

August 2002

DIFFUSE SECURITY THREATS

USPS Air Filtration Systems Need More Testing and Cost Benefit Analysis before Implementation



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Abbreviations

AFCS	Advanced Facer-Canceller System
AFSM	Automated Flats Sorting Machine
DAR	Decision Analysis Report
DBCS	Delivery Bar Code Sorter
HEPA	high-efficiency particulate air
P&DC/F	processing and distribution center/facility
USPS	United States Postal Service



G A O

Accountability * Integrity * Reliability

United States General Accounting Office
Washington, DC 20548

August 22, 2002

The Honorable Henry A. Waxman
Ranking Minority Member
Committee on Government Reform
House of Representatives

The Honorable Danny K. Davis
Ranking Minority Member
Subcommittee on Civil Service, Census, and
Agency Organization
Committee on Government Reform
House of Representatives

In response to the anthrax attacks of October 2001, the United States Postal Service (USPS) acknowledged the need for increased protection for both its employees and customers. In this regard, USPS has started to look at various technologies that could be implemented in the event of another bioterror attack. One technology that is being used as a prototype at two facilities and planned for implementation throughout the country is the high-efficiency particulate air (HEPA) filtration system. HEPA filtering technology is the state-of-the-art technology for removal of particulate biohazards and other particles in the micron-sized range. It is used in countless facilities around the world for biosafety, electronic clean room assembly, isolation wards, surgical theaters, bioengineering, pharmaceutical processing, and any application where the maximum state-of-the-art reduction or removal of submicron particulate material is required. USPS expects that the use of HEPA filters will reduce the risk of exposure to biohazards and prevent cross-contamination of the mail.

You requested that we review USPS's plans to deploy air filtration systems nationwide at its processing and distribution centers/facilities (P&DC/F). Specifically, we reviewed the (1) effectiveness and design of HEPA filtration systems for implementation on mail processing equipment; (2) issues associated with HEPA filter interaction with USPS's proposed air sampling and detection systems; and (3) costs, benefits, and risks associated with deploying an air filtration system.

To address these objectives, we reviewed and analyzed USPS's Emergency Preparedness Plan and other documents describing the agency's plans to deploy and test air filtration systems. To assess the effectiveness of the

HEPA design, we reviewed USPS's test plans and results. We also visited the Dulles and Merrifield P&DC/Fs in Virginia to observe USPS's mail processing operations and how the HEPA filtration systems were designed, installed, tested, and used in an operational environment. During the course of our work we met with USPS officials to discuss the HEPA air filtration system's interaction with detection equipment. We also met with industry personnel to discuss the effectiveness of HEPA filters in capturing biohazardous materials. Additionally, we interviewed USPS officials to discuss the objectives, costs, benefits, and risks of deploying the air filtration system nationwide. We conducted our review at the USPS Headquarters in Washington, D.C., and P&DC/Fs in Merrifield and Dulles, Virginia, from May through July 2002, in accordance with generally accepted government auditing standards. We requested comments on a draft of this report from USPS, and these comments are discussed later in this report and reproduced in appendix I.

Results in Brief

USPS has not adequately tested the HEPA air filtration system to confirm that it will meet its intended purpose of trapping anthrax spores and its secondary purpose of cleaning the mail processing equipment. USPS's testing has not shown conclusively (1) the HEPA air filtration system's ability to trap released hazards and other contaminants, and (2) what level of hazards or contaminants could be released into the mail processing environment as a result of the air filtration system's design. We recognize the challenge that USPS faces in trying to protect its workers from airborne biohazards while trying to maintain its operations and control costs. However, without adequate testing USPS has no assurance that investing in air filtration equipment will provide adequate risk reduction to its employees.

Furthermore, USPS has not verified through testing that the air filtration system will not interfere with the air sampling and detection equipment. Even though HEPA filtration systems could reduce the risk of exposure to biohazards, they may negate the benefits of other technologies being considered by USPS to protect its employees and customers in the event of another anthrax attack. USPS recognizes that it will need additional technology to detect and identify potential hazardous materials as early as possible in the mailstream. Therefore, in addition to installing air filtration equipment, USPS is designing and installing air sampling and detection equipment to monitor airborne particles released during automated mail processing. USPS plans to use this sampling in conjunction with biohazard detection technology to confirm whether anthrax spores are present. To be most effective in collecting airborne anthrax, the air sampling

equipment must be placed directly over the automated mail processing machines. However, unless designed correctly, HEPA filtration systems might have a negative impact on the air sampling and detection equipment because the anthrax spores could become lodged in the filters and render the air intake ineffective for detection. Although the USPS has requested funding for both technologies, it has not yet completed any tests to determine whether the HEPA filtration systems interfere with the performance of the proposed air sampling and detection equipment, or whether other alternatives should be assessed.

Finally, the design and installation of the HEPA filtration system requires custom modification to USPS equipment nationwide and will likely cost more than USPS projected in its Emergency Preparedness Plan. In addition, even as USPS is initiating efforts for the full deployment of HEPA filtration systems at its nearly 300 P&DC/Fs across the country, it has not yet performed a comprehensive investment analysis to identify the costs, benefits, and risks associated with this initiative or any alternative solutions. While USPS estimates that the total cost of its HEPA filtration initiative could be over \$300 million by the end of fiscal year 2002, without a complete investment analysis, the agency will not know whether these costs outweigh the benefits of the technology. Moreover, we believe that USPS's \$300 million estimate is understated because it does not include other costs associated with maintenance. Specifically, the HEPA filtration systems and portable vacuum systems appear to be less efficient in cleaning the mail processing equipment than the former process of blowing out the dust with compressed air (i.e., pressurized air exiting through nozzles akin to the air nozzles used to fill up tires). Thus, there is the potential for greater maintenance costs, and USPS runs the risk that the costs of investing in a HEPA filtration system nationwide could be more than originally planned.

To address these concerns, we are recommending that the Postmaster General take steps to (1) perform additional tests to assess the system's ability to capture biohazardous materials and its compatibility with other proposed technologies before making a decision on whether to deploy the system nationwide; and (2) evaluate the costs, benefits, and risks associated with implementing air filtration on mail processing equipment and other alternative solutions before a large-scale rollout is initiated.

