Y/DN-407

BWXT Y-12, L.L.C.

Y-12 Respirator Flow

Cycle Time Reduction Project

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Product Certification Organization

Y-12 National Security Complex
Oak Ridge, Tennessee 37831
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Y-12 National Security Complex

Managed By
BWXT Y-12, L.L.C.
For the United States
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Subject: Respirator Flow Cycle Time Reduction

02/06/01

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Respirator Flow Cycle Time Reduction Project
Y-12 National Security Complex
Oak Ridge, TN

Project No. Y/DN-407

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I. Executive Summary

In mid-July 2000, a Cycle Time Reduction (CTR) project was initiated by senior management to improve the flow and overall efficiency of the respirator distribution process at Y-12. A cross-functional team was formed to evaluate the current process and to propose necessary changes for improvement. Specifically, the team was challenged to make improvements that would eliminate production work stoppages due to the unavailability of respirators in Y-12 Stores. Prior to the team initiation, plant back orders for a specific model respirator were averaging above 600 and have been as high as 750+.

The Cycle Time Reduction team segmented the respirator flow into detailed steps, with the focus and emphasis primarily being on the movement of dirty respirators out of work areas, transportation to Oak Ridge National Laboratory (ORNL) Laundry, and return back to Y-12 Stores inventory. The team selected a popular model respirator, size large, to track improvements. Despite a 30 percent increase in respirator usage for the same period of time in the previous year, the team has reduced the back orders by 89 percent with a steady trend downward.

Summary of accomplishments:

- A 47 percent reduction in the average cycle time for dirty respirators to be laundered and stocked for reuse at the Y-12 Complex

- A 73 percent reduction in the average cycle time for dirty respirators to be laundered and stocked for reuse specifically for major users: Enriched Uranium Operations (EUO) and Facilities Maintenance Organization (FMO)

- Development of a performance measure for tracking back orders

- An 89 percent reduction in the number of laundered respirators on back order (unfilled orders; Figure 2.0 page 14)

- Implementation of a tracking method to account for respirator loss (Appendix D tag compared to respirator orders)

- Achievement of an annual cost savings/avoidance of $800K with a one-time cost of $20K

- Implementation of a routine pick-up schedule for EUO (major user of respirators)

- Elimination of activities no longer determined to be needed

- Elimination of routine complaint calls to Stores requesting respirators

- Recommendation of improvements at the supplier (ORNL Laundry and Quality groups):

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(1) Recommended additional Radcon support during peak periods (2) Recommended smaller batches of respirator bags moved more frequently from ORNL Radcon check to ORNL Quality Engineering and Inspection (QE&I)

Team Recommendations:

Organizations using respirators:

- Avoid excessive accumulation of dirty respirators (Rule of thumb: 1-3 bags)
- Observe requirements for proper bagging, labeling, and pickup (Y73-050INS)
- Do not dispose of respirators as waste unless authorized by Industrial Hygiene
- Do not order in excess of short-term need (contact Industrial Hygiene for guidelines)

Industrial Hygiene:

- Monitor (1) respirator back orders and (2) respirator returns vs. orders placed
- Periodically poll organizations for inventory to compare against previous periods (Take corrective action for gross discrepancies)
- Establish a method to replenish respirator inventory based upon feedback of disposals at ORNL QE&I

Enriched Uranium Operations (EUO):

- Per applicable requirements in 29 CFR 1910.134(a) and the OSHA Compliance Guide, 1910.134 (a) (1) and (a)(2), the CTR team recommends EUO to determine the feasibility and practicality for implementing engineering controls (Appendix E) to eliminate or minimize respirator usage in specified areas. The current cost evaluation per respirator is estimated at $83, which includes payment to offsite vendors and the internal costs to Y-12 associated with distribution.

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II. PROJECT OVERVIEW

2.1 Background

The Cycle Time Reduction team was formed to improve the method by which respirators flow at Y-12. The goal was to minimize or eliminate the potential for work stoppage due to insufficient respirator supply. Initial efforts of the team were to focus on customer value. This effort was to gain an understanding of the needs of the organizations that use respirators. The primary need for an organization is to have respirators delivered quickly once an order has been placed in System Applications, and Products (SAP).

The team defined the value stream of the respirators by identifying each process and sub-process required to facilitate the pickup of dirty respirators, movement through laundering, return to Store's inventory stock, and delivery to the user. This value stream analysis, including processes within the supplier (ORNL) for laundered respirators, provided the identification of opportunities that would help streamline the distribution of respirators and ultimately eliminate work stoppages due to lack of respirator supply.

The project team was multi-functional and included key personnel from both operations and site support groups. The CTR team met weekly to discuss opportunities and to solve issues. The team was empowered by management to review and challenge the overall process and program activities. As this report illustrates, not only was the team successful in meeting this goal, but they have also greatly enhanced their overall knowledge of the respirator supply process which is a key ingredient in continuous improvement and integrated safety management. This approach ultimately led to a more responsive system for distributing respirators to the customers.

While there were many topics covered by the team, there were specific factors that were critical to the continued success for respirator distribution. These factors included getting dirty respirators appropriately labeled and moved out of operational areas in a timely manner, the elimination of disposing respirators as waste (unless authorized by Industrial Hygiene), and continued management of the respirator program. This management includes the establishment of measures to gauge quantities of dirty respirators returned for reuse and methods to replenish respirator inventories from eventual loss.

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2.2 Cycle Time Reduction Process Overview

Cycle Time Reduction (CTR) is an action-oriented team-directed approach to streamlining any process, whether manufacturing, administrative, engineering, etc. Teams, comprised of individuals involved in the process, are empowered by management to challenge their entire system and redesign and implement a more responsive process. The overall quality of the system is also often improved since feedback mechanisms are streamlined as well. In addition, since most improvements developed and implemented by the team usually require minimal capital, the CTR methodology is low cost, where the major expenditures are due to time contributed by the team. The end result of a successful CTR project is an improved, more responsive process in use. This is an attribute, which separates CTR from other improvement methodologies, where the effort is a study and the end objective is the production of a report. With CTR, the team not only redesigns the system on paper, but also executes the necessary actions, once validated by the sponsors, to realize the improved system.

