ARMSTRONG LABORATORY (AL) ANALYTICAL SERVICES
PROCESS IMPROVEMENT TEAM (PIT) - AIR FORCE
TEAM QUALITY AWARD APPLICATION

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Air Force Team Quality Award Application

The evaluation was based on a ten-page application and a 15-minute oral presentation. The application (this report) included a description of teamwork, process selection criteria, analysis techniques, solutions, results, deployment, and presentation. The team's mission was to improve the support the Surgeon General is providing for Environmental and Occupational sample analyses. AL's PIT Team was selected one of five Air Force Team Quality Champions at the Quality Air Force Symposium "The Quest for Quality" in Montgomery, Alabama, 19-22 October 1993. The Team's results showed overall 20-30% improvement in analysis turnaround times, with better results in specific process steps, e.g., reduction in paperwork delays following analysis.

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Process improvement

Team Quality Award

TOM

Analysis support

Customer improvement

Mid

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AIR FORCE TEAM QUALITY AWARD

1993 APPLICATION

ANALYTICAL SERVICES PIT
ARMSTRONG LAB, HSC, AFMC
BROOKS AFB
NOMINATION FORM

Applicant Organization

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Process Owner

Signature: [Signature]

Name/Rank/Grade: Dr Billy E. Welch, PhD

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Team Members: See Attached Sheet
SUMMARY OF UNIT’S MISSION

The Analytical Services Division, to which this Process Improvement Team (PIT) belongs, is part of the Occupational and Environmental Health Directorate, Armstrong Laboratory, headquartered at Brooks AFB, TX. The Analytical Services Division provides Analytical Chemistry Services in support of Air Force Environmental Pollution Control and Occupational Health Programs. We respond to over 250 base level customers who send over 75,000 samples to the laboratory annually. These occupational and environmental samples include substances contained in air, water, soil, vegetation, hazardous waste, industrial materials, and biologicals. The laboratory employs 55 chemists, technicians, and other support personnel; and utilizes $5-6 million of complex, sophisticated instrumentation.

The Analytical Services Division maintains analysis certification in 43 states, 10 EPA Regions, the Center for Disease Control, and a private scientific society. The laboratory must maintain its certifications and follow approved analysis methodologies to meet environmental and occupational health requirements placed on Air Force installations worldwide. The major Air Force Commands at each installation have civil engineering, bioenvironmental engineering, and environmental management components that collect the required environmental and occupational health samples. They ship the majority of these samples to the Analytical Services Division for analysis. The installations use the analysis results to meet federal, state, and local requirements concerning pollution and health hazards. Failure to comply with all of the requirements could lead to mission interruptions, notices of violation, and fines up to $25,000 per day per violation.

In the last several years, many factors have placed an increasing strain on the Analytical Services Division. As environmental and occupational health requirements grew more numerous and demanding, bases were forced to send more samples to the laboratory. The analysis requirements for each sample are growing more numerous and complex. Downsizing of the military has caused the laboratory to lose staff and face budget reductions. New requirements for certifications, sample holding times, decreased detection limits, and new reporting requirements were added each year. Dr Welch, Director of Armstrong Laboratory, had these concerns expressed to him by headquarter officials from our customer bases. He understood the problems faced by the laboratory and strongly supported us. However, he was concerned about possible laboratory failures and noncompliance situations at the bases and therefore requested the initiation on the PIT described in this application.
1.0 Teamwork

1.1 Team purpose and membership.

1.1.A. This application for the 1993 Air Force Team Quality Award describes and documents the activities of a Total Quality Process Improvement Team chartered by the Director of the 1,500 person Air Force Materiel Command, Human Systems Center, Armstrong Laboratory (AFMC/HSC/AL), Dr Billy E. Welch, and by the Chief of the Occupational and Environmental Health Directorate (AL/OE), Mr John C. Mitchell.

1.1.B. In response to customer feedback and the prospect of a greatly increasing work load, Dr Welch requested his total quality advisor, Dr. Jim Cupello, to start a PIT in the Analytical Services Division (AL/OEA) for the general purpose of decreasing the time required to process analytical samples and report the results to the customer (turnaround time). To better define the PIT’s purpose and establish selection criteria for team members, Dr Cupello designated an advance group consisting of himself, the Chief of OEA, two recently trained TQM Facilitators, and two statistical consultants. For two months, this advance group reviewed data on the 204,588 tests conducted by OEA during the previous 6 months, grouping the results by process step and analytical function. This preliminary analysis confirmed that turnaround time was indeed in need of improvement, and identified specific process steps (e.g., receipt of sample, analysis of sample, mailing results) and analytical functional areas (e.g., metals, inorganics, pesticides) that provided the greatest opportunities for improvement. The advance group met with Dr Welch and Mr Mitchell in Jul 92 and, after negotiations, a specific scope and set of goals for the team were established. (See Atch 1.1.B.)

1.1.C. During the Jul 92 meeting with Dr Welch and Mr Mitchell, the advance group proposed specific process steps and functional areas to be targeted for improvement, suggested the performance areas to be tracked and improved, proposed Team membership, recommended a 12-month effort, requested resource support in a number of areas, including professional team training and a dedicated TQ meeting room, requested permission to visit other analytical laboratories for benchmarking purposes, and asked for open access to the Director should problems arise. After discussion and negotiation, nearly all of the Team’s proposals were accepted, with some modifications, resulting in mutual consensus among four levels of management.

1.1.D. The Team’s charter (mission) aligned extremely well with HQ AFMC and HSC goals and supporting objectives. Most importantly, we were dedicated to meeting our customer’s needs: our customers wanted quality analytical services with rapid turnaround time. Secondly, we were oriented toward operating quality installations by both improving the quality of our own organization and by providing speedy analysis of environmental samples, which effects the quality of all Air Force installations. Enabling people to excel is the very nature of the TQ approach to management. HQ AFMC Objective 1.3 is to be our customers’ supplier of choice by meeting schedule baselines; the Team’s mission was to reduce turnaround time so our customers could meet their schedules. HQ AFMC Objective 2.3 is to enable our people to excel through moving decisions to the lowest level, expanding individual responsibility and authority, and seeking feedback; the essence of the PIT was to empower members to question, challenge, and improve all analytical business practices. HQ AFMC Objective 4.1 and its HSC supporting objective is to enhance the competitiveness of our operations by improving throughput, decreasing inventory and operating expense, and streamlining support processes; it was obvious that the Team’s mission of reducing turnaround time, while maintaining quality, was essential to our future as a support organization.

1.1.E. Individuals were afforded the opportunity to participate based on their expertise in the functional areas identified during the analysis by the advance group. Included were
both military and civilian representatives of varied ranks from each of the three targeted functional areas (Cortez, Cruz, Long), a representative of one of the lab's major customers (Garland), and individuals who were particularly familiar with laboratory automation and contracting (Schwartz, Wiley). Also included were individuals familiar with Division administrative and management issues (Jehl, D. Thompson, Thomas). The Team also included the two statisticians (Miller, Oakes) and two TQ facilitators (Engquist, Murphy) from the advance group, as well as administrative support to record minutes and track time during weekly meetings (I. Thompson). Final team membership was negotiated between the process owner and the advance group in Jul. After team training, the Team began work in Aug 92. (See Atch 1.1.11.)

1.2. Group Dynamics and Documentation

1.2.A. Smooth and effective team dynamics were greatly enhanced by a week of intensive on-site training on TQM PIT development that was conducted by professional TQM teachers from Change Navigators, Inc. of Loveland, CO. This training not only instructed the team on the use of numerous effective tools, but also instilled a sense of camaraderie. A particularly useful product that resulted from this training was our Code of Conduct, which later proved critical to our success as a team. This Code included such statements as "during team operations, all members will be considered equal, on a first name basis, regardless of rank", that "new ideas are expected", and that "ideas can be criticized, but not people". The Code was placed on the wall of the meeting room so any member could refer to it when necessary. Team dynamics were also helped by the presence of a facilitator at each meeting, however our Team learned to work so well together that the need for formal facilitation decreased steadily over the one year life of the Team.

1.2.B. The synergy generated by everyone's participation in the Team greatly facilitated the understanding of the laboratory processes and related problems. Since no one person was familiar with every aspect of the laboratory's functioning, there were always questions by some and answers by others, which led to an increased clarity of thought and to new ideas. This interaction led to fresh perspectives for area experts as well as created a better understanding for those who were not as familiar with a given area. For example, the use of Brainstorming and Affinity Diagrams allowed everyone to put forth their creative ideas and then, by clustering, expanding, and further discussion, arrive at truly team ideas and solutions that would not have occurred to any team member alone.

1.2.C. To ensure effective progress toward our purpose, a milestone chart was developed. The Team also followed the Armstrong Laboratory 14 Step Method for Continuous Improvement Manual as a guide for its development. Furthermore, agendas were provided prior to each meeting, thereby allowing members to come prepared and greatly increasing meeting efficiency and focus. (See Atch 1.2.C.)

1.2.D. Roles of our team members fell into six main categories. The facilitators kept the group focused on the TQ process and introduced and supervised our use of appropriate TQ tools. Members from target areas brought their specific expertise and experience to the group, and the customer member presented the AF user and base level perspective. The recorder was able to capture and record group ideas. The team leader provided the management perspective and our statisticians and computer programmers provided expert data analysis and perspective on automation. However, in addition to their main roles, all members contributed on all topics.

1.2.E. The Team documented its progress weekly through meeting critiques and detailed minutes. A storyboard was developed in the OEA work area and later placed in the
lobby of the AL command building so that others might follow the activities of the PIT. Furthermore, quarterly progress briefings were given to the Quality Council headed by Maj Gen Anderson, HSC.

2. Process Selection Criteria

2.1. The Team identified both external and internal customers. The external customers included all the AF-wide organizations that collect environmental and occupational samples and submit them to AL/OEA for analysis. We identified these customers through a historical address listing and found that 630 installations had submitted samples to OEA. We then grouped our customers into Bioenvironmental Engineers, Civil Engineers, other DoD groups, and Federal, State, and local regulatory agencies. Internal customers included other divisions in the OE directorate, which account for 10% of our analytical work. We also considered that in every process we evaluated, there were internal customers within the OEA division. For example, the chemists were customers of people who receive samples, and the data entry personnel were customers of the chemists. (See Atch 2.1.)

2.2. Identify the customer’s key result areas (KRAs).

2.2.A. We used the expertise and experience of our customer team member and a prioritization matrix developed with senior MAJCOM customers to identify the customer’s key result areas (KRAs). The Directorate sent a detailed questionnaire to key customers to determine KRAs as part of a separate activity in Nov 92. Then many of those customers met at Brooks AFB and completed a matrix of factors that, in part, described what they needed most from a support laboratory. Fifteen factors were ranked and weighted. These factors included accuracy and quality, rapid turnaround for special samples, chain-of-custody procedures, access to the status of samples, certification, etc. Further discussion and customer’s comments led to a prioritization of customer desires. The Team’s customer member provided further feedback at weekly meetings. A KRA of all analytical customers was fast turnaround time, and this was certainly the prime KRA on which a problem was perceived. Customer rankings dovetailed with the conclusions of the early data review by the advance group and customer comments we had received in the past. (See Atch 2.2.A.)

2.2.B. Our action, based on customer response, was to continue with the course of our charter to focus on reducing turnaround time and increasing capacity.

2.2.C. The Team’s actions have had a direct impact on several of the customer’s KRAs. We greatly improved turnaround time and capacity, as described in the results. The customers now has faster access to the status of their samples through early electronic mail. The spirit of change and customer focus, fostered by the Team, has resulted in spinoffs in more rapid customer service, improved handling of special samples, and increased laboratory automation.

2.3. Focus on customer satisfaction.

2.3.A. Prior to the start of the PIT, informal customer communication indicated that faster turnaround time was desired. At the Air Force-Wide Laboratory Consolidation Meeting, a survey was taken on customer satisfaction utilizing a Multivoting technique. A list of the top seven issues was generated in decreasing order of interest. Later, when the Team began to implement changes, customer satisfaction was assessed by requesting comments on initial electronic mail trials and consolidated results letters as well as issuing customer survey forms. (See Atch 2.3.A.)
2.3.B. Our initial conclusion was that to improve customer satisfaction, quicker turnaround times were needed. Later we concluded from the comments on the electronic mail trials that customers loved the immediate access to results.

2.3.C. The PIT adopted improvement in analysis turnaround time as its top priority. To keep the customers involved and to ensure effective feedback, communications with customers was given a high priority. The latest customer feedback was discussed at all PIT meetings. Based on the customer’s comments on the electronic mail trials, we expanded the electronic mail database, and solicited other volunteers to use the program. Based on the positive feedback regarding the analytical results cover sheet, we have continued this procedure.

2.4. Process identification and definition.

2.4.A. Dr Cupello’s advance group narrowed the scope of the PIT during its initial study of all processes and the overall performance of the laboratory. Flow Charts and Box and Whisker Diagrams were tools the Team used to identify processes and define boundaries. The Team used data from an extensive historical database. (See Atch 2.4.A.)

2.4.B. It was not difficult for the Team to determine if the boundaries of the process were within their scope. AL leadership empowered the Team to modify any applicable business practices. Those practices selected for process improvement fell functionally within the Analytical Services Division (OEA) and its Division Chief served as team leader. The functions on which the Team focused were showing high variability and long average analytical turnaround times.

2.5. Opportunities for improvement were identified and prioritized by a study of the historical data from our laboratory information system. From these data, the advance group identified four key areas for improvements: metal analysis, pesticide analysis, hazardous waste analysis, and customer service.

2.6. The Team evaluated process performance with metrics developed from the laboratory’s historical database. We produced Control Charts, Pareto Charts, and Scatter Diagrams to analyze turnaround time and sample workloads for each targeted area. (See Atch 2.6.)

2.7. A schedule for process documentation and leadership reviews.

2.7.A. The Team kept on schedule and provided leadership reviews by developing and maintaining milestones based on our charter. Facilitators followed the chart and kept us focused on the schedule. Review of progress often was made an agenda item. We provided senior leadership reviews through the storyboard and frequently briefed senior management.

2.7.B. Dr Welch and Mr Mitchell were briefed and gave approval to the original team charter. They also requested that HSC Quality Council be briefed quarterly, thereby keeping upper management informed on the Team’s progress and providing an opportunity for feedback.

3. Analysis Techniques

3.1. Analyze the process for improvement.

3.1.A. Process analysis began with a general review of OEA procedures and functions, including a tour of the laboratory. Next, a very simple chart describing the flow of a sample through the lab was created. After narrowing the focus to three analytical functions,
additional tours were made. Brainstorming and Affinity techniques then were used to establish general process steps for Flow Charting, after which, a detailed Flow Chart was created for each of the three targeted analytical functions. (See Atch 3.1.A.)

3.1.B. Lab tours were especially important for Team members naive to OEA, e.g., the facilitators and the customer representative. Their simple but probing questions often revealed process steps that were taken for granted by those who had been intimately involved with the process. The initial tour revealed six major process steps: shipping, log-in, analysis, reporting, verification, and mailing results. While the first and last two steps were similar for all samples, the analysis and verification steps were specific for each of eleven types of functional analyses (See previous Atch 2.4.A.). After the team decided to focus on only three of the eleven functions, detailed tours of each resulted in more questions and copious notes. Subsequent Brainstorming resulted in a broad process outline that was valid for the analysis and verification steps of any function. Team members representing specific functions were then asked to develop a detailed function-specific flowchart for their areas, using the broad outline devised by the team. These Flow Charts were presented to the team, critiqued, and revised. Brainstorming and Affinity Diagraming were used to help identify bottlenecks in problem areas.

