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USERS SPEAK OUT ON TECHNOLOGY DEPLOYMENT

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Users Speak Out on Technology Deployment

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Executive Summary

This report summarizes user feedback data collected during a recent Accelerated Site Technology Deployment (ASTD) project: the Fluor Fernald ASTD Technology Deployment Project from May, 1999 through September, 2000. The main goal of the ASTD project was to use the "Fernald approach" to expedite the deployment of new or innovative technologies with superior safety, cost, and/or productivity benefits to Department of Energy (DOE) facilities. The Fernald approach targets technology end-users and their managers and directly involves them with hands-on demonstrations of new or innovative technologies during technology transfer sessions. The two technologies deployed through this project were the Personal Ice Cooling System (PICS) and the oxy-gasoline torch. Participants of technology transfer sessions were requested to complete feedback surveys. Surveys evaluated the effectiveness of the Fernald approach to technology deployment and assessed the responsiveness of employees to new technologies. This report presents the results of those surveys.

In total, 249 surveys were completed and analyzed for this report. Survey questions were designed to address the following aspects of the ASTD project: 1) determine whether the target audience was reached; 2) evaluate the effectiveness of the technology transfer presentations; 3) estimate the need for PICS and oxy-gasoline torch technologies; 4) learn about competing technologies; 5) identify valuable learning tools for employees; and 6) identify obstacles which delay the widespread use of new technologies.

Based on the data collected, the target audience (technology end-users and their managers) was reached through Fernald's technology transfer session. Those who attended the session found it to be a worthwhile and effective learning tool. Results suggest that PICS technology would benefit most sites throughout the DOE complex, while a smaller market exists for the oxy-gasoline torch. Several alternative techniques are currently used to combat heat stress, while the main competitor for the oxy-gasoline torch appears to be the oxy-acetylene torch. Respondents generally utilize tools such as web sites and fact sheets to learn about new technologies; these resources can supplement hands-on presentation methods. Lastly, survey results indicate that management and funding are viewed as major obstacles to the deployment of the PICS and oxy-gasoline torch.

The trends that emerged through analysis of these surveys can prove beneficial to future deployment efforts. DOE/Fernald can use this feedback to improve its presentation methods and address specific employee concerns, though survey results suggest that the DOE/Fernald technology deployment projects have already achieved considerable success. An overwhelming majority (> 91 percent) of respondents rated the presentation methods employed in technology transfer sessions to be above average or excellent, and nearly 99 percent of respondents would attend a similar presentation on other technologies. These figures indicate that Fernald's innovative and active approach should be replicated in future deployment efforts. The overall success of Fernald's deployment effort is best summed up by one respondent who said, "Keep up the good work – more tech transfer!"

1.0 Introduction

This report summarizes data collected from technology end-users who participated in the Fernald ASTD Technology Deployment Project. The project's main goal was to expedite the deployment throughout the DOE complex of new or innovative technologies that were determined to have superior safety, cost, and/or productivity benefits. Using the Fernald approach, the ASTD project targeted PICS/oxy-gasoline torch end-users and their managers, involving them in a hands-on demonstration of each technology. This project also furnished them with technology-specific training and provided end-users with technology seed units, when applicable. Figures 1 and 2 illustrate activities conducted during technology transfer sessions.

Figure 1: Hands-on demonstration of Personal Ice Cooling System during technology transfer session.

Figure 2: Workers observing oxy-gasoline torch demonstration during technology transfer session.

During technology transfer sessions, participants were requested to complete surveys for evaluation of the project's effectiveness. The main purpose of this report is to summarize survey results and identify trends in the data. This information can be used, in part, to evaluate the success of past presentations, to assess the responsiveness of employees to new technologies and to improve Fernald's technology deployment approach for future deployments.