In commenting on a draft of our report, the USPS generally agreed with our recommendations and stated that USPS already has actions under way to address them prior to deploying the filtration systems. While USPS had concerns that we placed too much emphasis on the secondary benefits of

the air filtration system's ability to control dust and its increased maintenance costs, it agreed with our recommendation to conduct additional testing to determine the system's ability to capture biohazards prior to making a decision on nationwide implementation.

Background

USPS is a vast enterprise that delivers about 680 million pieces of mail daily to virtually every household and business in the United States through an array of services. Typical mail items—letters, flats, and parcels—may be introduced into the mailstream through mailboxes and collection boxes, thousands of drop points at customer sites, mail facilities, and other locations across the country. Once mail enters the USPS mail processing operation, it becomes part of a complex and diversified system, requiring the coordinated effort of mail processing plants and delivery units across the country. While much of mail delivery is labor intensive, most of the effort required to sort the mail for distribution has been automated by a series of high-volume machines. USPS has at least 10 different types of automated mail processors totaling more than 10,000 pieces of equipment in operation. These machines exist at various points in the mailstream and have mechanical forces that are likely to cause the release of substantial amounts of anthrax spores from a piece of mail.

The October 2001 anthrax attacks raised great concerns over the security of postal employees and customers from exposure to biohazardous materials. In January 2002, Congress passed Public Law 107-117 providing USPS \$500 million for emergency expenses to buy equipment for sanitizing and screening mail and to protect postal employees and customers from biohazardous material with the requirement that they develop an emergency plan.¹ On March 6, 2002, USPS issued its Emergency Preparedness Plan. The plan discusses a variety of process changes and technology initiatives that could be applied to the threat of biohazards in the mail. In addition, the plan addresses USPS's goals of protecting postal employees and customers from exposure to biohazardous material and safeguarding the mail system from future bioterror attacks, while maintaining current service levels. USPS plans to achieve this by developing prototypes to test and evaluate which technologies should be used together with existing mail processing equipment. To fund its efforts,

¹USPS was also allocated \$175 million out of emergency supplemental appropriations for fiscal year 2001 to be used in part to purchase mail sanitization equipment, for employee safety measures, and for other expenses related to the anthrax attacks.

USPS plans to request an additional approximately \$1.8 billion for fiscal years 2002 through 2004.

USPS Needs to Address HEPA Filtration System's Effectiveness and Design Issues

In response to the anthrax-laden letters that caused widespread contamination at two postal facilities, USPS began testing HEPA filters to minimize paper dust, reduce risks to employees from biohazards, and clean mail processing equipment. The Postal Service plans to deploy this technology at nearly 300 P&DC/Fs² that handle outgoing mail, but is specifically testing the prototypes for this technology at its Dulles and Merrifield, Virginia P&DC/Fs.³ These filtration systems have been implemented to run on two major types of mail processing equipment, the Delivery Bar Code Sorter (DBCS) and the Advanced Facer-Canceller System (AFCS) at both sites. The DBCSs are computerized machines that sort letter-sized mail by using a reader to interpret an imprinted barcode, while the AFCS is a type of mail processing equipment that automatically faces letter-sized mail in a uniform orientation and cancels the postage stamps. However, issues associated with the design and effectiveness of HEPA filtration systems still need to be addressed. First, USPS has not completed necessary tests and analysis to confirm the effectiveness of HEPA filtration systems installed on mail processing equipment and, therefore, does not know whether this technology will satisfy the agency's objectives. Second, the benefits of the HEPA air filtration system's ability to reduce dust and clean the mail processing equipment have not been confirmed. Third, the amount of energy needed to run the HEPA systems might overwhelm the existing power supply at some P&DC/Fs and, therefore, degrade the operation of current mail processing equipment. Finally, the mail processing equipment will have to be modified in order for the filtration systems to operate effectively.

²USPS P&DC/Fs are the facilities in which mail is processed and distributed from its origin to its final destination using computer-controlled electromechanical sorting equipment and computer data processing systems. A vast transportation network including trucks, airplanes, and trains, moves the mail between these centers.

³Although the automated mail handling machines at the P&DC/Fs generate a lot of dust, the mail processing environment has been checked and rated as an acceptable place to work by regulatory agencies.

Effectiveness of HEPA Filtration Systems in Mail Processing Equipment Has Not Been Confirmed

To date, USPS has performed initial tests to determine the effectiveness of its HEPA system's (1) airflow velocity and (2) ability to remove dust in the mail sorting machines. However, USPS has not yet confirmed whether its HEPA filtration system's prototypes are designed properly to capture and contain airborne anthrax within the system and not release it into the mail processing environment. As a result, USPS does not yet know whether this technology will meet its intended objectives.

USPS has performed tests to determine its HEPA filtration system's airflow velocity, but it has not performed the necessary test to confirm whether the system can actually capture anthrax spores in a mail-processing environment. When installed correctly and in the proper environment, HEPA filters were designed to effectively capture 99.97 percent of all dust, pollen, mold spores, and bacteria at the 0.3-micron particle size that might pass through them. Because biohazard particles typically fall into the range of 1 to 10 microns, HEPA filtration may significantly reduce the number of particles that exhaust from the vacuum system into the ambient air of postal facilities. USPS has designed its air filtration equipment such that the air flows in accordance with industry standards to capture particle sizes similar to anthrax. To test the effectiveness of this design, USPS is working with the National Institute for Occupational Safety and Health to release smoke and tracer gas⁴ to verify that the air filtration equipment is working as expected. Using tracer gas confirms that the system is moving air as intended through the filters. Experts from the Environmental Protection Agency agree with this approach for testing airflow and capture velocity. However, this procedure does not test either how much anthrax is trapped in the system or the system's effectiveness in not releasing anthrax into the mail processing environment. Without conducting tests that confirm the system's ability to trap anthrax and not release any into the mail processing environment, the USPS has not proven that its design will meet the intent of protecting its employees and customers.

⁴Sulfur hexa fluoride (SF6).

