WCBF Presents:

The Global Six Sigma Awards

2006

Honoring the Year's Best Individual and Organizational Achievements in Six Sigma

Cooper-Standard's award-winning entry showcased how the use of Design for Six Sigma delivered a cost-effective water valve design while generating increased sales for the company.

An independent judging panel announced the winners for eight categories from a total of 65 entries on June 28, 2006 at the Global Six Sigma Summit and Awards Dinner, the largest Six Sigma-related gathering of CEOs and senior executives.

QUALITYDIGEST July06'

Best Achievement of Design for Six Sigma: Cooper Standard Automotive Global Fluid Systems

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Cooper Standard

Background

Cooper Standard Automotive Global Fluid Systems division is headquartered in Auburn Hills, Michigan. Its design and engineering teams provide subsystems and components that control, sense, deliver, and measure fluids and vapors. By using core competencies of emissions, heating and cooling, fuel and brake, and power steering management, Cooper Standard Automotive Global Fluid Systems satisfies the stringent environmental and performance requirements demanded by its customers.

Strategic Objectives

- Senior managers define their high-level expectations and communicate their commitment to a Six Sigma culture.
- Project teams complete actions in support of the strategic imperatives, while allocating resources to ensure effectiveness.
- Master Black Belts or coaches monitor teams' utilization of Lean/Six Sigma tools and ensure that projects don't overlap.

The type of project and scope needs to match the individual's current job function and level of design for Six Sigma (DFSS) training. Training levels are as follows:

- *Voice of the Consumer (VOC).* Project scope should include identifying requirements with the greatest value, their measures and a concept to satisfy them.
- *Green Belt.* Project scope should include identifying requirements with the greatest value, their measures and demonstrating a statistically capable concept.
- *Black Belt.* Project scope should include identifying requirements with the greatest value, their measures and a verified/validated statistically capable design.
- Projects can be focused on products, processes or business systems.

Six Sigma Program Implementation

The Cooper Standard Automotive DFSS process follows the concept, design, optimize, verify (CDOV), or the more commonly known identify, design, optimize, verify (IDOV) road map.

Cooper engineer Tim Wade and his team were tasked with adding enough value to persuade Nissan to use a Cooper-manufactured water valve instead of a purchased valve in the Cooper assembly.

Step 1—Concept DOV or Identify DOV: The team's champion was Mark Slater, the director of Cooper's New American Manufactures (NAM) business unit, which has targeted Nissan as a growth partner.

- *Charter.* Mr. Slater wrote the project charter to ensure that the scope, boundaries and expectations were clearly defined.
- *Value chain.* The team mapped the flow of value from the material suppliers to the vehicle owner.
- *Interviews.* The team interviewed individuals up and down the value chain.
- *KJ.* Jiro Kawakita's method to convert qualitative word data into quantitative data; the team's conclusion of the KJ process was, "To be successful, Cooper Standard Automotive must develop a valve that has low pressure drop, has a low weight, meets functional requirements and has very good reliability; while maintaining good communication throughout the process."
- *KANO attractive quality model.* The KJ output was screened through KANO so the team understood delighters from basics.
- *Quality Function Deployment (QFD).* The team surveyed the interviewees to determine customer weighting of the requirement produced by KJ. After functional measures were defined for each requirement, QFD was applied to determine the importance of each functional measure.
- *PUGH concept selection.* Brainstorming resulted in an optimized design which incorporates a common molded housing, snap-in motor and snap-on cover.

Step 2—Design:

- *Design failure modes and effects analysis (DFMEA); and critical parameter map.* DFMEA was used to identify areas that could be incorrectly designed or developed. A critical parameter map was used to identify capabilities that would affect the functions and could be addressed by the design.
- *Design for assembly (DFA).* DFA allowed the team to identify any mistake proofing, handling, insertion, or secondary operation issues, and to brainstorm corrections.
- *Process failure modes and effects analysis (PFMEA).* Process mapping and prioritization were applied to identify which critical process variables affected functional requirements and needed to be addressed in a PFMEA and control plan.

Step 3—Optimize:

- Statistical tolerance analysis and Monte Carlo simulations were performed to ensure that material dimensional capabilities interacting with varying material expansion rates during temperature changes would allow the valve to continue functioning properly.
- Design of experiments was performed to characterize the effect of variation in key processes such as the sonic welding of components.

Step 4—Verify/Validate: The new Cooper Standard Automotive water valve passed all customer vehicle durability and laboratory testing. Additionally, Nissan and Cooper created new specifications to ensure that requirements realized during the interview process are never overlooked.

Organizational Results

- The customer will save an additional $1.00 per vehicle due to component reduction.
- The project saved $883,200 annually.
- A total of $2,081,600 in annual revenue was added to Cooper Standard Automotive Europe for new Nissan business utilizing the Cooper water valve.

Finalist:

- ***Cooper Tire & Rubber Company–DFSS, Sidewall Design Development Project***