

**STATUS REPORT  
on  
COMBUSTIBLE DUST  
NATIONAL EMPHASIS PROGRAM**



**Office of General Industry Enforcement  
Directorate of Enforcement Programs**

**October 2009**



## **Background**

Fires and explosions fueled by combustible dusts have long been recognized as a major industrial hazard. A November 2006, Chemical Safety Hazard Investigation Board (CSB) report described the occurrence of nearly 280 dust fires and explosions in U.S. industrial facilities over the past 25 years, resulting in approximately 119 fatalities and over 700 injuries.

OSHA initiated its Combustible Dust National Emphasis Program (NEP) on October 18, 2007, to inspect facilities that generate or handle combustible dusts that pose a deflagration/explosion or other fire hazard. The NEP was based in large part on a Region III Special Emphasis Program that had begun in 2000.

Although OSHA, at present, does not have a specific standard on combustible dust hazards, there are several existing OSHA standards that apply to combustible dust handling facilities. The NEP focuses on these standards, as well as the General Duty Clause.

Following a massive sugar dust explosion at Imperial Sugar's Port Wentworth Georgia facility on February 7, 2008, that killed 14 workers and injured many more, OSHA revised the Combustible Dust NEP to focus on industries with more frequent and high consequence dust incidents, and to include more inspections. The revised NEP targets 64 types of industries. In addition, all sugar refineries (beet and sugarcane) in Federal jurisdiction will be inspected. OSHA also strongly recommended that all State Plans participate in the NEP.

### **Number and Types of Inspections Conducted under the NEP**

The Combustible Dust National Emphasis Program applies to 64 industries (SICs / NAICs), including wood products, food products, metal products, chemicals, pharmaceuticals, rubber and plastic products, paper products, furniture, electric and sanitary services, transportation equipment, durable goods, and textile mills. Each area office is required to conduct at least four inspections per year. The figures below include inspections data from October 2007 through June 2009. Since the inception of the NEP, more than 1000 inspections have been conducted, including inspections conducted by State Plan States. (See Figure 1). To date, 11 states have adopted OSHA's NEP and an additional four states have plans to adopt the program.

## Total Number of Inspections Conducted

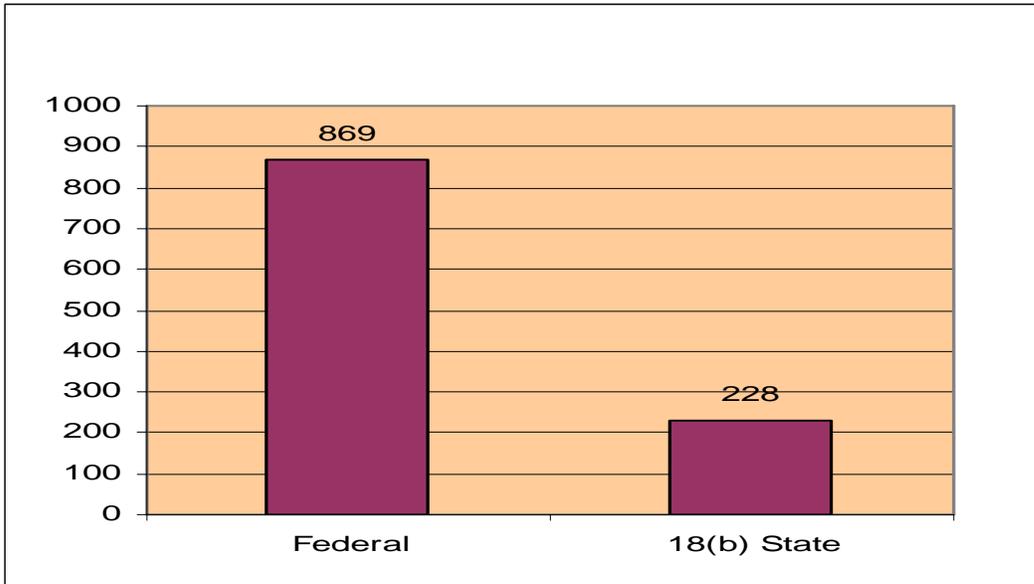


Figure 1. Number of Inspections Conducted

The wood products, food products, chemicals, metal products and rubber / plastic products industries account for more than 70 percent of inspections under the NEP. See Figures 2 and 3 below for the types of industries inspected along with their numbers and percent distributions.