Secondary Benefit of Reducing Dust and Cleaning Machines Also Not Confirmed

According to USPS, another benefit of installing HEPA air filtration systems is that the negative air pressure (i.e., vacuum) generated by the systems may help clean the mail processing equipment. Until October 2001, USPS mail processing machines, including rollers, belts, and electronic card cages, were cleaned with compressed air—pressurized air exiting through nozzles akin to the air nozzles used to fill up tires—a generally acceptable way to blow out and clean dusty equipment. USPS maintenance personnel stated that using compressed air is the best way to clean its machines because most of the dust collects on the pinch rollers, which are hard to access using a vacuum nozzle. However, USPS banned compressed air blowing following the anthrax attacks last fall. As a result, USPS began installing HEPA systems to permanently vacuum its mail processing equipment and reduce or eliminate the need to hand vacuum the internal workings of the machines, which is the current process.

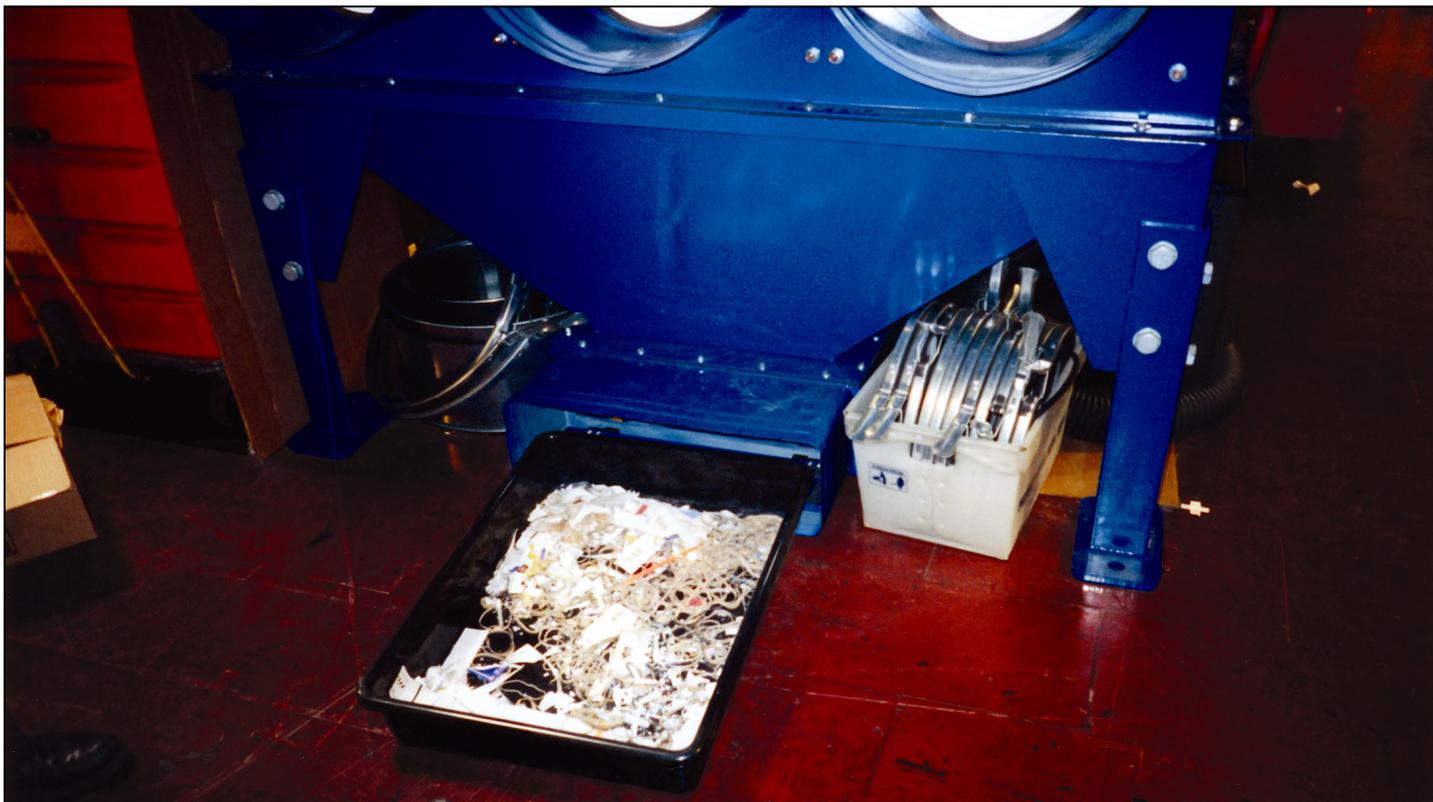
USPS recently performed a test to quantify the amount of dust collected by the HEPA filtration systems deployed at Dulles, but the results have not yet been analyzed. USPS gathered data from June 11 through June 25, 2002, on the amount of dust captured by the HEPA filtration systems installed at the Dulles facility. The test used data collected from four machines—two AFCSs and two DBCSs—to determine how much dust the filtration systems are actually capturing and how much dust remains in the mail processing equipment. Although one AFCS and one DBCS have a HEPA filtration system installed, the remaining two did not. The test involved using preweighed filters on four portable HEPA vacuum cleaners, which are used to clean the four machines individually. After the 2-week test period, USPS weighed the portable vacuum filters and canisters to determine how much dust the mail processing equipment collected with the HEPA filtration system versus those that did not have the prototype system. These test results are still being analyzed. While this initial testing is a positive step, we are concerned that the amount of dust collected by the portable HEPA vacuums from the mail processing machines with filtration systems will be understated because the data reflect a 24-hour period of operations versus the normal operations, which are between 7 and 16 hours depending on the type of equipment. Accordingly, the test may not provide USPS with the reliable data necessary to make valid conclusions about the efficiency of the HEPA filtration system.

Given the importance of USPS's initiative, it is imperative that reliable tests be performed to confirm whether the use of air filtration systems to clean mail processing equipment is effective. According to our preliminary observations, the HEPA filtration systems installed at the Dulles P&DC/F are collecting relatively few dust particles and may be causing the dust to

settle inside the mail processing equipment. When we visited the Dulles P&DC/F, we were shown the trays where some of the dust could settle. The trays contained only rubber bands, paper clips, loose bits of paper, and mail. See figure 1 for the contents of HEPA filtration system's tray at the Dulles P&DC/F. The Dulles P&DC/F maintenance manager stated that when maintenance personnel blew air back through the filters to purge any dust that may be trapped in them, there was no dust dislodged and the filters appeared to be clean. The bulk of the dust may be lodged in the innards of the machines and electronic equipment and not in the filters. Therefore, USPS maintenance officials are concerned that mail processing equipment, such as the DBCS, is not being cleaned as thoroughly as it was previously with the dry sweeping and compressed air blowing methods. Without an effective mechanism to clean the equipment,⁵ the dust lodged in the machines will manifest itself relatively quickly and may result in burned out pinch rollers, equipment breakdowns, and generally higher repair costs and downtime. Hence, USPS may incur additional costs for repairing equipment in the AFCS and the DBCS, and the additional maintenance may possibly affect its operations.