3.2. Measurement of the process identified as relevant to customer needs/satisfaction.

3.2.A. Data on turnaround time for every analytical sample processed by OEA since 1991 were available to the Team in a laboratory information system (Hewlett Packard Lab/UX) computer database. While this database had been routinely maintained, it had never before been queried in the manner and detail required for Team use. Team members wrote programs to extract the desired data and TQM statistical process control software, developed by the Air Force Materiel Command, was used to generate Control Charts. Initial Control Charts, along with Box and Whisker summaries of the same data, were used to determine target function baselines. After narrowing the Team’s scope, we developed specific Control Charts for each of the targeted functions and considered other factors, such as the day of the week a sample was received, the number of analyses required per sample, analytical equipment utilized, and volume of samples processed at the same time. (See Atch 3.2.A.)

3.2.B. Early in process analysis, we learned that some data fields in the database were automatically entered during certain operations whereas other fields were copied from forms and entered manually. It was easy to determine that the automatically recorded data were more complete and valid, so the Team limited its review to those data as much as possible. Furthermore, statistical analysis, as well as direct observation of our Control Charts and Box and Whisker Diagrams, revealed an inordinate number of outliers, which we were able to trace to consistent but inappropriate inclusion of certain types of data in our original analyses. These data were those from samples transshipped to contractors, samples generated by a special Environmental Protection Agency program, Quality Control samples, and canceled samples. We modified our programs accordingly, thereby obtaining much more valid, accurate, and relevant data for our process measurement of in-house analytical performance. The revised analyses still demonstrated a great opportunity for improvement in the targeted functions.

3.3. Problem identification

3.3.A. To facilitate problem and solution identification, the Team visited two premiere national analytical laboratories in Salt Lake City. The fresh ideas generated from this trip, along with the results of our own process identification and measurement, were used to Brainstorm and record as many candidate problem areas as possible. Then, using an Affinity Diagraming tool, problem areas were clustered and grouped into six primary categories,
which then made the major ribs of a Fishbone Diagram. Secondary and tertiary ribs were derived from the affinity groupings and supplemented by additional Brainstorming. (See Atch 3.3.A.; note that the Affinity Diagram was destroyed to make the original Fishbone Diagram and therefore couldn’t be included.)

3.3.B. A two stage process was used to determine the most significant areas for improvement. First, using the extensive experience and expertise of the group, we labeled, by consensus, the various ribs of the Fishbone Diagram as having a large, medium, or small effect on turnaround time (See previous Atch 3.3.A.); eleven of the candidate problem areas were labeled as having a large influence. Next, we utilized the Interrelationship Digraph technique to pairwise rank these eleven factors in order to determine which were the driving or root causes. Of the five driving factors (those with the most "out" arrows on the digraph) two, New Regulations and Slow Procurement, were considered out of the Team’s control. The three remaining, coordination, automation, and personnel experience, were thus identified as being the most significant improvement opportunities in our control. (See Atch 3.3.B.)

3.4. Throughout the whole procedure of process analysis, process measurement, and problem identification the Team’s attention was constantly focused on the customer’s most significant requirement, namely an improvement in turnaround time. The Team also was alert to the fact that other customer requirements, which were not perceived as a problem, could not be sacrificed to improve turnaround time. Customers were often asked for their comments on changes the Team were considering. During team meetings, the internal customer on the team helped keep our focus on customer requirements and became the leader for developing coordination alternatives with the customer.

3.5. The specific processes chosen for improvement were defined in the Flow Charts included earlier (See previous Atch 3.1.). The improvement approaches were identified as described above and further elaborated in Tree Diagrams utilized in delineating root causes (see Atch to later section, 3.6.A.) A letter was issued by the Division Chief to the Branch Chiefs to communicate the Team’s decision. (See Atch 3.5.)

3.6 Root cause analysis.

3.6.A. Brainstorming, Multivoting, and Affinity Diagraming were used to develop Tree Diagrams to identify root causes and a range of possible solutions for each problem area. (See Atch 3.6.A.)

3.6.B. In order to verify root causes, appropriate team members developed check sheets, data forms, and survey tools to assess baseline times required for identified root causes. For example, customers were queried on the time it took to receive mailed results, chemists recorded the time to complete manual calculations, and function managers recorded the time required to verify and sign reports.

3.7. After problem identification and the analysis of root causes, described earlier, final target selection was done using two approaches. First, we employed Criteria Development and Prioritization Matrix procedures, described more fully in section 4.2 (See Atch 4.3.) and second, we performed a risk/benefit analysis, which involved a variety of issues, including Division dynamics, and led to the exclusion of certain possible solutions from consideration.

4. Solutions

4.1. Possible solutions were identified simultaneously with root causes using Brainstorming, Multivoting, Affinity Diagrams, and Tree Diagrams (See previous Atch 3.6.A.). It was at this critical stage in Team activity that previous groundwork began to really pay off. The
original careful selection and training of team members, the cross functional education in OEA process of all members, our fact-finding tour of premiere national labs, the use of TQ teaming procedures, and the "just-in-time" introduction and use of TQ tools all contributed to a smoothly functioning group of experts that was optimally prepared for identifying and prioritizing possible solutions. Assistance and advice on possible solutions were also elicited from other experienced OEA personnel, who had not had the opportunity to participate in earlier Team activities.

4.2. In order to assess the best solutions, the Team first developed a set of implementation criteria and assigned weightings using a modified version of the Full Analytical Criteria Method. The original criteria were: low cost, low manpower, no effect on quality, not impeded by regulations, large reduction in turnaround time, high chance of success, high spin-off potential, and short time to implement. (After experience with the method, a number of criteria were later deleted.) Then, using a Prioritization Matrix technique, the various solutions developed using Tree Diagrams (See previous Atch 3.6.A.) were rated on each of the criteria. After being multiplied by the criteria weightings, the adjusted ranks were summed across criteria to yield a relative priority rating for each solution. From this matrix, the Team chose to implement solutions that had received the highest priority ratings.

4.3. After choosing target solutions, the Team broke into several subgroups to develop and implement specific action plans. Progress was reported and discussed at weekly meetings of the whole Team. Examples of three different action are provided. Also included are the final results from the prioritization matrices on which all actions plans were based. (See Atch 4.3.)

4.4. The Team tested all solutions on a small scale. For example, three appropriate Air Force bases were selected to test effects of sending analytical reports by electronic mail; results were sent by electronic mail for two months, and feedback was solicited from the customer. A similarly cautious test was conducted on the response to our changing the way analytical results are signed off by the chemist; we included a paragraph to the customer on the new version, explaining the change and soliciting comments and suggestions. We worked directly with our MAJCOM customers on how to better schedule sample workload, again explaining our proposals and soliciting feedback.

4.5. The Team ensured implementation of the action plans by including affected personnel, especially supervisory personnel and Branch Chiefs, in their development and execution. Often, affected personnel were invited to a weekly Team meeting at which a progress report on their area was on the agenda. Status of implementation was typically an agenda item on weekly meetings. Occasional briefings by Mr. Thomas to the OEA Division staff members also enlisted their support and helped ensure timely implementation.

5. Results

5.1. Results of the team's solutions met or exceeded customer requirements.

5.1.A Results derived from the Team’s process improvement efforts fall into two main types. The first type relates to the effects of specific process changes that were expected to improve turnaround time. The results of these efforts are clearly successful. Because of changes in the procedures by which chemists sign-off on analytical results, this type of paper work has decreased from 57 to 74% in targeted areas. New electronic mailing procedures now provide results to the customer within 10 minutes of chemist approval, compared to 4-6 days required previously for postal delivery. In another case, implementation of new automated procedures has reduced by 50% the time required to download and quality control data. The second type of result relates to improvements in overall turnaround time. While overall turnaround time for our targeted functions has decreased 30 to 36%, compared with
baseline performance, changes have been in place for far too short a time for these results to be conclusive. During the course of our examination of OEA processes, we learned that there are a great many factors affecting overall turnaround time, many of which are uncontrollable and somewhat unpredictable. For example, during the same time that turnaround times have declined, workload has increased by 30 to 38%, compared with the baseline period. Although we are optimistic that turnaround times will remain lower and decline even more, we feel we need at least six additional months of data to make an adequate assessment.

There also have been many positive spin-offs resulting from our improvements. The use of signature cover letters, electronic transfer of results, and automated downloading of analytical data has been adopted by four additional functions, not originally targeted by the Team. Increased automation has led to personal computers throughout the work area, speeding data handling and communications. Our introduction of daily and weekly sample management suspense lists allows chemists to identify and expedite older samples, reducing peaks in analysis turnaround times.

In the analytical services business, it is difficult to immediately measure whether our solutions meet or exceed the customer requirements. There are many variables that affect each sample, and while a customer will immediately notice if a single sample is very late, the same customer might be slow to realize that ten other samples have been analyzed 20 or 30% faster. However positive customer feedback on our initial steps, especially electronic mailing, show we are on the right track.

5.1.B. The results of specific process changes are easy to link directly to team efforts. The idea for having a single signature cover letter originated in the team and was researched and tested by the team prior to implementation; this prime example of finding and eliminating non-value added work, caused an immediate, significant time savings, clearly attributable to the Team. Similarly, the Team's introduction of electronic mailing of analytical results was logically developed using TQ tools, tested and revised, and then transitioned to the whole Division. This change saved days of turnaround time; the customers like it; and it would not have happened without the Team's efforts.

While the Team believes it has had a major impact on overall turnaround time, it is doubtful that such a global variable can ever be conclusively proven to have been caused exclusively or directly by the Team's changes. In an organization as complex and dynamic as OEA and with a metric as multidependent as turnaround time, it is impractical to conduct a controlled, scientific study. However, since the time-saving changes, described above, have shortened component parts of the overall turnaround process, we feel confident in extrapolating that our Team's efforts were, at least partially, responsible for the observed improvements in overall turnaround time.

Phenomena such as enthusiasm, cooperation, and esprit de corps are difficult to measure, but we know that they affect the productivity of an organization and that they have dramatically increased in OEA over the past year. The Team would not presume to take credit for all of the attitudinal improvements in the Division, but can certainly attest to the positive effect participation in the PIT had on its own members.

5.2. The Team's results meet the HQ AFMC and HSC goals and objectives, earlier described with respect to Team mission (See previous section 1.1.D.). If our decreases in overall turnaround time are sustained, we will definitely have satisfied our customers' needs. Electronic reporting of results clearly supports our objective of helping customers' meet their schedules. Streamlining and automation of operations have greatly enhanced our business practices. The new esprit de corps and enthusiasm at all levels in the laboratory are indicators of success in enabling our people to excel. Our use of advanced automated technology has enhanced the technological superiority of our lab. Our improved ability to provide timely environmental analyses supports the operation of quality installations throughout the Air Force. We now have the capacity and excellence to attract and sustain new business. Our Team's results strongly support the goals and objectives of our organization.
6. Deployment

6.1. During preliminarily testing and adjusting of the proposed process changes, Branch Chiefs and additional Function Chiefs from the areas most affected were invited to attend Team meetings. Their presence and involvement in the ensuing discussions proved extremely valuable to the implementation of the changes. After the concurrence of these leaders was secured, the Team scheduled briefings for the entire OEA division, at which proposed process changes were discussed in detail and comments were solicited. As the scheduled dates for implementation drew near, division personnel were updated via electronic mail. This approach allowed our introduction of an analytical report cover sheet and electronic mailing of results to expand from the initial test cases to becoming standardized procedures for the whole Division. To inform and involve the customer, the Team Leader visited several AF Command HQs and briefed key personnel on proposed improvements being considered by OEA. This information was also made available on the OE Directorate electronic bulletin board, to which over 240 of OEA's customer groups have access.

6.2. The Team believes that improvements in information availability and tracking, communication, and a new spirit of cooperation will ensure that the increased level of performance is maintained and shared. As a direct result of the Team's demands for data analysis and automation, information from the OEA database is much more readily available. The Team not only acquired workplace computers and developed software to automatically download data from analytical equipment, but also developed a maintenance procedure. Our programmer has followed up with the chemists to ensure the new output meets their needs, and will stay available to support changes. New, weekly metrics on turnaround time, workload, accuracy, productivity, backlog, and many other parameters are now available by analytical function to nearly all lab personnel. Regular tracking of such metrics is now required by management, ensuring that quality is maintained as turnaround time is decreased. Communication within OEA has improved considerably and, through a reorganized customer service area, communication with customers has never been better. Finally, our effective demonstration that empowerment and teamwork can lead to meaningful process improvements has resulted in a positive, energetic, and cooperative spirit in OEA that will ensure increased performance is maintained and shared well into the future.

6.3. As a result of the Team's recommendations, the OEA Division has implemented ongoing bench-level, process control, and management metrics to monitor results and ensure continuous process improvement. For management at the bench and Function Chief levels, the Team instituted a daily "sample suspense list" and a weekly "sample suspense management list", for use in tracking sample turnaround time. These lists provide a detailed look at the status of all samples. Chemists can use them to control work flow and meet analysis times. Function Chiefs use the lists to manage personnel, schedule equipment maintenance, and decide when to augment in-house resources with contract laboratory capability. Branch and Function Chiefs now also receive weekly consolidated Control Charts on the customer's key interest areas, allowing them to assess trends and anticipate problem areas. (See Atch 6.3.)

7. Presentation

7.1. The primary tool we used for internal evaluation was that of holding a critique session at the end of each Team meeting. This critique involved the facilitator asking each Team member what that person liked best about the meeting and what that person would have improved. The responses were written down on a large tablet for all members to see and were included in the minutes of the meeting. Common complaints involved infractions of the Code of Conduct, concerns about losing focus or not making rapid enough progress, and the need for more resources. Sometimes the issues raised could be dealt with immediately, but
often they were included in the official agenda for the next meeting. Most of the time, the positive comments outweighed the negative and only minor corrections were needed to keep the Team on course. Initially, the Team facilitators held separate discussions with the Team leader to evaluate internal Team functioning. These discussions were helpful at the time but became unnecessary as the Team matured.

7.2. How did the team evaluate its performance externally?

7.2.A. The most severe problem faced by the Team was a drain on human resources. Midway through the Team's progress, two members were lost, one due to promotion/reassignment, and one due to unexpected retirement. The Team responded by adjusting the scope of the remaining work and by getting the temporary assistance of others with suitable expertise. Another human resource problem was the increasing demands on some of the Team members whose regular duties were in organizations other than OEA; this time the Team appealed to higher OE and AL leadership for a restoration of personnel resources and was at least partially successful. A third problem was that of obtaining adequate and timely physical resources, particularly computer hardware and software. As in other activities, the team took a combined "can do" and "make do" cooperative approach to get the job done. For example, one member might obtain a surplus computer, another the software, and another a peripheral device to create a needed system.