2.0 Methods

This report focuses on the deployment of two technologies: the PICS and the oxy-gasoline torch. At present, Fluor Fernald has deployed these technologies to 24 sites nationwide, 18 of which have completed and returned feedback surveys to Fernald. Table 1 is a list of deployment sites that participated in the evaluation process and their selected technologies. Subsequent PICS and/or oxy-gasoline torch purchases, which were initiated and financed independently of the Fernald deployment project, are also listed.

Table 1: PICS/Oxy-Gasoline Torch Deployment Sites

SITE	PICS	OXY-GAS TORCH	SUBSEQUENT PURCHASES	
			PICS	TORCH
Ashtabula	✓	✓		
Carlsbad	✓			
Center to Protect Workers Rights	✓			
Hanford	✓	✓	✓	✓
Lawrence Livermore National Laboratory	✓			
Los Alamos National Laboratory	✓			
Mound	✓			✓
Nevada Test Site	✓			
Oak Ridge	✓		✓	✓
Paducah Gaseous Diffusion Plant	✓		✓	
Pantex	✓		✓	✓
Portsmouth Gaseous Diffusion Plant	✓	✓	✓	✓
Rocky Flats	✓			✓
Sandia National Laboratory	✓			
Savannah River	✓		✓	
University of Findlay Environmental Response Training Ctr.	✓			
Volpentest HAMMER Facility	✓	✓		
West Valley Demonstration Project	✓	✓		✓

To evaluate the effectiveness of the technology deployment project, survey questions were designed to address specific aspects of the project. These aspects are listed below:

1. Determine whether the target audience was reached. The target audience consisted of technology end-users such as hourly employees, field line supervisors and their direct managers.
2. Ascertain whether technology transfer presentations were well executed and effective as a means of learning about new technologies.
3. Obtain a better understanding of the potential need for PICS and oxy-gasoline torch technologies throughout the DOE complex.
4. Find out which competing technologies are currently being used.
5. Discover which information resources are most valuable to those seeking new technologies.
6. Determine what obstacles, if any, thwart the implementation of new technologies.

Two hundred and forty-nine surveys were included in the analysis. Appendix A is a sample of the survey form used. The twelve questions remained constant for all sites surveyed with the exception of questions six, seven and eleven. Since the survey was originally developed prior to torch deployments, a supplemental part (a) was added to each of these questions to accommodate the deployment of the oxy-gasoline torch.

Survey responses were analyzed using Microsoft Excel. Only those who answered a particular question were included in the analysis of that question; non-responses were eliminated. Percentages were then obtained by dividing the number of responses in each category by the number of total respondents to the question. Respondents were able to choose more than one answer to questions 7, 7(a), 10, 11 and 11(a). Percentages continued to be obtained by dividing the number of responses in each category by the number of total respondents to the question. However, since the same respondent could have chosen multiple answers, adding up the percentages across all categories will result in a figure greater than 100 percent for these five questions. It should also be noted that the number of total respondents was lower for questions regarding the oxy-gasoline torch (*), since this technology was not deployed to all of the surveyed sites. Total respondent counts for each question are summarized below:

- Question 1: 228
- Question 2: 218
- Questions 3 & 4: 249
- Question 5: 246
- Question 6: 238
- Question 6(a): 31*
- Question 7: 238
- Question 7(a): 25*
- Question 9: 215
- Question 10: 135
- Question 11: 207
- Question 11(a): 20*

Questions 8 and 12 required open-ended responses and were not quantified in this paper. The next section of this report will summarize survey responses.

3.0 Results and Discussion

Questions 1 and 2 asked for the employee's job classification and description (See Figs. 3 and 4). The individual percentages indicated a relatively even distribution of respondents, particularly hourly employees, field line supervisors and their direct managers, who were the main targets of the presentation. However, it should be noted that the sites surveyed are not homogenous: they vary by factors such as size, number of employees, and duties being performed. Based on these results, it is apparent that the target audience has been reached through the technology transfer sessions.