⁵Although USPS P&DC/F officials are also attempting to clean the machines with the HEPA filtered portable vacuum cleaners recently acquired, the nozzles are not small enough to allow the staff to clean the intricate portions of the equipment, including bearings and electronic card cages.

Figure 1: Tray Showing Items Captured by HEPA Filtration System



USPS HEPA Design Calls for Additional Requirements

USPS believes that installing HEPA filtration systems will minimize the risks of airborne biohazards in the event of another anthrax attack, reduce dust levels, and lessen workers' allergy-like symptoms. Therefore, USPS is proposing the use of HEPA filtration technology as a final filtering stage to remove smaller particles that constitute airborne biohazards. However, the design and configuration of the HEPA filtration system calls for additional requirements.

First, USPS has identified that the HEPA filtration systems installed at the Dulles P&DC/F require additional power to avoid affecting current mail processing equipment. At the Dulles facility, two air filtration systems—the Torit and FSX—have been installed. The Torit system is being tested on the DBCS. The FSX system is being tested on the AFCS. See figure 2 for a picture of the HEPA filtration system design at the Dulles P&DC/F and figures 3 and 4 are pictures of the FSX and Torit HEPA air filtration systems being tested at the Dulles P&DC/F. Both the FSX and Torit systems have been installed with the ductwork covering the entire AFCS

and the DBCS units. The front of the DBCS is covered with plastic, and the back of the cabinet doors have channels cut into them to allow the air to flow up into the ductwork along the entire length of the machine.

Figure 2: Design of HEPA Filtration System at Dulles P&DC/F



Figure 3: Prototype FSX Air Filtration System on the AFCS

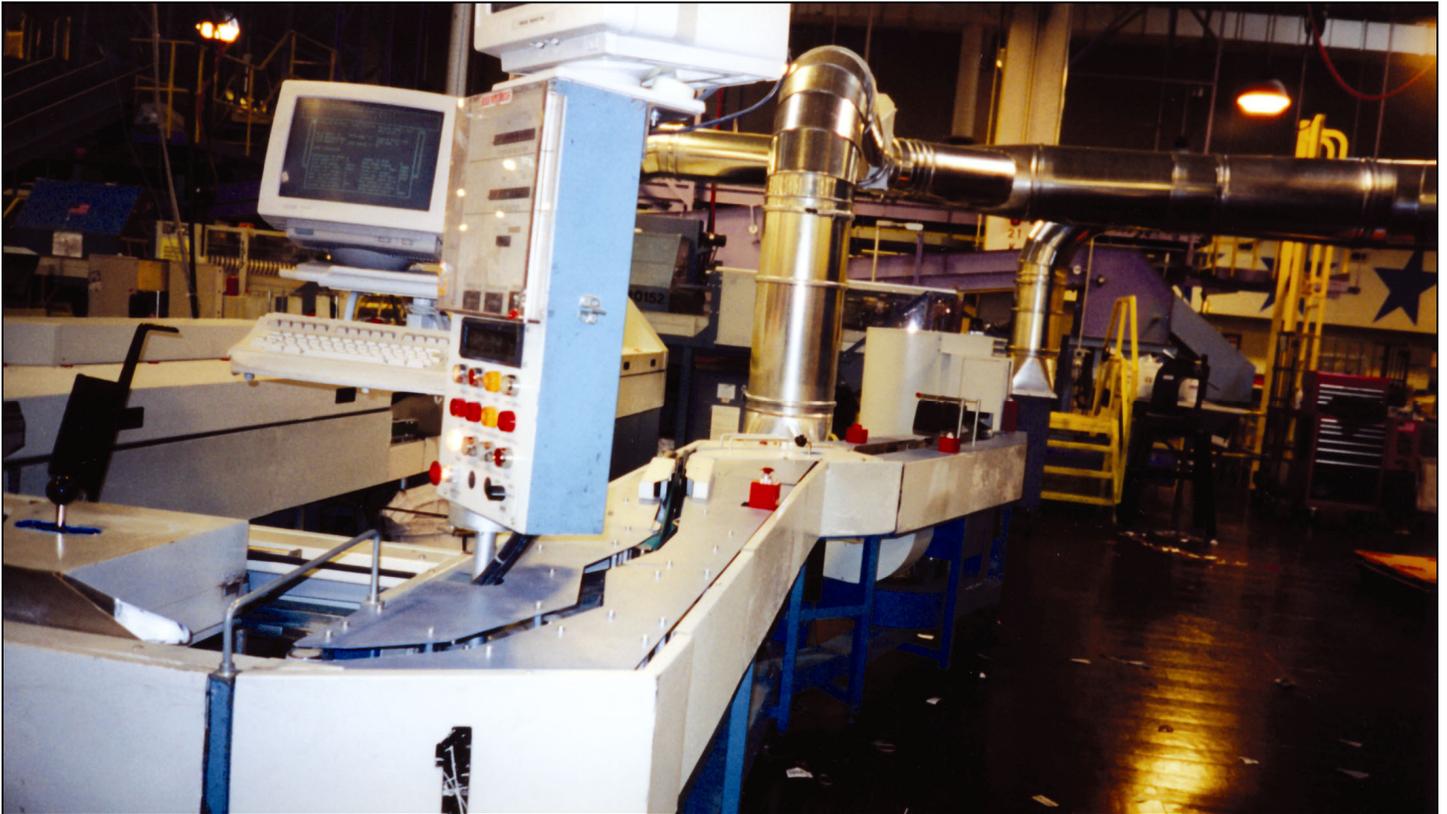


Figure 4: Prototype Torit Air Filtration System on the DBCS



According to USPS officials, this design, as it is configured, presumably collects dust from all of the rollers and belts along the length of the machine and directs airborne dust to the ductwork. However, this design requires a large amount of power to generate enough airflow to move the dust through the machines. As a result, the Vice President of Engineering is concerned that the amount of energy required to run the HEPA filtration systems might overwhelm the power supply at the P&DC/F and may result in an outage if additional power is not provided. He added that the HEPA filtration system's impact on the power supply is a serious concern, which the agency plans to address by performing site surveys to determine how much additional power is required for HEPA air filtration to operate effectively and to avoid degrading the performance of mail processing equipment.

