NDI False Failure Reduction

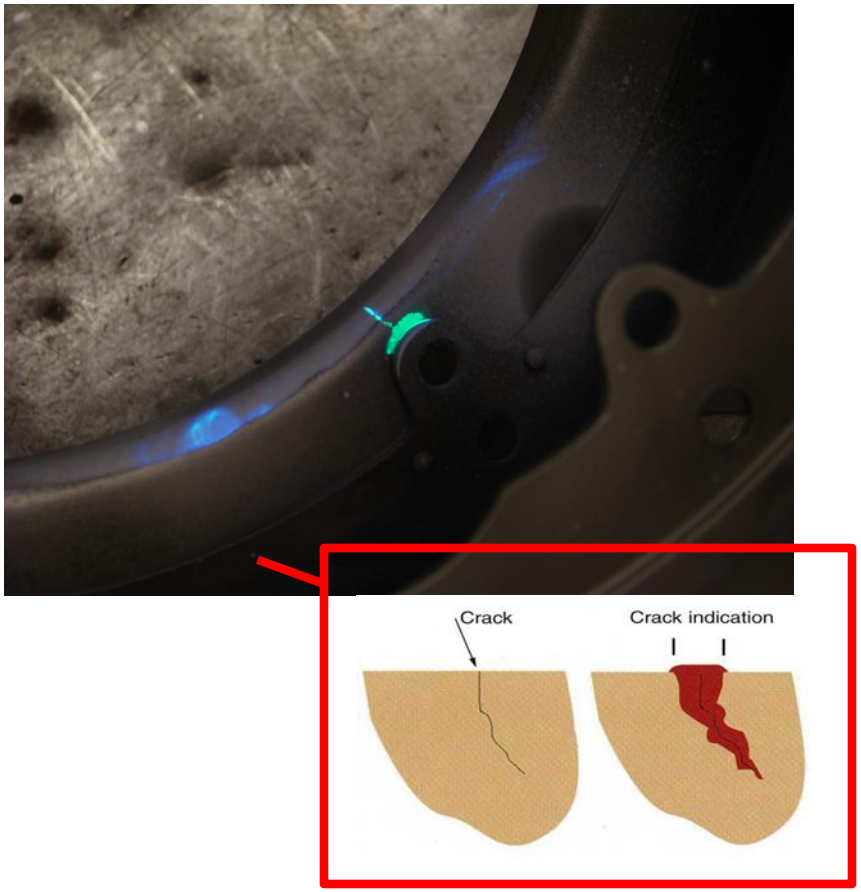
- **Executive Summary:**

  This project focused on the reduction of false failures resulting from NDI Liquid Penetrate Inspections. Liquid Penetrate Inspections are a visual inspection which use a liquid dye to indentify potential cracks in both consumables and repairable gear.

  An examination of failures from the NDI shop indicated that approximately 58% of the items failed should have passed inspection. Failing items result in rework, excessive TRR and man-hours, scrap and in some cases BCM.

  The estimated cost of these false failures are $376,589 for BCM and $16,765 in rework man-hours. Additionally, work centers affected by these failures experienced an increase in TRR of up to 15 days.

NDI Liquid Penetrate Inspection



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- **Problem Statement:**
  NASWI FRCNW Work center 530 performs Non-Destructive Inspection on various mission critical parts. The shop workload accounts for 10% of total work output from FRCNW (measured in one year). Preliminary analysis, conducted by the work center, indicate a high false failure rate resulting in good parts being sent back to the customer to be reworked, scrapped, or BCM'ed.

Sponsors	Team Members
▪Champion: CDR Parrish (CO)	▪Black Belt: AT1(AW) Chris Benally
▪Process Owner: AMCS Paul Jung	▪AM1(AW) Snyder
▪Process Sponsor: CWO3 Castleberry	▪AM1 (AW/SW) Butler
	▪George Wolcott
	▪Sam Bullard

