WAYNE METALS SPECIFIC TOOLS

Problem Solving & Root Cause Analysis
8-STEP PDCA PROCESS

Introduced to Wayne Metals by Toyota Industrial Equipment
INTERNAL DEFECT COUNTERMEASURE LOG

Follow 8-Step Memo #124

STANDARDIZATION / YOKOTEN

TEACH & TRAIN
(90 DAY NO DEFECT)

CONTAIN

DETECT

FIND ROOT CAUSE

IMPLEMENT COUNTERMEASURES
REPORT @ DAILY MEETING

Date:
Where:
Who:

1234-U4567-71
Dimension out of spec
ID undersized
Spec = 24 ± 1
Actual = 22
12 pieces

(1) Genchi Genbutsu (ASAP)
Date:
PIC:
How:
Result:

(2) Containment (ASAP)
Date: PIC:
How:
Result:

At Customer & in Transit

(3) Root Cause (Same Day)
Date:
PIC:
How:
Result:

(4a) Countermeasure for escape prevention (Same Day)
(To prevent flow out recurrence)

(4b) Yokoten (By 2nd Day)

(5) Daily Meeting (Next Day)
Date:
Reported by:
How:

(6a) Standardize (By 2nd Day)
Date:
How:

(6b) Yokoten (By 2nd Day)

(7) Teaching & Training (By 2nd Day)
Confirmed By
Date
Leaders:
In-House
Operators:
Back-ups:

90 Days
Confirmed By
Date
Comments:

(8) Management confirms activity good & kept

Date:
Where:
Who:

FORM 04368
Revision: New
Department: Machining
PIC:
Bob Smith

Go and See
FOLLOW THE 8 STEP METHOD EVERY TIME

1. Genchi-Genbutsu “Go and See”
2. Contain
3. Root Cause
4. Countermeasure
5. Asaichi
6. Yokoten/Standardize
7. Teach/Train
8. Daily Management Control
Quality defect will decrease if the quality defect reoccurrence prevention's 8 step is implemented regularly.

“What is the quality defect reoccurrence prevention 8 step?”

Many people cannot answer this question. Once more, this note will explain the 8 step.

Request strongly to implement this 8 step to be ‘Zero’ of defects which are big MUDA.

To do this, **Top management should take initiative**

<table>
<thead>
<tr>
<th>STEPS 1 &amp; 2</th>
<th>START IMMEDIATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Go and see the defect at Genchi</td>
<td>Responsible TL</td>
</tr>
<tr>
<td>② Sort out inventory</td>
<td>Responsible TL</td>
</tr>
</tbody>
</table>
## Step 3: Complete at “Go and See” - Genchi Genbutsu

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>Find root cause</td>
<td>Responsible TL</td>
</tr>
<tr>
<td></td>
<td>Within the day</td>
<td></td>
</tr>
</tbody>
</table>

### ③ Find the cause by genchi genbutsu.
1. If the defect is occurred first time:
   - Tell Associates about the defect occurrence and ask them if they know anything about the cause.
   - Confirm the Standardized Work Sequence Sheet.
   - Confirm whether the quality gate exist or not.
   - Watch the process to see if the standardized work is implemented.
   - Check if the equipment, jig, mold, etc are normal.
   - Check the material. Check the layout.
   - Check if there are any Henkaten Associate, material, tools, equipment
2. If the defect is reoccurred or repeated:
   - Confirm the past countermeasure history. (See note no. 122 ‘Visualizing the history’)
   - Think why the defect is reoccurred. Check following items by Genchi Genbutsu.
     - (a) What was missing in the past countermeasure?
     - (b) What was wrong with the past countermeasure?
     - (c) The countermeasure ideas were good, but the Associate did not follow the countermeasure? The Associate skill was not enough for the countermeasure?