Installation of HEPA Air Filtration Systems Requires Equipment Modifications

Another concern with USPS's design of the HEPA filtration system on the mail processing equipment is that modifications must be made to each type of machine to ensure that it is automatically and continuously vacuumed and minimal dust escapes. For instance, the air from inside these machines will be filtered using HEPA filters before it is discharged back into the mail processing environment. The continuous flow of air into the equipment and the discharge of air through multistage vacuum filtration (to initially filter out larger particles to prevent their plugging the finer filters), with a final filtration through a HEPA filter, is expected to reduce the release of airborne hazards from processing equipment into the facility by several orders of magnitude. To ensure that air is routed to the HEPA filters, the AFCS and the DBCS have to be closed up with metal and plastic hoods, respectively. See figures 5 and 6 for examples of the AFCS metal hoods and DBCS plastic shrouds and figure 7 for the DBCS Torit air filtration system.

Figure 5: AFCS Modified with Metal Hoods

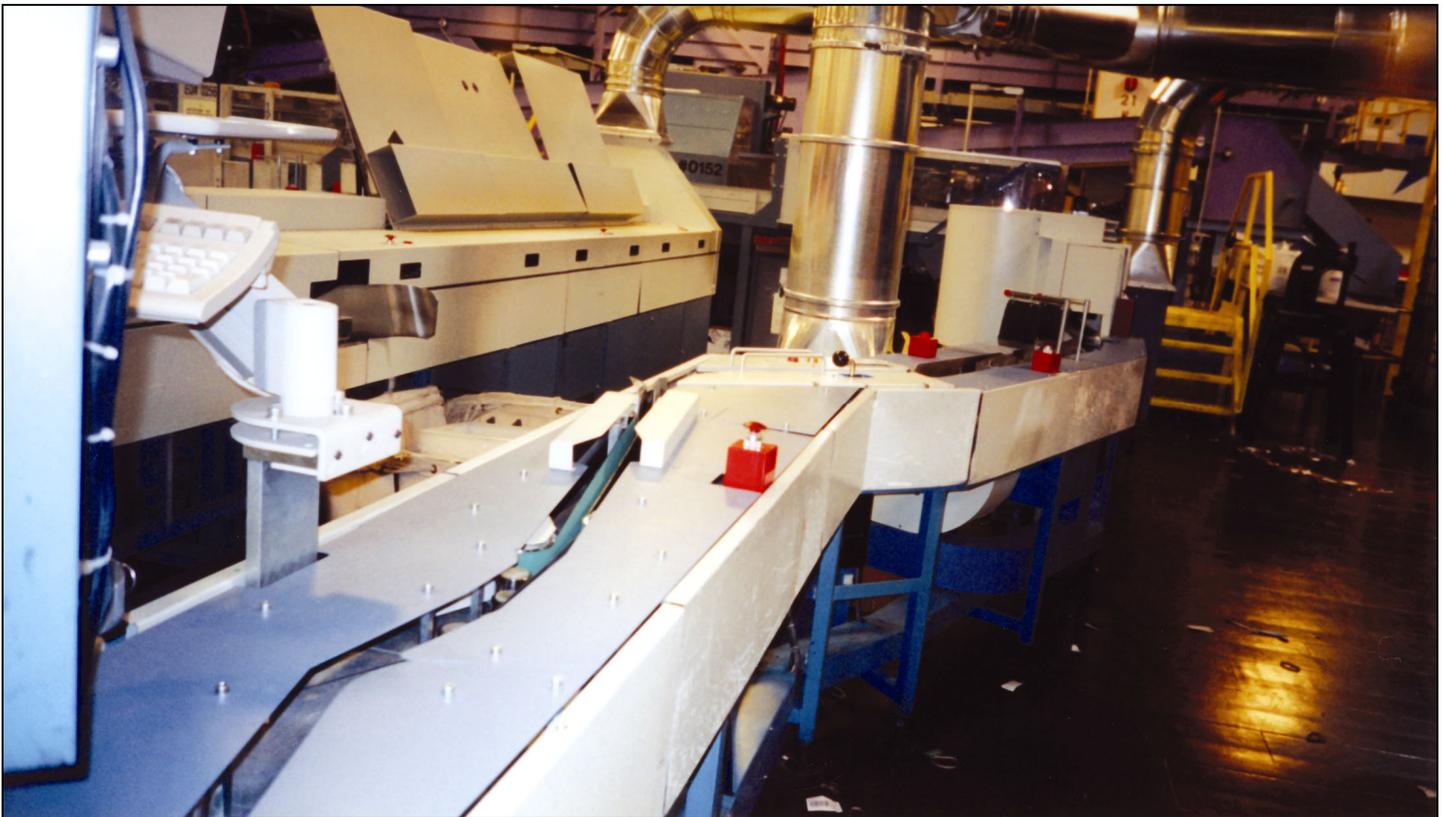


Figure 6: DBCS Modified with Plastic Shrouds



Figure 7: DBCS Torit Air Filtration System



Air Filtration System's Effects on Air Sampling and Detection Need to Be Determined

USPS has not yet performed any tests to determine whether the HEPA air filtration system will impede the performance of the proposed air sampling and detection system. While HEPA filtration systems might reduce the risk of exposure to biohazards, USPS will need additional technologies to detect and identify potential hazardous materials as early as possible in the mailstream. Therefore, in addition to installing air filtration equipment, USPS is designing and installing air sampling and detection equipment to monitor airborne particles released during automated mail processing. USPS plans to use this sampling in conjunction with biohazard detection technology to confirm whether anthrax spores are present. According to USPS officials, to be most effective in collecting airborne anthrax, the air sampling and detection system must be placed directly over the automated mail processing machines, including the AFCS and the DBCS, where the anthrax dispersion is most likely to occur. The efficacy of the air sampling detection equipment, however, might be hindered since the AFCS and