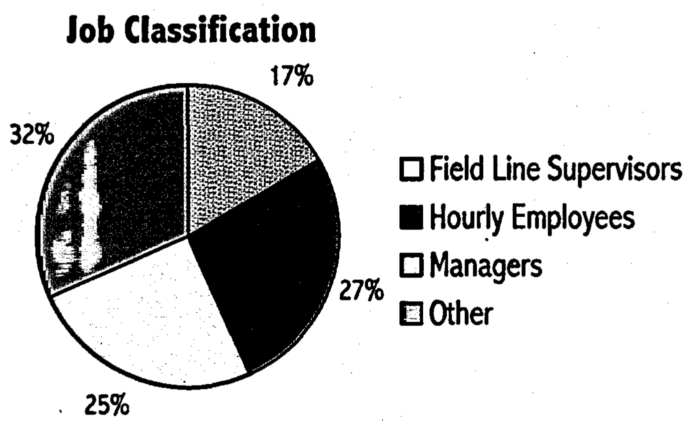

Figure 3: General employee classification of survey respondents.

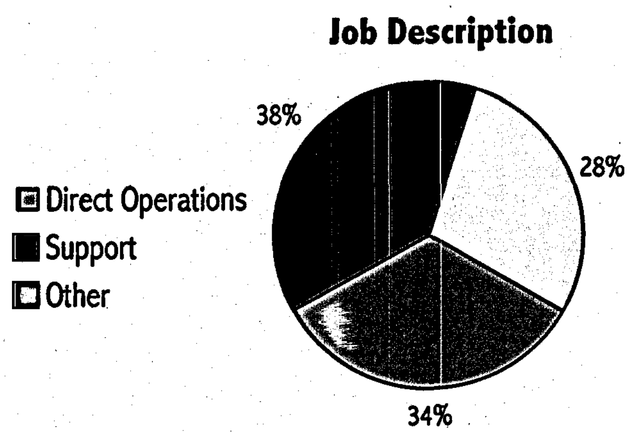

Figure 4: Job description of survey respondents.

Questions 3 through 5 targeted the respondents' opinion of the presentation. As illustrated by the graphs below, responses were positive. Analysis of question 3 indicates that over 90 percent of respondents believed the presentation to be well worth their time (See Fig. 5). Though responses to question 4 are not represented pictorially, results showed that nearly 99 percent of respondents would attend a similar presentation on other technologies.

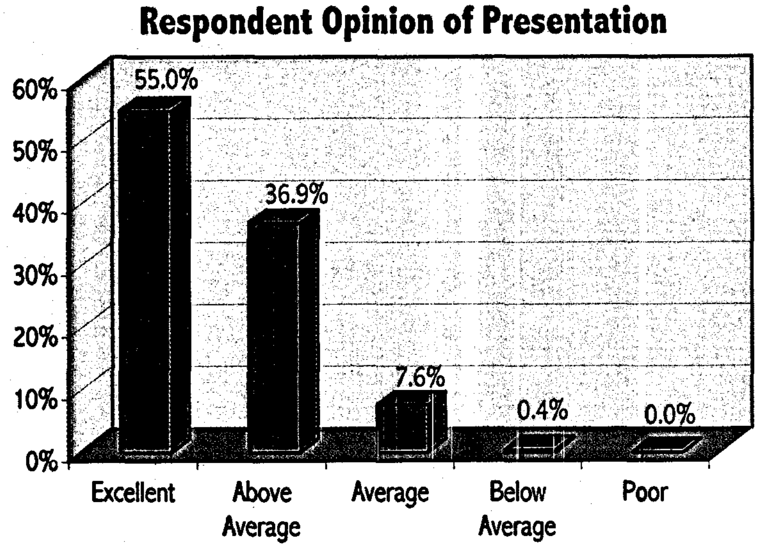

Figure 5: Respondents' evaluation of whether presentation was worth their time.

Attendants also favored the Fernald approach as a way of learning about technologies, as evidenced by responses to question 5 (See Fig. 6). Once again, over 90 percent believed the interactive presentation method to be above average or better. The results of these three questions support the idea that the Fernald approach to technology deployment is beneficial to the DOE, workers in the field, and site contractors.

