September 29, 2000

JOHN E. POTTER
SENIOR VICE PRESIDENT, OPERATIONS

WILLIAM J. DOWLING
VICE PRESIDENT, ENGINEERING

SUBJECT: Audit Report – Use of Robotic Tray Handling System
(Report Number AC-AR-00-004)

This report presents the results of our review of the Use of the Robotic Tray Handling System (Project Number 00PA028AC000). The objective of the audit was to assess the impact of the Robotic Tray Handling System on Postal Service operations.

We could not assess the benefits of the Robotic Tray Handling System because processing facilities did not retain and use the empirical data collected to assess performance. However, plant managers at the facilities where the tray feeding mechanism was installed were impressed with system performance and operational benefits. Plant managers viewed the pedestal robot as being less productive if it was not equipped with a tray feeding mechanism. We also identified additional funding requirements associated with system installation that were not identified in the Decision Analysis Report as well as costs incurred due to program changes. Management generally agreed with our findings and recommendations. Management's comments and our evaluation of their comments are included in the report.

We appreciate the cooperation and courtesies provided by your staff during the review. If you have any questions or need additional information, please contact Ralph "Stew" Dorris at (703) 248-2357 or me at (703) 248-2300.

Debra S. Ritt
Acting Assistant Inspector General
for Business Operations

Attachment

cc: John R. Gunnels

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EXECUTIVE SUMMARY

Introduction

This report presents the results of our audit of the Robotic Tray Handling System. The objective of the audit was to assess the impact of the Robotic Tray Handling System on postal operations.

Results in Brief

We could not assess the benefits of the Robotic Tray Handling System because processing facilities did not consistently capture and retain empirical data on system performance. However, 18 of 42 plant managers we interviewed indicated the pedestal robot had a positive impact on postal operations when the system was installed with a tray feeding mechanism.

The pedestal robot was not as successful at 24 of 42 facilities that lacked tray feeding mechanisms needed to operate the system at maximum capacity. Managers did not install the tray feeding mechanisms because funding was not provided for this equipment in the Decision Analysis Report for the Robotic Tray Handling System. Also, several plant managers told us they were unwilling to install the system due to concerns about performance and the advent of new technology.

Eighteen postal facilities that installed the pedestal robot expended an additional $7.2 million to deploy and complete the system. These costs were not included in the original or modified Decision Analysis Reports. Most of these expenditures were for installation of tray feeding mechanisms. Additional funding will be required to fully deploy the system and achieve the anticipated performance improvements in the Decision Analysis Report. In addition, the Postal Service incurred another $1.3 million in warehousing and other costs due to program changes.

Summary of Recommendations

We recommend the senior vice president, Operations, ensure that system performance data is retained and analyzed to assess impact on mail processing operations.

We also recommend the vice president, Engineering, consider providing funds to deploy the remaining Robotic Tray Handling Systems and to install tray feeding mechanisms for the previously deployed pedestal robots.

Summary of Management's Comments

Management agreed with the recommendation concerning the retention of performance data, and offered a better solution that went beyond our recommendation. They proposed to combine performance data and work hour data and integrate it into the management information routinely used by field managers.

Additionally, management agreed that the pedestal robot was more efficient when used in conjunction with a tray feeding mechanism, but did not agree that a tray feeding mechanism needed to be provided for every robot. Management also stated that a task force had been established to identify candidate sites for undeployed robots and potential performance improvements at sites lacking tray feeding mechanisms. They expect this approach to result in the deployment of tray feeding systems to existing sites currently lacking them.

Management also stated that funding to deploy the remaining pedestal robots with tray feeding mechanisms is already available under the Field Fixed Mechanization Program. They expect the task force will help sites justify tray feeding mechanisms and a need for the undeployed pedestal robots.

Management also pointed out that their early projection of $497,200 for warehousing costs of undeployed pedestal robots was now expected to be less than $200,000. We have changed the report to reflect that lesser amount.

Management's comments, in their entirety, are included in the Appendix.

Overall Evaluation of Management's Comments

Management's comments and proposed alternative corrective actions are responsive to our recommendations concerning performance data. Management's comments concerning the provision of a tray feeding mechanism for all deployed pedestal robots meet the intent of our recommendation. However, we do not agree that it is unnecessary to provide a tray feeding mechanism for every deployed pedestal robot. We also do not agree that the tray feeding mechanisms should be separately funded. We

believe the cost of both systems should be captured jointly to provide complete disclosure of project costs and return on investment.