DBCS will have to be closed up with metal and plastic hoods, respectively, in order for the HEPA filtration equipment to function effectively. Refer to figures 5 and 6 for pictures of AFCS and DBCS with the metal and plastic hoods installed. Therefore, any HEPA filtration equipment that is installed in the P&DC/F would have to be designed so that it does not interfere with anthrax air sampling and detection system. USPS engineers recognize this requirement and stated that they would design a “dead zone,” or an area free of any negative air pressure, in the location where singular pieces of mail are processed through pinch rollers so that a proper sample can be taken by the air sampling and detection system. Consequently, until USPS tests this requirement, it will not know whether the “dead zone” design will be sufficient to ensure that an adequate sample can be collected for detection.

USPS Plans to Deploy Air Filtration Systems Nationwide Are Not Justified

According to industry best practices, investment analysis is a critical process required to select and fund technology investments that will result in cost-effective solutions focused on measurable and specific mission-related benefits. This process involves examining the fundamental cost, benefit, schedule, and risk characteristics of each investment before it is funded. USPS has not completed an investment analysis of its HEPA air filtration systems currently deployed at the Dulles P&DC/F and, thus, has not justified investing in HEPA filtration systems for deployment in its approximately 300 P&DC/Fs across the country.

Even though the USPS has prepared cost estimates to develop and implement HEPA filtration systems at its nearly 300 P&DC/Fs across the nation, these estimates are incomplete and, therefore, are understated. USPS plans to implement the HEPA air filtration systems nationwide, at a cost of \$245 million, by the end of fiscal year 2002 for air filtration on the Loose Mail system, AFCS, DBCS, and the Automated Flats Sorting Machine 100 (AFSM). A supplemental funding request of \$61 million is also being considered for fiscal year 2002 to acquire additional air filtration systems on the regular and outgoing DBCS machines. When added to the \$245 million already being considered for near-term purchase, the total cost of HEPA air filtration systems could increase to \$306 million by September 2002. However, these amounts do not include USPS’s recurring costs including the air filtration estimate of more than \$125 million annually for regular activities such as equipment maintenance, purchase of new filters, training, and updates to air filtration manuals for more than 10,000 HEPA filtration systems nationwide. Furthermore, USPS may also incur additional costs. For instance, preliminary data show that the HEPA filtration systems require more

power, which results in additional costs to run these systems. According to our analysis of the initial implementation of air filtration on the Loose Mail systems, an annual cost of about \$8 million will be required to power these systems. When this amount is added to expenditures associated with providing more power to support the 6,300 AFCS and DBCS units on which HEPA filtering technology will be installed, the annual cost for the extra energy required could be as high as \$42 million.⁶

Furthermore, there is the potential risk for greater maintenance costs because the HEPA filtration systems and portable vacuum systems appear to be less efficient in cleaning the mail processing equipment and may result in burned out bearings and equipment parts. USPS maintenance and engineering personnel at Dulles and Merrifield informed us that there is significant potential for equipment maintenance costs to rise. For example, we analyzed the potential cost impact of bearing replacement for the DBCS machines and found that, depending on the cost of the bearing, an additional \$26 to \$46 million could be spent on maintenance each year. According to USPS officials, the DBCS is the largest fleet of machines the USPS owns, and they run all secondary mail. If these machines break down more often because the bearings need replacing, this could affect both costs and operations. In addition, USPS will also have to consider the risks of increased maintenance costs associated with other equipment such as the AFCS, Loose Mail, and AFSM 100, which also contain bearings. However, until USPS completes a risk assessment to determine if the bearings are wearing out faster using the new maintenance procedures, it cannot know the extent of the additional maintenance costs that will be required.

With respect to benefits, USPS officials stated that the agency is reluctant to quantify benefits because it is committed to spend whatever is necessary to protect its employees from future biohazard attacks. Therefore, the officials noted that it is difficult to quantify the benefits of this technology and its ability to safeguard human life. Nevertheless, without completing required tests to confirm that the HEPA filtration systems are able to contain airborne anthrax in a mail processing environment, USPS will not know whether it is making a worthwhile investment.

⁶These cost estimates assume that the air filtration systems are running at the same time the machines are processing the mail.

Conclusions

We recognize the challenge that USPS faces in trying to protect its workers from airborne biohazards while trying to maintain its operations and control costs. By designing and testing air filtration systems on its mail processing machines, USPS has taken steps to reduce risk of exposure from biohazards to its employees. However, the USPS HEPA air filtration system design has not yet been proven to contain anthrax spores or reduce the levels of dust in a mail processing environment and in mail processing equipment. In addition, the HEPA filtration system's design and installation require additional energy and modifications to the mail processing equipment in order to work properly. Furthermore, USPS has not verified through testing that the HEPA air filtration system will not interfere with the air sampling and detection system. Finally, even though USPS has identified initial cost estimates, it has not yet completed investment analyses to identify the costs, benefits, and risks associated with alternative deployment scenarios for HEPA filtration systems. As a result, USPS has no assurance that investing in HEPA air filtration systems will provide adequate risk reduction to its employees.

Recommendations

Given the magnitude of this investment and its impact on maintaining the mail processing equipment, as well as potential effects on its operations and proposed biohazard detection capabilities, it is important that the USPS show the specific performance gains attributable to this initiative before full deployment is pursued.

To ensure that USPS is making a sound investment, we recommend that the Postmaster General direct the Vice President of Engineering to complete the following actions before determining whether to proceed with a large-scale rollout of air filtration systems at 300 USPS P&DC/Fs:

- Perform tests to determine (1) the HEPA air filtration system's ability to trap released hazards and other contaminants and (2) what level of hazards or contaminants could be released into the mail processing environment as a result of the air filtration system's design.
- Perform integrated tests with HEPA air filtration system and detection technologies being considered to determine whether the "dead zone" will impede the detection technology's performance.
- Identify the effects of the HEPA filtration system's energy consumption on mail processing equipment performance and what could be done to mitigate this risk.
- Complete an investment analysis to prioritize USPS's plans to spend approximately \$300 million to deploy the HEPA air filtration systems nationwide.