NDI False Failure Reduction

Within Appraiser

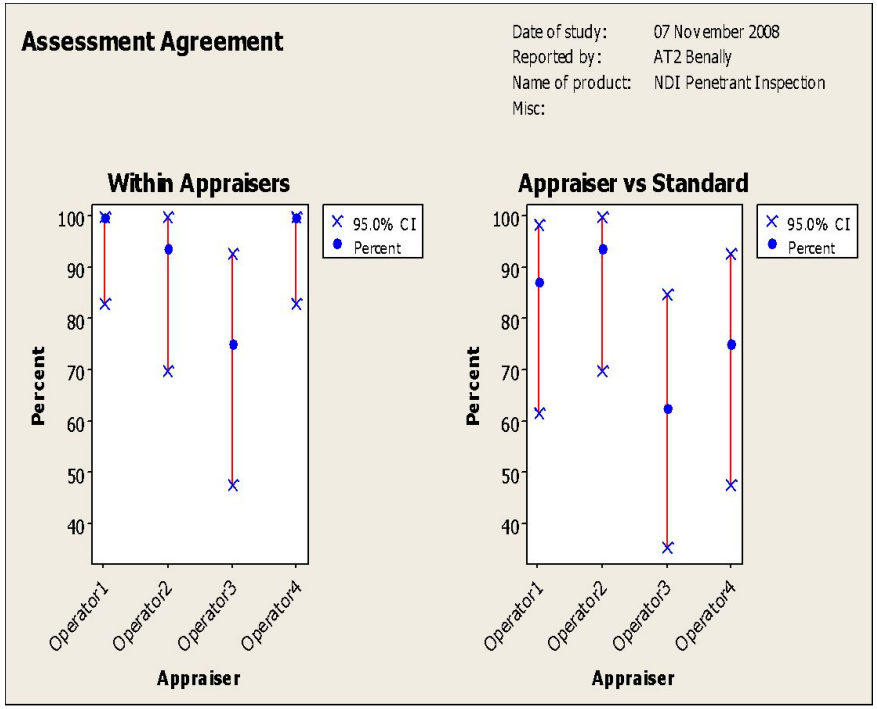
Fleiss' Kappa Statistics

Appraiser	Response	Kappa	SE Kappa	Z	P(vs > 0)
Operator1	FAIL	1.00000	0.25	4.00000	0.0000
	PASS	1.00000	0.25	4.00000	0.0000
Operator2	FAIL	0.87045	0.25	3.48178	0.0002
	PASS	0.87045	0.25	3.48178	0.0002
Operator3	FAIL	0.49206	0.25	1.96825	0.0245
	PASS	0.49206	0.25	1.96825	0.0245
Operator4	FAIL	1.00000	0.25	4.00000	0.0000
	PASS	1.00000	0.25	4.00000	0.0000

Each Appraiser vs Standard

Fleiss' Kappa Statistics

Appraiser	Response	Kappa	SE Kappa	Z	P(vs > 0)
Operator1	FAIL	0.733333	0.176777	4.14836	0.0000
	PASS	0.733333	0.176777	4.14836	0.0000
Operator2	FAIL	0.935223	0.176777	5.29042	0.0000
	PASS	0.935223	0.176777	5.29042	0.0000
Operator3	FAIL	0.465444	0.176777	2.63295	0.0042
	PASS	0.465444	0.176777	2.63295	0.0042
Operator4	FAIL	0.466667	0.176777	2.63987	0.0041
	PASS	0.466667	0.176777	2.63987	0.0041



- The data indicate that experience does not play a factor in getting an inspection correct against a standard.
- This was further verified with Chi-Square and proportions tests.

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- Solution:
  It was verified that false failures were occurring because of an inability to verify that potential cracks were indeed cracks.

  - Procuring better optical equipment to enable the shop to more confidently verify cracks will reduce the potential for false failures

		False Indications	10	Not Long in Oven	1	Timer	1	10					
Inspect	Developer	Miss Cracks	10	Underdeveloped	3	Training / Experience	2	60					
		Excessive Background Fluorescence	10	Overdeveloped	3	Re-Do Process	2	60					
	Eyesight	Miss Cracks	10	Bad Eyesight	2	Current Eye Exams	1	20					
	Test Equipment	False Failure	10	No Zoom Capability	8	10X,200X Magnifiers	8	640					

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- Business Case
  - By reducing the amount of false failure incidents generated by the current testing process, customers can see a reduction in rework, BCM, scrap, parts ordered, reduced TRR & man hours.
- Expected Benefits
  - Type I: None Identified
  - Type II: $376,589.00 Total
    - 71D: $296,672.00
    - 520: $79,672.00
    - Rework: 406 man hours (annual)
    - Scrap: $16,765.00
    - Reduced TRR to 15 Days
  - Type III:
    - Increased Morale

- Control Plan
  - AIRSpeed monthly sustainment through division greenbelts
  - Control charts updated monthly to AIRSpeed Officer via Division Representative
  - AIRSpeed Division Representative will track False Failure Candidates & Cost
  - S.O.P. for Part Induction to NDI LAB to be posted at entrance to Lab with additional distribution via email to workcenter supervisors.