Management's comments regarding the provision of funding to deploy the remaining pedestal robots with tray feeding mechanisms meet the intent of our recommendation.

INTRODUCTION

Background

The Robotic Tray Handling System consists of two components: a pedestal-style robot and a tray feeding mechanism. The system moves strapped and sleeved letter mail trays from the tray feeding mechanism to the pedestal robot and distributes the trays into twelve all-purpose containers. Also, the system was intended to reduce manual workload hours and risks involved in manual lifting tasks. The pedestal robot and the tray feeding mechanism are both essential to operate the Robotic Tray Handling System at maximum capacity.

Pedestal Robot

In August 1996, the Postal Service Board of Governors approved a Decision Analysis Report for 102 pedestal-style robots at a total cost of $28.9 million. In June 1998, Postal Service Engineering submitted and received approval on a request for additional funding of $8.8 million to complete the program. Seventy-three pedestal robots have been installed in 42 facilities. Twenty-seven pedestal robots remain to be deployed.

Objective, Scope, and Methodology

Our audit objective was to assess the impact of the Robotic Tray Handling System on Postal Service operations. In conducting the audit, we interviewed plant managers at all 42 facilities where the robots were installed. Additionally,

we conducted site visits at 15 of 42 facilities that were randomly sampled. During site visits, we interviewed plant managers, in-plant support managers, maintenance managers, contractors, and other personnel. We observed robots in operation, obtained and analyzed data related to the Robotic Tray Handling System, and physically counted robots warehoused in Detroit, Michigan. At the remaining 27 facilities we conducted telephone interviews with facility personnel. Finally, we reviewed the original and revised Decision Analysis Reports for the project.

This audit was conducted from March through September 2000 in accordance with generally accepted government auditing standards and included such tests of internal controls as were considered necessary under the circumstances. We discussed our conclusions and observations with appropriate management officials and included their comments, where appropriate.

Prior Audit Coverage

The Postal Inspection Service completed an audit of the planning and developmental phases of the Robotic Tray Handling System project in October 1997. They determined the cost/benefit analysis for the Robotic Tray Handling System, Phase 1 did not include additional site modification costs and projected benefits for development and deployment. Also, system performance could not be accurately projected until all significant associated project costs and benefits were identified.

Management concurred with both findings, and stated Engineering would include the additional investments in future Robotic Tray Handling System Decision Analysis Reports. However, management did not agree to recalculate the return on investment for the purchase. Additionally, management stated access controls will be improved, and Engineering will work with Information Systems Security for the appropriate security requirements and policy for future Robotic Tray Handling System projects.

