

# DEPARTMENT OF JUSTICE

## Lean Six Sigma at FCI Gilmer

### FEDERAL PRISON INDUSTRIES



#### With Lean Six Sigma...

##### FPI's Heavy Equipment Plant Triples Production, Increases Quality

Federal Prison Industries' (FPI) heavy equipment remanufacturing plant in Gilmer County, W. Va., was in operation less than a year, when management introduced Lean Six Sigma, a sophisticated methodology designed to increase speed, efficiency and quality.

In May 2006, the Gilmer facility faced a huge remanufacturing assignment on a tight deadline for U.S. Army's Tank-Automotive and Armament Command (TACOM). Learning to operate in a Lean Six Sigma environment on top of this demanding assignment would be a significant challenge.

However, Gilmer, part of FPI's Fleet Management & Vehicular Components Business Group, proved more than equal to both tasks. In less than a year, Gilmer tripled production

output while improving quality. In the process, three members of the supervisory staff are working towards their Lean Six Sigma green belt status.

Many staff members and inmate workers have been part of Gilmer's Quality Action Team (QAT). The QAT has undergone a very extensive quality training program and continues to discuss and implement new quality initiatives relating to product development, vehicle assembly and inspection processes.

Christi Cutright, Factory Manager at Gilmer, reports, "We were able to increase production from 2-3 fully remanufactured Army tractor-trailers to as many as eight a month.

This threefold production increase was quite a feat, given the size and complexity of the TACOM vehicles.

**“We were able to increase production over 200% on remanufactured Army tractor-trailers.”**

**Christi Cutright**  
Factory Manager  
FPI, Gilmer County, W. Va.



**U.S. Department of Justice**  
Federal Prison Industries, Inc.



## Lean Six Sigma

### **What it is:**

A statistically driven quality process designed to increase speed and efficiency while reducing waste and improving quality.

### **What it does:**

Assists organizations to become faster and more responsive to customers, and operate at world-class cost and quality levels.

### **Lean Six Sigma at FPI:**

Many facilities in Federal Prison Industries already operate in Statistical Process Control (SPC) and ISO 9000:2001 environments. Lean Six Sigma is the next step forward in FPI's efforts to continually build upon its quality focus, cost effectiveness and rapid response to customer needs.



Cutright explains, "The tractor-trailers are part of the M916 and M920 family of trucks with gross vehicular weights of 30,000 pounds and over 5,000 parts. After 35 years in the field, these tractor-trailers required a complete rebuild—from the frame down to the last bolt, including a new power train and new coat of paint."

A significant benchmark of the Lean Six Sigma process at Gilmer was achieving a goal of 80% of all production defects be identified prior to the vehicles reaching the final production stage and be prepared for delivery to the customer.

Gilmer met and exceeded this benchmark by a large margin: Dean Howard, Quality Manager at Gilmer stated, "In less than six months from the start of the Lean Six Sigma process, 78% of defects were identified prior to the last inspection station. By October 2007, 90% of all defects were isolated before vehicles came off the production line. The remaining 10% were identified and corrected through final QA inspection and road testing."

### **Faster Production, Better Quality, New Customer**

Howard adds that Gilmer also improved the quality of its operations while speeding production volume. For example, Lean Six Sigma analysis helped to improve transmission and differential remanufacturing.

By examining extra raw material usage in transmission remanufacturing, Gilmer found that the source of the problem was variation in the angle that dip stick tubes were installed. Depending on the angle, under- or

overfilling could result, leading to wasted transmission fluid, rework and additional road-testing to get the levels right.

Although manufacturers had no documentation on the proper angle for dip stick tubes, Gilmer devised a standard slope and installation method that assured accurate fluid levels. This reduced the number process defects associated with fluid fill levels, and the amount of time-consuming road tests.

Another study was conducted on differential valves and vent tubes that were allowing fluids as well as air to escape. Gilmer determined that the root cause of the problem was cavitation and secured alternative valves that alleviated the venting of fluids.

These and other Lean Six Sigma efforts have helped to gain a major new customer—U.S. Army FORSCOM, which contracted for transmission remanufacturing services following a plant tour, where they witnessed the facility's operational efficiency and quality.