7.2.B. It is readily apparent that there have been many spin-offs and general benefits of our Team to the organization. Most important is the fact that our Team's success has demonstrated that there exists a willingness and a means for effective change in the organization. In these days of downsizing, yet increasing work load, it is easy to become discouraged and depressed. It is clear to OE and AL management, and to the Team itself, that its activities have increased spirits and reinstated confidence in all those involved in the endeavor. Another, more tangible benefit of the Team's existence was a great improvement in communication within the OEA Division and an increase in widespread understanding of Division processes. The invigorated OEA spirit and increased expertise were both demonstrated recently when a report of the AF Audit Agency required a complex and rapid response. Another benefit of the OEA Team's efforts to the broader organization has been the initiation of TQ teams in other OE Divisions by personnel who honed their skills on the OEA Team.

7.2.C. The OEA Team's most compelling communication tool was a 40 square foot, highly attractive, storyboard. After its initial development in the OEA work area, this dramatic display, which told the Team's story in easy to follow charts and illustrations, was placed for several months in the highly trafficked lobby of the AL command building. There it conveyed the message of an energetic TQ effort to employees throughout AL as well as to many visitors from other organizations. The Team also used briefings and publications to share its experiences with others. At various times during the year, the team leader, Mr. Thomas, formally briefed AL, OE, and HSC senior management, the HSC Quality Council, all employees in the OEA Division, specialized audiences in the OE Directorate, and MAJCOM headquarters. The activities of the Team were discussed in AL's Quality Air Force Newsletter, and the Brooks AFB newspaper. Customers were advised of Team actions through an article in the OE newsletter, which is distributed AF-wide to civil engineer and medical customers, and by adding a paragraph to our sample results sheets, which go directly to the technicians in the field. Finally, Team benefits and lessons learned were spread verbally to others directly by each Team member; in three clear cases, team members used expertise and experience gained on the OEA team to benefit TQ activities in other organizations. (See Annex 7.2.C.)
ATTACHMENTS

ATTACHMENT 1.1B - TEAM PURPOSE
Mission Statement
Scope of PIT Group
Administrative Issues
Empowerment Issues
Code of Conduct

ATTACHMENT 1.1E - PIT MEMBERSHIP
Membership Selection Criteria
Laboratory Staffing Diagram
Team Membership

ATTACHMENT 1.2C - TIME MANAGEMENT AND GUIDELINES
Meeting Agenda Example
PIT Group Milestone Chart
Continuous Process Improvement Guide

ATTACHMENT 2.1 - CUSTOMER IDENTIFICATION
Analytical Services Customers
FY92 Customers by Command

ATTACHMENT 2.2A - TOOLS USED TO SURVEY CUSTOMERS
Environmental Sample Analysis Questionaire

ATTACHMENT 2.3A - CUSTOMER SATISFACTION DATA
Key Parameters of Customer Satisfaction

ATTACHMENT 2.4A - FLOW CHART AND STUDY OF ANALYTICAL CHEMISTRY PROCESSING STEPS IN THE LABORATORY
Process Flow Chart
Codes for Analysis Functions
Box/Whisker Diagram for Process
Box/Whisker Diagrams for Analysis Times

ATTACHMENT 2.6 - EVALUATION OF PROCESS PERFORMANCE
Samples Received Control Charts
In-house
Total
Analysis Times Control Charts
Metals
Pesticides
Scatter Diagrams
Pareto Chart
ATTACHMENT 3.1A - TOOLS USED TO ANALYZE THE PROCESS
Metals Analysis Flow Chart (condensed)
Raw Chart
Customer Services Flow Chart (condensed)
Pesticide Analysis Flow Chart
Sample Process Flow Chart

ATTACHMENT 3.2A - PROCESS PERFORMANCE BASELINE
Control Charts:
Metals(01)-1991
Metals(01)-1992
Pesticides(04)-1991
Pesticides(04)-1992
Samples Received

ATTACHMENT 3.3A - IDENTIFICATION OF POTENTIAL AREAS FOR PROCESS IMPROVEMENT
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ATTACHMENT 3.3B - DETERMINATION OF MOST SIGNIFICANT IMPROVEMENT OPPORTUNITIES
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Personnel Experience

ATTACHMENT 4.3 - TEAM ACTION PLANS
Direct Data Transfer Plan
Electronic Result Mailing Plan
Coversheet Plan
Matrix Diagram - Work Flow Management
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Work Flow Management
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ATTACHMENT 6.3 - METRICS USED ON AN ON-GOING BASIS TO ENSURE CONTINUOUS PROCESS IMPROVEMENT
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   Sample Suspense List
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ATTACHMENT 7.2C - BENEFITS OF THE TEAM AND LESSON LEARNED THAT WERE COMMUNICATED
   Storyboard Photo
   AL Newsletter Article
   OE Newsletter Article
   Customer Satisfaction Survey
   Customer Feedback Electronic Mailing
   Cover Letter Explanation
Attachment 1.1B - Team Purpose

When Prepared: August 1992

Need/Purpose: Mission Statement and Scope - Direction for Team

Administrative Issues - Guidelines for Team

Empowerment Issues - Support by Management

Code of Conduct - Rules for Team

How: Mission Statement and Scope - Developed by Team in Brainstorming/Sessions

Administrative, Empowerment Issues - Developed by Mr Thomas, Dr Cupello and agreed upon by Dr Billy Welch, AL/CC

Code of Conduct - Developed by Team during Team Training Process
TEAM MISSION STATEMENT

- FOR METALS, PESTICIDES AND CUSTOMER SERVICES FUNCTIONS, REDUCE THE AVERAGE PROCESSING TIMES AND INTRA-FUNCTION VARIATION ASSOCIATED WITH THOSE PROCESSING TIMES.

- FOR METALS AND PESTICIDE FUNCTIONS, INCREASE LAB TESTING CAPABILITIES BY IMPROVING THE OEA PROCESSING STEPS BETWEEN "ANALYSIS" AND "REPORTING OF RESULTS" WITHOUT COMPROMISING QUALITY.

- PROVIDE CUSTOMER SERVICE AND PERFORMANCE DATA TO OE MANAGEMENT AND ASSIST IN THE DEVELOPMENT OF MARKETING MATERIALS.
SCOPE OF PIT GROUP

- ONE YEAR COMMITMENT BY TEAM
- WILL IDENTIFY PROBLEMS IN THREE FUNCTIONS
- WILL ZERO IN ON ONE OR TWO MAJOR PROBLEMS IN EACH FUNCTION
- SCHEDULE:

  FIRST 6 MONTHS: IDENTIFY MAJOR PROBLEMS AND ESTABLISH BASELINES

  NEXT 3 MONTHS: FIND POSSIBLE FIXES FOR PROBLEMS AND IMPLEMENT

  FINAL 3 MONTHS: TRACK FIXES AND SHOW IMPROVEMENTS
ADMINISTRATIVE ISSUES

- OEA OUTPUT IN THESE 5 FUNCTIONS WILL LIKELY DECLINE DURING THIS TEAM ACTIVITY

- TEAM MEMBERSHIP WILL BE BY INVITATION

- THE TEAM WILL MEET 90 MINUTES/WEEK (1530-1700 HRS)

- TEAM MINUTES WILL BE TAKEN BY A DEPARTMENT SECRETARY; NON-TEAM MEMBER

- QUALITY COUNCIL WILL BE BRIEFED AT LEAST QUARTERLY; MORE FREQUENTLY AT FIRST

- TEAM LEADER IS MR. THOMAS C. THOMAS

- TEAM WILL NOT UNDERTAKE ANY PROCESS IMPROVEMENTS THAT CANNOT BE FULLY IMPLEMENTED DURING THE 9-12 MONTH DURATION OF THE TEAM

- IN THE EVENT ANY ISSUES ARISE THAT CANNOT BE RESOLVED BETWEEN THE TEAM LEADER (MR. THOMAS) AND THE FACILITATOR (MR. CUPELLO), THOSE ISSUES WILL BE BROUGHT TO THE ATTENTION OF THE QUALITY COUNCIL FOR RESOLUTION

- THIS TEAM IS "LIKELY" TO EXIST FOR A PERIOD OF UP TO 12 MONTHS
"EMPOWERMENT ISSUES"

- SERIOUS CONSIDERATION SHOULD BE GIVEN TO SENDING SELECT TEAM MEMBERS TO VISIT AT LEAST ONE OTHER "QUALITY" ENVIRONMENT TESTING LAB IN THE COUNTRY; PHILOSOPHICALLY DOES THE QUALITY COUNCIL SEE THE MERIT OF SUCH A SITE VISIT?

- THERE SHOULD BE AT LEAST ONE EXTERNAL CUSTOMER ON THE TEAM

- THE TEAM SHOULD HAVE PERMISSION TO CONDUCT A SURVEY OF CUSTOMERS IF THEY DEEM IT NECESSARY

- ALL TEAM MEMBERS WILL BE TRAINED IN GROUP DYNAMICS, TEAM ACTIVITY, ETC. BY CHANGE NAVIGATORS; AND OTHER ORGANIZATIONS IF NECESSARY

- TEAM PROGRESS WILL BE DISPLAYED PUBLICLY ON A "STORYBOARD" IN THE LOBBY OF BLDG. 125

- THE TEAM WILL HAVE ACCESS TO THE ENTIRE LAB/UX DATABASE, WILL TREAT ALL SUCH DATA AS PROPRIETARY AND SENSITIVE, AND WILL RETURN OR DESTROY ALL MATERIALS RECEIVED ONCE IT IS NO LONGER OF VALUE TO THE TEAM

- THE TEAM WILL ASSUME THAT THERE ARE NO "SACRED COWS"; ANY AND ALL PROCESS IMPROVEMENT IDEAS ARE FAIR GAME AND OPEN FOR DISCUSSION

- DUE TO MAGNITUDE OF THE OEA DATABASE THE TEAM WILL BE PROVIDED WITH THE REQUISITE DATA PROCESSING AND STATISTICAL ANALYSIS SUPPORT IT DEEMS NECESSARY TO CARRY ITS ASSIGNMENT
RULES AGREED UPON BY TEAM

○ EQUALITY OF MEMBERS, FIRST NAME BASIS

○ ATTACK PROBLEMS NOT IDEAS

○ ENCOURAGE NEW AND INNOVATIVE IDEAS

○ NO GROUP DIVISIONS

○ TOTAL PARTICIPATION BY EACH MEMBER
● COME PREPARED

● REGULAR MEETING TIMES

● NO PRE-CONCEIVED NOTIONS

● NO SACRED COWS

● CONSIDER CUSTOMERS

● BE ON-TIME, END ON-TIME
Attachment 1.1E - PIT MEMBERSHIP

When Prepared: July 1992

Need/Purpose: To select an effective team

How: Membership Selection Criteria - Developed by Mr Thomas and Dr Cupello to determine team membership.

Laboratory Staffing Diagram - Used by Mr Thomas to select members ensuring laboratory-wide representation.

Team Members Chart - Final team selection
MEMBERSHIP SELECTION CRITERIA

- VOLUNTEER TO DEDICATE THEMSELVES TO A ONE YEAR PROJECT INVOLVING WEEKLY MEETINGS

- PERSONNEL FROM IN-HOUSE, CUSTOMER, AND SUPPORT AREAS

- MUST BE WILLING TO ATTEND A ONE WEEK TRAINING COURSE PROVIDED BY CHANGE NAVIGATORS FROM DENVER COLORADO

- WILLING TO ACCEPT THIS ADDITIONAL WORKLOAD AND MAINTAIN THEIR NORMAL WORK ASSIGNMENTS

- DIVERSE MEMBERSHIP
  -- REPRESENTATIVE RANK STRUCTURE
  -- PERSONNEL WITH A WIDE RANGE OF EXPERTISE
  -- INDIVIDUALS THAT DON'T HAVE THE MIND-SET "THAT IS THE WAY IT'S ALWAYS BEEN DONE"
ARMSTRONG LABORATORY
Analytical Services Division (OEA)

Mr. T. Thomas, GM-15
Chief

Ms. D. Doyle
Secretary

Mr. L. Rodrigues
Deputy Chief

Mr. A. Richardson, Chief
Occupational Hazards Branch (OEAD)
Tsgt. R. Briones
MEDIC

Mr. D. Birc, Chief
Industrial Hygiene Fund
VRC, J. Mason
Medical Lab Specialist

Lt. S. Sveida, Chief
Industrial Hygiene Fund
Mr. K. Groden
Deputy

Mr. J. Dedridge
Physical Science Tech
Br. J. Green
Medical Lab Specialist

Mr. C. Long, Chief
Metals Analyze Fund
Mr. M. Wheeler
Deputy
Mr. F. Washington
Physical Science Tech
Mr. A. Forrest
Medical Lab Specialist
Br. A. Beang
Medical Lab Specialist
Br. A. Hughes
Medical Lab Specialist
Ags. T. Fisk
Medical Lab Specialist

Mr. A. Landy, Chief
Asbestos Fund
Mr. E. Reskorn
Deputy
Ms. G. Gover
Chemist
Ms. D. Stancher
Physical Science Tech

Mr. W. Saad, Chief
Ventilation Fund
Lt. T. Popal
Deputy
Ags. T. Grulich
Medical Lab Specialist
Mr. J. Katka
Physical Science Tech

Mr. J. Ferreira, Chief
BOM Fund
Tsgt. C. Boettcher
Medical Lab Specialist

Mr. P. Randolph, Chief
Automation Fund
Mr. R. Delgado
Physical Science Tech

Capt. T. Wiley, Chief
Contractor BOM Fund
Ms. G. Cruz
Customer Service
Ags. C. Roll
Medical Lab Specialist
Ms. R. Hiltburn
Clerk

Contractors
Data Entry Personnel
Chemical Processing Personnel

Mr. D. Mark, Chief
Pesticides/Toxins Org Fund
Lt. Cortez
Deputy

also: Tsgt. J. Thompson - OEPD, customer; LT COL John Wolkand A1/OEPD
suggest: Ernie Bade, V/Sc, AFCE member?
<table>
<thead>
<tr>
<th>Name</th>
<th>Duty Title</th>
<th>Office Symbol</th>
<th>Team Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Lt Chris Cortez</td>
<td>Deputy, Trace Organics</td>
<td>AL/OEAE</td>
<td>Trace Organics</td>
</tr>
<tr>
<td>Ms Lupe Cruz, GS5</td>
<td>Chief, Customer Service</td>
<td>AL/OEAT</td>
<td>Customer Service</td>
</tr>
<tr>
<td>Dr Jim Cupello, GM15</td>
<td>Total Quality Advisor</td>
<td>AL/TQ</td>
<td>Total Quality Advisor</td>
</tr>
<tr>
<td>Capt Sheree Engquist</td>
<td>Chief, Person Job Match Technology</td>
<td>AL/HRLM</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Maj John Garland</td>
<td>Chief, Water Quality</td>
<td>AL/OEBE</td>
<td>Customer</td>
</tr>
<tr>
<td>Mr Leo Jehl, GS13</td>
<td>Chief, Special Projects</td>
<td>AL/OEAT</td>
<td>Asst Team Chief</td>
</tr>
<tr>
<td>Mr Cornell Long, GS12</td>
<td>Chief, Metals Analysis</td>
<td>AL/OEAE</td>
<td>Metals</td>
</tr>
<tr>
<td>Ms Stephanie Miller, GS9</td>
<td>Research Physiologist</td>
<td>AL/OERP</td>
<td>Statistician</td>
</tr>
<tr>
<td>Dr Michael Murphy, GM14</td>
<td>Chief, Performance Extrapolation</td>
<td>AL/OERP</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Mr Ernie Oakes, GS12</td>
<td>Lead Programmer</td>
<td>AL/OEYSCP</td>
<td>Statistician</td>
</tr>
<tr>
<td>Maj Lloyd Swartz</td>
<td>Chief Consultant, Lab Automation</td>
<td>AL/OEAT</td>
<td>Lab Automation</td>
</tr>
<tr>
<td>Mr Thomas Thomas, GM15</td>
<td>Chief, Analytical Division</td>
<td>AL/OEA</td>
<td>Team Leader</td>
</tr>
<tr>
<td>TSgt Dan Thompson</td>
<td>NCOIC, Environmental Chemistry</td>
<td>AL/OEAE</td>
<td>Environmental Chemistry</td>
</tr>
<tr>
<td>SSgt Ira Thompson</td>
<td>NCOIC, Quality Assurance</td>
<td>AL/OEPQ</td>
<td>Recorder</td>
</tr>
<tr>
<td>Capt Tim Wiley</td>
<td>Chief, Contracting and Cust. Service</td>
<td>AL/OEAT</td>
<td>Contracting Services</td>
</tr>
</tbody>
</table>
Attachment 1.2C - Time Management and Guidelines

When Prepared: Meeting Agenda: 13 October 1992
Milestone Chart: August 1992
CPI: Early 1992

Need/Purpose: To ensure the team stayed on the original timeline and meet the steps necessary to identify and improve problems.