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- Analyze alternative solutions, including whether maintenance costs can be reduced by using compressed air for cleaning mail processing equipment after implementing a suitable detection technology.

Agency Comments and Our Evaluation

USPS provided comments on a draft of this report in a letter dated August 9, 2002. These comments are summarized below and reproduced in appendix I. In commenting on a draft of our report, USPS shared overall concerns that (1) our report placed too much emphasis on the supposed secondary benefits of the air filtration systems, (2) their cost estimates in its Emergency Preparedness Plan are low, and (3) increased maintenance costs are not anticipated.

On the other hand, USPS generally agreed with our recommendations to continue testing the system to confirm its ability to trap anthrax spores and to test for interaction between the air filtration and detection systems. Furthermore, the Service noted that detailed site surveys would be performed at each P&DC/F as part of the deployment planning process to ensure that operation of these systems will not adversely affect the P&DC/F's power supply. USPS also commented that a Decision Analysis Report (DAR) is being prepared that will address both start-up costs to procure and deploy the equipment, as well as recurring costs such as increased electrical usage, maintenance support, spare parts, and training costs for HEPA air filtration systems. In its comments, the Service stated that it plans to submit a DAR that must be reviewed and approved by senior management and voted on by USPS's Board of Governors prior to deployment. Finally, USPS agreed with our recommendation that it review the prohibition on using compressed air to clean mail processing equipment after effective biohazard detection systems are in place.

With regard to the concern about too much emphasis on secondary benefits, USPS noted that the main purpose of adding air filtration systems to the mail processing equipment is to minimize the potential exposure risk to postal employees and customers in the event of another anthrax attack. Further, the Service stated that it does not expect the air filtration systems to eliminate the need for daily cleaning of the mail processing equipment, and that no cost reductions for reducing nuisance dust were used to justify the deployment of these systems. We modified our report to address USPS's concern that the draft report placed too much emphasis on the secondary effects of air filtration systems.

The reason we also focused on the HEPA air filtration system's ability to clean mail processing equipment is because an additional maintenance

cost of up to \$46 million annually could result from installing these HEPA air filtration systems and changing maintenance practices from compressed air blowing to hand vacuuming. Furthermore, USPS's Emergency Preparedness Plan discusses the HEPA air filtration system's ability to clean equipment and also states that such designs for reducing nuisance dust were under way prior to the anthrax attacks.

USPS's comments additionally stated that the cost for deploying HEPA air filtration systems nationwide was based on the best information available at the time. The Service anticipates that as it moves further into testing and manufacturing, it may run into unanticipated complications that will require revisions to the cost estimates. We agree that unanticipated complications may arise and, as a result, additional funding may be required to reengineer and resolve these issues, which will most likely increase the cost to develop, deploy, and maintain the HEPA air filtration systems. Furthermore, we are concerned that the costs are understated due to the potential for increased operational costs to power the equipment. This potentially could add up to \$42 million annually.

The Service also had concerns relating to our finding on increased maintenance costs. The comments stated that USPS has not seen any increase in the number of machine repairs and parts replacements that were required because of dust buildup in bearings and other components and, therefore, does not foresee any increased maintenance costs. Our audit work and evidence provided to us by USPS engineers shows that bearing replacement rates have changed in the last 6 months. USPS may need to conduct more studies and analysis before it will know for sure whether the cost of the new maintenance procedures is higher or lower.

With regard to USPS's concurrence with our other recommendations, these planned actions are the appropriate steps to take. USPS plans to conduct additional testing at the Dulles P&DC/F to determine the system's effectiveness in capturing biohazards and to determine the amount of biohazards that might be released into the mail processing environment. Testing in an P&DC/F environment with particles in the 2 to 6 micron range can be used by the USPS to confirm that the system operates as designed and will provide the USPS with objective data to make appropriate modifications, if necessary, to improve the design.

Finally, once the additional testing is completed, USPS plans to complete the DAR for the HEPA air filtration system and present it for management review. This should ensure that USPS management has accurate and

complete information on the capabilities and cost of the air filtration system prior to making a decision on nationwide implementation.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the date of this letter. At that time, we will provide copies to interested congressional committees, the Postmaster General, and Chief Executive Officer of USPS. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you have any questions on matters discussed in this report, please contact me at (202) 512-6412 or Madhav Panwar, Director, at (202) 512-6228. We can also be reached by E-mail at rhodesk@gao.gov and panwarm@gao.gov, respectively. Individuals making key contributions to this report were Karen A. Richey, Yvette R. Banks, Teresa Anderson, Teea Kim, and Sushil Sharma.



Keith A. Rhodes
Chief Technologist, Applied Research and Methods

Appendix I: Comments from the U.S. Postal Service

PATRICK R. DONAHUE
Chief Operating Officer
and Executive Vice President



August 9, 2002

Mr. Keith A. Rhodes
Director, Center for Technology and Engineering
United States General Accounting Office
Washington, DC 20548-0001

Dear Mr. Rhodes:

Thank you for providing the U.S. Postal Service with the opportunity to review and comment on the draft report titled Diffuse Security Threats: USPS Air Filtration Systems Need More Testing and Cost/Benefit Analysis Before Implementation.

The deliberate and malicious introduction of anthrax-laden letters into the nation's mail system last October had consequences that spread far beyond the immediate confines of the Postal Service facilities that collected, processed, and delivered the letters. Not only was the safety and health of many of our employees and customers directly affected, tragically in several cases, the public's confidence in the entire mail system was compromised. If such an incident was repeated on a larger scale, the consequences to the economic health of the entire nation could be truly incalculable. The Postal Service is committed to the safety of its employees and will do whatever is necessary to assure them that simply doing their jobs will not put them in harm's way. Likewise, the American people should not fear the simple task of going through their mail. The viability of the Postal Service and its value to the country's economy is dependent upon maintaining the public's confidence that the system is and will remain both open and safe.

