

Western Region

Unleashing the Power of Kaizen at NUMMI

A shining example of the continuous improvement process.

John Coltman

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AME's workshop at NUMMI (New United Motor Manufacturing Inc.) was eagerly awaited by attendees who had followed press reports about this novel venture between General Motors and Toyota after GM closed the Fremont, CA assembly plant in 1982. We wondered how the Toyota production system could be fostered, given abysmal labor relations during the GM tenure. Changes at the plant were described in the book, *Kaizen*, by Masaaki Imai in 1986. The plant recently decided to expand production by adding a light truck assembly line.

What we actually saw at NUMMI and discussed with employees was nothing short of a total transformation of the plant culture and its production system. If an atmosphere of mutual trust between the plant management and the labor force was necessary for this transition, then Kaizen (continuous improvement process) was the engine that drove it.

First and Second Beginnings

When GM opened the Fremont plant in 1962, it was a state-of-the-art facility. Imports held only five percent of the U.S. auto market. Twenty years later, imports had captured 50 percent of the California market and the Japanese manufacturers claimed cost and quality advantages. GM-Fremont was troubled by labor-management wars, poor quality, and low productivity. Daily absenteeism ran as high as 25 percent. GM-Fremont joined three other California auto plants that closed their doors between 1980-82.

Shortly afterward, GM and Toyota be-

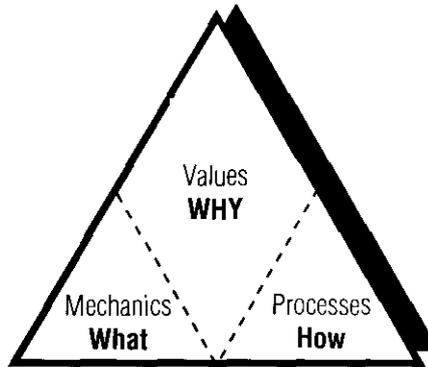
gan negotiations to reopen the plant as a joint venture. Toyota wanted to establish a manufacturing presence in North America and gain experience with workers and suppliers here. GM sought Toyota's efficient production techniques, a source for a competitive domestic subcompact, and a labor relations model (if this plant could turn around, others could).

Three major hurdles had to be overcome, according to Dennis Cuneo, NUMMI's vice president of corporate planning and legal affairs. First, a 15-month investigation by the Federal Trade Commission (FTC) questioned the antitrust implications of the proposed agreement. The agency finally approved the venture, stipulating a 12-year life, a maximum of 250,000 cars for GM, and an arm's length relationship between the stockholders of the two companies.

Another challenge was the business arrangement. NUMMI was set up as a separate corporation with GM and Toyota sharing equally as stockholders.

Perhaps the most difficult task was to negotiate a letter of intent with the UAW (United Auto Workers). When it was finalized, this letter included commitments that shattered the old paradigm of labor relations in the U.S. auto industry. NUMMI rehired the majority of Fremont workers, recognized the UAW as a bargaining agent, paid typical auto industry wages and benefits, and offered enhanced job security. In turn, the union agreed to treat NUMMI as distinct from GM and committed to support

New United Motor Manufacturing Inc.



Human Relations Values

Cornerstones:

- Mutual trust and respect
- Teamwork
- Involvement
- Equity
- Job security
- Develop full potential of team member

NUMMI Production System

- Standardized work
- Visual control
- Kanban system
- Jidoka: quality principle
- Sustained cleanliness
- Reducing waste, unevenness, over-building
- Five why's: Ask "why" until the root cause is reached
- Heijunka — evenness (leveling)

Production System Goals

- High quality
- Low cost
- Safe working conditions
- Eliminate waste
- Simplicity
- Flexibility
- Just-In-Time

Organizational Process

- Goals and objectives
- Reward system
- Selection/orientation
- OJT (on-the-job training)
- Training and development
- Nemawashi — process to gain consensus
- Ringi-sho: document which explains details of a procedure, for which approval of policies and expenditures is gained.

Figure 1. Mutual trust and respect, teamwork, involvement, and equity are cornerstones of the NUMMI philosophy.

efficient work practices and minimum job classifications.

Trust and Values

Management and the union recognized that the trust of the work force was a prerequisite for continuous improvement. The concept of "line stop" — each worker can slow or stop the assembly line for quality or productivity-related problems — was copied from Toyota. Time clocks were eliminated. Union leaders went to Japan for three weeks to evaluate production systems. The union agreed to ensure good attendance

habits, and to actively support quality and productivity improvements in return for improved job security.

Values are important (see Figure 1 for a summary of how the company views itself), contributing to continuous improvement as a way of life for every employee. NUMMI took an egalitarian approach to benefits and policies. Senior management has no special privileges for parking or lunchrooms, and there is only one private office in the entire plant (the president's). As in some Japanese factories, employees are issued shirts and

jackets. Wearing them is voluntary, but managers do so as a matter of course.

Teamwork

Employee involvement is based on the premise that the people doing the job know it best. All improvement ideas are discussed and agreed upon by the work teams. NUMMI funds team social and sports activities off the job to improve members' awareness of each other and break down communications barriers. Employees are assigned responsibilities for such things as documenting their work methods and procedures, referred to as "standards."

Kaizen Power

Gary Convis, vice president of manufacturing and engineering, defines Kaizen as the "continuous search for improvements throughout the company." Everyone at NUMMI is part of a team, and "all team members seek ways to improve quality, safety, and efficiency."