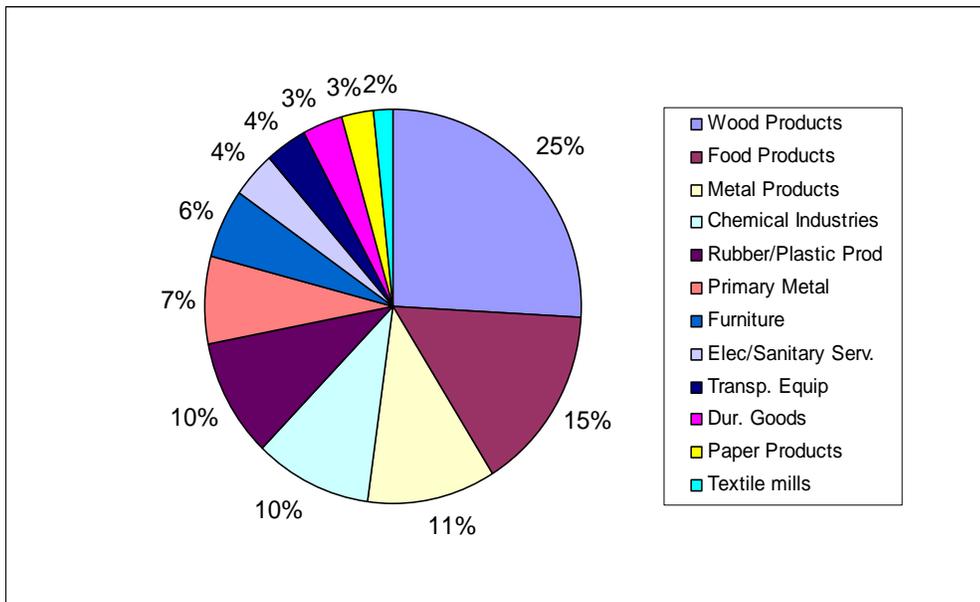


Figure 2. Types of Industries Inspected by Percent

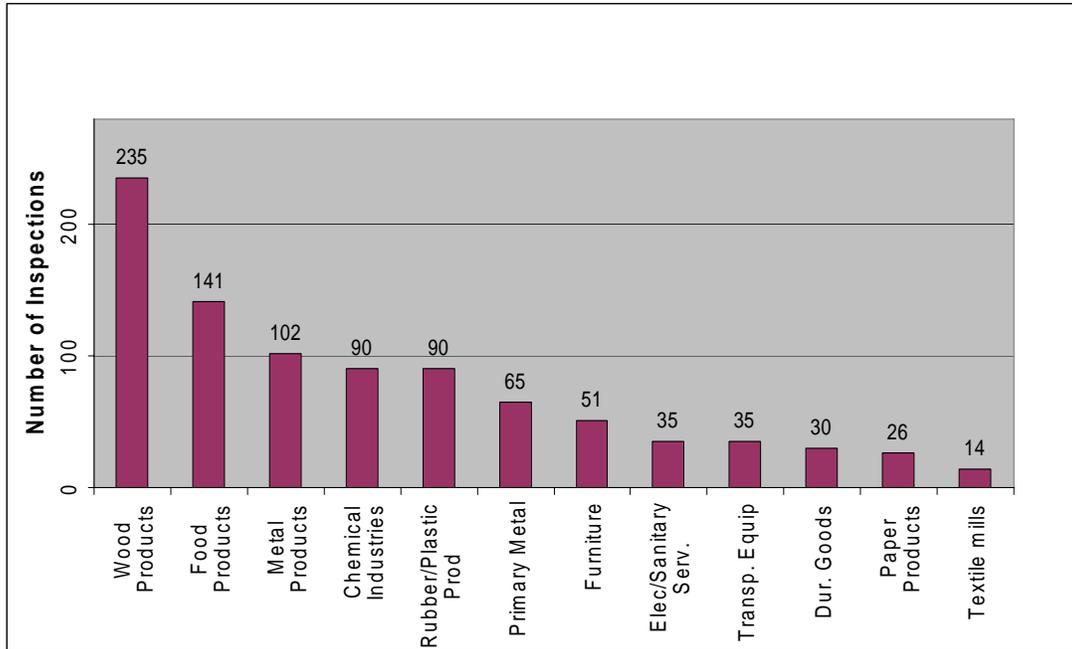


Figure 3. Types of Industries Inspected by Number

### Enforcement Findings

OSHA has found more than 4900 violations (See Figure 4) at the facilities inspected pursuant to the Combustible Dust NEP. This includes not only combustible dust related violations, but also violations such as lockout/tagout, walking and working surfaces, and other hazards.

### Total Number of Violations

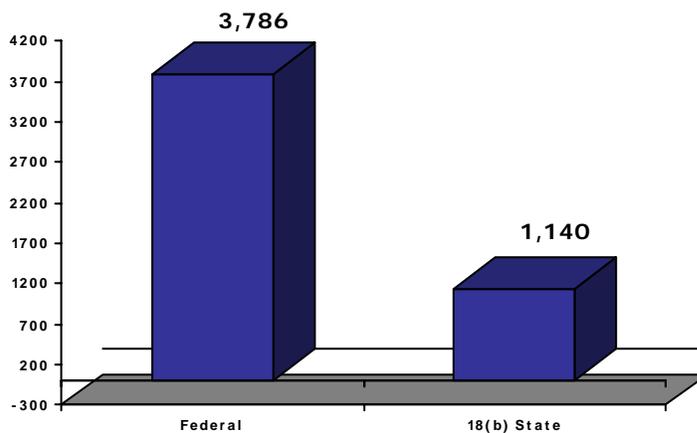


Figure 4. Total Number of Violations

## Percent Total Violations Cited As Serious

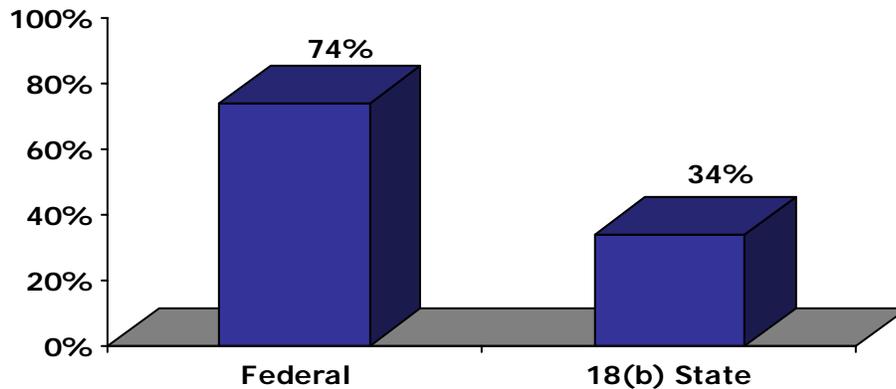


Figure 5. Percent Total Violations Cited as Serious

Because hazards associated with combustible dust normally result in fires and/or explosions, the injuries would generally be burns, possibly resulting in death. OSHA categorized 74 percent of violations found at the facilities under Federal jurisdiction as serious. 34 percent of violations in State Plan inspections were also characterized as serious (See Figure 5).

## Violations Related to Combustible Dust Hazards

Under the NEP, the Hazard Communication standard is the standard most frequently cited with respect to combustible dust related hazards, followed by the housekeeping standard (see Figures 6 and 7). OSHA's housekeeping standard at 29 C.F.R. 1910.22 not only applies to typical housekeeping hazards but also applies to dust accumulation hazards. In several instances, OSHA found combustible dust accumulations ankle deep and covering an entire room.

Employers were also cited for violations of personal protective equipment, electrical equipment for hazardous (classified) locations, first aid, powered industrial trucks, and fire extinguisher standards during these inspections. OSHA compliance officers also found that compressed air in excess of 30 psi was being used for cleaning purposes. As well as violating an OSHA standard, the use of compressed air to clean accumulated dust would create a dust cloud and can result in deflagration or explosion if the ignition sources are present. OSHA issued General Duty Clause citations for this practice (see Figure 6 and 7).