How: Meeting Agenda - Developed by group participation at end of each meeting. Agenda was set for next meeting.

Milestone Chart - Developed by Team Leader

CPI - 14 Step method for PIT groups to use. Developed by Dr Cupello for use by Armstrong Laboratory PIT groups.
# Meeting Agenda

There will be a meeting in Bldg. 140.  
Room Conf, R. only 3 Oct 92 (date)

Purpose: PIT Group Meeting

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description of Agenda Item</th>
<th>Responsible Person</th>
<th>Desired Outcome(s)</th>
<th>Time Allotted</th>
<th>Process to be used</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Flow Chart Presentation of Pesticide Analyses</td>
<td>Lt Cortez</td>
<td>Understand Process</td>
<td>0945-1000</td>
<td>Blackboard, Overhead Viewer</td>
</tr>
<tr>
<td>3.</td>
<td>Flow Chart Presentation of Metal Analyses</td>
<td>C. Long</td>
<td>Understand Process</td>
<td>1000-1015</td>
<td>Blackboard, Overhead Viewer</td>
</tr>
<tr>
<td>4.</td>
<td>Flow Chart Presentation of Customer Service</td>
<td>L. Cruz</td>
<td>Understand Process</td>
<td>1015-1030</td>
<td>Blackboard, Overhead Viewer</td>
</tr>
<tr>
<td>5.</td>
<td>Discussion on Agenda—What Area of Flow Charting to Focus in on?</td>
<td>L. Jehl</td>
<td>Follow on Study Area</td>
<td>1030-1045</td>
<td>Group Discussion</td>
</tr>
<tr>
<td>6.</td>
<td>Other Items/Critique</td>
<td>Dr Cupello</td>
<td>Better Meetings</td>
<td>1045-1100</td>
<td>Group Involvement</td>
</tr>
</tbody>
</table>

Participants:
- Dr Cupello (AL/TQ)
- 2Lt Cortez
- Dr Murphy (OED)
- Major Swartz
- Capt Enquist (HRLM)
- TSgt D. Thompson
- HS Cruz
- SSgt I. Thompson
- Mr Jehl
- Capt Wiley
- Mr Long
- Mr E. Oakes (SCYOEP)
- Major Garland (OEBE)
- HS S. Miller (OED)

cc:

"All good meetings eventually degenerate into work." [Peter Drucker]
MILESTONE CHART FOR AL/OEA PIT GROUP

AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG

IDENTIFY MAJOR PROBLEMS & ESTABLISH BASELINES

TAT DATA
SAMPLES RECEIVED DATA
WORKLOAD PROJECTIONS

FLOWCHARTING
FISHBONE DIAGRAMING

FIND POSSIBLE FIXES FOR PROBLEMS AND IMPLEMENT

ID DIAGRAMING
TREE DIAGRAMING
CHANGE FLOW CHART STEPS

TRACK FIXES AND SHOW IMPROVEMENTS

MONTHLY SUMMARIES

PESTICIDE TATS
METAL TATS
CUSTOMER SERVICE PROCESSING TIME

REPORT TO
AL/OE
CC
14 Step Method For Continuous Process Improvement
The Armstrong Laboratory 14 Step Method For Continuous Process Improvement (CPI)

There are literally dozens, if not hundreds, of process improvement recipes used by various companies, government agencies, total quality gurus, etc. In developing this employee handbook we looked at a number of them.

For example, Dow Chemical Company describes a 10-step method in their employee QUALITY PERFORMANCE GUIDEBOOK. Lockheed Corporation publishes a 5-step process in their GUIDELINES AND TOOLS FOR CONTINUOUS IMPROVEMENT booklet. Joiner Associates Inc. publishes a copyrighted booklet entitled the JOINER 7 STEP METHOD. The Xerox Corporation U.S. Marketing Group employs a 9-step quality improvement process in their USMG PARTNERSHIP booklet. Mr. Hitoshi Kume, 1989 winner of the Deming Prize for individual achievement describes a 7-step process in Chapter 10 of his 1985 book entitled STATISTICAL METHODS FOR QUALITY IMPROVEMENT. The Japanese Union of Scientists and Engineers (JUSE) Problem Solving Research Group recommends a 14-step process. Electronic Systems Center and the Rome Laboratory, our sister DOD laboratory, employ a 7-step model when training their process improvement teams. Lam, Watson and Schmidt offer a 14-step and 9-step methodology in their 1991 textbook entitled TOTAL QUALITY. Peter Scholtes, in the highly acclaimed TEAM HANDBOOK, describes a 5-step method. Boeing Aerospace Company teaches a 9-step problem-solving process in their TOTAL QUALITY IMPROVEMENT guide. I won’t bore you with any more examples, but there are plenty of them.

Quality gurus the world over would be the first to admit that at the heart of each of these methods listed above is the basic Shewhart Cycle, also known as the 4-step PDCA (Plan, Do, Check, Act) Cycle or Deming Cycle. So why not just use the simpler 4-step PDCA cycle? The more detailed, 14-step method described here provides a useful framework for most people who are just beginning to become involved in process improvement. In this author’s experience a 4-step process lacks sufficient detail and guidance to help the beginner. On the other hand, most experienced practitioners do not find a more detailed methodology to be a burden; successful teams end up following the same general pattern irrespective of the model chosen. So the 14-step process has been selected because of its utility to both "new" and "seasoned" practitioners alike.

Lastly, we recommend that you start small with your process improvement efforts. Pick a problem or process within your group’s total control; ensure you can identify customers, as well as your product or service, very clearly; and pick a problem you can solve in 3-9 months, including the time it takes to charter, form and train a small, functional team.

Initially follow the process outlined here as closely as possible. Use it as a crutch until you have the experience to customize it to each situation. But most of all, enjoy the challenge of continuous improvement. It will be the hardest, and most enjoyable, work you will ever do.
13. Celebrate team success !!!!

12. Standardize the process improvements

- Evaluate and confirm improvement to the process

10. Develop and implement solution(s) on a small scale

9. Identify and prioritize possible solutions; select the best alternative

8. Verify root causes of the problem with data

14. Anticipate and plan future improvements
1. Identify, prioritize and select opportunities for improvement

2. Identify the customer(s) of primary concern and the product or service targeted for improvement

3. Select team members; develop a Team "mission statement;" negotiate a Team Charter with the Quality Council

4. Describe specific characteristics of the problem from as many perspectives as possible

5. Identify the process that is producing the troublesome symptoms and describe this process in detail

6. Identify key parameters for measuring customer satisfaction; establish targets for improvement whenever possible

Plan
### Identify, prioritize, and select opportunities for improvement.

#### Hints

<table>
<thead>
<tr>
<th>Question</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>What issues do external customers bring to the attention of senior management most frequently?</td>
<td>There are problems everywhere, both large and small. With limited time, money and people resources, only the most important problems should be addressed. One of the key roles of senior management is to prioritize what gets done. In a TQL environment, this means the Quality Council selects and charters all process improvement activity. They should know better than anyone the major concerns of external customers. The fictitious example to be used throughout this booklet involves the following concern, expressed by the head of the Quality Council.</td>
</tr>
<tr>
<td>Which new products and services do your customers keep &quot;bugging&quot; you to provide?</td>
<td>&quot;In the current DOD environment of base closures and force reductions, it is likely that this Laboratory will have to significantly increase its capacity to do drug testing for DOD personnel. How can we increase the number of samples we process per month?&quot;</td>
</tr>
<tr>
<td>When angry customers complain to senior leadership, what is it they complain about most vehemently or most often?</td>
<td>CAUTION: Executives tend to identify large system problems like: &quot;Solve world hunger!&quot; System problems are generally too complex to attack whole. They need to be broken down into their smaller components called processes, and improved one process at a time. By definition then, your team is likely to end up working on a problem slightly different than originally identified by the Quality Council. You need to manage the Council’s expectations in this regard very carefully.</td>
</tr>
</tbody>
</table>
What issues do "AL" executives consistently identify as major barriers to satisfying the external customer?

If you called one of your external customers and described the "team" project you had selected as a continuous improvement project, would he/she tell you to pick a better one?

What issues do middle managers identify as the "really" big ones that executives always overlook?
2 Identify the customer(s) of primary concern and the product or service targeted for improvement.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>List all external customers currently using the system or process identified in Step 1. Be specific.</td>
<td>The process owner described the &quot;AL&quot; drug testing system as shown below. Please note that it consists of a number of processes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Receive Samples</th>
<th>Initial Processing</th>
<th>RIA Screen</th>
<th>RIA Repeat On Positives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7 Days 1-7 Days</td>
<td>2-8 Hrs 2-8 Hrs</td>
<td>4-8 Hrs 4-8 Hrs</td>
<td>2-4 Hrs 2-4 Hrs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What does each of these customers expect in the way of products/services? Do all customers expect exactly the same &quot;thing&quot;?</th>
<th>7-20 Days 7-20 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE: The last two process steps seem to offer the greatest potential for &quot;reducing cycle time.&quot; But remember, the Quality Council defined the problem in terms of &quot;samples/month.&quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Days</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-7 Days</td>
<td>8-12 Hrs</td>
</tr>
<tr>
<td>8 Hr-10 Days</td>
<td>AF Form 1890 On Positives</td>
</tr>
<tr>
<td>Prepare AF Form 1890</td>
<td>GC/MS Repeat On Positives</td>
</tr>
</tbody>
</table>

Describe the process used to deliver this product/service using a flow chart with no more than 5-10 process steps; macro-flow charting, if you will.

The only external customers are the Air Force and Marines at 15,000 and 5,000 samples per month, respectively. Monthly workloads range from 17,000-25,000 samples. Two Marine bases account for 80% of Marine samples. Over 100 Air Force installations submit samples to the Laboratory.

CAUTION: There is a tendency at this stage to try and define/solve the problem. But we are still attempting to identify the process we are going to propose to the Quality Council for improvement. Focus on process, not problem.
Hints

Who is the process owner for this process? Did you involve him/her in this step?

Who on the Quality Council does the process owner ultimately report to? If no one, you have a serious problem.

Consider which external customer you might invite to "sit" on your process improvement team.
Select team members; develop a Team "mission statement;" negotiate and develop a Team Charter with the Quality Council.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on what you discovered in Step 2, who should be on the team? Will you attempt to improve all of the steps on the macro-flow chart, or will you focus on those few steps with the greatest potential for improvement?</td>
<td>Lets assume that the Quality Council, appropriate Director and process owner all agree to focus on the last two steps identified on the &quot;macro&quot; flow chart. How are team members identified? Simply stated, the process owner must map the process to a finer level of detail, and in so doing, identify key players in the process. The people who do the work are the best qualified to improve the process, if they are trained and empowered.</td>
</tr>
<tr>
<td>Are the supervisors of potential team members aware that this process is under review? Do they understand that senior management is sponsoring the effort?</td>
<td></td>
</tr>
<tr>
<td>Do team members have time to spend 1-2 hours per week in team activity? How will they get their other work done? Note: this team could function for 6-12 months.</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION: The team should be kept small (5-10 people). Team members need training in group dynamics and quality tools before being asked to negotiate a team charter with the Quality Council. Quality takes time.

CAUTION: The team should be kept small (5-10 people). Team members need training in group dynamics and quality tools before being asked to negotiate a team charter with the Quality Council. Quality takes time.
Does the process owner know the detailed process well enough to recommend team members? If not, find someone who can.

Which members of the Quality Council are stakeholders of the process to be improved? What restrictions or limits might they place on your improvement efforts? Why?

Which team members will negotiate the team charter with the Quality Council? Why not all of them? When? Where? How long will it take? How polished should it be?
Describe specific characteristics of the "improvement opportunity" from as many perspectives as possible.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historically, what kind of performance has this process been able to deliver? Plot the data on a run chart or control chart.</td>
<td></td>
</tr>
</tbody>
</table>

"Skilled original investigators and private detectives always use a common technique: they thoroughly investigate the site of the crime before they do anything else. They obtain clues from the site on which to base their hunt for the perpetrator, and gradually tighten the noose around the suspect. If the investigator does not thoroughly appreciate the situation where the crime was committed before starting the search, he will not only fail to find the right person, but may wind up arresting a wholly innocent person. The same is true in problem solving." [Hitoshi Kume in STATISTICAL METHODS FOR QUALITY IMPROVEMENT, 1985.]

From a time perspective, does process variation change from morning to afternoon, day to day, week to week, month to month, seasonally, etc?

\[ \text{XmR Chart For Drug Testing Cycle Time} \]

From a location perspective, does process variation change with different suppliers, how and where product is stored, how product is shipped to the customer, geographic location of the customer, which machines are used to produce it, etc?

CAUTION: The objective of this step is not to discover the causes of the problem in question, but to understand the environment in which the causes have been able to survive and flourish.
**Useful Tools**

<table>
<thead>
<tr>
<th>Control Chart</th>
<th>Run Chart</th>
<th>Check Sheet</th>
<th>Scatter Diagram</th>
<th>Histogram</th>
</tr>
</thead>
</table>

**Hints**

Spend time at the process location and collect information that cannot be put into data form.

From a symptoms perspective, how do "defects" reveal themselves: schedule, cost, appearance, functionality, accuracy, etc?

When the process is working poorly or producing poor results, who is involved in the process and who is not?

Notes & Data
Identify the process that is producing the troublesome symptoms and describe this process in detail.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2 involved a 5-10 step macro-flow chart. Step 3 was approximately twice as detailed. This step should be as detailed as the knowledge of the team members will allow.</td>
<td>Additional work by Team members produced the following, more detailed flow chart.</td>
</tr>
</tbody>
</table>

Prior to flow charting, simply list every known step in the process. Don’t worry about “wiring” the steps together until you have a fairly complete list.

Use "POST-IT NOTES" to record individual process steps and then arrange these slips of paper in a flow chart format on the wall.

CAUTION: This is not a trivial exercise. The extent of process improvement is directly related to the team’s intimate knowledge of the process they are improving. Ultimately, suggested improvements are driven by in-depth understanding of process.
Hints

Subdivide the process flow charting task by assigning team members to those aspects of the process they know best. Then bring the team back together to construct the composite process flow chart.