CTR projects are particularly effective on processes that are cross-functional and involve various areas of the complex. Such is the case with the Respirator Flow project which involves flow in various sections of the Y-12 Complex including multiple operational areas, West End Laundry, East End Laundry, Stores, and multiple facilities at ORNL. The project also involved personnel from various organizations such as Radcon, Industrial Hygiene, M&P (Material and Parts) transportation, EUO, FMO, Stores, DUO and various personnel at ORNL.

The generic steps of the CTR Process are outlined below:

- Identify core team members and facilitator.
- Facilitator becomes oriented with the process and members through interviews, walkdowns, etc.
- Facilitator conducts kick-off meeting - briefs team on value vs. non-value added activities.
- Team determines missions and goals.
- Team develops as-is flow for entire process.
- Team defines and supports process redesign and improvement activities.
- Team develops action plan.
- Team implements action plan.
- Facilitator prepares final report, which includes improved process and cost saving/avoidance.
- Team conducts project close-out session.

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2.3 Team Members

The team was composed of employees who have direct "hands-on" involvement in the flow of respirators and employees who play key roles from various support groups within Y-12. Core team members included:

Dave Bethel	Enriched Uranium Operations
Tony Catlett	Facility Maintenance Organization
Kevin Funk	Stores Operations
Sharon Gasaway	Property Management and Material Services
James Griffin	Stores Operations
Todd Hawk	Product Certification Organization
Bill Holbert	General Plant Services
Anita Ishman	General Plant Services
Kevin McElmurray	Materials and Mechanical Operations
Mike Napier	Material and Parts Service
Randy Redmond	Radiological Control
Melissa Rich	Industrial Hygiene
Paul Rogers	Product Certification Organization
Beth Schaad	Site Services
Ernest Wright	Facility Maintenance Organization

In addition to the original team members, the following employees provided valuable assistance and support to the project:

Tom Ford	Industrial Hygiene
Jim Hendershot	Industrial Hygiene

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III. PROCESS IMPROVEMENTS

The pre-analysis phase for the CTR effort defined the project scope, the process, and identified potential team members. This phase involved touring the various areas involved in the distribution of respirators and interviewing both operations and support personnel. The area visits and interviews led to the drafting of a process flow diagram, identification of improvement opportunities and a preliminary list of personnel from the team. This phase of the project concluded with a brief meeting with the project sponsor, a list of team members, and an initiation letter to begin the CTR project.

The next phase of the project was the Kick-Off meeting with the team members. In this meeting, the team came to "mission level" by developing/revising flow charts of the entire process which illustrated respirator issues from Stores, deliveries to docks, use by operations, preparation of dirty respirators for pickup, movement to laundry, ORNL laundry operations, and movement back to Y-12 Stores. The team made numerous refinements to the flow diagrams.

Once the team developed the correct process flow, numerous opportunities for improvement to the flow and process were identified in team meetings and brainstorming sessions.

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3.1 Process Improvement Summary

General Improvements

- Communication Improvement
- Bar Coding all Delivery Docks
- Elimination of "Call-In" Orders
- Resolution of Multiple Facilities Problem in SAP

Streamlining Improvements

- Elimination of Radcon Survey of Returned Respirators Laundered at ORNL
- Routine Pickups Established for Largest End User (EUO)
- Modification of Respirator Collection Method for Major End-User (FMO)
- Reduction of Time Delays of Respirators Moved through Portals
- Establishment of Point of Contact List for Personnel Responsible for Bagging, Labeling, Moving
- Development of a Tracking Method for Industrial Hygiene to Measure Returns vs. Orders
- Development of a Performance Indicator for Industrial Hygiene to Measure Backorders
- Recommendation of Flow Improvement to Supplier (ORNL) of Laundered Respirators

Recommendations (Critical Factors for Continued Success)

- Improvements for Operational Areas using Respirators
- Recommendations to Industrial Hygiene for Continual Improvement
- For EUO, use of Engineering Controls where Feasible and Practical

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3.2 General Improvements

During brainstorming efforts, the team was able to identify opportunities that would improve other areas, not specific to the flow of respirators. The summarized improvements are as follows:

Communication Improvement

As stated previously, perhaps the greatest benefit achieved as a result of the CTR project is the knowledge gained by the team about the entire operation. Often, those involved in a process understand only their portion of work. After seeing all steps in the entire process, those involved will bond, work to reach a common goal and assist one another when necessary even after the CTR project is completed, and ultimately improve end product quality and enhance the responsiveness of their delivery system.

Such is the case with this CTR project whose participants quickly became a multi-functional active team. The team was able to produce a flow diagram of the respirator flow process. For many it was the first time they understood the many activities required. This proved to be a very helpful tool in identifying unnecessary activities and inter-relationships necessary for efficient flow.

Not only was the team able to plot and challenge the entire process on paper, but they also were successful in executing actions that have already resulted in an improved system. Those actions, along with additional recommended improvement actions, are outlined in the following two sections.

Specific communication efforts made to users of respirators:

1. Industrial Hygiene's issuance of revised procedure Y73-050INS *Respiratory Protection Program Instruction*
2. Industrial Hygiene's issuance of *Required Reading*
3. Reiteration of labeling requirements and instructions
4. Reiteration of method to get respirator bags picked up from docks
5. CTR team efforts communicated to plant Issue Point Administrators (IPAs)
6. Respirator assessments (i.e. finding excess quantities of respirators on docks) forwarded to respirator users

Bar Coding all Delivery Docks

Early in the CTR process, the team recognized that all docks did not have a permanent bar code identification label to capture the drop-off point for Stores' shipments. For this reason, material drivers had to guess at the dock number or take unnecessary time chasing down the correct location number. Efforts of the team resulted in the application of bar code labels for each dock with an increase in accuracy in SAP and a decrease in time spent in data collection and resolving data issues. This improvement is applicable to all dock deliveries, not just respirators.

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Elimination of Orders by Calling In

Team members from Stores indicated that all orders are not processed electronically. Some orders continue to be made by phoning in to Stores personnel. Processing orders manually takes additional resources in addition to delaying other activities. The team agreed that ordering by phone should be discontinued. This is communicated on a one-on-one basis to each user calling in. Guidance/instruction for getting electronic access is also provided to the user.

Resolving Multiple Facilities Problem in SAP

In recent months there has been an increase in the number of Accelerated Vendor Inventory Delivery (AVID Plus) orders that contain incorrect delivery information. These errors can result in additional time spent processing orders and can lead to a delayed shipment to the user. The specific problem involved multiple facilities being entered into the system, thus creating confusion during delivery. In these cases, both the "Building Number" field and the "Location/Control Area" contained conflicting delivery information. To alleviate this problem, specific instructions were forwarded to AVID Plus users stating not to enter a building number in the "Location/Control Area" field. This field should contain either a dock number or a room number and the appropriate hazardous material control area, where applicable. This improvement is not limited to respirators, but is applicable to other types of AVID orders.