### Combustible Dust Related Violations

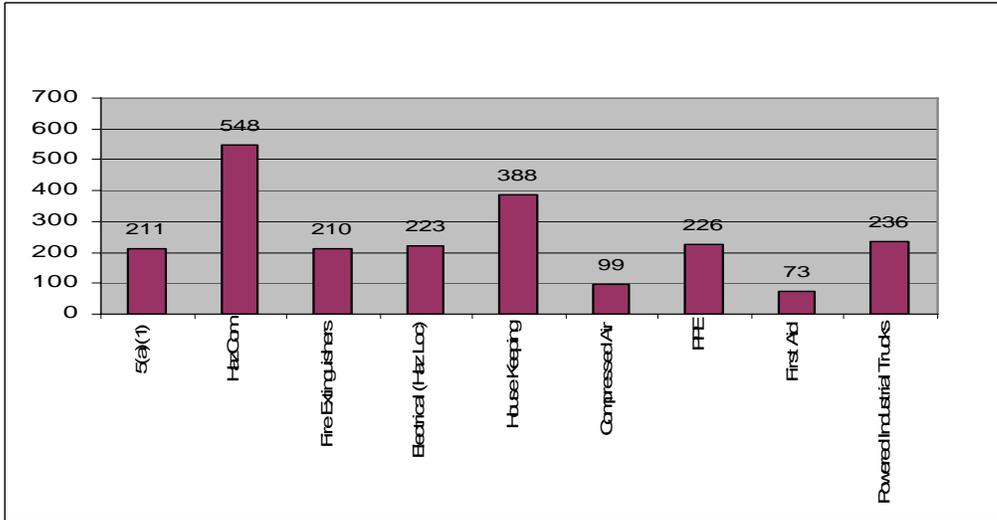


Figure 6. Number of Combustible Dust Related Violations

Figure 7 shows that 20 percent of combustible dust related violations pertain to housekeeping, 27 percent to Hazard Communication, and 11 percent each to electrical, personal protective equipment, fire extinguishers and hazards addressed by the General Duty Clause.

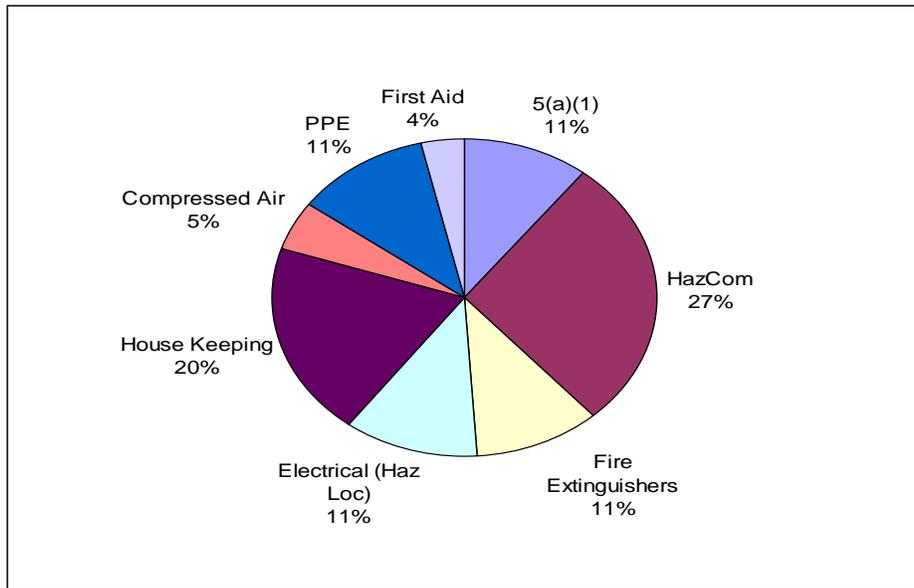


Figure 7. Percent Combustible Dust Related Violations Distributions

In the absence of an OSHA standard, OSHA can cite Section 5(a)(1) of the OSH Act, the General Duty Clause, for serious hazards, such as fire and explosion hazards for which there are feasible means of abatement. OSHA has referenced NFPA standards 654, 484, 61, and 664 as potential means of abating combustible dust hazards in citations issued under the NEP. OSHA also referenced NFPA 499 in recommending safe practices for electrical equipment used in Class II locations, and NFPA 68 and 69 for explosion prevention and protection techniques. Some of the hazards cited under the General Duty Clause are listed below.