Notes & Data

Invite non-team members to review and critique the process flow chart.

It is often useful to “Pareto,” by category, how total process time is consumed by a process: operations, delays, movement, inspection, decision-making, and filing.
6

**Identify key parameters for measuring customer satisfaction; establish targets for improvement whenever possible.**

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which parameters are most important to the external customer?</td>
<td>POSSIBLE TARGETS: Step 2 revealed an average monthly load of 20,000 samples. A 25% increase in productivity would increase capacity to 25,000; a level encountered during peak workloads. If base closings double the workload, a mere cycle time improvement of 20-50% will be inadequate. Most importantly, until we get this process under statistical control we don't really know what it is capable of delivering.</td>
</tr>
</tbody>
</table>

Which process steps are most likely to positively influence these external, macro-measures of customer satisfaction?  

Consider these possible measures of customer satisfaction:  
- cost  
- on-time delivery  
- productivity  
- safety  
- technological superiority  
- cycle time  

**Key Parameters of Customer Satisfaction**

CAUTION: Ultimate success must be measured in customer terms. Make sure the parameters you track and improve are customer driven, not Quality Council driven. Customer agendas are usually straightforward; internal agendas can become distorted.
Hints

Can the Quality Council or process owner estimate how much process improvement is required or anticipated?

Have you realistically evaluated this process on its ability to meet or exceed key parameters of interest to the customer?

Notes & Data

Should your team's "target" improvement goals exceed the customer's expectations rather than just meet them?
Identify the probable causes of, or barriers to, process improvement.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hints</strong></td>
<td><strong>Example</strong></td>
</tr>
<tr>
<td>What are the possible causes leading to the symptoms identified in Step 4?</td>
<td>Using the Nominal Group Technique the Team identified the four most likely causes of inadequate &quot;cycle times&quot; in each of four categories: manpower, methods, machines and facilities. The resulting &quot;cause and effect diagram&quot; is shown below.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manpower</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understaffed</td>
<td>Insufficient Training</td>
</tr>
<tr>
<td>1 Shift</td>
<td>Boring</td>
</tr>
<tr>
<td>Untrained</td>
<td>Complex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>Machines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken</td>
<td>Many Models</td>
</tr>
<tr>
<td>Storage Space</td>
<td>Too Few</td>
</tr>
<tr>
<td>Too Small</td>
<td>Calibration</td>
</tr>
<tr>
<td>Too Few</td>
<td>Old</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Turnover</th>
<th>Positives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient Training</td>
<td>Complex</td>
</tr>
</tbody>
</table>

CAUTION: You will identify ten times more "probable causes" than you can ever hope to investigate. While brainstorming for ideas go for quantity. But once you have a list of probable causes, tap the knowledge of your best people to identify the one or two which promise the greatest potential for improvement. In short, you can't investigate everything so choose wisely that which you will study.

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Hints

Make sure you invite non-team members who work in the process constantly to offer their suggestions. Why not invite them to brainstorm their ideas on the matter.

If a given process step is on the flow chart because the step is supposedly required by policy or regulation, confirm the truth or inaccuracy of such a requirement.

Notes & Data

Are problems arising because the process is unnecessarily complex?
Verify root causes of the problem with data.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect data on the probable causes identified in Step 7. Does your team know enough about variation and measurement to detect a root cause in a data set if it's there?</td>
<td>HYPOTHESIS: One possible cause of long cycle times is the detection of a &quot;positive&quot; in a &quot;lot&quot; of samples from a customer. We want to test the hypothesis that the presence of a &quot;positive&quot; result increases the time required to process the &quot;lot&quot; containing said &quot;positive.&quot; The following 30 &quot;lots&quot; of data were tabulated to test this possible &quot;cause and effect&quot; relationship.</td>
</tr>
<tr>
<td>Will senior management be convinced that a root cause has been identified if they review your data and method of analysis?</td>
<td>One or More Positives Per &quot;Lot&quot;</td>
</tr>
<tr>
<td>Once root causes have been verified, does team membership need to be changed in the interest of team effectiveness?</td>
<td>Yes</td>
</tr>
<tr>
<td>Time To Process &quot;Lot&quot;</td>
<td>8</td>
</tr>
<tr>
<td>20 + days</td>
<td>1</td>
</tr>
<tr>
<td>The calculated Chi-square value of 17.9 exceeds the critical value of 3.84 at 95% confidence: the presence of one or more &quot;positives&quot; in a &quot;lot&quot; has a definite effect on total processing time for said lot.</td>
<td></td>
</tr>
<tr>
<td>CAUTION: Three points! Avoid making decisions on main causes by voting. Voting is a democratic process but it may lead to incorrect conclusions. Secondly, have some number crunching skill on your team; you'll need it. But most importantly, once you've identified a root cause consider carefully how you are going to fix it?</td>
<td></td>
</tr>
</tbody>
</table>
Useful Tools

Hints

How would you know if someone was providing the team "false" data out of fear, ignorance or malice? How could you request data in a less threatening or invasive way?

Notes & Data

In the process of verifying root causes have you uncovered additional root causes? Are they significant enough to pursue? Does the rest of the team know of them?

Ask non-team members what kinds of data they would collect to verify a given root cause.
Identify and prioritize possible solutions; select the best alternative.

**Hints**

Have you asked the person who initially proposed the cause and effect relationship if they have a possible solution?

Use "divergent" thinking to ensure the team looks at a number of alternatives, not just the first solution that comes to mind.

Ask non-team members who actually do the work what they might propose.

**Example**

ISSUE: A "positive" during drug testing of a "lot" of samples increases processing time. How can we eliminate the delays caused by "positives?"

- **Manpower**
  - Have "Retest"
  - Analyst On Call

- **Method**
  - Report + and - Separately To The Customer
  - Improve Storage & Retrieval of Samples

- **Materials**

- **Machines**
  - Reserve 1 Machine For Retests Only

**CAUTION:** The major concern here is similar to the "caution" given in Step 7; you will probably have more possible solutions than you could ever test. So pick carefully. If you are careless you might work on a solution that yields a 10% improvement while one of the "untested" solutions is capable of 1,000% improvement. And you'll never know how close you really were.
**Hints**

As in Step 7, search for solutions in the areas of manpower, machines, materials, facilities, methods, etc.

Consider using the pairwise-ranking approach to selecting among alternatives if your choices are few.

**Notes & Data**

What does the process owner suggest in the way of solutions? How about the Quality Council?
Develop and implement solution(s) on a small scale.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognize the difference between steps taken to cure the symptoms (reworking a defect) and actions taken to eliminate the causal factors (improving the process).</td>
<td>The team decides to implement the plan outlined below. The purpose of the test is to determine if drug testing cycle time can be reduced significantly by reporting results on “positives” separately from the bulk of the “negatives” in a given “lot.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Air Force Test Site</td>
<td></td>
</tr>
<tr>
<td>Select Marine Test Site</td>
<td></td>
</tr>
<tr>
<td>Advise Customer Of Test</td>
<td></td>
</tr>
<tr>
<td>Set Test Dates</td>
<td></td>
</tr>
<tr>
<td>Collect Data</td>
<td></td>
</tr>
<tr>
<td>Analyze Data</td>
<td></td>
</tr>
<tr>
<td>Improvement ?</td>
<td></td>
</tr>
<tr>
<td>Report Results To Council</td>
<td></td>
</tr>
<tr>
<td>Report Findings To Customers</td>
<td></td>
</tr>
</tbody>
</table>

Many times there are multiple, interdependent causes for a given effect. Before accumulating information try to design a data collection strategy that will unambiguously align solutions with causes and causes with effects.

CAUTION: Is the implementation plan robust enough to prevent the occurrence of the Hawthorne effect; spurious improvements because people are being watched?
Useful Tools

| Gantt Chart | PERT Chart | Critical Path Method |

**Hints**

As you prepare an implementation plan to test the merits of your proposed solution, ask the "5 Why's and 1 How" to clearly specify who will do what, where, when, why and how. Produce a schedule of key milestones.

If multiple solutions are to be tested at the same time, schedule them in such a way that you can tell which actions produce results and which do not.

**Notes & Data**

During implementation, check to make sure the plan unfolds as scheduled. If it doesn’t, find out what has changed and take corrective action as required.
Evaluate and confirm improvement to the process.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the results meet the targets initially set for improving this process?</td>
<td>The Team executes the plan outlined in the previous step, and observes the following results.</td>
</tr>
<tr>
<td>Was the purpose of this activity to influence the process average, reduce process variability, or both? Which, if any, occurred?</td>
<td></td>
</tr>
<tr>
<td>What intangible benefits resulted from this process improvement activity?</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION: Everyone perceives improvement in their own relative terms. Make sure that your external customer believes any "claimed" improvement is real and significant. It doesn't really matter what the Quality Council or process owner think about the extent of improvement; perception is reality to the customer.
Useful Tools

Hints

How well was the plan executed?
What would you do differently next time?

Can you document the benefits of this action in dollars & cents, increased quality, improved safety, etc?

Notes & Data

What did the team learn about the process of continuous improvement?
Standardize the process improvements.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>What does the new process look like? How does it differ from the flow chart developed in Step 5?</td>
<td>The following flow chart is the revised drug testing process which led to the improvements confirmed in Step 11.</td>
</tr>
<tr>
<td>It is the endurance of the improved results that makes them meaningful. How are you going to ensure the improvements last?</td>
<td></td>
</tr>
<tr>
<td>How and when will all employees affected by these process changes be trained in the new way of doing their jobs?</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION: Change is always difficult, especially when it affects us personally. No matter how great you think this improvement is, the workers whose lives are affected by it, but who were not on the Team, probably do not see it as positively as you do. Help them to understand what's in it for them.
Do all of the major stakeholders like your proposed process changes? Don't standardize a process change that is offensive to any stakeholders; especially the external customer.

Do you intend to collect data on the new process to ensure it doesn't degrade? How often will you check? Who will collect and analyze the data? How long will you continue to monitor it?

Have you considered empowering the workers to track the indicators and record the data necessary to keep the process "in control?"
Celebrate team success !!!

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has the Team created a story board that captures the essence of their success in simple, graphic, data-based terms?</td>
<td><img src="image1" alt="Example" /></td>
</tr>
<tr>
<td>Has the Team been given the opportunity to explain their success to the senior leadership of the Laboratory, Product Center, or Command?</td>
<td><img src="image2" alt="Example" /></td>
</tr>
<tr>
<td>What form of concrete, physical recognition will team members be able to look at a year from now to remember their success and show to others?</td>
<td><img src="image3" alt="Example" /></td>
</tr>
</tbody>
</table>

CAUTION: When recognizing teams, there is a tendency to want to shake hands, say "thanks," hand out tee-shirts and mugs, and get back to work. Make it a big deal. Celebrate long and hard in as many ways as you know how. These people have spent a better part of a year trying to improve things. They deserve it.
### Useful Tools

| Party | Recognition | Celebration | Recognition | Party |

### Hints

How can you involve the families and co-workers of the Team members in the celebration activities?

What additional TQL training can you provide select Team members as a form of recognition/reward?

Is there some way in which the external customer can participate in celebrating with the Team?
Anticipate and plan future improvements.

<table>
<thead>
<tr>
<th>Hints</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is not a good idea to focus on the same activity for too long. If the original time limit has been reached and the Team has not yet reached its original objectives, consider redefining the scope of their activities to ensure a timely conclusion of their work.</td>
<td>So where does one go from here?</td>
</tr>
</tbody>
</table>

Did the Team uncover any systemic problems that might be plaguing other groups? Could these groups benefit by reviewing what this Team learned?

During executive briefings has the Team provided senior management with a list of important problems yet to be addressed?

CAUTION: As noted previously, there are problems everywhere, large and small. There will be a tendency for this Team to want to solve the other problems they've discovered during their journey. It is important that they close out this activity completely before starting another, and that they negotiate permission to perform additional "team" work with the Quality Council. Only the Quality Council should be chartering process improvement activities. Why? Read Step 1 again!
How do you intend to share your "lessons learned" with others?

Team members have learned some valuable lessons during this activity. That knowledge is too important to waste. Maximize its value by ensuring that the original team members work on different teams in the future. Don't simply reform the old team because it worked well.

Some Team members may need a break between team assignments to catch their breath. You can have too much of a good thing.
Attachment 2.1 - Customer Identification

When Prepared:  Analytical Services Customers - Aug 92
                   FY92 Customers by Command - Oct 92

Need/Purpose:  To identify the customers and examine their impact on our organization

How:  Analytical Services Customers - Developed through database search.
       FY92 Customers by Command - Designed with data management information system.
ANALYTICAL SERVICES CUSTOMERS

OE DIVISIONS
COMMAND BIOENVIRONMENTAL ENGINEERS
BASE BIOENVIRONMENTAL ENGINEERS
COMMAND CIVIL ENGINEERS
BASE CIVIL ENGINEERS
BASE ENVIRONMENTAL MANAGEMENT GROUPS
OTHER DOD AGENCIES
FEDERAL/STATE/PRIVATE AGENCIES
FY92 Customers By Command
74,816 Samples
Attachment 2.2A - Tools Used to Survey Customers

When Prepared: Environmental Sample Analysis Questionnaire - 20 Nov 92

Need/Purpose: Team needed to know customer's desires of services provided. With this knowledge these key desire areas could be focused on by the PIT group.

How: Questionnaire developed with guidance from Deputy Director of OE Directorate.
FROM: AL/OE  
2402 E DR  
BROOKS AFB TX 78235-5114  

SUBJ: Environmental Sample Analysis Questionnaire  

TO: See Distribution List  

1. We previously announced a Symposium on Environmental Analytical Laboratory Efficiency will be held 30 Nov-2 Dec 92 at Brooks AFB TX. Your organization has been identified as providing analytical services for a sector of the Air Force's environmental samples. At attachment 1 you will find a copy of the questionnaire. Request you complete and telefax to us at DSN 240-2025 by 27 Nov 92.

2. At attachment 2 is a copy of the draft agenda, some minor changes may occur between now and the symposium. The billeting arrangements must be made by the traveler (see atch 3); transportation will be provided from the hotel to Brooks AFB.

ERIK K. VERMULEN  
Deputy Director, Occupational and Environmental Health Directorate  

3 Atch  
1. Questionnaire (Laboratory)  
2. Agenda  
3. Billeting/Transportation Information
QUESTIONNAIRE

ENVIRONMENTAL LABORATORY WORKLOAD

AND

OPERATIONAL COST DATA

PURPOSE OF QUESTIONNAIRE: This questionnaire has been prepared to gather workload and operational cost data on Air Force environmental testing laboratories. These data are required to respond to a Congressional mandate for the Department of Defense to provide, as part of the FY94 Budget Request, "a complete construction, support cost, contractor cost and personnel breakout, by component and installation, of all spending associated with the operation and maintenance of all laboratories with current or potential environmental analysis capabilities."