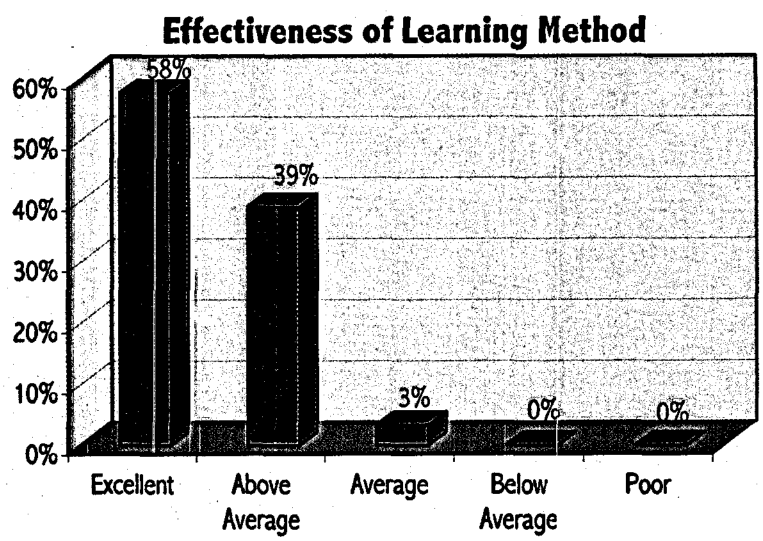

Figure 6: Respondents' opinion of presentation method as a learning tool.

The purpose of question 6 was to approximate the number of people at each site who need help mitigating heat stress. Half of the respondents estimated that more than 50 people at their site would need such assistance (See Fig. 7). This data can be interpreted to mean that heat stress is a potential problem at many DOE sites.

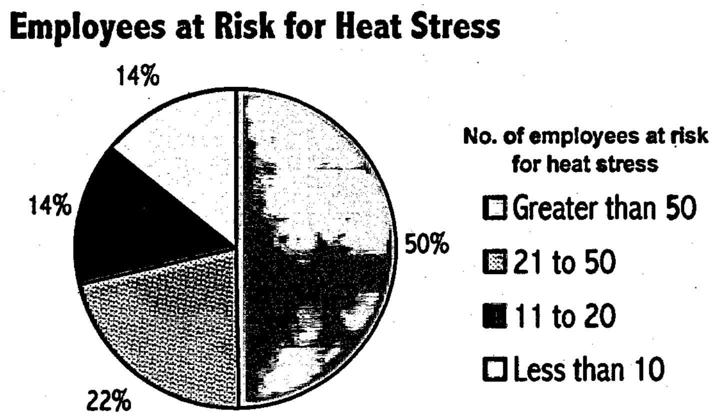

Figure 7: Estimated number of employees at each site who need help mitigating heat stress.

Responses to question 6(a) showed that 45 percent of respondents estimated that less than 10 people at their site would benefit from improved torch-cutting technology (See Fig. 8). Questions like these can be used to estimate the size of the market, or need, for each technology and to determine where demand exists. Results suggest that the potential market for the PICS is much larger than that for the oxy-gasoline torch. These results are supported by the fact that more workers are required to "dress out" in personal protective equipment to perform various jobs than those required to use an open-flame steel cutting device.