### **Examples of General Duty Clause Violations**

The following summarizes some General Duty Clause citations issued by OSHA under the Combustible Dust NEP:

1. Dust collectors were located inside buildings without proper explosion protection systems, such as explosion venting or explosion suppression systems.
2. Deflagration isolation systems were not provided to prevent deflagration propagation from dust handling equipment to other parts of the plant.
3. The rooms with excessive dust accumulations were not equipped with explosion relief venting distributed over the exterior walls and roofs of the buildings.
4. The horizontal surfaces such as beams, ledges and screw conveyors at elevated surfaces were not minimized to prevent accumulation of dust on surfaces.
5. The ductwork for the dust collection system did not maintain a velocity of at least 4500 ft/min to ensure transport of both coarse and fine particles and to ensure re-entrainment.
6. Flexible hoses used for transferring reground plastics were not conductive, bonded or grounded to minimize generation and accumulation of static electricity. A nonconductive PVC piping was used as ductwork. Ductwork from the dust collection system to other areas of the plant was not constructed of metal.
7. All components of dust collection system were not constructed of noncombustible materials in that cardboard boxes were being used as collection hoppers.
8. Equipment such as grinders, shakers, mixers and ductwork were not maintained to minimize escape of dust into the surrounding work area. Employer did not prevent the escape of dust from the packaging equipment, creating a dust cloud in the work area.

9. Interior surfaces where dust accumulations could occur were not designed or constructed to facilitate cleaning and to minimize combustible dust accumulations. Regular cleaning frequencies were not established for walls, floors, and horizontal surfaces such as ducts, pipes, hoods, ledges, beams, etc.
10. Compressed air was periodically used to clean up the combustible dust accumulation in the presence of ignition sources.
11. Air from dust collector was recycled through duct work back into the work area without the protection of a listed spark detection system, high speed abort gate and/or functioning extinguishing system.
12. Air displaced during filling and emptying at the packaging and weighing systems which was discharged into the building was cleaned with a filter that was not 99.9 percent efficient at 10 microns.
13. Exhaust ventilation systems were not installed to control dust clouds escaping from blending and other processing machinery.
14. Bulk material conveyor belts were not equipped with bearing temperature, belt alignment, and vibration detection monitors at the head and tail pulleys to shut down equipment and/or notify the operator before the initiation of a fire and/or explosion.
15. Enclosureless systems were allowed indoors where they were connected to sanders having mechanical feeds; where they were not emptied at least daily; where they were located in areas routinely occupied by personnel; and where they were not separated by at least 20 feet.
16. Silos, legs of bucket elevators were not equipped with explosion relief venting.
17. Explosion vents on dust collectors and bucket elevators were directed into work areas and not vented to a safe, outside location away from platforms, means of egress, or other potentially occupied areas.
18. The dust collector's baghouse automatic pulse cleaning system was nonoperational due to equipment defects. The dust collector systems' hoods and ductwork were in disrepair with substantial air leaks in the ductwork created by missing inspection covers, unused opening, incomplete or poorly designed capture hoods and physical damage.
19. A dust collector collecting aluminum dust was located inside a building and not located outside with appropriate venting and other safeguards to protect employees in the event of an explosion