※ The TL of the process should take in charge and investigate the cause. (Give TL time to investigate for few hours.)
※ Write down the defect occurrence information with a red pen on the sequence sheet. (The history will be easy to see at a glance.)
※ Write down what TL found out on the big paper and narrow down the cause.
※ It is muda to do FTA for the simple defect. When the defect is reoccurred, think why the past countermeasures does not work.
STEP 4-COMPLETE WITHIN 24 HOURS

4) Take countermeasure within the day.
1) New issues will come up tomorrow, so implement countermeasure within the day. (Speed is a key)
2) If the countermeasure will take some time to implement, implement a temporary countermeasure as soon as possible to prevent the defect reoccurrence. Soon or later, this defect is needed to be fixed, so just implement countermeasure before it’s too late.
3) If it will take a long time, write down PIC and target date on the ‘PDCA’ format and follow up till the countermeasure is completed.
5) Write down by hand the countermeasure result.
※ Take countermeasures against cause of occurrence and cause of outflow.

※ If the cause is still remained, the defect will be occurred continuously. For every cause, the countermeasure should be implemented.
※ The last, check Associates. People usually does not try hard to solve the problem unless the problem cause the person trouble. Please read memo No. 106. Motivate Associate and promote visualization.
| Step 5: Conduct Daily - Asaichi or Yuichi |

- **Implement Asaichi**: Set up time and implement the meeting everyday. About 20 min.
- **Top Manager or Plant Manager**

**What is Asaichi?**

- The defect which is occurred the day before is presented by the responsible TL. Review the countermeasure. If the countermeasure is not enough, guidance TL and genchi genbutsu.

**Asaichi Effect**: The company who implement Asaichi as directed reduces the defect rapidly. The company who does not implement Asaichi as directed does not reduce defect.

1. The responsible TL present the root cause and countermeasure of the day before. For reoccurred defect, explain the history first and the new countermeasure to prevent from reoccurrence.
2. The top manager should listen and determine whether the countermeasure is appropriate or not. Confirm the problem by genchi genbutsu and give advice if it's needed.

※ Asaichi should be maximum 30 min to keep their mind. If there are many defects, a high important defect should be presented first. Finish the meeting when the time is up.
※ It is important that all listen and judge if it is effective. If the countermeasure is not firm, genchi genbutsu and confirm the countermeasure again.
※ Asaichi will be a good tool to provide communication between top management and the middle management. It will develop a teamwork and human resources through this meeting.
WAYNE METALS YUICHI MEETING
<table>
<thead>
<tr>
<th></th>
<th>Standardize and Yokoten</th>
<th>Responsible TL</th>
<th>Within the day 1) and 2) Depend on plan 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Standardize and Yokoten to similar process...</td>
<td></td>
<td>The countermeasure information should be standardized and Yokoten to similar process to achieve Defect Zero for all process. 1) Work - Revise the work sequence sheet and add the key point. Make a sequence sheet if there is none. For the TSDR item, add information to the drawing beforehand. 2) Basic Rule - If there is no rule about work stopping, abnormal situation communication, set up the rules. If the rules are not clear, revise the rules, so all can understand it clearly. 3) Equipment, mold, jig - Yokoten the countermeasure for the equipment, mold and jig. List up the items.</td>
</tr>
<tr>
<td>7</td>
<td>Teaching and Training</td>
<td>Responsible TL</td>
<td>Within the day 1) Depend on plan 2)</td>
</tr>
<tr>
<td>8</td>
<td>Daily Management</td>
<td>Responsible TL</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(8) Manage daily to confirm if new standard work is followed. Watch the process, and if the new standard work is not followed, be strict with the Associate. Teach the Associate. It is important to be able to distinguish between normal situation and abnormal situation immediately.</td>
</tr>
</tbody>
</table>