We appreciate your staff's evaluation of our plans to deploy air filtration systems on mail processing equipment in our processing and distribution centers (P&DCs) nationwide. We agree with the report's recommendations and have actions underway that will address them. We plan to have these actions completed before we deploy the filtration systems. We have, however, three concerns with the report: first, it seems to put too much emphasis on the supposed secondary benefits of the air filtration systems; second, readers may presume that the \$245 million we estimated for installing air filtration systems nationwide is firm, when it is likely to change as plans are refined; and third, the report's estimate of future increased equipment maintenance costs is not supported by data on repairs to date. Each of these concerns is discussed separately below.

Dust Reduction

We are concerned that the report may lead readers to incorrectly conclude that we consider the reduction of paper dust generated in the course of daily operations to be one of the primary justifications for deploying the air filtration systems. The purpose of adding air filtration to the processing equipment is to minimize the potential exposure risk to our employees and ultimately to our customers in the event of another biohazard attack. The air filtration systems are not designed to eliminate the need for daily cleaning of the mail processing equipment. While the air filtration systems do reduce paper dust, it is a side benefit. It was not used as a justification to deploy the systems.

Cost Estimates

The \$245 million cost estimate for deploying air filtration systems nationwide, as reflected in our Emergency Preparedness Plan, was based on the best information available at the time. We are in uncharted territory here, designing an engineering retrofit of unprecedented magnitude and complexity.

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We had to develop estimates without the luxury of having complete data on every design and installation factor that may impact the system's final deployed costs. As we move further into testing and manufacturing, we may run into other unanticipated complications that will require revisions to our cost estimate.

Increased Maintenance Costs

The report raises the issue that "there is the potential for greater maintenance costs as a result of burned out bearings and equipment parts" due to greater accumulations of paper dust at critical wear points. While it is true that vacuuming, the currently mandated cleaning method, is less efficient than the former practice of using compressed air, we have not seen any increase in the number of machine repairs and parts replacements attributable to dust buildup in bearings and other components. Consequently, we do not envision increased bearing wear to be a factor that would escalate maintenance costs anywhere near the \$26 to \$46 million the report theorizes. The new cleaning methods have been in use for over six months and the frequency of machine repairs does not support the report's cost projections in this area.

We have reviewed each of the report's recommendations and have provided below specific information concerning the actions we are taking to implement them.

Recommendation: perform tests to determine (a) the HEPA air filtration system's ability to trap released hazards and other contaminants, and (b) what level of hazards or contaminants could be released into the mail processing environment as a result of the air filtration system's design.

Our engineering staff, with the assistance of the National Institute for Occupational Safety and Health (NIOSH), has conducted several tests to determine the capture efficiency of the high-efficiency particulate air (HEPA) filtration systems we are considering. These tests have shown that the prototype systems provide excellent capture efficiency in the 1-10 micron range and are a reasonable approach to reducing exposure risks to biohazard attacks. As your report notes, for filters to be certified as being HEPA, they must be 99.97 percent efficient down to the 0.3-micron level, and consequently, they are even more efficient for particles corresponding to the size of anthrax spores.

In accordance with the Industrial Ventilation Manual of Recommended Practice and NIOSH recommendations, we plan to continue testing the performance of the air filtration systems by measuring the air velocity, using tracer gas to demonstrate an effectiveness of at least 98 percent, and smoke for a visual check and demonstration. In addition, we plan to install pre-production systems in the Dulles P&DC by September 2002 to determine the system's effectiveness in capturing biohazards and to determine the amount of biohazards that might be released into the mail processing environment.

Recommendation: perform integrated tests with HEPA filtration system and detection technologies being considered to determine whether the "dead zone" will not impede the detection technology's performance.

We are planning to perform integrated testing of portions of the mail processing equipment modified to work with both air filtration and bio-detection technologies. During this testing, we will determine the required air flow velocities in the detection area while running the ventilation and filtration systems. These air velocities will become part of the specifications for the ventilation and filtration system's final design. We believe our testing will provide sufficient data to ensure that the "dead zone" we are requiring in the air sampling area does not interfere with or degrade the detection system's performance.

Recommendation: identify the effects of the HEPA filtration systems' energy consumption on mail-processing equipment performance and what could be done to mitigate this risk.

The air filtration systems will consume a substantial amount of electricity to generate the air flows required in full operation. Whether the additional power demand will overload a facility's electrical capacity will have to be determined on a case-by-case basis. Because P&DCs are not standardized in terms of size, age, physical layout, or type and number of pieces of mail processing and other

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equipment, it is not possible to develop a one-size-fits-all approach to determining the additional energy demands the deployed filtration systems will impose. However, as part of the deployment planning process, a detailed site survey will be performed at each P&DC receiving the filtration systems to ensure that operation of the systems will not adversely impact the P&DC's power supply. Where this is a concern, additional capacity will be brought in.

Recommendation: complete an investment analysis to prioritize USPS's plans to spend approximately \$300 million to deploy the HEPA filtration systems nationwide.

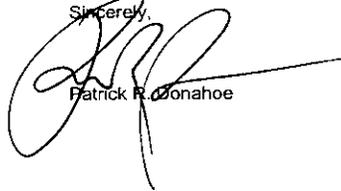
The Postal Service has a comprehensive procurement review and approval process. The process requires the preparation of a Decision Analysis Report (DAR) that lists and quantifies all one-time acquisition costs as well as all recurring costs. One-time costs include not only the costs of the new equipment itself but also site preparation and other costs required by the initial deployment, including upgrading electrical service and HVAC capacity. Recurring costs include such items as increased electrical usage, increased maintenance support, spare parts, and training costs. A DAR is being prepared for the air filtration systems. It must be reviewed and approved by both senior management and our Board of Governors before the air filtration systems can be purchased and deployed. We expect the DAR for the air filtration systems will be ready for management's review once testing has been completed and we are confident that the systems are effective in capturing airborne biohazards. We plan to conduct these tests within the next several weeks and will share the results with your staff.

Recommendation: analyze alternative solutions, including whether maintenance costs can be reduced by using compressed air, for cleaning mail-processing equipment after implementing a suitable detection technology.

After effective biohazard detection systems are in place, the prohibition on using compressed air to clean mail processing equipment will be reviewed. At this time, we do not have sufficient data available to determine the impact on maintenance costs of the prohibition on using compressed air to clean the machines.

If you or your staff would like to discuss any of these comments further, my staff is available at your convenience.

Sincerely,



Patrick R. Donahoe

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