AUDIT RESULTS

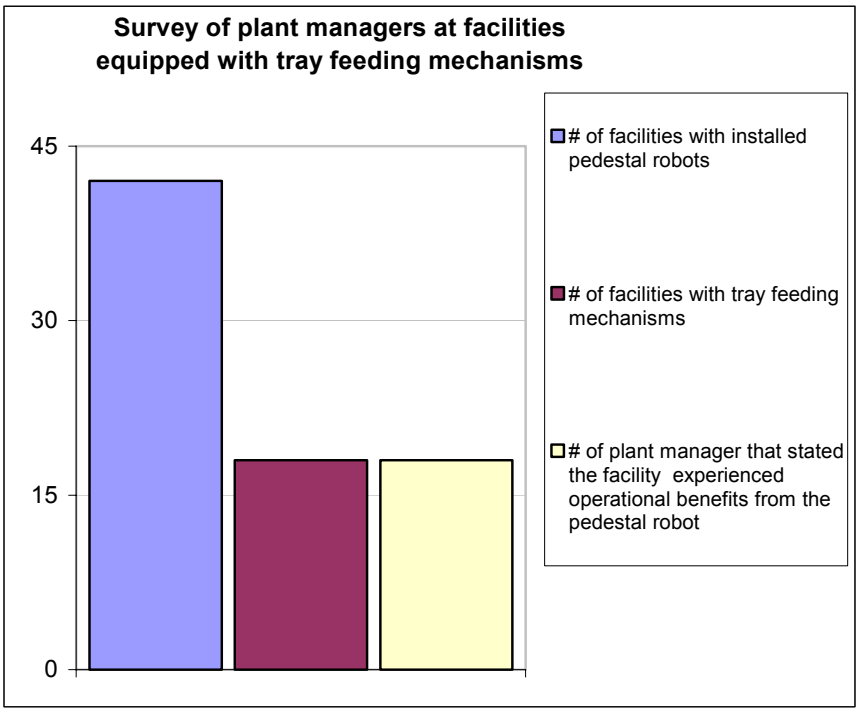
System Performance

We could not assess the impact of the Robotic Tray Handling System on postal operations because processing facilities did not consistently capture and retain empirical data on system performance. Incomplete data did not allow managers to effectively analyze system performance and compare it to other postal mail processing systems. For example, throughput volume measures the amount of mail processed by a system, usually in hourly or daily increments. With this data, managers can compare mail volumes of various processing systems and establish which system maximizes throughput. These measurements, along with other performance data, can assist the Postal Service in making decisions about those systems to invest in and deploy.

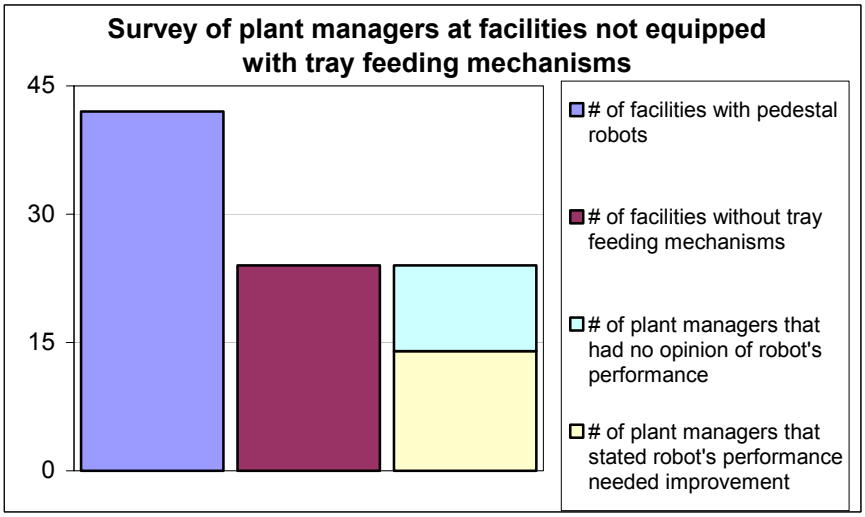
Because performance data was not complete, we interviewed 42 plant mangers to determine if the system increased productivity or reduced costs. Plant managers at the 18 facilities where the tray feeding mechanism was installed said they observed operational benefits from the pedestal robots. Additionally, these plant managers were impressed with the robot's performance, and told us the system:

- Reduced labor hours and overtime.
- Reduced risk of industrial accidents.
- Reduced transfers of mail to other facilities for processing.
- Increased productivity.

Based on these interviews, which are summarized in the chart below, we concluded the tray feeding mechanism was needed to achieve the operational benefits of the system.

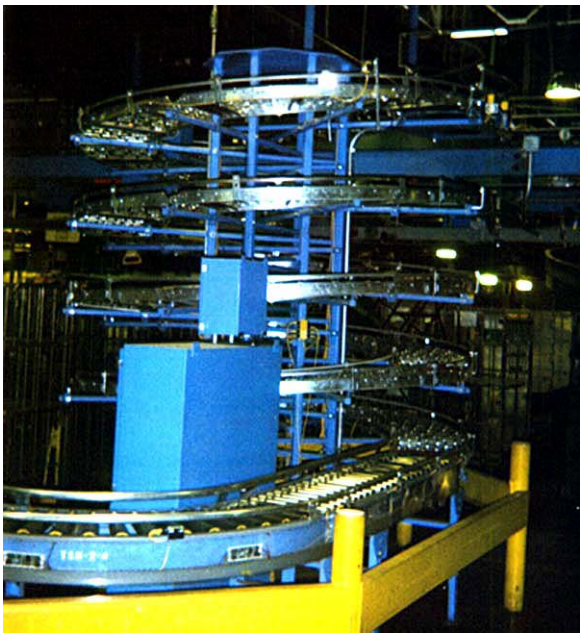


Managers at 14 of the 24 facilities who did not have the tray feeding mechanism also confirmed the tray feeding mechanism was needed to optimize performance. The remaining ten managers had no opinion of the pedestal robot's performance. The tray feeding mechanism complements the pedestal robot by automating the transfer of mail trays from dispatch and/or manual sorting operations to the pedestal robot. These results are summarized in the chart below.