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3.3 Streamlining Improvements

The team's primary focus was to identify bottlenecks in the existing flow of respirators. Furthermore, the team sought to make corrections or recommendations that would eliminate or improve these identified constraints. During the flow analysis, the path a single respirator travels throughout Y-12 and ORNL (for laundering) was identified with cycle times for each major area included. While the team developed a detailed diagram (not included) for analysis, figure 1.0 illustrates a conceptual view of the times in the major areas. The second block, "Operations," is the average time it takes to bag, label, and move dirty respirators out to a dock and be transported to Y-12 Laundry. This time does not include the amount of time a respirator may wait in Operations' cabinet inventory before use. However, there are guidelines in place to keep stocking of respirators in cabinets at a minimum or at a reasonable level. By reducing cycle times, the focus is on making clean, usable respirators available for use in the least amount of time, thus reducing the probability of work stoppages. Otherwise, the bulk of dirty respirators are scattered among Y-12 facilities, and unavailable for use.

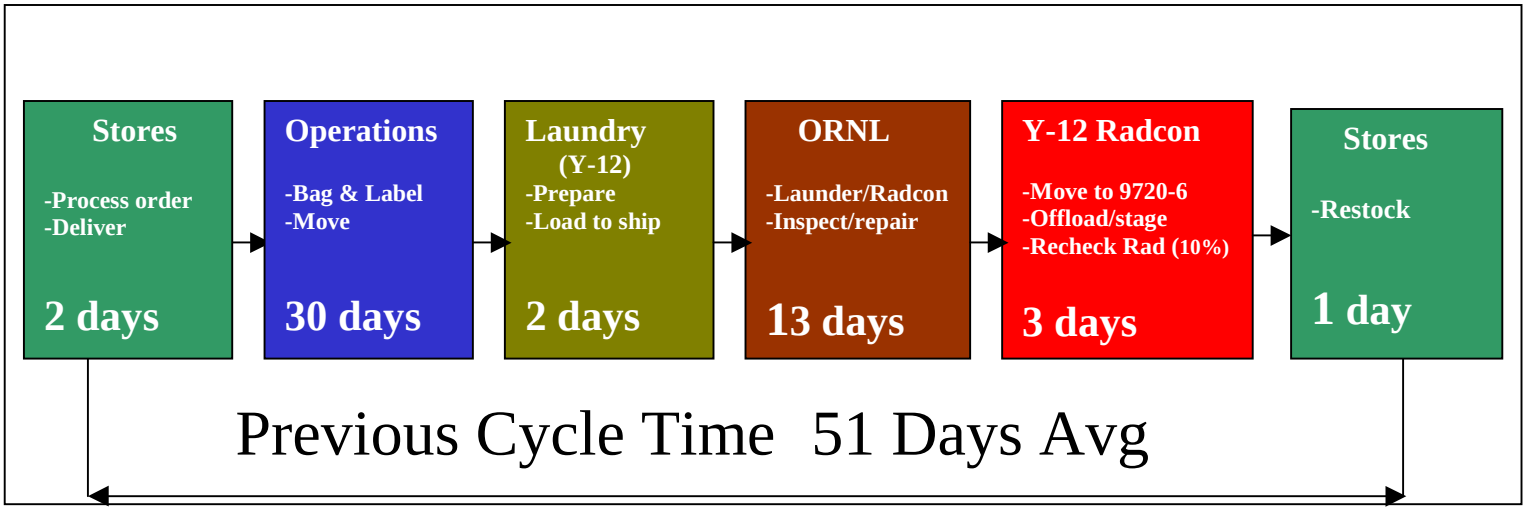

Figure 1.0 **Cycle Time Significance: For a given level of inventory, reducing the cycle time for respirator flow equates to increasing the throughput. As flow increases and becomes steady, more respirators are available in Stores for filling orders, thus minimizing chances of work stoppages due to shortage.**

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Elimination of Radcon Survey of Returned Respirators Laundered at ORNL

The 5th block in Figure 1.0 represents the time a respirator waits at Y-12 East End Laundry once received from ORNL. At the East End Laundry facility, 10 percent of the laundered respirators from ORNL were unpacked and rechecked for radiological contamination, repackaged, and moved to Stores. A team walk-down of the ORNL laundering operation indicated that an ORNL Radcon technician performs a thorough check of each respirator using Y-12 contamination limits. If the ORNL technician finds contamination, the respirator is re-washed until the survey shows that the respirator is clean.

Y-12 Radcon organization has reviewed radiological data gathered from December of 1999 to July 2000. For more than 4000 respirators received from ORNL, all survey results have been less than instrument detectable activities (less than respiratory protection radioactive material contamination limits). The Y-12 Radcon Engineer was satisfied with eliminating the additional monitoring on receipts from ORNL. Instead, a yearly surveillance will occur as part of the Radcon Survey Program. This improvement opportunity eliminated 10 percent of Radcon surveys of return respirators but also eliminated 100 percent of respirators moving to Y-12 East End Laundry with unnecessary wait times, which averaged 3 days.

Routine Pickups Established for Largest End User (Enriched Uranium Operations)

As previously mentioned, the second block of Figure 1.0 indicates an average time required for Operations to move a bag of respirators, once labeled and surveyed, to the dock for pickup. The time in this block is highly variable among areas in the plant. Time could range from 2-3 weeks to several months. Some areas encounter more difficulties in moving material than others. Material Access Areas (MAAs) and Radcon areas pose more problems than others do.

Early in the CTR process, an e-mail message stated that 300 dirty respirators were on a 9212 dock needing to be picked up. Pickups require notification of M&P. Additional data indicated that respirators from this area get picked up in large quantity but infrequently. This frequency is graphically illustrated in Appendix A. The CTR recommended that M&P could establish a routine pickup route for 9212 EUO. Monday and Wednesday were chosen to allow Y-12 Laundry (Block #3 of Figure 1.0) to prepare the respirators to ship to ORNL on each Tuesday and Thursday. This improvement is working very well for 9212. The coordination effort of 9212 to contact M&P has been eliminated. The cycle time for the operations block has been reduced from about 30 days to approximately 4 days for an 87 percent reduction. Since establishing a routine pickup, data collected by Y-12 Laundry and M&P indicates that bagged respirators from this area arrive at Laundry between 1 and 2 times per week. This type of frequent pickup would not be recommended for low usage areas because of the respirator bags not being routinely filled and prepared and the extra effort required by M&P drivers.