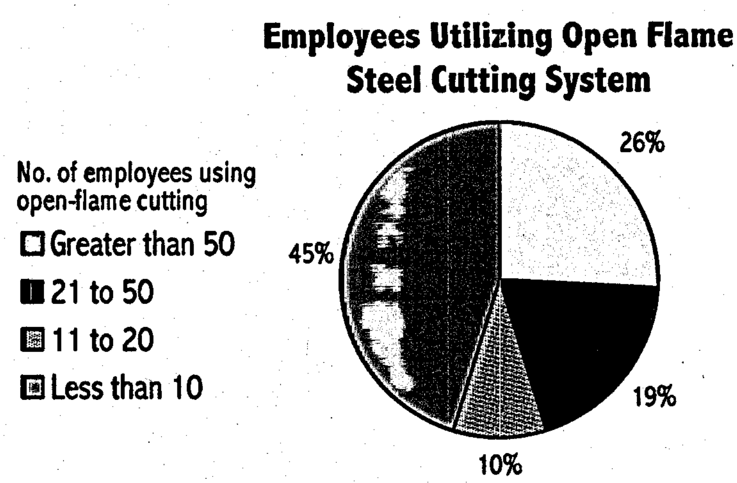

Figure 8: Estimated number of workers at each site who would benefit from improved steel-cutting technology.

Methods used to combat heat stress were explored in question 7. The question was designed to identify other technologies or practices that compete with the PICS. Based on survey responses, the three most common were limiting stay time, altered work schedules and ice vests (See Fig. 9). Three-fourths of respondents indicate that limiting stay time, a highly expensive practice, is a standard method of heat stress control at their site.

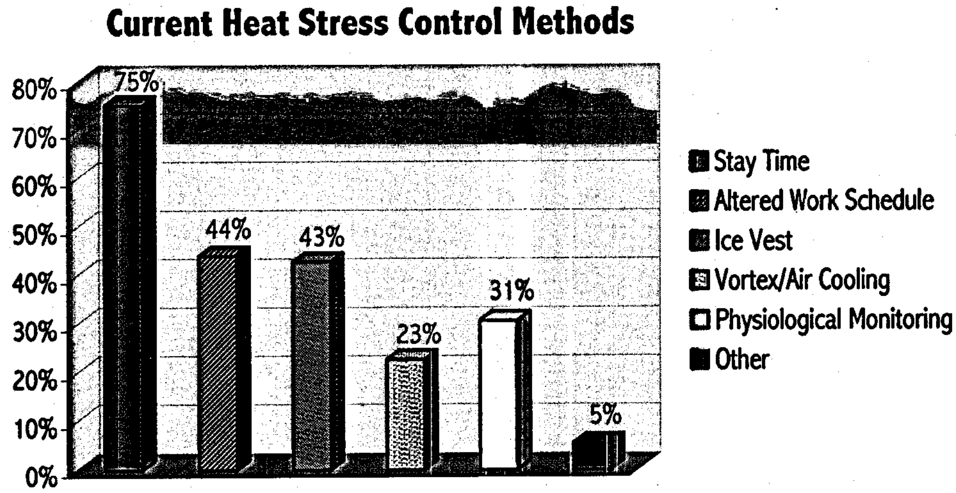

Figure 9: Heat stress control methods currently used by workers at survey sites.

Currently used steel segmentation methods are examined in question 7(a). In much the same way, this analysis identifies technologies that compete with the oxy-gasoline torch. By far, the most common steel cutting instrument is the oxy-acetylene torch, which is used by 100 percent of those responding to the question (See Fig. 10). The benefit of this data is that it enables Fernald to custom-design presentations to the needs of each deployment site by comparing new technologies to the site's most widely used methods.