POINT OF CONTACT: If you have questions pertaining to the information being sought or need help in filling out this questionnaire, call:

DSN __________________ Comm __________________

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QUESTIONNAIRE

PART I - GENERAL INFORMATION

1. OFFICIAL NAME OF LABORATORY:

2. OFFICE SYMBOL/CODE:

3. NAME OF LABORATORY POINTS OF CONTACT:
   LABORATORY DIRECTOR
   QUALITY ASSURANCE DIRECTOR

4. PHONE NUMBER: FAX NUMBER:
   DSN COMM   DSN COMM

5. PARENT ORGANIZATION NAME, OFFICE SYMBOL & ADDRESS:

6. PARENT COMMAND:

7. COMPLETE MAILING/CORRESPONDENCE ADDRESS:

8. SAMPLE SHIPMENT AND/OR STREET ADDRESS (IF DIFFERENT FROM MAILING ADDRESS):
PART I - GENERAL INFORMATION (continued)

9. YEAR THAT LABORATORY BECAME (OR WILL BECOME) OPERATIONAL
   (for environmental testing): _____

10. NUMBER OF LABORATORY SHIFTS: 1 | 2 | 3

11. HOURS OF OPERATION:
   1ST SHIFT AM - PM
   2ND SHIFT PM - PM
   3RD SHIFT PM - AM

12. FACILITY INFORMATION:

   YEAR CONSTRUCTED: _____
   YEAR OF LATEST MODIFICATION/RENOVATION: _____
   FACILITY SIZE: [Only include space used for or in support of
   analytical (direct testing) work or occupied by personnel
   directly supporting the analytical laboratory mission. Include the
   following areas: chemical/material storage rooms; sample
   receipt/storage areas; LIMS data control/computer room;
   and utility/heating/cooling system rooms; hallways;
   restrooms; personnel break areas.]

   TOTAL FACILITY: ____________________________ SQ FT
   ANALYTICAL SPACE: _________________________ SQ FT
   ADMINISTRATIVE/OFFICE SPACE: ____________________________ SQ FT

   ENVIRONMENTAL MISSION:
   ANALYTICAL SPACE: _________________________ SQ FT
   ADMINISTRATIVE/OFFICE SPACE: ____________________________ SQ FT

13. LABORATORY TEST EQUIPMENT:

   What is the total value of ALL ACCOUNTABLE equipment used to
   perform (and support) the laboratory environmental testing
   mission? [Data can be obtained from the Custodian Authorization/Receipt Products List (CA/CRL)]

   What is the total value of ALL CAPITAL equipment (items costing $15,000 or more) used to perform (and support) the
   laboratory environmental testing mission? [Data can be obtained from the Custodian Authorization/Receipt Products List (CA/CRL)]

   Please furnish a current copy of your CA/CRL along with the completed questionnaire.
PART II - LABORATORY MISSION/WORKLOAD INFORMATION

1. What is the mission(s) of the analytical laboratory? Please check all appropriate blocks.

□ Medical (Industrial Hygiene/Occupational Health)
□ Medical (Clinical)
□ Environmental Compliance (SDWA/RCRA/TSCA/CWA/CAA, etc.)
□ Environmental Restoration (IRP/CERCLA)
□ QA/QC (Industrial Processes)
□ QA/QC (Fuels/Lubes, Propellants, Chemicals)
□ Other: ____________________________
□ Other: ____________________________

2. SAMPLE WORKLOAD: [A "sample" is defined as a product, material, or substance (either natural matrix or man-made) submitted to a laboratory for testing and identified with a unique customer (i.e., field) control number. Multiple containers of the same matrix which are submitted to comply with the containerization and preservation requirements of various analytical methods DO NOT constitute separate "samples" for the purposes of this tabulation, even when assigned separate laboratory control numbers.]

TOTAL NUMBER OF SAMPLES RECEIVED (ALL MISSIONS):

<table>
<thead>
<tr>
<th>Year</th>
<th>FY92</th>
<th>FY91</th>
<th>FY90</th>
<th>FY89</th>
</tr>
</thead>
</table>

TOTAL NUMBER OF ENVIRONMENTAL COMPLIANCE SAMPLES RECEIVED:

<table>
<thead>
<tr>
<th>Year</th>
<th>FY92</th>
<th>FY91</th>
<th>FY90</th>
<th>FY89</th>
</tr>
</thead>
</table>

TOTAL NUMBER OF ENVIRONMENTAL RESTORATION SAMPLES RECEIVED:

<table>
<thead>
<tr>
<th>Year</th>
<th>FY92</th>
<th>FY91</th>
<th>FY90</th>
<th>FY89</th>
</tr>
</thead>
</table>
3. **FY92 ENVIRONMENTAL TEST/ANALYSIS WORKLOAD:** [A "test" or "analysis" is defined as a laboratory procedure performed in accordance with a documented analytical method for the purpose of determining specific constituents in a sample or the physical and chemical properties of the sample (see definition of sample above)]

<table>
<thead>
<tr>
<th>ENVIRONMENTAL TEST CATEGORY</th>
<th>NUMBER OF TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Properties (Water &amp; Wastewater)</td>
<td></td>
</tr>
<tr>
<td>Inorganic Water Quality, Non-Metals</td>
<td></td>
</tr>
<tr>
<td>Inorganic Water Quality, Metals</td>
<td></td>
</tr>
<tr>
<td>General Screening Tests for Organics (Aggregate) in Water &amp; Wastewater</td>
<td></td>
</tr>
<tr>
<td>Organics in Water &amp; Wastewater</td>
<td></td>
</tr>
<tr>
<td>Radioactivity in Water</td>
<td></td>
</tr>
<tr>
<td>Biological Examination of Water</td>
<td></td>
</tr>
<tr>
<td>Microbiological Examination of Water</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Characterization, Metals</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Characterization, Organics</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Characterization, Radioactivity</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Characterization, Physical Properties, Inorganics, Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Site Characterization, Metals</td>
<td></td>
</tr>
<tr>
<td>Site Characterization, Organics</td>
<td></td>
</tr>
<tr>
<td>Site Characterization, Radioactivity</td>
<td></td>
</tr>
<tr>
<td>Site Characterization, Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Asbestos</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL NUMBER OF ENVIRONMENTAL TESTS/ANALYSES PERFORMED IN FY92:**

79
PART III - PERSONNEL INFORMATION

1. TOTAL NUMBER OF LABORATORY PERSONNEL (ALL MISSIONS):
   MILITARY: _____ CIVILIAN: _____

2. TOTAL NUMBER OF PERSONNEL SUPPORTING ENVIRONMENTAL MISSION:
   MILITARY: _____ CIVILIAN: _____

3. ORGANIZATIONAL STRUCTURE SUPPORTING ENVIRONMENTAL MISSION:
   A. TOTAL NUMBER OF SUPERVISORS: _____
      GRADE/RANK | NUMBER
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________

   B. TOTAL NUMBER OF ADMINISTRATIVE/SUPPORT PERSONNEL: _____
      GRADE/RANK | NUMBER
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________

   C. TOTAL NUMBER OF DIRECT LABORATORY PERSONNEL: _____ **
      GRADE/RANK | NUMBER
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________
      ________ | ________

   **ONLY INCLUDE CHEMISTS/TECHNICIANS WITH "HANDS-ON" INVOLVEMENT IN ENVIRONMENTAL ANALYSIS; DO NOT INCLUDE QUALITY ASSURANCE PERSONNEL IN THIS CATEGORY.
PART III - PERSONNEL INFORMATION (continued)

3. (continued)

D. TOTAL NUMBER OF QUALITY ASSURANCE PERSONNEL:

<table>
<thead>
<tr>
<th>GRADE/RANK</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E. TOTAL NUMBER OF OTHER PERSONNEL (IF APPLICABLE):

<table>
<thead>
<tr>
<th>GRADE/RANK</th>
<th>NUMBER</th>
<th>BRIEF STATEMENT OF DUTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
PART IV - COST OF LABORATORY OPERATIONS

1. Within which Major Force Programs (MFP) do your laboratory testing operations fall? List all applicable MFPs and the percentage of total laboratory funding applicable to each:

<table>
<thead>
<tr>
<th>MFP</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP</td>
<td></td>
</tr>
<tr>
<td>MFP</td>
<td></td>
</tr>
<tr>
<td>MFP</td>
<td></td>
</tr>
</tbody>
</table>

Which of the above MFPs covers environmental testing? ____

2. Provide FY92 data on total laboratory expenditures (all missions and all MFPs) for the following: [Round values to the nearest $100]

<table>
<thead>
<tr>
<th>EXPENSE CATEGORY</th>
<th>EEIC</th>
<th>DOLLARS SPENT, FY92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials/Supplies</td>
<td>6XX</td>
<td>$__________</td>
</tr>
<tr>
<td>Equipment Maintenance/Repair</td>
<td>569</td>
<td>$__________</td>
</tr>
<tr>
<td>Small Equipment Items</td>
<td>628</td>
<td>$__________</td>
</tr>
<tr>
<td>Utilities</td>
<td></td>
<td>$__________</td>
</tr>
<tr>
<td>Travel (non-training)</td>
<td>40X</td>
<td>$__________</td>
</tr>
<tr>
<td>Lab Certification Fees</td>
<td></td>
<td>$__________</td>
</tr>
<tr>
<td>Overtime Pay</td>
<td>391</td>
<td>$__________</td>
</tr>
<tr>
<td>Petty Cash</td>
<td>619</td>
<td>$__________</td>
</tr>
<tr>
<td>Training (course fees plus travel)</td>
<td></td>
<td>$__________</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td>$__________</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td>$__________</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td>$__________</td>
</tr>
</tbody>
</table>

TOTAL FY92 EXPENDITURES FOR LABORATORY OPERATIONS $__________
3. Does the laboratory directly pay (out of its operational fund) the Permanent Change of Station (PCS) expenses associated with moving civilian personnel within your laboratory organization or when hiring them from other Air Force or Federal agencies or from the private sector?

|   | Yes | No |
---|-----|----|
☐ |     |    |

If above answer is "Yes," how many such movements or hires typically occur (on the average) each year? ____________.

4. Does the laboratory pay (out of its operational budget) for contractors (or contractor personnel) to test a portion of the samples received in the laboratory? DO NOT include samples sent to a contract laboratory where analyses are paid for by the customer using mechanisms such as MIPRs.

|   | YES | NO |
---|-----|----|
☐ |     |    |

Are these contractor services provided on-site at the government laboratory facility?

|   | YES | NO |
---|-----|----|
☐ |     |    |

What is the annual cost of these contract services? $__________.

What percentage of the total laboratory workload is analyzed by contract or contractor personnel? __________________.
PART V - OTHER INFORMATION

1. Please list your laboratory certifications:

<table>
<thead>
<tr>
<th>REGULATORY PROGRAM*</th>
<th>CERTIFYING AGENCY</th>
<th>CERTIFIED ANALYTES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

* e.g. Drinking Water (SDWA), NPDES, etc.
Attachment 2.3A - Customer Satisfaction Data

When Prepared: Key parameters for measuring customer satisfaction: Dec 92

Need/Purpose: To find customer’s key desires on our services provided.

How: Team discussed customer feedback and matrix prioritization data, listed customer desires in order of priority. Team used this valuable information in zeroing in on improvements that would satisfy customers the most.
KEY PARAMETERS FOR MEASURING CUSTOMER SATISFACTION

1. FAST ANALYSIS TURNAROUND TIMES
2. CAPABILITY TO PROVIDE EMERGENCY ANALYSES
3. RESULTS TO SATISFY STATE AND FEDERAL REGULATIONS
4. ON THE SPOT TELEPHONE CONSULTATIVE HELP
5. QUICK LAB RESPONSE TO CHANGING REGULATIONS
6. ANALYSIS METHOD DEVELOPMENT FOR SPECIAL STUDIES
7. QUALITY OF RESULTS

*CUSTOMER SURVEY AT LAB CONSOLIDATION MEETING 30 NOV-2 DEC 1992
Attachment 2.4A - Flow Chart and Study of Analytical Chemistry Processing Steps in the Laboratory

When Prepared: June 1992

How: Dr Cupello and Mr Thomas made a detailed tour of the Division. They brainstormed together and came up with the flow chart.

From actual times for each process stored in the Lab’s Information Management System, Box and Whisker Diagram for 1 Jan - 2 Jun 92 data was developed. This showed times required for each process step.

Analysis times were also stored in the Laboratory Information Management System. Each analysis function, 1-11, was broken down and plotted. The Box and Whisker Diagrams show analysis turnaround times.

Make Note Of: See chart for functions represented by 1-11. SRF is short for Sample Request Forms. LAB/UX is Laboratory Information Management System.
PROCESS STEPS

Samples Collected -> Samples Received -> SRF Logged -> Worksheets Generated
Worksheet Sorted by Function -> Samples, SRF, etc. to Function

Shipping <- Log-in <- Analysis

Function 1 2 3 4 5 6 7 8 9 10 11

Analyze Sample -> Generate Lab/UX Report
Lab/UX to Function -> Lab/UX to Function

Report to Customer

Reporting <- Verification <- Mail
<table>
<thead>
<tr>
<th>CODE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metals</td>
</tr>
<tr>
<td>2</td>
<td>Industrial Hygiene</td>
</tr>
<tr>
<td>3</td>
<td>GC/MS</td>
</tr>
<tr>
<td>4</td>
<td>Pesticides</td>
</tr>
<tr>
<td>5</td>
<td>Volatile Organics</td>
</tr>
<tr>
<td>6</td>
<td>Inorganics</td>
</tr>
<tr>
<td>7</td>
<td>Bulk Asbestos</td>
</tr>
<tr>
<td>8</td>
<td>Air Asbestos</td>
</tr>
<tr>
<td>9</td>
<td>Air Particulates</td>
</tr>
<tr>
<td>10</td>
<td>Commercial Products</td>
</tr>
<tr>
<td>11</td>
<td>Haz/Tox</td>
</tr>
</tbody>
</table>
\( \diamond = \text{median} \quad \text{whisker} = 10-90\text{th percentile} \)
\( \text{box} = 25-75\text{th percentile} \)

**PROCESS STEP**

- Shipping
- Log-in Procedure
- Analysis
- Reporting Procedure
- Verify
- Mail
Attachment 2.6 - Evaluation of Process Performance

When Prepared: Control Charts/Scatter Diagrams - Sep/Oct 92

Need/Purpose: By looking at historical performance records, the areas of "improvement opportunities" will become evident

How:

Samples Received: Control Charts showed two year record of incoming samples, listing variances and yearly means.

Analysis Turnaround Times: Control Charts were developed for functional analysis areas, showing variance in analysis times and overall means.

Scatter Diagrams: Used to compare analysis time verus analyses requested.

Pareto Chart: Looked at top workload drivers in each analysis function.