Modification of Respirator Collection Method for Major End User (Facility Maintenance Organization)

Prior to this CTR effort, the method to distribute respirators to maintenance personnel (i.e. insulators, carpenters, etc) was for the planner to stock respirators and allocate as needed. The method of collection of

the dirty respirators was left up to the individual using each respirator. There was a fear by the maintenance planner that many of these dirty respirators were not getting returned to Laundry. The result of not returning respirators is the depletion of respirator inventory stock required to supply Y-12's needs. The maintenance planner also determined that the dirty respirators, that did get returned, were not done so in a timely manner. This was primarily due to a low rate of usage and turnover, thus infrequent calls to M&P for pickup. To remedy this problem, a decision was made to allocate a respirator disposal tag to each work group as respirators were distributed. This method results in a centralized collection of dirty respirators back at the distribution point (Facility 9744). This ensures respirators are returned to Laundry rather than lost or dispositioned. The respirators are returned to Laundry, accumulating much faster for a quicker turnover rate. This method is working very well. Contaminated respirators (i.e. from a radiological area) continue to be disposed appropriately in the work areas rather than returned to the planner or supervisor.

Reduction of Time Delays of Respirators Moved through Portals

Significant time delays can occur while transporting respirators from Stores to facilities located within the Protected Area of the complex. Specifically, traveling through Portal 33 is time consuming, primarily due to the security checks for packages entering the Protected Area. Security dogs are required to "sniff-out" packages upon entry. Stores drivers are currently required to open the bags that contain boxes of respirators to allow searches to occur. This process can cause significant delays. For an improvement, Stores is currently working with the vendor to procure a permeable shipment bag that will allowing "sniffing" without opening. It is believed that this improvement is applicable to various shipments other than respirators.

Establishment of Point of Contact List

To further address Block 2 on Figure 1.0 the team focused on responsibilities pertaining to removal of the respirator bags from operational areas. Various problems became evident from e-mails circulating prior to and during the CTR effort. Respirator bags are required to have the proper labels attached. These labels must be filled out properly in order for M&P to pick-up and transport to Laundry. There were numerous cases of labels missing or filled out incorrectly. There were also accounts of old labels (dates exceeding six months) on the bags, indicating that the bags were not placed on the docks in a timely manner, or information was incomplete. Also, there were cases of miscommunication with M&P.

The team realized that the respirator return methods that occur in each work area are wide-ranging and sometimes problematic. Thus, it was difficult to come up with a one-size-fits-all solution. In some cases the responsible personnel are the Issue Point Administrators (IPAs) but not always. Some facilities have one IPA but have a number of personnel assigned to different areas of the building responsible for respirators returned to Y-12 Laundry. The team compiled a responsibility contact list that identifies each person responsible for getting respirators bagged, moved, and picked up. This list is a good tool for enhancing any communication gaps between Industrial Hygiene, M&P, and Operations. Briefing of the issues to the IPAs during the quarterly IPA meeting and numerous corrective bulletins issued to Industrial Hygiene has also been beneficial to improving the flow.

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Development of a Tracking Method for Industrial Hygiene to Measure Returns vs. Orders

A major issue discussed during the CTR effort was the lack of accountability for users (or organizations) to return dirty respirators back into the system via Laundry. Basically, organizations could order unlimited quantities without enforcement to return what was ordered. This problem leads to a depletion of respirator inventory in Stores with an end result of a back order entry and possibly work stoppage. Two methods of tracking were discussed. One method was to have ORNL QE&I permanently fasten small bar code labels to the inner section of each respirator as each laundered respirator gets inspected. Then, Y-12 would implement a bar code system where each respirator is assigned to a user or organization. This method would permit accurate tracking of respirators.

The team determined that another possible method of tracking would be to compare each organization's orders in SAP to the quantity of respirators returned to Laundry. This comparison would be done over an extended period, i.e. 6 months or annually. Gross differences between orders and returns could indicate problems that would require corrective action. The team decided that this method should be pursued before bar coding due to the cost associated with bar code equipment, personnel, training, etc. To account for the number of respirators returned by each organization, the team modified the Respirator Disposal Tag to allow collection of appropriate information for comparison purposes. This information will be compiled by Industrial Hygiene.

Development of a Performance Indicator for Industrial Hygiene to Measure Backorders

In addition to SAP orders vs. returns, the CTR team has developed a performance indicator for Industrial Hygiene to track potential work stoppages. Every order that is placed for a respirator that cannot readily be filled in a short period of time could potentially result in a lost work assignment or a work stoppage. Back orders also result in unnecessary time and effort spent by Stores' personnel by performing additional data entry. The team recognized that unfilled respirator orders, or backorders, should be routinely monitored with a goal of zero. Figure 2.0 illustrates the decrease of backorders from just prior to the CTR effort until the first of November. Prior to the CTR effort, back orders of the most common respirator were consistently hovering above 600. Back orders of 800 were also mentioned in the meetings for previous periods. Since the inception of the team, backorders for this popular model have consistently declined while demand (respirator orders) has increased by 30 percent from the same time span in the previous year. Maintaining the back order performance indicator will visually alert Industrial Hygiene when customers do not have respirators. Thus, corrective action can be taken.

