Eaton Corporation
4200 HWY 30 East
Kearney NE

8D Report

Date:

THE DISCIPLINED PROBLEM SOLVING PROCESS REPORT		
Title: JT4E-6507-AB Keeper Groove Burn	**Date Opened:** 10/18/21	**Last Updated:** 11/1/21
Product/Process Information: P/N JT4E-6507-AB (Eaton 372237) Nano Intake Valve	**Organization Information:** Ford-Lima	**Ref. No.:** Ford Concern Number: QR# UF50198
D0 Symptoms At Ford: Keeper groove found burned (rehardened) or tempered back.		
D1 Team (Name, Dept., Tel) **Champion:** Jonn Nebbe – Quality Supervisor (308-233-5447) Ken Bentley – Metallurgical Technician Lynette Buss – Metallurgical Technician		

D2 Problem statement:

DESCRIBE THE PROBLEM: At Ford: Rehardened and tempered back area of the keeper groove identified in a keeper groove field failure.

Before trying to define the root cause or jump to solutions – stop and take time to describe the problem, using as much data and facts as you can gather. Use the questions below to guide you.

PROBLEM PROFILE		
DESCRIPTION AREA	**DESCRIPTION DATA** **Be as specific as possible, identifying part numbers, machines, dates, quantities etc.**	**QUESTIONS CHECKLIST**
WHAT		**What object has the defect?**
Object?	Intake valve	
Defect?	Keeper groove found to be "burned" rehardened and tempered at the surface in localized areas.	**What is the defect?**
WHERE		**Where specifically on the object do you see the defect?**
Seen on object?	Valve keeper groove region.	
Seen geographically?	Field failures in various North American locations. Engines assembled at Ford-Lima.	**Where geographically is the defective object observed?**
WHEN		**When in time, was the defect first observed?**
First seen? · **By the customer?** · **When did we make the part?**	July 2021 field failure at customer	**When were the defectives made?**
When seen since?	Five total failures from this date	**When, since the first observation, has the defect been**

	code.	**observed? (e.g. continuously, in patterns, only on Mondays?)**
When seen in • Process flow?	At customer (field failures)	**When is the defect seen in the process of making the object?**
• Operating cycle?	Field failures.	**When is the defect seen in the operating cycle of the object? (i.e. when the object/system is used)**
• Life cycle?	Typically, several thousand miles.	**When is the defect seen in the life of the object? (e.g. when new or after 200 hours?)**
HOW BIG **How many objects have the defect?**	Approximately 15. About half of the total field failures have "burn" or rehardened material in the keeper groove region.	**How many objects have the defect?**
How many/much defect(s) per object?	1	**How much or how many defect(s) per object? (ie are all bad parts defective to the same extent?)**
What is the trend?	Stable. Raw material has been changed from Sil-lite to Silchrome 1. Expect field failures to stop. Inspection process changed.	**How has the trend developed since first observation and what is it now? (e.g. stable/erratic, getting better/ worse)**
Consider Similar Parts	***Could this problem affect other similar parts: on other lines, in other plants with the same process, other parts with the same materials/process? List those areas or parts you consider at risk, and inform the Champion to enable communication with others.***	

Pictures of concern

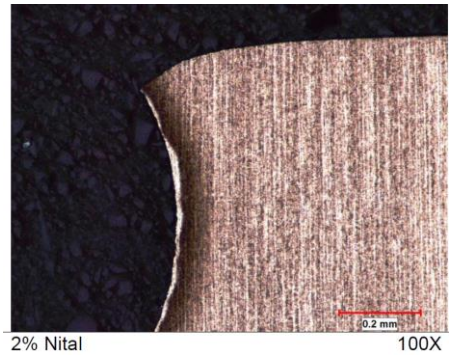

Figure 1: Rehardened Material (white) in Keeper Groove (Dewey Moore)