These charts were developed by team members from LAB/UX data and discussed/analyzed at our meetings. These data charts helped us better understand the process and it's problems.
OEA WEEKLY SAMPLES RECEIVED 1991-1992
All Functions Combined (In-House)
OEA WEEKLY SAMPLES RECEIVED 1991-1992
All Functions Combined (Total)
OEA WEEKLY TURNAROUND TIME

Function 1: Metals (Total)

Turnaround Time (days)

UCL 57.83656
UCL 36.176001
LCL 14.51944

Turnaround Time (days)

UCL 38.84673
22.637955
LCL 6.42918
OEA WEEKLY TURNAROUND TIME
Function 4: Pesticides (Total)
# Pareto Chart of Analyses Performed by 11 OEA Functions

Jan 1992 thru June 1992

(top 3 per function)

<table>
<thead>
<tr>
<th>Function</th>
<th># of analyses</th>
<th>total # for function</th>
<th>top 3 as % offcn total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. HAZ/TOX *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lead</td>
<td>1489</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chromium</td>
<td>1405</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cadmium</td>
<td>1378</td>
<td>45591</td>
<td>9.4%</td>
</tr>
<tr>
<td>2. METALS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lead</td>
<td>6603</td>
<td></td>
<td></td>
</tr>
<tr>
<td>copper</td>
<td>2995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chromium</td>
<td>2686</td>
<td>33861</td>
<td>36.3%</td>
</tr>
<tr>
<td>3. PESTICIDES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aroclor 1016</td>
<td>2245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aroclor 1232</td>
<td>2244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aroclor 1242</td>
<td>2244</td>
<td>34958</td>
<td>19.3%</td>
</tr>
<tr>
<td>4. AIR ASBESTOS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asbestos</td>
<td>2550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fiberglass</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEM analysis</td>
<td>1</td>
<td>2553</td>
<td>100.0%</td>
</tr>
<tr>
<td>5. BULK ASBESTOS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asbestos</td>
<td>2033</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chrysotile asbestos</td>
<td>230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>amosite asbestos</td>
<td>85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. INORGANICS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oil and grease</td>
<td>1900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chem oxygen demand</td>
<td>1047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>phenol</td>
<td>1027</td>
<td>16120</td>
<td>21.9%</td>
</tr>
<tr>
<td>7. VOLATILE ORGANICS *</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1,4-dichlorobenzene</td>
<td>1588</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chlorobenzene</td>
<td>1510</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,2-dichlorobenzene</td>
<td>1498</td>
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<td></td>
</tr>
<tr>
<td>55971</td>
<td>8.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. AIR PARTICULATES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nuisance partic.</td>
<td>1021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>silica</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>carbon black</td>
<td>48</td>
<td>1193</td>
<td>94.0%</td>
</tr>
<tr>
<td>9. INDUSTRIAL HYGIENE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>naphthas</td>
<td>848</td>
<td></td>
<td></td>
</tr>
<tr>
<td>benzene</td>
<td>647</td>
<td></td>
<td></td>
</tr>
<tr>
<td>toluene</td>
<td>599</td>
<td>8152</td>
<td>25.7%</td>
</tr>
<tr>
<td>10. COMMERCIAL PRODUCTS</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>major components</td>
<td>179</td>
<td></td>
<td></td>
</tr>
<tr>
<td>carbon dioxide</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>acetylene</td>
<td>45</td>
<td>767</td>
<td>36.0%</td>
</tr>
<tr>
<td>11. GC/MS *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,3-dichlorobenzene</td>
<td>337</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,2-dichlorobenzene</td>
<td>337</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,4-dichlorobenzene</td>
<td>337</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20693</td>
<td>4.9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GRAND TOTAL | 41262 224221 18.4%

* sample size much smaller than desirable using only top 3 analysis per function
Attachment 3.1A - Tools Used To Analyze The Process

**When Prepared:**
- Metals Function Flow Chart-Oct/Nov 92
- Customer Service Flow Chart-Oct/Nov 92
- Pesticide Analysis Flow Chart-Jan 93
- Sample Process Flow Chart-Jul 92

**Need/Purpose:** To educate team members on processes being studied and for identification of bottlenecks.

**How:** The team made a detailed tour of these functions. The flow charts were then developed by utilizing expertise from the functional areas being studied and by group brainstorming.
FLOW CHARTING OF METAL ANALYSIS FUNCTION PROCESS
A1

Initialize Robot

Run Robot 15mnu/Sample

System Failure

Yes: Correct Error

No

Overnight Continued Operation

Yes

Stop Robot

Record Sample Numbers on Paintout

Reload Robot

No

Shut down System

Record Sample Numbers on Paintout

A3
A2
↓
Label Tubes
↓
Tare Tubes
↓
Pipet 100 ml Sample + weigh
↓
Add 9.9 ml isooctane
↓
Add 0.5 ml H2SO4
↓
Vortex 30 sec
↓
Pipet to Auto Sampler Vials
↓
A3

A4

A6
A3

Prepare GC/ECD (System, Flow)

Pipet Standards into Auto sampler (8 Aracneas x 5 conc)

Position Standards + Every 10th position

Transfer prepared samples to GC/ECD

Run GC/ECD 45 min

Label Chromatograms

Examine Chromatograms

Dilution Required

Yes

Make Dilution

No

A5
A5

ARACLOL Present

Yes

Identify ARACLOL

Was ARACLOL Standard Run

Yes

Sum Peaks

Prepare Standard Curve From Summed Stds.

Determine Concentration of Sample From Std Curve

F

Add Proper ARACLOL Standard

ReRun

A6

Sample N.D.
* "\text{SbCl}_5 = \text{Antimon Penta Chloride}"
HPLC with post Column Derivatization FD

Like EPA608
Derivatize with Penta-Hexamethyl-hydrazine
GC/ECD

Prepare C-18 Cartridge
Run 500ml Sample
Elute with Paez Ion Chromatography Reagents
HPLC with PDA Diode Array Detector (DAD)

Paraquat + Diquat absorbs to glass MUST Use silanized glass

B1

C4

B2

C4

B3
C

B4

Prepare C-18 Cartridge

Run 1000 mL Sample

Elute Methanol

HPLC / DAD
C3

- Pipet Standards into Auto Sampler Vials
- Position Standards in Run
- Transfer prepared sample to GC/ECD or GC/NPD
- Run GC/ECD or GC/NPD
- Label Chromatograms
- Examine Chromatograms

- Dilution Required? Yes: Make Dilution
  No: F

C4
C1

Adjust pH < 2

Extract x3 with Diethyl Ether 150mL, 50mL, 50mL

Add NaOH 20mL, pH > 12

Reflux for 90min

Transfer to 60mL Separatory

Extract x3 with Diethyl Ether 40, 20, 20mL

Throwaway Ether extract (Basic)

C2

Day 1

Day 2
Acidity with conc HCl to pH < 2

Extract with Diethyl ether 40, 20, 20 mL

Dry ether extract over Acidified Na₂SO₄

 Concentrate

Methyleate with Diazomethane/Ether

Remove Excess Diazomethane

 Concentrate

Exchange to Iso octane

GC/ECD

C₂
F

Write Results on Worksheet

Work sheets to Sample Control

Logout Samples

Generate Reports

Deliver Reports to Chemists

Review Reports

Reports Valid

Yes

Sign Reports

Dispose of Samples

Deliver Reports to Customer Service

No

Return to Sample Control

Correct Mistake
PROCESS STEPS

Samples Collected -> Samples Received -> SRF Logged

Worksheets Generated -> Worksheet Sorted by Function -> Samples, SRF, etc. to Function

Shipping  Log-in  Analysis

Function 1 2 3 4 5 6 7 8 9 10 11

Analyze Sample -> Generate Lab/UX Report

Lab/UX to Function -> Lab/UX to Function

Report to Customer

Reporting  Verification  Mail
Attachment 3.2A - Process Performance Baseline

When Prepared: Turnaround Time Control Charts -
Sep/Oct 92
Samples Received Control Chart-
Sep/Oct 92

Need/Purpose: To establish a baseline as a reference point
for determining process improvement.

How: The charts were developed using data obtained from
the Analytical Services Division sample database

Make Note Of: Charts are $x$ and $r$
INHOUSE TURN AROUND TIME
FOR SECTION 01 FOR 91

TIME IN DAYS

UCL 102.29278

30.548780

LCL -41.19522

DAYS
INHOUSE TURN AROUND TIME
FOR SECTION 01 FOR 92

TIME IN DAYS

UCL 95.49973

30.329729

LCL -34.84027

DAYS
INHOUSE TURN AROUND TIME
FOR SECTION 04 FOR 91

TIME IN DAYS

DAYS

UCL 104.86961

23.376884

LCL -58.11584
INHOUSE TURN AROUND TIME
FOR SECTION 04 FOR 92

TIME IN DAYS

UCL 104.06569

41.844826

LCL -20.37604

DAYS
Attachment 3.3A - Identification of Potential Areas for Process Improvement

When Prepared: Fishbone Diagram - Dec 92/Jan 93
Laboratory Visit Findings-Feb 93

Need/Purpose: To identify all factors which contribute to overall sample turnaround times.

How: Developed through group brainstorming and employing the function flowchart.

Make Note Of: (L) Large effect on turnaround times
(M) Medium effect on turnaround times
(S) Small effect on turnaround times

Visit Commercial Laboratory-DataChem Inc., and Governmental Occupational Chemistry Laboratory-OSHA in Salt Lake City
SAMPLES RECEIVED FOR FUNCTION 11 BY DAY

Number of Samples Received

Day of Week

Week of Year

0
1
2
3
4
TOPIC: Trip Findings on Salt Lake City Visit of Data Chem, OSHA

I. TURNAROUND TIMES:
   a. TAT God/Expediter on special problems
   b. Drop Unnecessary Certifications
   c. Cut-back on Quality Assurance
   d. Add Penalties to Contractor Non-Performance
   e. Establish Target/Estimated Completion Dates
   f. Multiple Level of Approval?
   g. Screening Tests in Field?
   h. Sample Prep Drives Work, Drives Operation
      20/Organic 17/Inorganic-Personel in Prep
   i. "Hit List"
   j. Break-up Sampling Number System Differently to Slant TATs?
   k. Individual Function Matrices
   m. Coversheet Signature Idea

II. LABORATORY AUTOMATION:
   a. Data Chem on Same Wavelength in Laboratory Automation
      Approach
   b. Bar Coded Refrigerators to Identify Where Samples are
   c. Different Lab Automation Approach Headed by ADPE Person/
      Coordinates with Chemist
   d. AutoRefill for Argon/Nitrogen
   e. Electronic Data Transfer of Results to their Customers!
   f. AutoFax
   g. Centralized Data Collection/LAS into LABUX
   h. Investigate Lease Equipment
   i. Data Chem has Unified Data System-Drives more Training
III. PERSONNEL:

a. Surge Capabilities-Train People in Other Areas, Pull People to Where Needed

b. OSHA-People Going TDY, Need it Stress relief/Reward

c. Data Chem had In-House Electronic Repair Service Person

d. Flexible training Schedule

e. Separate Long term Waste Storage, Separate Group to Dispose of Waste

f. "Bullpen" Idea

g. 5 x More Space, 3-4 x Personnel to do Same Workload

h. Career Ladder Based on Evaluation/ED/Exp. Salary According/KeePs People

i. Samples Receiving for Start-up, Education Driven Program, 2 year after program - paid well, zero turn over of personnel

j. Flex Time at OSHA. Can work 10-12 hrs/day

k. Double Shift in Practice

l. Seven Days a Week Operation

m. Inorganic/Organic Sample Prep Areas

n. Non-Compliance/Problem Samples Handled By loading Dock People

IV. COORDINATION:

a. OSHA Had On-Call Contracts!

b. Chemists/Technicians Went to Get their own Samples

c. Don’t Perform Non-Profit Type Work

d. Control Charts Displayed

e. POC Contact

f. Have Productive Weekly Meetings
V. PIT

a. Very Interested in our PIT Approach—Forecasting Workload

b. All Refrigerators Locked

c. Data Chem—Creative Space utilization

d. Individual Vents for Instruments

e. Hot HNO\textsubscript{3} Wash of Glassware/Stored Glassware with D-H\textsubscript{2}O

f. Established a Voucher System

g. List of Responsibility of Analysts—Posted which Motivates People
Attachment 3.3B - Determination of Most Significant Improvement Opportunities

When Prepared:  Interrelationship Digraph - Feb 93

Need/Purpose:  After identifying areas for improvement, the digraph was used to zero in on areas which would have the biggest impact on the overall process.

How:  The digraph was developed via group brainstorming.

Make Note Of:  Lack of automation, personnel experience and lack of coordination impact the analysis areas over which the PIT has some control.
What are the major issues that might increase cycle time in the Metals function?

- Lack of Coordination
  - In: 0, Out: 3

- Contract Results Review
  - In: 3, Out: 2

- Signs Reports
  - In: 2, Out: 0

- Need for More Space
  - In: 2, Out: 0

- Slow Procurement
  - In: 0, Out: 3

- Lack of Automation
  - In: 0, Out: 3

- Personnel Experience
  - In: 0, Out: 5

- Sample Preparation
  - In: 5, Out: 0

- Final Result Calculations
  - In: 0, Out: 0

- QC Charting
  - In: 0, Out: 0
Attachment 3.5 - Final Statement of the Process to Be Improved

When Prepared: Recommendation of PIT Team - Feb 93

Need/Purpose: To keep staff informed on PIT group progress and findings.

How: Letter issued by Division Chief to Branch Chiefs. The Branch Chiefs held meetings to inform the analysts of the PIT approaches.
FROM: PIT Team

SUBJ: Recommendation of PIT Team

TO: AL/OEA
2402 E Drive
Brooks AFB TX 78235-5114

The PIT Group will zero in on the following areas in order to improve our quality character of decreasing analysis turnaround time:

a. Lack of customer coordination
b. Lack of needed automation
c. Lack of personnel experience

THOMAS C. THOMAS, GM-15
Chief, Analytical Services Division
Attachment 3.6A - Tools Used in Root Cause Analysis

When Prepared: March-April 1993

Need/Purpose: Root causes of major problems had to be identified and verified. If root causes can be fixed, major problems will be solved and the process improved.

How:

Tree Diagrams - The PIT group broke into sub-groups and came up with ideas for tree diagrams. PIT group then met and brainstormed final diagrams.

Make Note Of: Tree Diagrams - 3 Charts
Primarily hardware related:
- Get instruments to capture data
- Get PCs to all personnel
- Send electronic results to field
- Automate QC
- Automated QC-controlled software

Primarily software related:
- Improve Inst Maximized (ICP) logout
- Generate automated worksheets by batch
- Get electronic results from contractors
- Upgrade management reports
- Send electronic results to field
- Sample prep selection
- Have one sample per page
- Eliminate signature block
- Standardize contract form
- Eliminate hand calculations
- Generate automated worksheets by batch
- Eliminate multiple reviews
- Contractors send electronic results to field

Improve automation in OEA

Primarily a procedural or policy issue:
- Standardize contract form
- Eliminate hand calculations
- Generate automated worksheets by batch
- Eliminate multiple reviews
- Contractors send electronic results to field
Attachment 4.3 - Team Action Plans

When Prepared: Direct Data Transfer for Metals - Apr 93
Electronic Mailing of Results - Mar 93
Implementation of Coversheet - Mar 93

Need/Purpose: To establish a schedule for implementing process improvements selected by the team.

How: Interfaced with personnel who would be involved in the implementation to determine time required for each facet of the proposed improvements.

Rating of Root Causes - Matrix diagraming and rating was accomplished by the PIT Group to identify key root causes. The group to voted comparing root causes versus criteria, with majority vote ruling
DIRECT DATA TRANSFER FOR METALS
20 April 1993

PC PORTION

13 Apr - Down loading of data from instrument started.

20 Apr - Data Transfer from instrument to PC and edit capability complete. Review time line.

21 Apr - 1Lt Wheeler tests upload program for user friendliness

22 Apr - Start programming QC features

27 Apr - QC programs complete

28 Apr - Test QC portion

29 Apr - Program upload portion

4 May - Upload portion complete

5 May - Start testing complete system

11 May - System in operation

12 May - Fine tune system

June - Start Manual Entry

Mid-June - Evaluate Manual Entry

July - Implement in other locations in lab

LABUX

13 Apr - Design started for upload program.

20 Apr - 23 Apr - Resolve upload parameters.
IMPLEMENTATION OF ELECTRONIC MAILING OF RESULTS

29 March 93 - Begin initial testing of electronic mailing of results.
   - Four test bases will be: Kelly, Reese, Vandenberg, Andrews.
   - Begin with metal section only.
   - Working group: Long, Oakes, Swartz

19 April 93 - Survey test bases to gauge response to E-Mailing.

3 May 93 - End of initial period in metals function. Group to review feedback.

6 May 93 - Begin testing in multi-functional areas: pesticides, TCLP, metals, volatiles, BC/MS and hazardous waste.
   - Add two bases, Hahn and Robins.
   - Add a "heads up" page to analytical report to inform chemist results can be electronically mailed.