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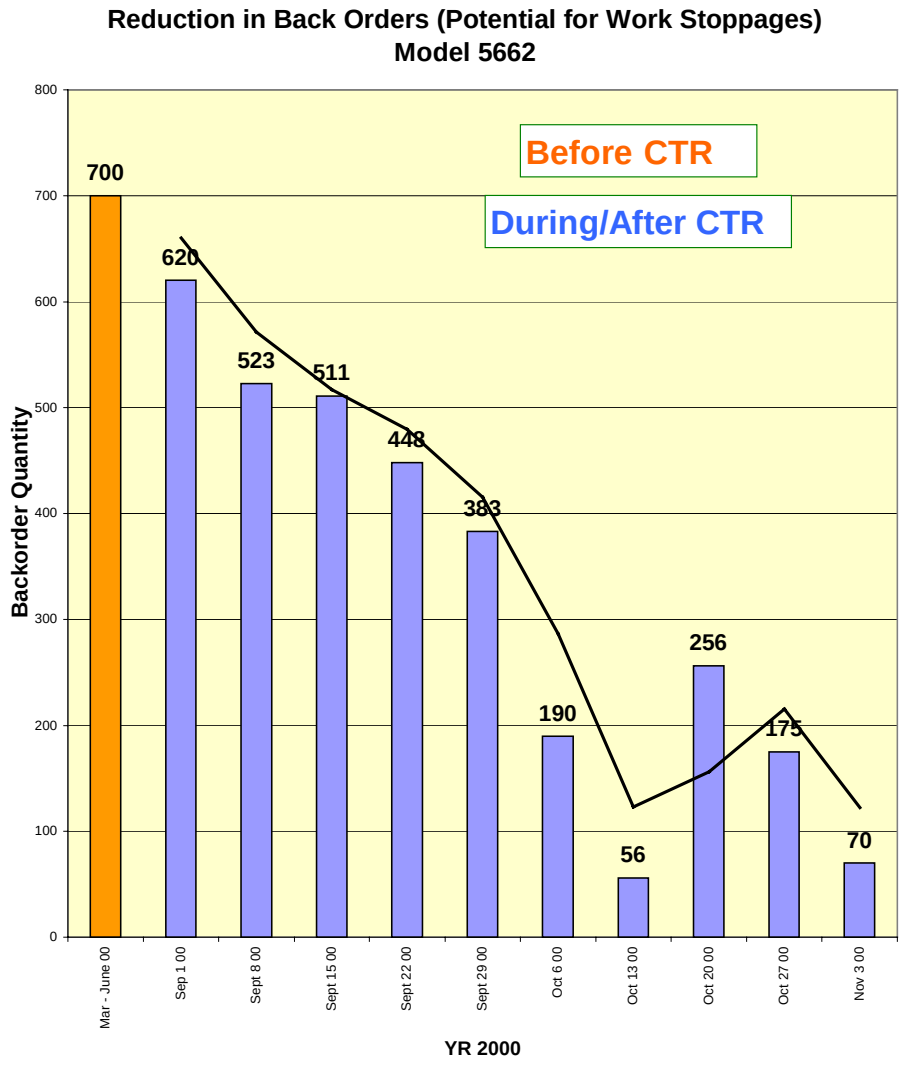

Figure 2.0

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Recommendation of Flow Improvement to Supplier (ORNL) of Laundered Respirators

Evaluation of Work Station Capacities

Dirty respirators are transported to the ORNL for laundering and quality inspections/repair. After cleaning and surveying for contamination, each respirator is inspected and repaired, if needed. Each respirator is then bagged, boxed, and loaded for shipment back to Y-12 Stores. Members of the CTR team visited the ORNL operation to determine if improvements could be made. From observation of the three primary workstations (washing/drying, Radcon surveys, and inspections/repair), minimum manning requirements for Radcon surveys were determined to be insufficient for maintaining adequate and continuous flow. Whereas the washer can load 70+ respirators per wash, the Radcon survey is a time consuming and labor intensive operation. On this particular day, there were 300-400 respirators awaiting Radcon surveys. After consulting with ORNL Radcon, an additional Radcon technician was assigned to this operation during high volume flow.

From observations, it was noted that the Radcon organization at ORNL surveys large quantities of respirators (coming from the washer/dryer) before they are moved to the quality inspection area. A recommendation was made to ORNL Radcon to move smaller batches of respirators to quality inspections rather than wait till several hundred were surveyed. This method of splitting the lot sizes in smaller increments allows the inspections to begin sooner and ultimately permits more frequent shipments to Y-12. As Y-12 Laundry delivers dirty respirators to ORNL, the Y-12 driver will attempt to bring back laundered respirators on the return trip. This is usually unsuccessful because the batches of respirators at ORNL are not ready to be shipped. The lot splitting will increase the probability of a return shipment of laundered respirators. ORNL Radcon and Laundry have been extremely helpful and willing to assist in improving flow for Y-12.

Bottlenecking at ORNL also occurs when extremely large batches of respirator bags are transported to ORNL. This method chokes the flow at ORNL. The week of June 19 in Appendix B part 1 illustrates the large quantity pushed through the system at one time. The emphasis of the CTR team was to balance the flow of respirators. As previously stated, this was achieved by more frequent pickups of correctly labeled, dirty respirators from docks. Part 2 of Appendix A shows an improvement in leveling of the flow. Fewer bags picked up more often have been emphasized in the Cycle Time Reduction meetings and to the IPAs.

Repairs at ORNL

The trip to ORNL also revealed that most Y-12 respirator wearers remove the plastic covers from the lens of the respirators. The plastic cover is a transparent covering that appears to be a protective film that should be removed before use. However, the intent of this covering is to remain on the respirator while used in order to protect the lens. ORNL quality data sheets reveal that the majority of repairs are for lens replacement. During a recent IPA meeting, Industrial Hygiene has communicated the need for users to leave the covers on respirators. This action will reduce costs for part purchases. The greater benefit is to reduce the time required to fix each respirator. As the bottleneck at the ORNL Radcon workstation is diminished, the flow constraint is likely to move to the inspection area. Time reduction on each respirator is important to allow respirators to flow efficiently back to Y-12.

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3.4 Critical Factors for Continued Success

Operational Areas Using Respirators

1. Operational areas should not accumulate large quantities of bagged, dirty respirators before contacting M&P for pickup. While there is no single optimum number to fit all areas, one to three bags of respirators could be used as a rule of thumb.

2. Respirator orders should be reasonable in quantity in comparison to the near-term work to be performed. Excess inventory stocking in areas can result in high back orders and potentially lost work in other areas.

3. Respirators should not be disposed of as waste unless specifically directed by Industrial Hygiene. In these approved cases, quantities disposed of should be reported to Industrial Hygiene in order for respirator inventories to be replenished. Based on inspections and testing, ORNL QE&I will determine which respirators are unfit for use and ready for final disposal.

Industrial Hygiene

1. Industrial Hygiene should monitor (a) respirator back orders to ensure work is not stopped due to insufficient respirator supply and (b) dirty respirator returns vs clean respirator orders.

2. Industrial Hygiene should periodically (i.e. annually) poll each organization for a respirator inventory count. The compiled inventory quantity should be compared with the previous quantity. Corrective action should be taken where there is large decreases from period to period.