Like many other facilities in FPI's Fleet Business Group, Gilmer already was operating in a statistical process control (SPC) and ISO 9001:2000 environment. Lean Six Sigma represented a next logical step in FPI's continuing quest to build speed, efficiency and quality.

"Because we were new, FPI's Fleet Business Group felt that Gilmer was a 'clean slate,' and didn't have ingrained work processes yet. That made us an ideal place to pilot Lean Six Sigma," Cutright says.



## Developing a Lean Six Sigma Culture

The Lean Six Sigma process at Gilmer started with intensive training of supervisory staff, followed by educating inmate workers in the methodology, which emphasizes statistical-based analysis, process flows, quality data and time management.

The term "Six Sigma" relates to the number of defects in a process. Lean Six Sigma provides the decision tools to delve into a process, understand its work flow, make operational improvements and sustain them.

An important part of the methodology is clear and frequent communication. Once Gilmer defined work processes, instructions were clearly worded and accompanied by diagrams so that anyone new to the work area could understand the process.

Production areas were reorganized for optimum work flow and given "Five S" audits for safety, cleanliness and organization. Simplifying the work environment helped to reduce waste and non-value-added activity, while improving quality, efficiency and safety.

## Tracking Parts, Saving Time

One of Gilmer's first Lean Six Sigma projects involved parts availability and tracking, a vital issue, since remanufactured vehicles have thousands of parts.

"To give parts added visibility, we set up 'supermarkets'—or storage locations—at key points in the production process. This helped us

keep track of parts more easily and make sure they are available when and where they are needed," says Bentley Stires, the Fleet Business Group's Lean Six Sigma black belt.

Since many components are remanufactured, a labor-intensive task, inmate workers and civilian staff analyzed the time required to complete this work. They used their findings to identify opportunities to improve the speed and quality of component remanufacturing.

"Since Lean Six Sigma places a major emphasis on visual displays, we've installed Takt Boards in every production area. That way, we know the status of our performance on an hourly basis," Stires says.

With continual awareness of how their area is performing, production groups can take corrective action and immediately see results. This allows workers to celebrate successes and build team spirit.

Tom Burkett, General Manager of FPI's Fleet Business Group comments, "The introduction of Lean Six Sigma is an essential part of Federal Prison Industries' commitment to total quality management, lean business operations and responsiveness to customers. We are proud of Gilmer's immediate success because it demonstrates the experience, training and quality focus of our civilian staff and inmate workforce."

## Gilmer Heavy Equipment Remanufacturing Plant

- State-of-the-art facility in Gilmer County, W. Va., with 57,000 square feet of production space; employs a 250 inmate workforce and civilian staff supervisors
- Expert in heavy equipment remanufacturing, vehicle modifications and upgrades, and transmission remanufacture
- Handles tactical wheeled vehicles, semi-trucks and trailers, forklift and transmissions
- Operates in statistical process control (SPC), ISO 9001:2000 and Lean Six Sigma environment
- Fiber-reinforced floor to accommodate almost any type of large equipment
- Up to 20 tons of bridged lifting capacity
- Blast and paint booths with room for equipment up to 60 feet long and 15 feet wide; can handle two-part epoxy and chemical agent resistant coatings (CARC)

## Federal Prison Industries

- FPI, a whole owned self-sustaining government corporation, was founded in 1934 by executive order with the goal of employing federal inmates in productive work and training them in valuable real-world job skills.
- Over 70 years of experience in manufacturing and distributing a wide range of quality products and services to the federal government, and now state and municipal governments.

## Fleet Management & Vehicular Components Business Group

- Provides vehicle and vehicular components remanufacturing, vehicle upfitting and leading-edge fleet management solutions.
- 126 FPI staff members have been trained and working towards their green belt status. To date, 13 individuals have had black belt training.
- Nationwide network of state-of-the-art facilities with individualized service solutions based on each customer's requirements.
- Customers include the Department of Defense, Department of Homeland Security, U.S. Forest Service and other federal government and law enforcement agencies.



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