28 June 93 - Survey test bases and chemist to gauge how E-Mail of results are going.
   - Entire team to phone bases

26 July 93 - End of test period.
   - Start establishing E-Mail accounts for all bases.
   Implementers: Swartz, Oakes

Spring 94 - Full implementation of E-Mail results to all customers with E-Mail capability.
IMPLEMENTATION OF COVER SHEET

29 March 93 - Start report cover sheet test in metals sections.
   Working group: Long, Jehl, Oakes

13 April 93 - End of initial test period.
   Report by Long

13 April 93 - Begin testing of report cover letters lab wide.
   Implementation group: Jehl, Wiley, Garland, Long, Oakes,
   function and branch chiefs.

13 May 93 - Test period concluded.
   Report and recommendations by same group.
<table>
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<th>Activity Description</th>
<th>Low Manpower to Implement</th>
<th>Big Reduction of Turnaround Time</th>
<th>High Chance of Success</th>
<th>High Spin-off Potential</th>
<th>Increases Capacity</th>
<th>Short Time to Implement</th>
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SOLUTION RATING FOR LAB AUTOMATION IMPROVEMENTS IN METALS

SIGNATURE COVER SHEET - 4.39

IMPROVE ICP DATA/RESULT LOGOUT PROCEDURE - 4.25
ELIMINATE HAND CALCULATIONS - 4.22
SEND ELECTRONIC SAMPLE RESULTS TO FIELD - 4.21
HAVE CONTRACTORS MAIL SAMPLE RESULTS TO FIELD - 4.15

TECHNICIANS/CHEMISTS ENTER DATA - 3.88
GENERATE AUTOMATED SAMPLE "HIT LIST" - 3.79

STANDARDIZE CONTRACT LAB RESULT FORMS - 3.46
HAVE MULTIPLE SAMPLE RESULTS PER PAGE - 3.42
GET ELECTRONIC SAMPLE RESULTS FROM CONTRACTORS - 3.28

GENERATE AUTOMATED WORKSHEETS BY BATCH - 2.91
START A CUSTOMER SERVICE STATUS LINE - 1.92
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Rating Returns for Improving Personnel Experience

Provide for Workstations Rotations - 3.89

Establish & Validate Training Objectives - 3.18

Work with Civ Personnel Departments to Improve Retention - 3.10

Identify Key Military Personnel - 2.99

Request MAJCOM to Reinstate Control Tours - 2.86

Allow Flex Time for Education - 2.78

Increase Opportunities for In House/TDY Training - 2.73

Provide Recognition/Rewards for Personnel - 2.44

Offer Incentives/Rewards for Education - 2.30

Advertise Current Programs for Tutoring/Other Ed. - 2.01

Help Determine Appropriate Course Levels - 1.76
Attachment 6.3 - Metrics Used on an On-Going Basis To Ensure Continuous Process Improvement

When Prepared: April - August 1993

Need/Purpose: Process control and management metrics utilized to monitors results and insure continuous process improvement.

How: Performance charts to monitor analysis turnaround times, customer service, and capacity.

Sample suspense and sample suspense management lists are to ensure better turnaround times were being achieved.
Attachment 4.

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<thead>
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<th>Inhouse Metals Section vs All Sections Performance 1992-1993</th>
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### Metals Turn Around in Days

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### All Sections Turn Around Time in Days

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### Total Number of Samples Analyzed for All Sections

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### All Sections, Inhouse Paperwork Time in Days

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ANALYTICAL SERVICES DIVISION

SAMPLE SUSPENSE MANAGEMENT LIST

SAMPLES WHOSE MAIL DATE EXCEEDED THE SUSPENSE DATE

DATE/TIME: 30-Aug-93 08:35:44
FUNCTION: 02 Pesticide Function
FUNCTION CHIEF: Mr. Dennis Mark

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TOTAL SAMPLES WITH EXCEEDED SUSPENSES: 31
Attachment 7.2C - Benefits of the Team and Lesson Learned Communicated to Other Teams, Management, and the Rest of the Organization

When Prepared: Storyboard - Feb 93
AL Newsletter - Spring 93
OE Newsletter Article - Fall 92
Customer Satisfaction Survey - Apr-Aug 93
Customer Feedback on Electronic Mailing - Apr 93
Cover Letter Explanation - Apr-May 93

Need/Purpose: To communicate existence of AL/OEA PIT, it’s progress and improvements, and to help later TQ teams in their efforts.

How: Storyboard - Combine Team Effort
AL/Newsletter - Prepared by PIT facilitator
OE Newsletter - Article written by team effort
Customer Satisfaction Survey - Developed by Team
Cover Letter Explanation - Developed by Team effort
EXTRA, EXTRA

PIT STORYBOARD SETUP IN ARMSTRONG LABORATORY HEADQUARTERS LOBBY
Commentary

In this first QUALITY AIR FORCE newsletter I would like to share with you some of the important strides we have made within the Laboratory segment of the HSC community to promote quality. Unfortunately, or more correctly—fortunately, much of what has taken place is not yet visible at the "working level" within the Laboratory.

As I stated to you in my Jan 92 letter distributed inside the TQL DICTIONARY, "My initial efforts will be focused on getting senior management to understand the important role we must play in the TQL process, and the behavioral changes we must make as a leadership team if TQL is to survive." Much of the Total Quality emphasis is still focused on the top of the organization where it is needed.

Our Total Quality efforts could be more visible at the "working" level where research, consultation, and teaching take place if we could speed up the rate of "cultural" change in our organization. Cultural change takes time, however, and if you push too hard things can break.

We certainly have enough change taking place today to keep all of us busy, but not all of it is cultural-type change.

Some valuable and interesting things have been happening within the last 12 months. I'd like to review just a few of them with you.

- Monthly readings on "quality" are distributed to the top 250 leaders within HSC;
- A 30-page TQL DICTIONARY was distributed to all AL personnel;
- A 32-page TEAM HANDBOOK was created for use by AL Teams;
- An AL Quality Council has been formed and although it has not been meeting regularly to date, it will starting this Fall;
- A full-time TQL Advisor position was created, reporting to the Laboratory Director and supporting the Quality Council's activities;
- Two PIT Teams have been Chartered by the Quality Council, have received PIT Team training and are meeting regularly;
- A large conference room in Building 125 has been identified and reserved for PIT Team use;
- Over $15,000 worth of books, videos and audiovisual equipment was purchased for placement in the dedicated PIT Team room;
- 6 AL Facilitators have been trained, and 4 of them are spending 20% of their time in AL-specific TQL activities;
- A 4-hour TQL "awareness seminar" has been developed for Armstrong Laboratory personnel and will be available this Fall;
- The Quality Council has visited a worldclass R&D-based company, the Dow Chemical Company, to review their Total Quality efforts;
- The Quality Council has attended two, day-long executive seminars on Total Quality, and more are scheduled in the future;
- $100,000 was budgeted to support AL Total Quality efforts in FY92 and FY93;

There are many other things I could mention as well. But let me close on this note.

As the Director of this Laboratory I have not been able to [see "Commentary" page 4"]
Teams have existed on Brooks AFB for as long as the base has existed. But in August of 1992 two very special Teams were formed, one in OEA and the other in AOT. More about the AOT Team in the next issue of QUALITY AF. What makes these Teams so special? What is special is the way in which they are being selected, trained and nurtured.

First, a short history lesson. In January 1992 General Anderson sent a letter to the Laboratory explaining his vision for HSC to be "a leader in environmental restoration, protection and compliance." Shortly thereafter, HSC Vice Commander Klein sent Dr Welch a letter applauding the proud history of OE, and encouraging us to find ways to shorten OEA "response times" in order to capture the 62% of Air Force environmental samples currently being analyzed elsewhere. In May of 1992 Dr Welch directed the Laboratory Total Quality Advisor (AL/TQ) to establish a PIT Team in both OEA and AOT.

During the months of June and July, three facilitators (Dr Cupello, Dr Murphy and Cpt Engquist) started meeting regularly with Mr Tom Thomas, the OEA Division Chief, to more clearly define what this Team should accomplish.

A preliminary look at the way environmental samples are processed revealed that the "analysis" step was the most time consuming.

In early August Mr Thomas identified nine individuals to serve on the OEA PIT Team, including an internal customer (OEB) and function chiefs heading three of the 11 analytical functions: metals, pesticides and hazardous/toxic materials.

During the week of 24 August the AOT and OEA PIT Teams received four days of training in group dynamics and quality tools. This intensive course was offered by Change Navigators out of Colorado.

The Team has been meeting for 90 minutes every Tuesday morning since then. They are following a 14-step method for process improvement. To date they have developed a mission statement, analyzed over 40 control charts worth of "capacity" and "turnaround time" data, and have just recently begun flowcharting the work processes for metals, pesticides, haz/tox and customer service.

Dr Jim Cupello, the Team Facilitator, has commented, "I have never met a more positive, enthusiastic, hard working, aggressive Team as this one. When they are finished with this assignment, everyone will be able to tell the difference in OEA. Everyone! But management must have the courage to make the changes the Team recommends."
Commentary

spend as much time as I would like on Total Quality efforts within the Laboratory. The DOD environment is changing so rapidly that a great deal of my time is spent on survival issues; I must deal with that which is urgent, not necessarily what is important. Sometimes it is impossible to tell which is which.

Burt Nanus, an acknowledged expert on leadership, summed it up this way: "... why is leadership inadequate? The answer is that the prevailing wisdom about leadership has become dangerously unbalanced. Leadership is seen as primarily concerned with the relationship between the leader and the follower or organization ... The conditions are the new age demand at least as much attention to the ever-changing external environment as to the internal or organizational environment."

I can promise you two things relative to the future of TQL within the Armstrong Laboratory. I will make every effort to get the Quality Council meeting on a regular basis to discuss "quality," and I will also begin the process of pushing the quality effort down into the organization by emphasizing the creation of Directorate-level Quality Councils and PIT Teams at the earliest opportunity. [Dr Billy E. Welch].

Quality Books
In Review

RIGHT EVERY TIME: USING THE DEMING APPROACH by Frank Price. A Review by Lt Col Bob Cartledge, AL/OEDL

Dr W. Deming's strength is his weakness. He articulates a profound philosophical landscape of quality management but provides little insight as to how to tend the garden and when to plant the crops. Frank Price, in his book, fills the role of the county agricultural agent, translating what the professor said into a language we can understand.

Mr Price begins his book with an extraordinary introductory chapter about organizational cultures. If nothing else, get the book just to read the first chapter. Cultures, per Mr Price, are like mountains, each with different perspectives on the organizations. Cultures, which range from "please the boss" to "please yourself" are organizational glues. Mr Price skillfully argues that the glue ought to be Quality.

RIGHT EVERY TIME is organized around Deming's fourteen points. Unlike many other authors, Mr Price groups similar points into a single chapter. This approach helps to put the Fourteen Points into unifying themes and to simplify, somewhat, the Quality implementation process. The book employs a wide cross-section of examples to enlighten the reader about Quality. These examples range from a discussion of training and education in the early days of medicine to the purchase of nails to shoe horses in the U.S. Cavalry. In other words, don't expect an endless litany of examples of 1980's business failures and turnarounds, illustrating how TQM will save the American economy. Mr Price cultivates his Quality garden with a unique blend of insight, humor, history, and wisdom.

Mr Price believes in Deming so much, that the praise sometimes becomes a little too thick. But don't let that dissuade you from digging into Mr Price's words.

I don't know how many non-believers will see the Quality light after reading this book. But if you are curious about Deming, RIGHT EVERY TIME should be in your TQM library. In fact, the book does such a good job expressing Dr Deming's philosophy that I recommend reading it before Dr Deming's OUT OF THE CRISIS.

[Two copies of this book are available in the AL/TQ office; contact Dr Cupello (4-2091) for 1 week checkout. The book was originally published by Marcel Dekker, Inc. for $65 and may still be available from that source]
Analytical Services Division Process Improvement Team: The Analytical Services Division has initiated a Process Improvement Team (PIT) with an objective of improving analytical response time, improving the capacity of the laboratory, and communicating our services to our customers. The team is led by Mr. Thomas, Chief of the Analytical Services Division and includes other representatives from Analytical Services, Bioenvironmental Engineering Division, and supporting personnel for providing statistical, data, and facilitative support from other Armstrong Laboratory offices. The team's objective is difficult and the extent to which they can improve the lab's support to the field within the resources they have been provided is unclear at this point. However, if you are a customer of the laboratory, you can definitely expect that the team will be examining the process and your needs very closely in the upcoming months.
ARMSTRONG LABORATORY CUSTOMER SATISFACTION SURVEY

This survey helps us improve our service to you. Your confidential answers will significantly impact on how we allocate resources to meet your needs. Please return it promptly. Thank you!

PLEASE CIRCLE YOUR RESPONSES BELOW USING THE FOLLOWING SCALE:

1 2 3 4 5 6
Extremely Dissatisfied Slightly Slightly Satisfied Extremely
Dissatisfied Dissatisfied Satisfied Satisfied

1. Timeliness: Did you receive your results within published time limits? 1 2 3 4 5 6

2. Accuracy: Is the report in the proper format? Are the address and other data correct? 1 2 3 4 5 6

3. Content: Does the report answer your questions and provide the necessary data? 1 2 3 4 5 6

4. Customer Support: Have we been courteous and helpful in meeting your special needs (priority service, reporting format, etc.)? 1 2 3 4 5 6

5. Consultation Service: Have we answered your questions and provided necessary materials or reviews to support your mission requirements? 1 2 3 4 5 6

6. Overall Rating: Do you enjoy doing business with us? Would you recommend us to others? 1 2 3 4 5 6

7. Suggestions: Are there other services that you would like us to provide in the future? (Please list them below.)

COMMENTS: (Use the back of this form if more space is required)

RETURN TO: Armstrong Laboratory/ OEPQ
2404 E Drive
Brooks AFB, TX 78235-5114

171
Lab results received in good order on 26 Apr 93.

I love this system :) !!!!

thanks,

jeff cornell

p.s. If there is anything I can do to help this effort (write letters, collect info, etc.) please let me know! I feel like I'm actually in the 20th Century!
In an effort to improve our support for you, we are testing a new cover letter for sending results. This procedure will contribute to shorter analytical turn around times. If your office has comments on this new procedure or any questions concerning analytical results or methods, please let us know in the Analytical Services Division at DSN 240-3626, commercial 210 536-3626, or via electronic mail at "ecs@oehlis.brooks.af.mil".

Enclosed you will find laboratory reports for the following samples:

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Reviewed by: Thomas C. Thomas
Chief, Analytical Services Division

TO: OLAC-PL-WEST/SEH
EDWARDS AFB, CA 93523-5000