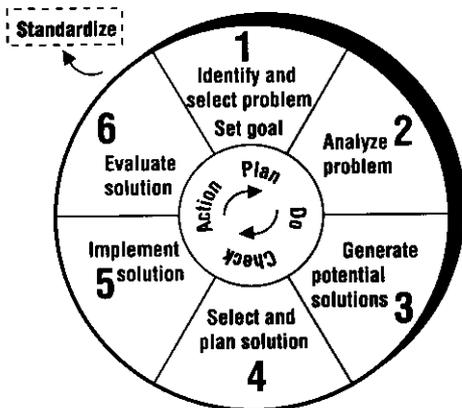
The assembly line is organized into work teams of six to eight members. Each team has a leader, and groups of four to six teams have group leaders (supervisors). Team members all learn jobs performed by other team members. They may rotate from job to job during the day to minimize fatigue and the monotony of repetitive tasks. Team leaders fill in for absent team members, train new team members, help with difficulties, and organize Kaizen tasks. They're selected by a joint panel of management and union representatives and receive a slightly higher hourly wage.

Most groups (of three or four teams) meet every two weeks for a half-hour after their normal shift to discuss safety, quality, etc. issues and to solve problems. They're paid an overtime rate for meeting time.

Plant employees are trained in the NUMMI six-step problem solving process. The objective: work standardization for high performance in efficiency, safety, and quality.

Every team documents work flow, tool location, etc. The cycle time for production of a car is 60 seconds. All work elements at each station on the line are timed to fit

The Six Steps for Solving a Problem



Building Our Future Together

Figure 2. Problem solving at NUMMI follows a modified version of the Deming circle.

within approximately 55-58 seconds. Teams use stopwatches on time changes developed through Kaizen activities. NUMMI is proud that there are no industrial engineers.

Organization in small teams and job rotation reinforce each other to facilitate Kaizen. Convis explained that job rotation reduces the traditional sense of job ownership and helps to facilitate changes. There is incentive for team members to share knowledge of the best way to do a particular job if each one has many jobs.

NUMMI has a suggestion system similar to those in many Japanese companies. While the U.S. national average for companies with suggestion systems is 10-15 percent participation, 2900 out of 3100 employees participated last year. More than 9000 suggestions were generated during 1990. When a suggestion is implemented, the responsible employee receives a gift certificate with a point value. Each point is equal to one dollar. Most implemented suggestions are signed off by group leaders. During the past three years, \$200,000 was paid out in the form of gift certificates.

NUMMI recently began experimenting with a new type of Kaizen team to speed improvement. It includes technical tradespeople and senior employees from the assembly line. This group helps work teams with particularly difficult problems (especially automation or robotic assists). The

Kaizen Team's enthusiastic presentation was one of the highlights of the workshop.

Problem Solving

NUMMI's problem solving methodology is an elaboration of the Deming wheel with its four elements of plan, do, check, and act. Figure 2 summarizes the problem solving cycle.

Employees are encouraged not to be content with the status quo. Problems should be viewed positively, as opportunities for improvement. Areas needing improvement are called "Kaizen points." As employees think of problems in terms of the difference between a standard and the actual situation, they are urged to quantify the differences in the form of a problem statement (current situation) and a goal statement (how much of the gap will be closed).

Employees receive training in the use of check sheets, cause and effect diagrams, graphs, Pareto charts, control charts, histograms, scatter diagrams, and force field analysis. They also learn how to generate, evaluate, and implement problem solutions. Implementation is particularly important. It includes documenting the new standard and training others so that the gain is permanent. Downstream customers are consulted if they may be affected by a change (a process called "Nemawashi" in Japan).

Production System

NUMMI set out to model itself after the Toyota production system. In addition to their focus on teamwork, Kaizen, and standardization, they've made progress with JIT and quality improvements. Production and vendor deliveries are controlled by Kanban. The stamping presses for car body panels can be set up quickly. Various models move down the assembly line in seemingly random sequence.

One of their biggest challenges is qualifying suppliers who can meet quality and delivery standards. This on-going task includes sourcing an increasing percentage of components in North America rather than Japan. Suppliers of seats, for example, deliver several times daily; on-hand inventory is measured in hours.

Jidoka, or the "Quality Principle," is another feature of the production system. Production halts whenever a defective part is produced. Higher quality may be achieved by fitting machinery with devices that detect defects and automatically shut down equipment or by authorizing assembly line workers to shut down the line if they observe a quality problem. Jidoka places enormous emphasis on eliminating the causes of problems.

Competitive Culture

NUMMI employees know they are competing with world-class companies, and they are committed to continuous improvement. Their job security depends on equal or higher improvements, compared to the competition. Peer pressure keeps everyone contributing new ideas.

Some observers believe that the system relies on "management by stress" — emotionally (if not physically) taxing. NUMMI management is convinced that tension from the drive to improve results in the most creative solutions. They recognize that it is a human tendency to resist change, and that the drive for change may cause managers to revert to non-participatory behavior modes. Management and the union have made great progress in developing mutual trust required to deal with these situations in a non-confrontational manner. The entire NUMMI employee group appears to have acquired pride in themselves and in the quality of their products.

John Colman is manufacturing operations manager at Oregon Cutting Systems, Blount Inc., Portland, OR and vice president of AME's Western Region board of directors.

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For information on reprints, contact:
Association for Manufacturing Excellence
380 West Palatine Road
Wheeling, Illinois 60090
708/520-3282