STANDARDIZE, YOKOTEN, TEACH AND TRAIN, MANAGEMENT COMMITMENT
### INTERNAL DEFECT COUNTERMEASURE LOG

**Follow 8-Step Memo #124**

**SAFETY FIRST**

**Keep it simple. Focus on the three Ms (Machine, Material, Method).**

**Take responsibility.**

**Commitment to continuous improvement.**

**Create a culture where people are comfortable to speak up.**

**Report problems and issues.**

**If repeat, assign a root cause.**

**Identify the root cause.**

**Implement countermeasures.**

**Verify countermeasures.**

**Check for recurrence.**

**Record issues and post where can be seen. CLEARLY identify who will take ownership to fix problem.**

**Used daily to visually track quick improvements of current issues**

**Proven extremely effective when completed daily and required by top management**
PROBLEM SOLVING TOOLS TO USE DURING “GO AND SEE” PHASE
3-LEGGED, 5- WHY
3-DIAMOND, 3-LEGGED 5-WHY
**Problem Analysis Steps:**

*Answer 18 questions below and utilize 5 Whys form as book as needed.*

<table>
<thead>
<tr>
<th>Process</th>
<th>Yes</th>
<th>No</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the WI clearly and accurately define the process steps needed to meet the product requirements?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Did SLP/Tooling accuracy contribute to the problem?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Were the work instructions followed?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Does the process include error proofing?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Was the job performed by a new/temps operator?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Was the operator trained for this station/operation?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Would the operator know if the defect occurs?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Does the operator know what to do when a defect is detected?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Was this process recently moved/changed?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<table>
<thead>
<tr>
<th>Tool</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Were correct tools/fixtures/error proofing available?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Were correct tools/fixtures/error proofing used per WI?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Were tools/fixtures/error proofing calibrated at applicable?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Were tools/fixtures/error proofing functioning properly?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Can correct tool/fixtures/error proofing be used without interference/difficulty?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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</table>

<table>
<thead>
<tr>
<th>Part</th>
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<tbody>
<tr>
<td>Were parts missing at the PCA when issue occurred?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Was wrong part used?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Is this a new part recently introduced to this station?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Do some parts assemble better than others?</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

*Actions are required if a red octagon is a true contributor to the problem statement. The 5 why process on the reverse side can be utilized both to determine the contributors to the problem statement and/or to identify some level root causes of the “red octagons” issues.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Containment Actions</th>
<th>Containment Date / Clean Line set or SN</th>
<th>Interim or Permanent Corrective Actions (note ICA or PCA)</th>
<th>ICA or PCA Date / Clean Line set or SN</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
QUALITY OBSERVATIONS
<table>
<thead>
<tr>
<th>Date</th>
<th>shift</th>
<th>Quality Observations Checklist</th>
</tr>
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<tbody>
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1. Make continuous rounds throughout shift to ensure all set-ups are verified and operators are working within set parameters.

2. Use “O” for conforming and “I” for nonconforming. Note nonconformances in “Comments” and immediately act on those issues to correct. Note change point and route parts through inspection with instructions.

| # | Date | WOK | Part # | Pertinent Process: Is the set-up correct? | Verification: Have the process parameters, etc. been met? | Verify that the parts are being handled correctly? | Filter/Emulsion check: Are the parts being handled correctly? | Has the operator been trained on the job being performed? | Verify SPC is being done correctly and entered into SPC system? | Is SPC being done correctly and entered into SPC system? | Stamping/Marking/Marking | Inspect sample of parts from the container: Are all nonconforming? | Verify that nonconforming product is corrected per procedure | Comments. Note that any discrepancy found should be corrected immediately and noted as a change point and routed through inspection for verification that they meet print tolerances. |
|---|------|-----|--------|------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------|
| 1 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 2 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 3 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 4 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 5 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 6 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 7 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 8 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 9 |      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 10|      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 11|      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 12|      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 13|      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 14|      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
| 15|      |     |        |                                          |                                                            |                                                     |                                                         |                                                               |                                                                 |                                                                  |                                                               |                                                              |                                                                  |                                                                  |
DEFECT PREVENTION TOOLS
1. Standardization
2. Visualization
3. Training
4. Communication
5. Sustainability
STANDARDIZATION & VISUALIZATION
**CAT, 334-6497P*03, CHANNEL, OP. 20**