Plant managers at the 24 facilities cited various reasons for not installing tray feeding mechanisms. For example:

- Funding was not provided for tray feeding mechanisms and managers were unwilling to expend funds from their budgets to complete the system.
- The system often did not read barcodes correctly.
- They were awaiting the new Robotics Containerization System, which offered greater efficiencies over the Robotic Tray Handling System and required less floor space to install. Additionally, the new system would be fully funded by the Decision Analysis Report.



Tray Feeding Mechanism

Recommendation

We recommend that the senior vice president, Operations:

1. Direct the area operations vice presidents to consistently capture and retain available performance data relating to the Robotic Tray Handling System and assess impact on mail processing operations.

Management's Comments	The senior vice president, Operations, agrees with the intent of our recommendation and believes that field managers would use the data if it were improved and interfaced with the Data Collection System. He proposed to combine performance data and work hour data and integrate it into the management information routinely used by field managers. Management's strategic plan is to integrate the Robotic Tray Handling System data into the corporate database and reporting systems. Management proposed doing this by is adding software and hardware to the Robotic Tray Handling System to expand its archiving capacity to ensure all appropriate data is captured and maintained. Management also plans on a test to interface the improved data capture system with the Data Collection System as a conduit for the Robotic Tray Handling System's data. The completion of this strategic solution is the integration of the Robotic Tray Handling System's data into the corporate database and reporting systems.
Evaluation of Management's Comments	Actions planned in response to recommendation 1 should address the issues identified. Management's efforts to integrate the two sources of data go beyond our recommendation and provide a better solution for providing performance data to field managers.

Recommendation

We recommend that the vice president, Engineering:

2. Equip previously installed pedestal robots with tray feeding mechanisms to maximize the robot's performance.

Management's Comments	The vice president, Engineering, agreed that the pedestal robot is more efficient when used in conjunction with a tray feeding mechanism, but did not agree that a tray feeding mechanism necessarily needed to be provided for every robot. Management further stated that the Decision Analysis Report intended that the Robotic Tray Handling Systems be targeted for sites that already had tray feeding mechanisms, but that for various reasons some robot systems met certain criteria and were deployed without tray feeding mechanisms. The vice president, Engineering further stated that Postal Service policy requires a site to justify the need for a tray feeding mechanism and provides a program to fund these requirements. Management also stated that a task force had been established to identify candidate sites for undeployed

robots and potential performance improvements at sites lacking a tray feeding mechanism. They expect this approach to result in the deployment of tray feeding systems to existing sites currently lacking them.

Evaluation of Management's Comments

Management's comments and planned actions meet the intent of our recommendation. However, we do not agree with management's assertion that providing a tray feeding system at every site without one is unnecessary. As discussed in the report, managers were pleased with the pedestal robot only if a tray feeding mechanism was installed with it, and according to the Decision Analysis Report, installation was only envisioned at sites with a tray feeding mechanism already installed. For these reasons, it seems prudent to provide one with each pedestal robot.

We also do not agree with management's assertion that tray feeding mechanisms should be funded separately. In contrast to management's interpretation of Handbook F-66A, General Investment Policies and Procedures, we interpret the handbook to require that both systems be funded together. Decision Analysis Reports should include the total cost of the project, including all planning, startup and direct costs. We believe management correctly included the cost of an integrated conveyor system in the next generation of robotics, the Robotic Containerization System. We also recognize that other systems have been funded separately in the past, but we believe that costs associated with both systems need to be captured to provide complete disclosure of project costs and return on investment. We plan to address this issue in a subsequent audit of the Decision Analysis Report process.