3. Individual respirators eventually wear out over a period of time from day to day usage and handling. Industrial Hygiene should establish a method to replenish respirator inventory based upon feedback of disposals at ORNL QE&I.

Enriched Uranium Operations

1. Engineering Controls: The CTR team recommends that EUO evaluate the feasibility and practicality of implementing engineering control measures for specific respirator areas (Appendix E) as required by 29 CFR 1910.134(a) and the OSHA Compliance Guide (***1910.134(a)(1) and (a)(2)).*** Feasibility studies for engineering controls can be based upon the elimination of respirator usage for the targeted areas. The current cost evaluation per respirator is estimated at $83. This cost includes payment to offsite vendors and the internal costs to Y-12 associated with distribution.

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3.5 Summary

Flow Improvement

As cycle time is reduced, dirty respirator inventory, for a given period, is decreased (Appendix A) and throughput is increased. Thus, Y-12 Stores is able to restock more often which means respirators are available for users to order. The team used respirator Model 5662, which historically has been in short supply, to gauge progress. Through comparison of the usage in 2000 with the same period of time in 1999, orders for the 5662 respirator have increased by 30percent. Streamlining efforts of the team have resulted in the reduction in back orders from 600+ to approximately 70, with a steadily decreasing trend over a four-month period. After the first week of November, additional procured respirators arrived in Stores to completely eliminate the few remaining backorders and to provide additional stock. The team determined that this supply would be needed to replace worn respirators and to handle the expected usage increase projected by Operations. Industrial Hygiene ingenuously swapped a large percentage of older models, no longer used, for the new supply.

Reports by operations personnel indicate that previous work stoppages due to lack of respirators were common and could disable the work of an entire shift. Additionally, when a crew is unable to make production, subsequent processes can be impacted. Since the efforts of the team, operations have expressed positive comments regarding team efforts and the ability to receive respirators as needed. Furthermore, the periodic complaints to Stores regarding lack of respirators have ceased.

Cost Savings/Avoidance

Savings from the elimination of work stoppages due to efforts of this Cycle Time Reduction team equate to approximately $800K annually. This cost avoidance is based upon the following improvements:

- The number of work hours lost due to insufficient quantities of respirators for production workers or maintenance personnel (maintenance jobs holding up production).

- Elimination of transportation of respirators to East End Laundry from ORNL, unloading/loading, unpacking/repackaging, and Radcon surveys.

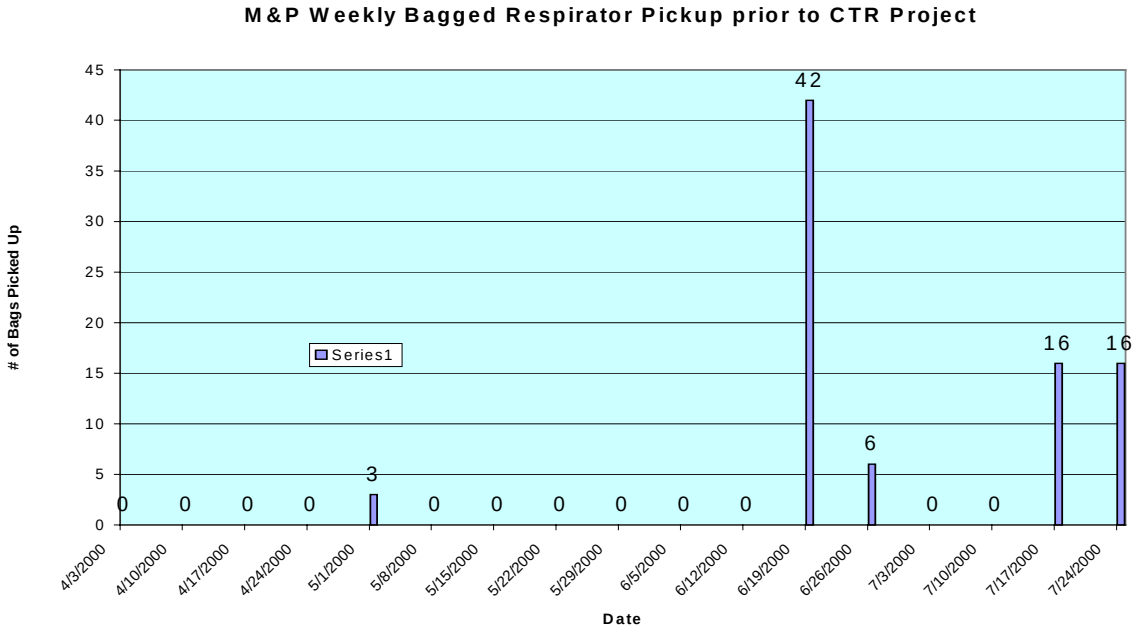
The cost of the CTR effort was approximately $20K. This was a one-time cost of the weekly one-hour meetings (10 meetings) and additional time for Industrial Engineering (technical support).