**Quality Gate(s):**
- Setup piece and second signature: N/A
- Operator first piece and second signature: N/A
- SPC: Operator inspection

**Part Number:** BT-3940*04
**Quantity per part:** (2)
**Thread:** M10 x 1.5

**INSERT:** (1) BT-3940*04

**CAT, 334-6497P*03, CHANNEL, OP. 20**

- Layout (3) pcs on table
- After 3 pcs load into container

**CAT, 334-6497P*03, CHANNEL, OP. 20**

- Place parts in WM15 as shown

**INSERT:** (1) BT-3940*54

Move part to next position
CORPORATE DILEMMA

WHAT IF WE TRAIN THEM AND THEY LEAVE?

WHAT IF WE DON’T... AND THEY STAY?

INVESTING IN EMPLOYEES
Wayne Metals University Training Map

Basic Training
- New Hire Training
- Safety Training
- Wayne Metals Policies
- Wayne Metals Organization
- Wayne Metals Operations
- Wayne Metals Facility
- Wayne Metals Environment
- Wayne Metals Compliance
- Wayne Metals Communication

Basic + Training
- Basic Training + Leadership

Advanced Training
- Leadership Development
- Management Development
- Technical Training
- Sales Training
- Customer Service Training
- Project Management Training
- Quality Control Training
- Safety Training

Refresher Training
- Refresher Training

*All Training to be Conducted by Certified Trainers*
WAYNE METALS MENTOR PROGRAM
CHANGE POINT TRAINING & COMMUNICATION
What is a Change Point?

- **Change Point** – Defined as any process deviation from the Customer Approved / PPAP Approved Engineering Process.

- Any change to the process you are running.

---

**Top Change Points**

- If you are running a work order with...
- 1. No Work Instructions / No Print / No Set-up Sheet / No Parameter Sheet
- 2. Incorrect or lack of tooling / Fixture / Check Fixture / Sensors
- 3. All Non-conformances that developed during production – What changed? **Stop and contain load!**
- 4. Team Members – new to department, new hire, never ran part
- 5. Outside of Normal Process – i.e. coil press to non-coil press; CNC Mill to a manual mill; Robot to manual weld, etc.
- 6. Toyota TSRO’s welded completely in tool room. Requires 100% inspection.
- 7. All reworks are change points. Requires 100% inspection.

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**Yield!**

- Alert team leader immediately. The team leader is to notify QE and area manager.
- As a team, make a decision to proceed or not to proceed.

---

**STOP!**

- DO NOT proceed without direction from Quality Engineer and/or Area Manager.

- On off shifts, see Andy Fifer 2nd shift; see Dave Davis 3rd shift from our Inspection department.

---

**What do I do when one of these occur?**

**GO!**

- If proceeding, the following actions are necessary:
  1. Determine increased inspection criteria.
  2. Establish frequency of checks involves first (3) parts and last (3) parts up to and including 100% inspection of all parts. First (3) and last (3) parts are to be verified by inspection. Required tags are to be filled out per procedure.
  3. Verify any KCC, CC, and/or SCC features on print. All safety features, in general, must be verified. All features in SPC must be maintained.
  4. Whomever authorizes Change Point must fill out and send Change Point Notification document #QA0588 to our change point group.
  5. Administrative Quality must review for internal PPAP.
SUSTAINABILITY
STRUCTURING MANUFACTURING FLOOR TO ENGAGE ALL EMPLOYEES IN QUALITY IMPROVEMENT ACTIVITIES.
ADVANCED PRODUCT QUALITY PLANNING
LESSONS LEARNED CARD

Engineering Check List

Manufacturing Process
- Review process sheet
- Annual volume

Material
- Review process sheet
- Scraped off lists/Process List file

Finish specifications/spec

New Materials, or outside service information sent to purchasing

(1/5th)

Deviation required per quotation notice (1/5th)

Deviation Request Submitted to the customer (date)

Engineering/Check List

Tooling

Tooling #/Stage #

Description

Estimated

Completion Date

Engineering and Prints

New part notification sheets have been given to production control, copies of New Part Notification sheets have been given to the intent for work instruction documentation.