Additional Funding

The decision analysis report did not include funding for tray feeding mechanisms and other improvements needed to operate the system at maximum capacity. According to Handbook F-66A, General Investment Policies and Procedures, Decision Analysis Reports should include the total cost of the project, including all planning, start-up, and direct costs. It should also include all related costs and expenditures, both capital and expense, necessary to complete the project, bring it to operational status and fund it through the economic analysis report displayed in the cash flow. In addition, all projects and agreements undertaken as a part of a single or unitary plan must be considered as one project.

Despite this requirement, Engineering did not include the funding needed to install the tray feeding mechanism in the original or modified Decision Analysis Reports. Consequently, 18 facilities, (43 percent of the facilities equipped with pedestal robots) expended approximately $7.2 million to install tray feeding mechanisms and complete site preparation.

Recommendation

We recommend the vice president, Engineering:

3. Consider providing additional funding to deploy the remaining pedestal robots with tray feeding mechanisms.

Management's Comments

The vice president, Engineering agrees with the recommendation and has established a task force to work with the field to identify candidates for the undeployed robots. He also pointed out that a policy waiver would be required to purchase feed systems that do not meet corporate investment standards. However, the purchase of the tray feeding mechanisms has been identified as a field initiative and the vehicle used to fund this effort is the Field Fixed Mechanization Program for sites meeting corporate investment standards.

Evaluation of Management's Comments

Management's comments are responsive to our recommendations.

Other Costs Resulting from Program Changes	Program changes impacted the deployment schedule that resulted in $1.3 million in added costs. These costs comprised warehousing of 27 pedestal robots that were not deployed, additional site and equipment surveys, and removal of robots at facilities that rejected the pedestal robot.
Warehousing Costs	In May 2000, we identified 27 pedestal robots in a Detroit, Michigan, warehouse that should have been deployed by August 1999. According to the June 1996 Decision Analysis Report, deployment of the pedestal robots was to start in November 1996 and end in July 1997. However, actual deployment did not begin until September 1997 and ended in February 1998, when funds allocated for the original Decision Analysis Report were exhausted. A contract modification was submitted and approved to complete deployment by August 1999. However, deployment was not completed, and as of June 2000, the Postal Service had estimated approximately $200,000 in storage costs will accrue for the stored robots.
Site Survey Changes	Engineering developed a list of sites to receive the pedestal robots and negotiated contracts to install the robots at those processing facilities. However, plant managers at some facilities, which had been surveyed for pedestal robot installation, made the decision to pursue the Robotic Containerization System instead because it was more efficient and required less floor space. As a result, facilities that had been surveyed were replaced with newly identified facilities. Consequently, the Postal Service spent an additional $160,300 for new site surveys.
Tray Feeding Mechanism Surveys	Engineering contracted with several firms to complete site surveys for installation of the tray feeding mechanism. Sixteen sites that did not receive the pedestal robot were surveyed for installation of the tray feeding mechanism. Subsequent to the surveys being completed, but prior to installation, some of the plant managers chose not to accept the pedestal robot, and decided to wait for deployment of the Robotic Containerization System, which was under development. Consequently, the Postal Service spent an additional $607,000 for tray feeding mechanism surveys.

Robot Removal	Nine robots installed at six processing facilities were removed after installation. These robots were installed without tray feeding mechanisms. Due to limited productivity, insufficient separations, or unwillingness to spend additional funds to install tray-feeding mechanisms, plant managers determined the pedestal robot was not cost effective to operate and requested removal. These removals cost the Postal Service $78,000.

APPENDIX. MANAGEMENT'S COMMENTS

WILLIAM J. DOWLING
VICE PRESIDENT
ENGINEERING

UNITED STATES
POSTAL SERVICE

September 22, 2000

DEBRA S. RITT

SUBJECT: Draft Audit Report - Use of Robotic Tray Handling System

We have reviewed the draft report of the subject audit. We generally agree with the findings and the intent of the recommendations. However, the proposed methods of implementation are limited or precluded by corporate policy. Engineering is already pursuing alternative methods of implementation to achieve the same desired results. Our detailed feedback, which includes that of Operations, is enclosed.