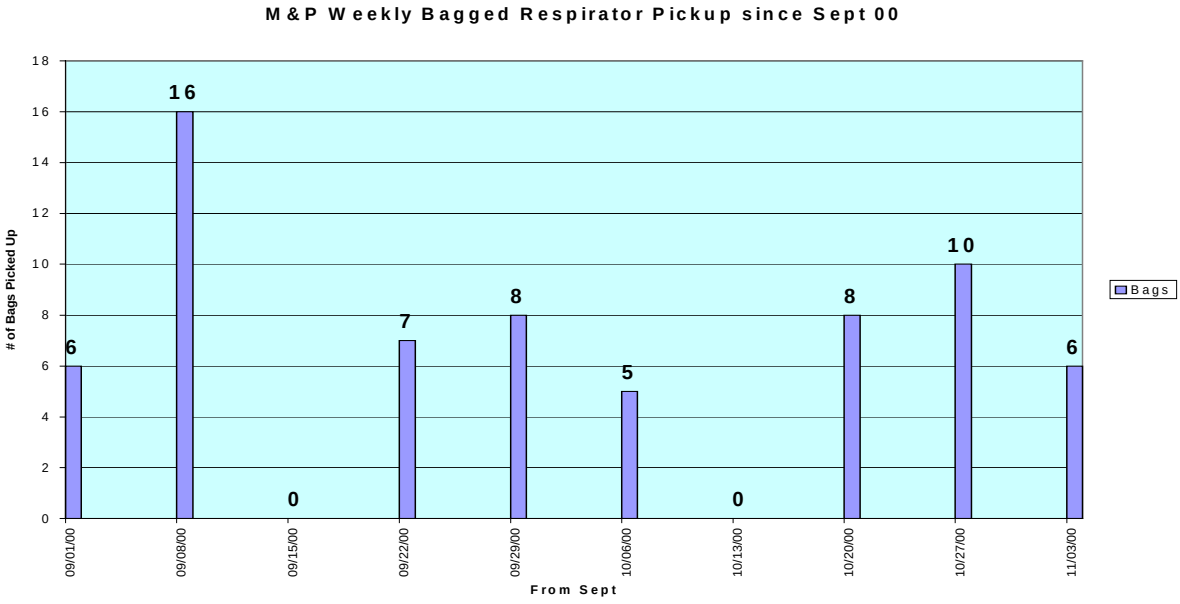
Continual Improvement

The improvements by made the team are significant and beneficial to the customer (operations). However, as indicated by the recommendations, continual improvement depends not on the CTR team but on all personnel that have a role in the respirator process, including users. The team emphasizes that the single biggest restriction of flow and ultimately inadequacy of respirator inventory in Stores is the infrequent removal of dirty respirators from the operation' areas. Historic occasions of discarding respirators as waste have also caused problems by depleting the inventory. User organizations need to be familiar with the findings by this team in addition to the procedures and guidelines issued by Industrial Hygiene.

Subject: Respirator Flow Cycle Time Reduction

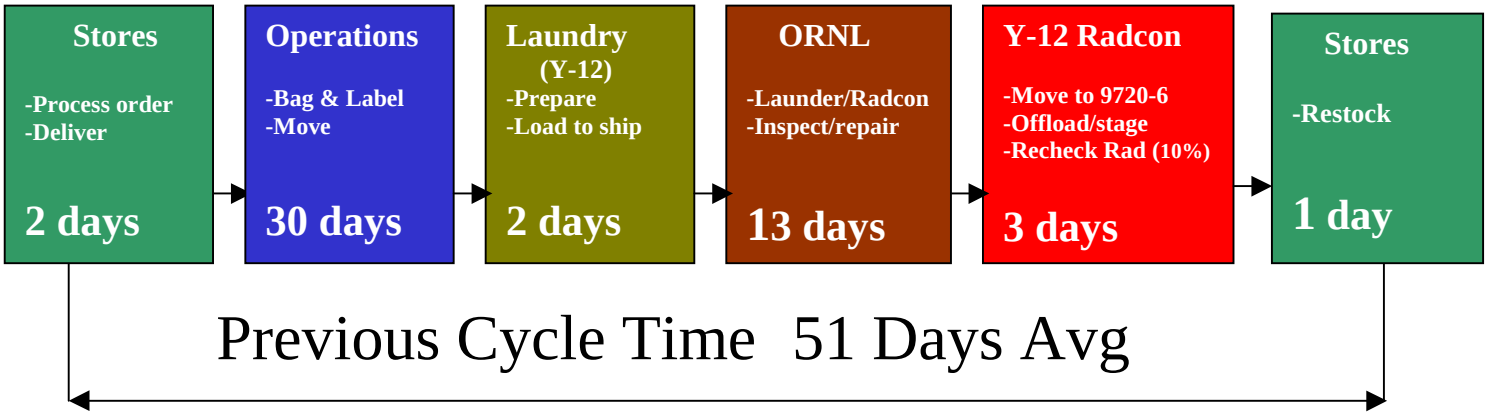
APPENDIX A
Respirators Pickup Comparison
(Operations calls M&P for Pickup)