20. Dust collectors were allowed to be shutdown periodically during unloading operations resulting in the creation of dust clouds in the processing areas. Procedures were not established to shut down related machinery if the dust collection system shuts down.
21. Collection points used for manual cleanup of wood dust and other foreign material including metal were not provided with magnetic separators, grates or other types of screening to prevent foreign material from entering into the dust collection system.
22. Automatic sprinkler systems were not provided on enclosureless dust collectors operating at 5500 cfm capacity, and were not separated by at least 20 feet from each other when located inside the buildings.
23. Process Hazard Analysis was not conducted to determine whether the process hazards necessitated the installation of approved devices such as explosion protection systems, interlocked rotary valves, deflagration vents, and flame front diverters.
24. Employees were exposed to explosion hazards due to the nitrogen blanketing piping disengaging from the mixer/blender during the mixing process.
25. Mixers and blenders used for the production of pulverized collagen was not dust-tight and not equipped and provided with explosion prevention, relief and techniques.
26. Miter saw was not maintained under continuous suction, thus allowing escape of dust during normal operation.
27. The Coalpactors (hammer mills) used to crush coal and their connected feed chutes were not equipped with protective systems to prevent or mitigate a deflagration in the event of an ignition of combustible coal dust inside the Coalpactors.
28. The company had not developed and implemented written Management of Change procedures for ensuring that potential changes to production equipment and dust control equipment do not result in fires, deflagrations and dust explosions.
29. Screw conveyors or screw augers were not provided with deflagration isolation devices, such as, but not limited to, deflagration/explosion relief venting, containment, or isolation to prevent continued propagation flame front and over pressure into adjacent building/structures or equipment.

30. The employer did not provided adequate maintenance and design of dust collector systems creating insufficient air aspirations, low duct velocities and blocked ducts.
31. Propane burners with open flames were used in the area where agricultural products were ground.
32. Employees were using electric grinder (s) on a duct entering a baghouse style dust collector without a hot work permit system.

**OSHA found that the majority of facilities inspected under the NEP had dust collectors located inside the buildings without proper explosion protections systems, such as explosion vents or explosion suppression systems .**

### **Average Number Violations Issued Per Inspection**

The average number of violations per NEP inspection is 6.5 in Federal enforcement as compared to 3.1 for the other inspections (See Figure 8). This means that OSHA is finding twice the number of violations at combustible dust handling facilities when compared to all other facilities in general.

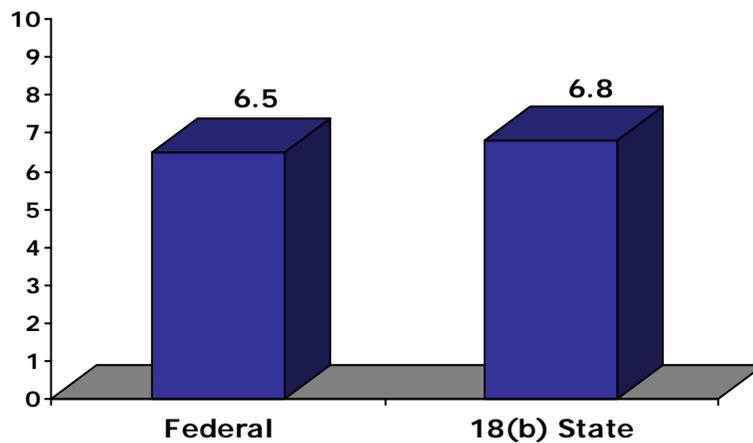


Figure 8. Average Number of Violations per Inspection

## Average Penalty per Serious Violation

The total citation penalty amount OSHA has proposed under the Combustible Dust NEP is: \$14,848,686. However, OSHA proposed the third largest fine in its history, exceeding \$8.7 million, following Imperial Sugar Refinery explosion in February 2008. The average penalty proposed per serious violation during combustible dust NEP inspections is \$1233 for Federal OSHA, and \$791 for State Plans.