IS / IS NOT CHART

	Problem Statement:	Several failed valves have been found to have “grinder burn” (rehardened material) adjacent to the keeper groove.				
	Problem Description	**Is**	**Logically could be but Is Not**	**Need Information**	**Differences**	**Changes**
WHAT	**What Object**	Intake valve	Exhaust valve	N/A	N/A	N/A
	What Defect	Rehardened material in the keeper groove	Bad keeper groove form	Contamination to be analyzed at Eaton-Marshall	N/A	N/A
WHERE	**Where On Object**	Keeper groove region.	Valve stem	N/A	N/A	N/A
	Where First Observed	Ford-Lima	Eaton-Kearney	N/A	N/A	N/A
	Where Seen Since	5 total failures from same date code	New valve made with Silchrome 1	N/A	N/A	N/A
WHEN	**When First Observed**	October 12, 2021	N/A	N/A	N/A	N/A
	What Pattern Since	No “burning” observed. Material changed to Silchrome 1	Not Sil-lite material.	N/A	N/A	N/A

D3 Containment Actions:

Containment Instructions		Implemented keeper groove microstructure and hardness checks at keeper groove grinding.				
AREAS TO EVALUATE						
WHAT TO EVALUTE		**Person Verifying**	**Potential Quantity**	**Actual Quantity located and identified**	**Product Disposition**	**Containment Completed (signature required)**
Production Records	Product produced in same time frame	Jonn Nebbe	0 pallets	0 pallets	OK	Jonn Nebbe
	Product produced with same raw material or components	No, raw material has changed.	0 pallets	0 pallets	OK	Jonn Nebbe
In-house Inventory	Receiving Area	N/A	N/A	N/A	N/A	N/A
	Laboratory	N/A	N/A	N/A	N/A	N/A
	Sort / Rework Areas	Jonn Nebbe	variable	0 pieces	N/A	Jonn Nebbe
	In-Process Area A	Jonn Nebbe	variable	0 pieces	N/A	Jonn Nebbe
	In-Process Area B	N/A	N/A	N/A	N/A	N/A
	In-Process Area C	N/A	N/A	N/A	N/A	N/A
	Finish Bank	Jonn Nebbe	variable	0 pieces	N/A	Jonn Nebbe
Product Shipped	At Customer	Jonn Nebbe	0 pallets	0 pallets	N/A	Jonn Nebbe
	End User	N/A	N/A	N/A	N/A	N/A
	In Transit	N/A	N/A	N/A	N/A	N/A
	Warehouse	N/A	N/A	N/A	N/A	N/A
Outsourced Processes	Heat Treat	N/A	N/A	N/A	N/A	N/A
	Plating	N/A	N/A	N/A	N/A	N/A
	Machining	N/A	N/A	N/A	N/A	N/A
	Other	N/A	N/A	N/A	N/A	N/A
Supplier Product	In transit	N/A	N/A	N/A	N/A	N/A
	At Supplier Warehouse	N/A	N/A	N/A	N/A	N/A
	At Supplier facility	N/A	N/A	N/A	N/A	N/A

D4 Root cause analysis:

Cause and effect category	Potential root cause for occurrence link to problem statement	Task to validate root cause	Who?	When?	Results
Man	Running more parts than prescribed on control plan.	Verify processing vs. control plan requirements.	Jonn Nebbe	October 25, 2021	No evidence that parts were processed outside of control plan.
	Not visual inspecting valves for burns.	Verify processing vs. control plan requirements.	Jonn Nebbe	October 25, 2021	No evidence that parts were processed outside of control plan.
Method					
	Only a visual inspection of the keeper groove was done for a "burn" check.	Added additional metallographic inspection at keeper groove grind.	Jonn Nebbe	July 30, 2021	Added additional metallographic inspection at keeper groove grind.
Material	Material correct, Sil-lite	Lab to verify material – material certificate	Jonn Nebbe	10/19/21	Material correct
	Material changed from Sil-lite to Silchrome 1	Already completed.	Jonn Nebbe	8/24/21	First order processed on this date.
Machine	Lack of coolant flow.	Verify machine shuts off with no coolant.	Jonn Nebbe	11/8/21	Testing to be performed week of November 1st.
	Inappropriate parameters	Use Silchrome 1	Jonn Nebbe	11/8/21	Testing to be performed week of November 1st.
	Dress frequency	Use Silchrome 1	Jonn Nebbe	11/8/21	Testing to be performed week of November 1st.
Mother nature	No known issues	N/A	N/A	N/A	N/A