IMF: Has been requested for assemblies. For revision changes if there is no change to IMF, has the current file be re-named to the current revision level?

IMD: Information, material type and weight, has been given to quality for Titanium, CVD and Military customers.

All revisions on the customer order are represented on the Work Order. Material information such as type, part, tapped or counter sunk holes.

All print librarians and materials have been reviewed and are achievable per process sheet. (If not, details must be submitted prior to part release from engineering)

Lasers and AAS

All laser cut holes are greater than material thickness, process has been reviewed to assure that tapped holes are not laser cut (If they do not meet hole size criteria + material thickness).

Three pieces have been reserved for appropriate care and stop areas.  Bar/Stand cannot enter into the parts. Note on programming request for material, 3% thicker.

Press Brake

Inside form radius on components is appropriate for material type: MBE sheet < 0.030 (1.146), Grade A36 and Grade 50-650 (1.567)

Grade BM-57 (2.547)

Formed parts have been reviewed for hole distortion after forming (hole too close to the bent line)

Formed parts have been reviewed for hole distortion after forming (hole too close to the bent line)

Special tooling required for forming and correct tooling specified on the process.

Metal parts have separate drawings. (Minor and major parts are to be shown on the same part)

Saw and Shearing

Correct material called out on the process sheet per product. (Correct thickness and customer specifications)

Punch Press

Process controls bars or the proper processes are employed to clean bars if required per print other than standard manufacturing bars. (i.e. barstock or grinded as needed)

Formed parts have been reviewed for hole distortion after forming (hole too close to the bent line)

Formed parts have been reviewed for hole distortion after forming (hole too close to the bent line)

1/4/00 parts have separate drawings. (Minor and major parts are to be shown on the same part)

Material

Drill/Tapping

Tapped holes have been reviewed for capable process. Drill on presses, only use holes if criteria allows.

Spot Welding

Grinding/Metal Preparation

Surface Class has been defined for Caterpillar parts

Operations such as rust preventative are structured as separate processes and not embedded in the weld or grind operations.

Welding

Weld callouts are easily interpreted as documented. (weld engineer to approve)

Quality/Gaging

If check gages or fixtures are required. Have alternate check methods been noted on the process and control plan until the gages can be placed in service?

All appropriate gages are available in the particular work area and in inspection areas. (th再度, gage, drill bits, paint plugs, eye bolts for printing if required)

Product Safety Characteristics are listed on the control plan for all customers with Product Safety characteristics.

If check fixtures or special tooling is required, notes are added to the PPAP operation for a (5) piece layout and 30 piece capability required to approve new or modified tooling or fixtures.

LESSED LEARNED CARD

1/5/2018

GAM01

Engineering Check List

The correct pilot hole sizes for studs and nuts have been confirmed on the flat sketch.

Spot-weld nuts are adequately represented as to assy., laser etch on nut side, or separate print with iso view.

Weld callouts are easily interpreted as documented. (weld engineer to approve)

Grinding/Metal Preparation

Surface Class has been defined for Caterpillar parts

Operations such as rust preventative are structured as separate processes and not embedded in the weld or grind operations.

Welding

Weld callouts are easily interpreted as documented. (weld engineer to approve)

Power Coating

Paint review of part hanging method with the paint line. Special hooks or racking required?

Correct finish specified on the process sheet. (per customer spec. correct color, plate or e-coat)

Appropriate masking notes are stated on the process for powder coat

Post paint assembly operations are structured in the process or separate operations

Assembly and Packaging

Customer specific shipping notes are added to the shipping data base if required. CAT purchase order notes are communicated on process sheet and added to work instructions at Plant B.

Any special equipment or work instructions required for assembly operations...
WEAK POINT MANAGEMENT

Improvement tool used to **Visualize** and **Prioritize** types of issues to provide guidance toward actions to improve.
EVERYONE IS AN INSPECTOR PROGRAM
THANK YOU!