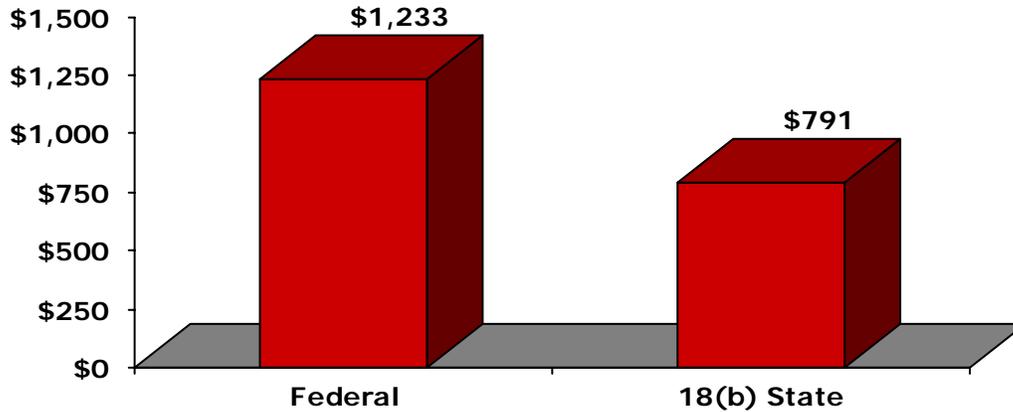


Figure 9. Average Penalty per Serious Violation

## Percent Inspections In-Compliance

OSHA found during the inspection of combustible dust handling facilities that only 18 to 22 % of facilities inspected were found to be in compliance with OSHA requirements (see Figure 10). OSHA's goal is that 100 percent of these inspections find compliance with OSHA requirements.

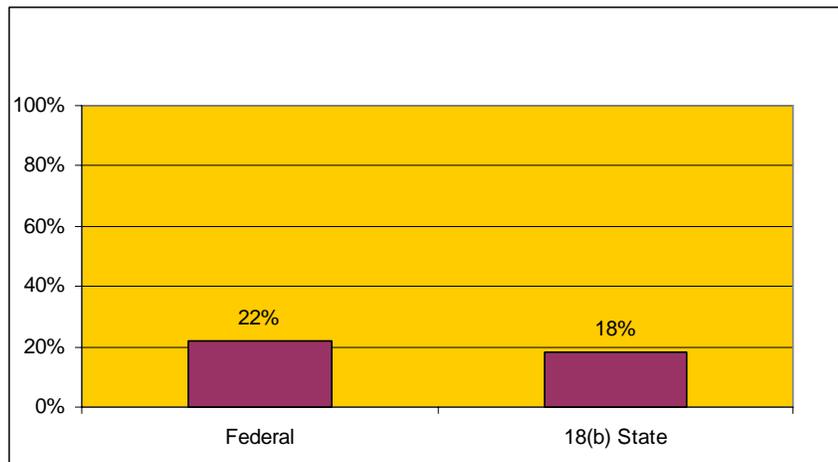


Figure 10. Percent Inspections In-Compliance

## **Combustible Dust Hazards Training**

OSHA has included combustible dust hazards in the Process Safety Management course it provides its compliance officers for more than three years. Over 350 compliance officers have received the PSM segment of training on combustible dust hazards. In addition, OTI, OSHA's Training Institute, has developed a specialized comprehensive three and one-half day course on Combustible Dust Hazards and Controls, which it began conducting since December 2007. Since the inception of this course, more than 200 Federal and state OSHA personnel have successfully completed it, and more classes are scheduled. OTI has also conducted two refresher seminars for nearly 1,400 Federal and State Plan personnel across the nation. Training is limited to OSHA and State personnel.

## **Combustible Dust Hazards Outreach**

In 2005, OSHA issued a Safety and Health Information Bulletin entitled *Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions*. This comprehensive guidance highlights the hazards associated with combustible dusts, the work practices and engineering controls that reduce the potential for a dust explosion or that reduce the danger to employees if such an explosion should occur, and the training needed to protect employees from these hazards. In March 2008, OSHA mailed copies of this guidance to 30,000 employers in industries it identified as being at-risk for dust hazards, a proactive step to remind employers of their duty to furnish their employees with places of employment that are free of hazards and to provide them with instruction and information as to how this can be accomplished.

OSHA is providing other assistance to employers and employees to protect against combustible dust hazards. Specifically, OSHA has created:

- a website, specifically dedicated to combustible dust hazards,
- a safety alert, and
- a poster addressing the measures employers handling combustible dusts must take.

## **Conclusion**

OSHA is taking, and will continue to take, strong enforcement actions to address combustible dust hazards. The Agency's strong enforcement of applicable regulatory and statutory requirements combined with education and outreach to employers and employees is helping to protect the safety and health of working men and women who may be exposed to combustible dust hazards. However, OSHA recognized that there are limitations to this approach, and OSHA has also initiated rulemaking to provide more targeted tools to address combustible dust hazards.