – PRC-DeSoto
- A pre-determined amount of *QwikSeal* sealant is applied to the fastener and quickly encapsulated with a fast-curing barrier coat
- The barrier coat excludes moisture from the system, preventing sealant cure and thus extending the shelf-life of the fastener
- Upon installation, the barrier coat ruptures exposing the sealant to ambient moisture and initiating cure



Benefits

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

QwikSeal:

- Requires no change to fastener design or size
- Requires no change to hole size
- Requires no change to tooling
- Is applicable to a wide variety of fastener types and interference conditions
- Reduces waste
- Can be replicated in volume

Current QwikSeal Status

Background

Sealant

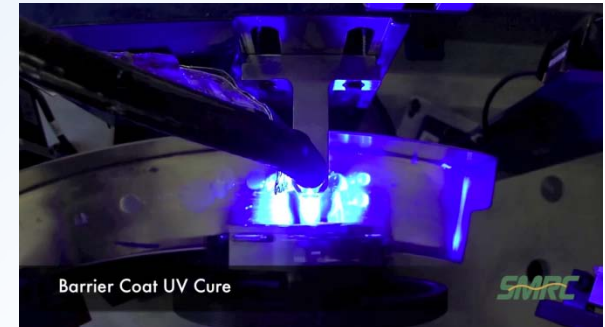
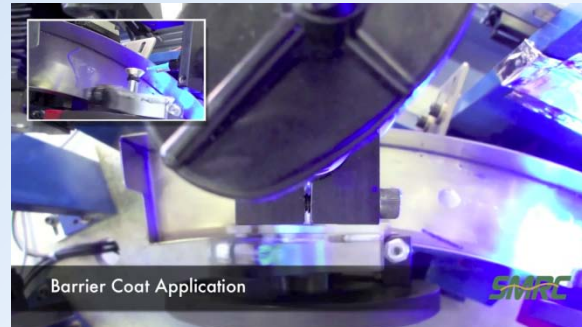
Barrier Coat

PCI

ESTCP Program

Integration

- *QwikSeal* cure-blocking chemistry demonstrated by SMRC
 - Sealant formulation and scale-up transitioned to PPG Aerospace – PRC-DeSoto
- Barrier coat characteristics being developed by SMRC
 - Material composition, profile, thickness, application hardware
- Premature Cure Indicator (PCI) being developed to provide a visual indication of sealant viability prior to installation (2nd generation)
- Prototype fastener production machine acquired
 - Process parameters/dispense hardware being finalized by SMRC
 - Transferring location to PPG's Valencia, CA Application Support Center (ASC) in September 2012



Automated Sealant Application

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

- New sealant dispense valve installed on production machine in 2011
- Capable of applying sealant to fasteners in a variety of profiles, likely to be application specific



QwikSeal Barrier Coat

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

- Rapidly curing material encapsulates *QwikSeal* sealant preventing moisture permeation and adding additional protection against handling
- Two barrier coat variants being developed
 - Frangible variant breaks into small pieces that mix intimately with sealant upon installation
 - Extrudable variant is removed from hole in 1-2 large pieces upon installation
- COTS as well as internally developed materials assessed
 - UV-curable and solvent-based systems being evaluated
 - New application methodology being integrated onto *QwikSeal* production machine

Automated Barrier Coat Application

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

- SMRC has recently acquired a valve capable of spraying materials with a wide range of viscosities
 - Solvent based and 100% solids UV-curable materials can both be sprayed with fine control
- Bench top system constructed at SMRC to finalize barrier coat characteristics
- Valve integration onto QwikSeal production machine currently underway
 - Optimized processing parameters will be transferred to QwikSeal production machine.