5 Why Analysis: *(Perform 5 Why Analysis on selected probable cause(s) from cause and effect analysis. Use additional rows if more than one probable cause.)*

#	Technical Causes (Related to Machine, Process, & Material)	Why 1	Why 2	Why 3	Why 4	Why 5	Is the Potential Root Cause a Real Root Cause (Yes or No)
1	Grinding aggressively enough to cause material to reharden	Wheel speed and/or infeed to high	Specifications designed for Silchrome 1 material?				Yes
#	Detection Causes (Process Error Proofing, Gaging Methods, Inspection Methods, etc.)	Why 1	Why 2	Why 3	Why 4	Why 5	Is the Potential Root Cause a Real Root Cause (Yes or No)
1	Visual inspection of the keeper groove was the only detection for burnt keeper grooves.	Visual inspection was deemed adequate at the time.	This was the standard hardness inspection at keeper groove grind for 50+ years.				Yes
#	Management Processes (PROLaunch Process, Change Management Process, Management Review Process, Training process, etc.)	Why 1	Why 2	Why 3	Why 4	Why 5	Is the Potential Root Cause a Real Root Cause (Yes or No)
1	Job instruction requirements are the same between Sil-lite and Silchrome 1 materials.	Large windows are specified for all grinding parameters.	Allows the operators to set-up properly and as-needed.				Yes

Cause #	*Root Cause*
1	No metallographic inspection at keeper groove set-up.
2	Grinding was too aggressive on the keeper grooves causing rehardened material.

3	
4	

D5 Develop and verify solution:

(Long term corrective actions to prevent reoccurrence of problem)	Who?	When?	Status	Results
Added metallographic inspection at keeper groove grind set-up.	Jonn Nebbe	7/30/21	OK	Improved data

D6 Implement corrective actions:

Countermeasures: *(Long term corrective actions to prevent reoccurrence of problem)*	Who?	Start Date	Status	Breakpoint/Due Date
Added keeper groove metallographic check at keeper groove grind at set-up and once/shift.	Jonn Nebbe	7/30/21	OK	8/24/21

D7 Prevent reoccurrence:

(How did you verify the countermeasure worked?) ***All questions are required for closure.***					Enter Status (Yes, No, N/A)	Responsible	Explanation for No or N/A Status
Can you show proof of the problem elimination? *(Via measurement chart or metric - Attach supporting charts)*					**Yes/No**	J. Nebbe	
Has a Quality Alert been posted?					**No**	J. Nebbe	In-process
Has a containment worksheet been completed?					**No**	J. Nebbe	In-process
Have PFMEAs been completed/updated? (Failure mode comprehended)	**Old RPN #**		**New RPN #**		**No**	J. Nebbe	Testing not complete
Was the Process Control Plan adequate and followed?					**Yes**	J. Nebbe	
Has Error Proofing been reviewed and verification completed?					**N/A**	J. Nebbe	No error proofing

Have the Job/Work Instructions been updated?	**Yes**	J. Nebbe	
Has training been completed and documented?	**Yes**	J. Nebbe	
Have the check sheets or other forms been updated?	**Yes**	J. Nebbe	
ECR/ECA/PCR(s) initiated? #	**Yes**	J. Nebbe	
The results/changes were communicated to the relevant Team Members on all shifts?	**Yes**	J. Nebbe	
Has the PM been reviewed and updated, if required?	**N/A**	J. Nebbe	No PM required.

Issue resolved?	**X**	**Yes, issue closed**
		No, assigned to **Date**

Lessons Learned:

Could the communication of this problem and its fixes possibly prevent other departments from incurring the same problem?

If "Yes", check relevant boxes and send a copy of this form to those departments (attach copy of email if applicable).

Yes	**X**
No	

Date sent: **10/20/21**

L1/2		L3S/N		L4/5		PTS		HV			
VF		RE		CP		HT		Gears		Other	MCO

If "No", document explanation

D8 Recognize project team:

Final Review/Coaching: *(Document signature & date for applicable role - initiator required for closure)*				**Signatures required for closure**
Date & Signature	**8D Leader**	**Production supervisor**	**Team Leader**	Area Mgr
1st Shift				Quality Mgr
2nd Shift				ME Mgr
3rd Shift				Product Line Mgr