For William J. Dowling

Enclosure

cc: John E. Potter

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Engineering's Response to OIG Draft Audit Report on Robotic Tray Handling System

Recommendation No. 1

We recommend that the Senior Vice President, Operations, direct the Area Operations Vice Presidents to consistently capture and retain available performance data relating to the Robotic Tray Handling System and assess impact on mail processing operations.

Response:

Management agrees with the intent of this recommendation but plans a potentially more effective approach to implementation. The RTHS does currently capture performance data, and workhour data is collected in the Management Operating Data System (MODS). However, use of the data is inconvenient because the machine data is not tied into corporate information and reporting systems. Management believes that the data would be more widely used if it is integrated into the management information routinely used by field managers. To this end we are pursuing the following technology solution.

For immediate improvement we are adding software and hardware to the RTHS which will expand its data archiving capacity to ensure that all appropriate data is captured and retained. We are also testing an interface with the Data Collection System as a conduit for the RTHS data. The strategic solution will be the integration of RTHS data into the corporate data base and reporting systems in a seamless fashion.

Recommendation No. 2

We recommend that the Vice President, Engineering, equip previously installed pedestal robots with tray feeding mechanisms to maximize the robot's performance.

Response:

Management agrees that the RTHS is more efficient when used in conjunction with a tray feed system and is working with the field to purchase additional tray feed systems at those sites where they can be economically justified. However, management disagrees that a tray feeding system should automatically be purchased for every robot that lacks one.

Corporate investment guidelines (F66 Handbook) define the RTHS and the tray feed system as separate, stand-alone decisions at each site. The application of this policy here is analogous to the handling of other equipment deployments, such as the Flat Sorting Machine 881 and the Small Parcel and Bundle Sorter. In each of those cases, the sorting equipment stood on its own and the field independently initiated, justified, funded, and built feed systems. Additionally, the RTHS DAR describes that the intent was to target RTHS at sites that already had a tray feed system. Thus, for policy, precedent, and planning reasons, the RTHS DAR included no funding for tray feed systems.

For various reasons, certain robot systems met the investment hurdle rate and were deployed at sites without tray feed systems. However, the justification for adding a tray feed system remains a stand-alone decision at those sites. The feed system must add sufficient value itself to meet the corporate investment hurdle rate. The decision to purchase this type of equipment has long been delegated as a field initiative and there is an existing funding vehicle in place, the Field Fixed Mechanization Program.

A task force has been established to work with the field to identify candidate sites for undeployed robots and to investigate potential performance improvement at RTHS sites lacking a feed system. The task force will share information about best practices and methods used by other sites to justify and benefit from tray feed systems. This effort is expected to result in the purchase of additional tray feed systems at RTHS sites lacking them. This approach will accomplish the objective using mechanisms currently in place for this purpose and will not require violating the scope of the RTHS DAR.

Recommendation No. 3

We recommend the Vice President, Engineering, consider providing additional funding to deploy the remaining pedestal robots with tray feeding mechanisms.

Response:

Management agrees with this recommendation but policy limits the extent to which it can be implemented. The undeployed pedestal robots have been paid for. Therefore, the suggested additional funding would be for tray feed systems. As discussed above under Recommendation 2, this funding is already available under the Field Fixed Mechanization Program. It would require a waiver of policy to purchase feed systems that do not meet corporate investment standards. However, with task force help, it is expected that some number of virgin sites will justify feed systems. In turn, these sites will become candidates for undeployed robots.

Other Comments:

Re: Other Costs Resulting from Program Changes
Postal business and the environment in which we compete are not static. In many, perhaps even most, equipment programs, even those based on site-specific plans, some needs or conditions change before completion of deployment. Management makes every reasonable effort to be flexible to accommodate changing field requirements. These changing requirements often entail surveying additional sites and other costs beyond the original plans. To some extent, this is simply an issue of timing rather than greater total cost. For example, surveys at additional sites are often costs that would otherwise be incurred at a later phase of the program. However, in general, it must be recognized that there are business costs associated with accommodating changes, and such accommodations are prudent and necessary to optimize equipment investments.

One specific cost referenced in the report is incorrect. The report quotes an early conservative projection of $497,200 in "storage" costs for stored robots. Most of this projection was actually to keep experienced trainers and installers available, a cost that was avoided by the contractor keeping them on the payroll but assigned to other projects. This cost is now expected to be less than $200,000.