

Request 16

Separately, describe the process used to identify and solve the alleged defect in the subject vehicles including, but not limited to information pertaining to the 8D team-oriented problem solving methodology.

In addition, produce copies of all documents related to this request.

Answer

In answering this question, Ford found the phrase, “describe the process used to identify and solve the alleged defect,” to be ambiguous and subject to multiple interpretations. Ford had provided details as to the alleged defect defined by NHTSA in the information request for PE22-007. To answer the question above, Ford is construing this request to refer to methods employed to determine the root cause of fractured intake valves occurring in the subject vehicles. Ford became aware of field concerns involving fractured intake valves as a result of monitoring low time in service warranty claims on the subject vehicles. Through Ford’s and the supplier’s 8D process, intake valves that had fractured in the field were found to have rehardened material (white martensite) on the valve surface at the third keeper groove. A separate 8D was opened to study intake valves with a tip hardness that was over specification. These files are provided with the following file names “EA23-002 Request 16 – Supplier 8D Grinder Burn” and “EA23-002 Request 16 – Supplier 8D Tip Hardness” respectively.

For background, the Global 8D (G8D) is a problem-solving methodology for product and process correction and improvement that is structured into eight disciplines (D1–D8), plus one preparation step (D0). A detailed description of the 8 disciplines, as documented in Ford resources, is provided in D0 through D8 below.

D0 - Prepare for the Global 8D Process: In response to a symptom, evaluate the need for the G8D process. If necessary, perform Emergency Response Actions (ERAs) to protect the customer and initiate the G8D process.

D1 - Establish the Team: Establish a small group of people with process and/or product knowledge, allocated time, authority, and skill in the required technical disciplines to solve the problem and implement actions that will correct and prevent the problem from recurring. The group must have a designated champion and team leader.

D2 - Describe the Problem: Describe the internal/external customer problem by identifying what is wrong with what and detail the problem in quantifiable terms by creating a problem description that describes what, where, when, and how big the problem is and is not.

D3 - Develop Interim Containment Actions (ICAs): Define, verify, and implement actions to isolate any internal/external customer from the effects of the problem until the problem can be resolved permanently. Validate the effectiveness of these actions.

D4 - Define and Verify Root Cause and Escape Point: Determine the root cause by identifying alternative causes and selecting the one that best explains the problem. Determine the place in the process closest to where the problem is generated where the effect of the root cause should have been detected and contained but was not (the escape point). Verify that the selected root cause is the actual root cause.

D5 - Define and Verify Permanent Corrective Actions (PCAs) for Root Cause and Re-evaluate Escape Point: Determine the best PCA to eliminate the effect of the root cause. Re-evaluate the escape point in light of the PCA. Verify that the PCA will be successful when implemented without causing undesirable effects.

D6 - Implement and Validate Permanent Corrective Actions (PCAs): Plan and implement the selected PCAs for the root cause and improve the control system at the escape point. Validate that these actions are effective and monitor the long-term results.

D7 - Prevent Recurrence: Modify the necessary systems, including policies, practices, and procedures, to prevent recurrence of this problem and similar ones. Make recommendations for systemic improvements, as necessary, and document technical lessons learned.

D8 - Recognize Team and Individual Contributions: Complete the team experience. Present technical lessons learned. Sincerely recognize both the team and individual contributions and celebrate the success of the project.

Prior to and preliminary in work product to the Global 8D process, Ford utilized its 6-Panel problem resolution process. While not directly responsive to this request, Ford is providing the 6-Panel in the file "EA23-002 Request 16 – 6Panel." Ford notes that this 6-Panel was created early in the problem solving process and does not appear to have been updated since 2021. At the time, the 6-Panel was used primarily to assess potential characteristics of third keeper groove failures and was, at the time, not specific to the cause of the alleged defect.

Ford's 6-Panel problem resolution process is a template underpinned by the Six Sigma DMAIC problem-solving methodology. DMAIC splits the problem-solving process into five discrete phases: Define, Measure, Analyze, Improve and Control. In the 6-Panel process, a sixth step is added named replicate (DMAIC-R). The process steps in the 6-Panel are outlined below.

1. Define: In this step, the problem (Y) is clearly defined based on the voice of the customer. A common means to define a problem like the alleged defect is utilizing warranty data. In this phase, the project objectives, project scope and key stakeholders are also defined.

2. Measure: In this step, data is collected to understand the current state of the process and to establish a baseline. The cross functional team identifies the key process metrics (X1, X2, ...) that are understood to affect the problem (Y). Often, Ishikawa type analysis is utilized to establish these process metrics. In this phase, the appropriate measurement systems are identified to measure and collect data.

3. Analyze: In this step, the team analyzes the data collected in the previous step to identify which critical process metrics (X's) affect the problem (Y). Various tools and techniques, such as process mapping, cause-and-effect diagrams, and statistical analysis, are used to identify the factors contributing to the problem. The team develops hypotheses and tests them to validate the root causes.

4. Improve: In this step, the team develops and implements solutions to address the root causes identified in the previous step. The team generates and evaluates potential solutions,

and selects the optimal ones. Work plans are developed for implementation of the solutions identified and solutions are tested on an appropriate scale to validate their effectiveness.

5. Control: In this step, the team establishes controls to sustain the improvements made in the previous step. The team develops a control plan to monitor the process and ensure that the improvements are maintained over time. The control plan includes metrics, monitoring systems, and response plans to address any deviations from the desired performance.

6. Replicate: In this step, the team performs an analysis of who else in the organization can benefit from the project findings, codifies the lessons learned in the corporate knowledgebase, and implements a system to measure sustained improvement. This step is analogous to D7 in the Global 8D process.