Premature Cure Indicator (PCI)

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

- PCI being developed under a DLA funded Phase II SBIR
- Applied in between sealant and barrier coat
- Dye reacts with activated (un-blocked) resin; changes from blue to colorless
- White base material becomes visible as reaction proceeds



t = 0 hours



t = 72 hours

Automated PCI Application

Background

Sealant

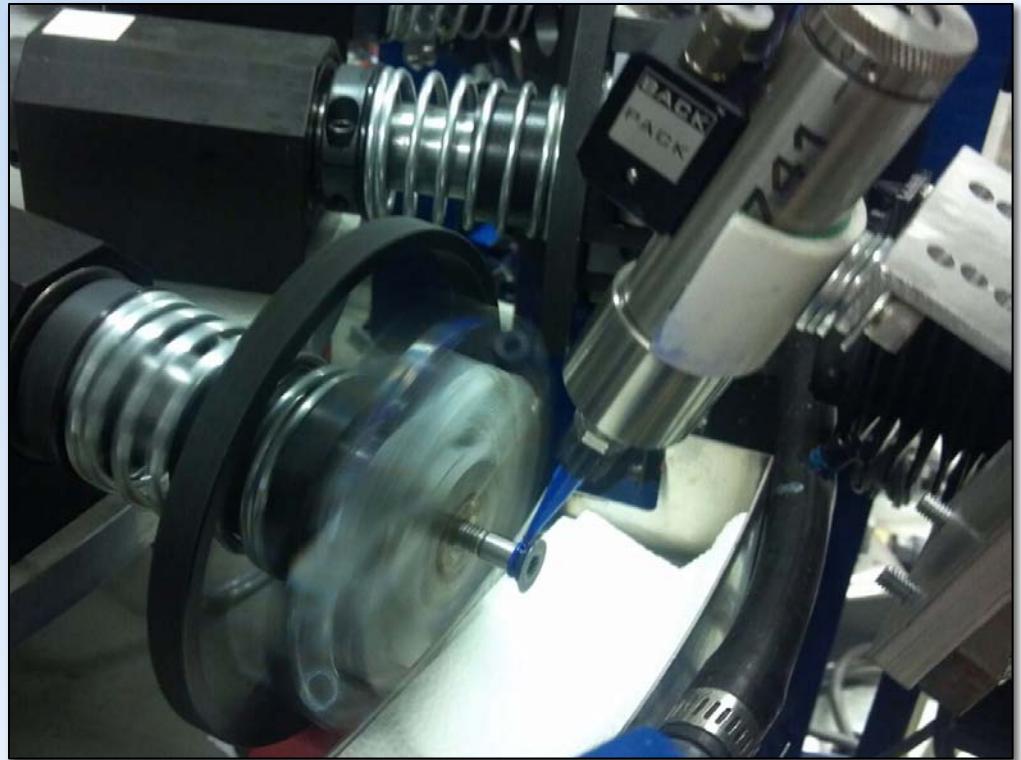
Barrier Coat

PCI

ESTCP Program

Integration

- *QwikSeal* with PCI is intended to be a 2nd generation product
- Dispense hardware has been identified and implementation on production machine is being assessed