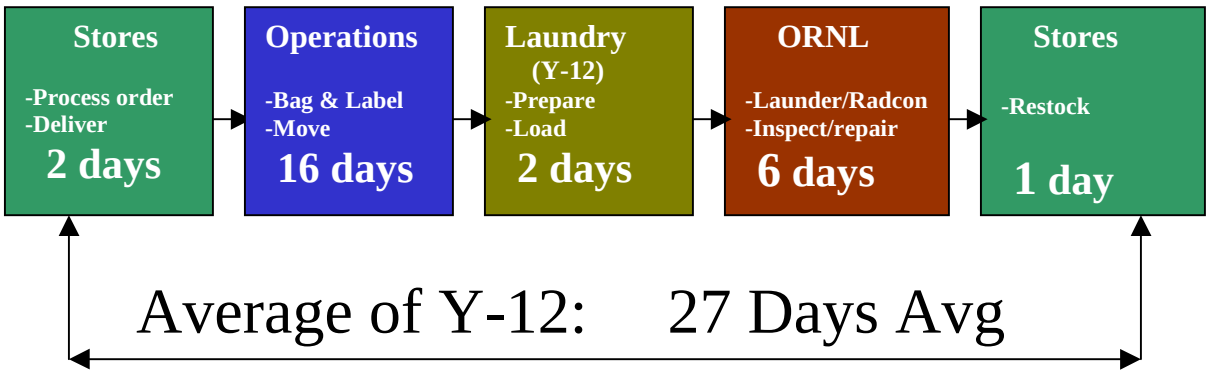


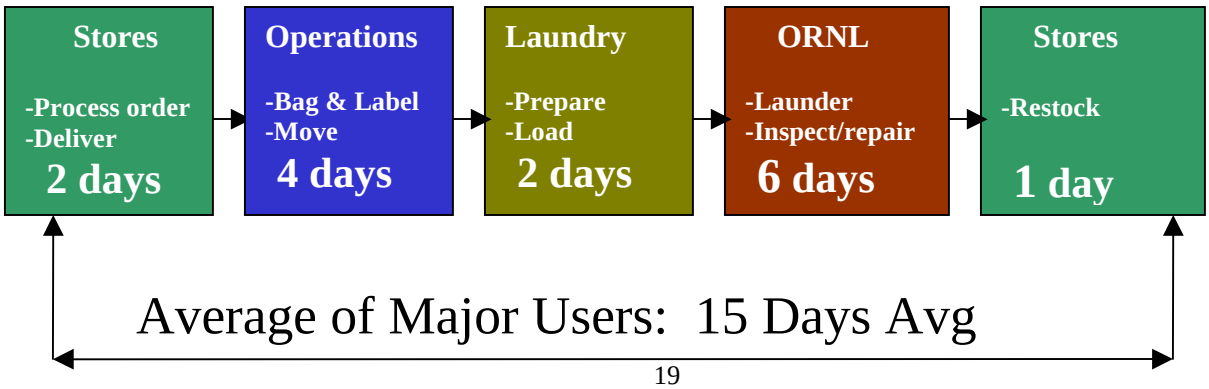


Subject: Respirator Flow Cycle Time Reduction

APPENDIX B
Cycle Time Flow Diagram





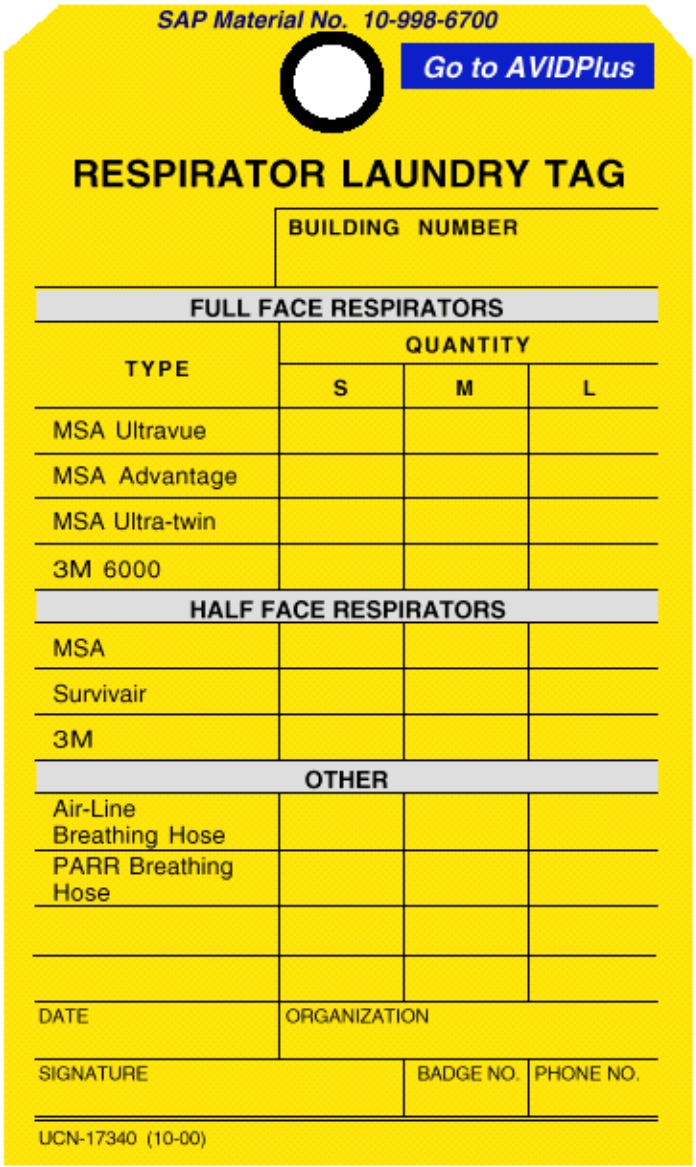


*9212 EUO & FMO

Subject: Respirator Flow Cycle Time Reduction

APPENDIX C
Modified Respirator Disposal Tag

Used to Monitor Quantities of Respirators
Each Organization Orders vs. Quantities (Dirty) Returned to Laundry



SAP Material No. 10-998-6700

Go to AVIDPlus

RESPIRATOR LAUNDRY TAG

BUILDING NUMBER			
FULL FACE RESPIRATORS			
TYPE	QUANTITY		
	S	M	L
MSA Ultravue			
MSA Advantage			
MSA Ultra-twin			
3M 6000			
HALF FACE RESPIRATORS			
MSA			
Survivair			
3M			
OTHER			
Air-Line Breathing Hose			
PARR Breathing Hose			
DATE	ORGANIZATION		
SIGNATURE		BADGE NO.	PHONE NO.

UCN-17340 (10-00)

Subject: Respirator Flow Cycle Time Reduction

APPENDIX D
Dirty Respirator Pickup Contact List

Operations (bag, label, and move respirators to dock):

Facility/Area	Contact
9201-5N/5W	M. L. Sheffler,
9201-5 Arc Melt	P. D. Psihogios
9998 H-1 Foundry	J. E. Thompson, Jr
9204-4 Press Area	M. K. Sidwell
9215 Rolling/Forming	J. G. Sexton
9215 M/O-Wing	J. M. Littleton
9212	P. M. Dutton
9212 Roof	Dan Lawson
9998	Dan Lawson
9204-1	T. L. Settles
9201-1	E. R. Roberts
9204-2	E. D. Dagley
9404-9	G. R. Ramsey
9720-17	G. R. Ramsey

M&P Service (pickup of respirators from dock):

Contact	Phone
Janet Eskridge	574-2686
Mike Napier	574-2666
Harold Beaty	574-2683

Subject: Respirator Flow Cycle Time Reduction

APPENDIX E
Engineering Control Measures (EUO)
(Potential Elimination/Reduction of Respirator Usage)

1. Design of the sorting hood in Head-house, Room 26, requires individuals performing sorting operations to wear respirators and requires individuals to work inside the hood. Most of the sorting operations described in Y50-37-92-420, Sorting and Packing Contaminated Waste, could be performed without respiratory protection if hood is redesigned.

2. Routine opening of drums after they go to NDA in order to remove their contents and contents transferred outside to B-25 Boxes. Walk-In hood, or hood with sufficient capture velocity, will reduce and possibly eliminate respirator use.

3. Design/install gloveboxes for dry vacuum trap change-out.

4. Obtain Criticality Safety approval for HEPA units, obtain and use.

5. Develop method to inspect and manually shake/beat E-Wing Dry Vacuum Bag Filter Tank bags that do not require system to be exposed while bags are being manually shaken/beaten. Current method : doors are opened exposing highly contaminated bags (oxide) and they are manually shaken/beaten with a stick sending oxide throughout Hopper Rooms. Suggestions: Use plexi-glass door with gloves similar to glovebox; develop glovebag design and use.

6. Enclose bottom of E-wing Bag-Filter House to avoid erecting temporary enclosure during bag shake-down/maintenance activities.

7. The enclosure(s) at the 45 Ton press and Shear in E-WING are inadequate. An enclosure has been designed and fabricated, but not installed.