ESTCP Program Overview

Background

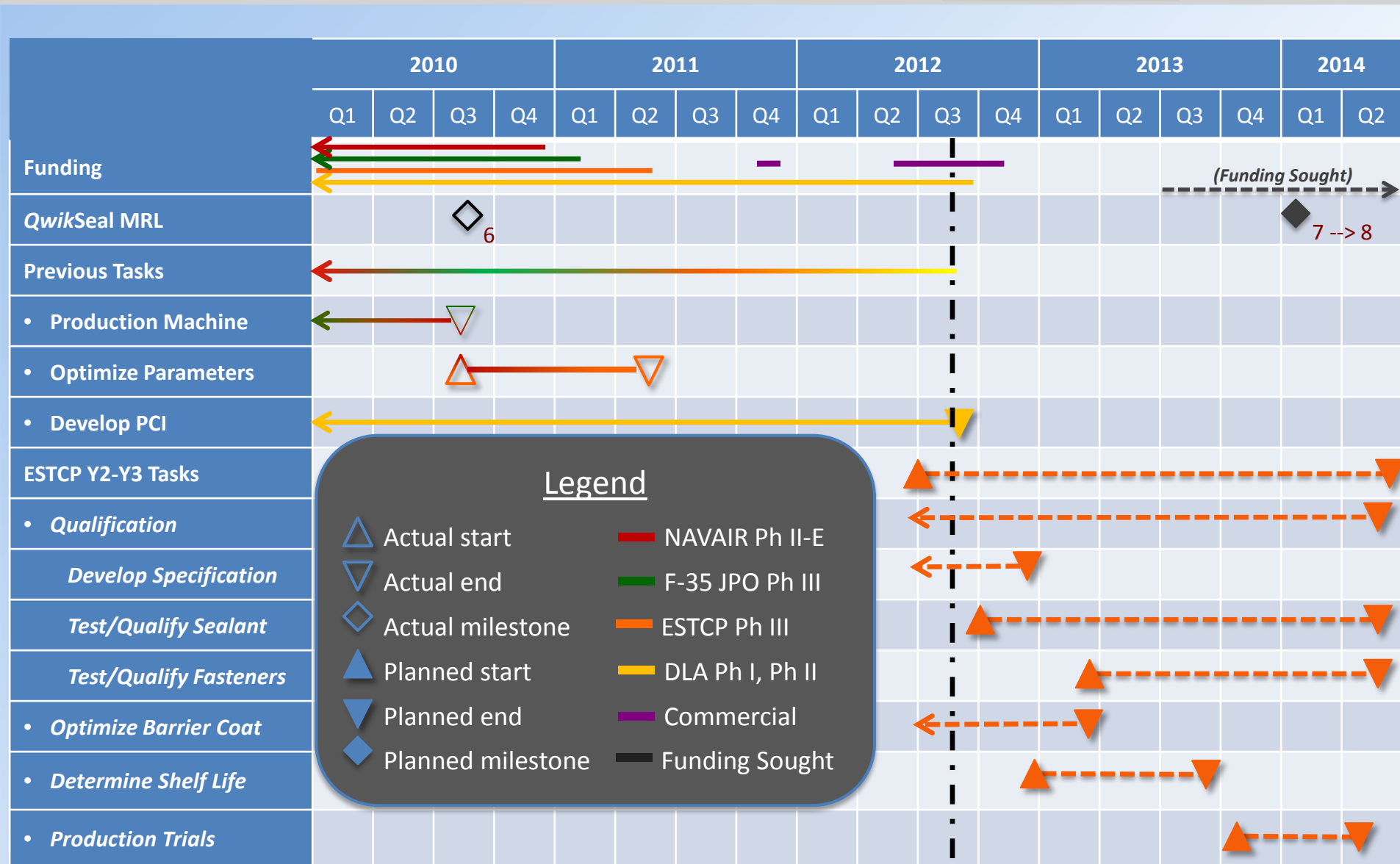
Sealant

Barrier Coat

PCI

ESTCP Program

Integration



Qualification

Background

Sealant

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Integration

- Qualification has been broken into 3 subtasks:
 - Develop specification, test/qualify sealant, qualify fasteners
- Draft specification is being developed between AFRL, NAVAIR, PPG Aerospace – PRC-DeSoto, and SMRC
 - Input from OEM's will also be sought
 - Working draft to be completed Q3 2012
- Sealant testing and qualification targeted to begin Y2Q2 of ESTCP program
 - External testing will be performed by UDRI
- Fastener testing and qualification will begin once barrier coat development has been finalized (anticipated Y2Q4)

Barrier Coat Optimization

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

Sealant Coverage Uniformity



Barrier Coat 1



Barrier Coat 2

Barrier Coat Optimization

Background

Sealant

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ESTCP Program

Integration

Breakaway Torque Adhesion

Test Method

- Prepare fasteners
 - Sealant only
 - Sealant with barrier coat
 - Sealant with PCI and barrier coat
- Install in countersunk panels and allow to cure for 1 week at ambient conditions
- Measure torque required to break fastener free of seal



Production Trials

Background

Sealant

Barrier Coat

PCI

ESTCP Program

Integration

- Production trials carried out with OEM's to determine possible problems before implementation
 - SMRC will work with OEM's to determine relevant test methods, fixtures, samples size, etc.
 - SMRC will provide fasteners as needed to complete testing
 - Tests performed by installers to provide feedback and identify potential issues

Target Platforms

Background

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Integration



P-3



V-22 (Bilge Area)



MQ-8



*F-35
(Upper/lower wing skin,
forward fuselage, mate areas)*

Conclusion

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Thank you for your support!

Questions & Discussions



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SMRC