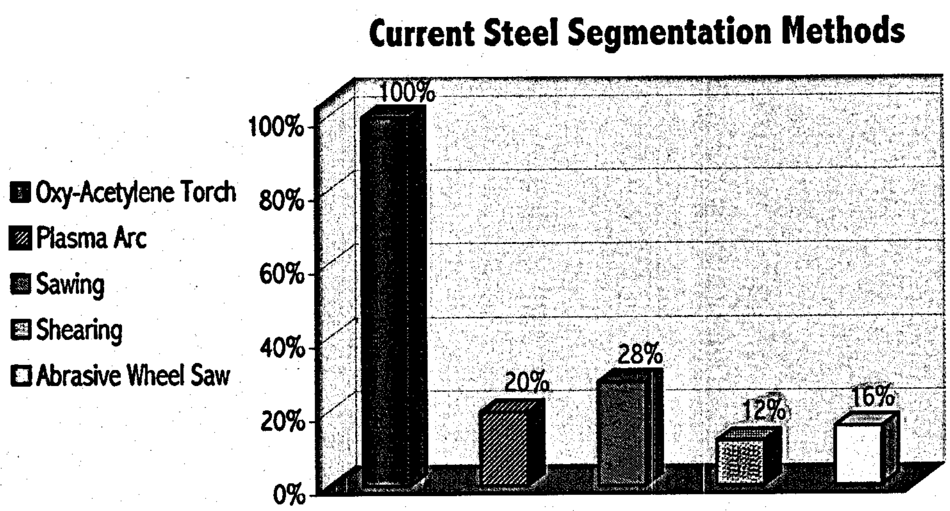

Figure 10: Steel cutting techniques currently used by workers at surveyed sites.

Question 10 asked respondents to identify information resources that they use to learn about new technologies. Results indicated that web sites, fact sheets, and Innovative Technology Summary Reports (ITSRs) are the most frequently accessed learning tools. Web sites are used by 64 percent of survey respondents; fact sheets are used by 48 percent, and ITSRs are used by 29 percent (See Fig. 11). Such data is valuable because it displays trends in the flow of information; these trends can be used by DOE/Fernald to effectively advertise or market new technologies.

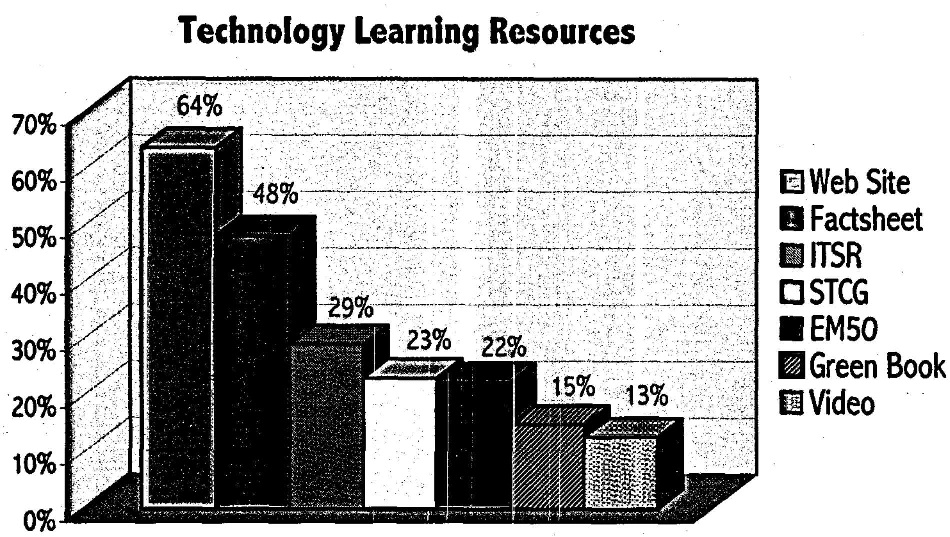

Figure 11: Methods commonly used by survey respondents to learn about new technologies.

Although the results of question 10 are valuable, it should be noted that only 135 (~54 percent) of the 249 survey respondents answered the question. Such a low response rate could be explained by several factors. Certain groups of survey respondents may be more inclined than others to research new technologies. Trainers or managers, for example, might actively perform such research in order to remain apprised of industry developments. Also, those in management or training positions may have better access to information resources than hourly employees. Another possibility is that workers utilize other information resources (e.g., word of mouth) that were not represented in the answer choices for question 10 on the survey form.

Questions 9, 11 and 11(a) targeted obstacles to the implementation of new technologies. Specifically, question 9 asked if there was any resistance to technologies that improve productivity. Of those who addressed the question, nearly 30 percent feel that there is some resistance. Respondents were then asked in questions 11 and 11(a) to name the greatest challenge facing the PICS and the oxy-gasoline torch, respectively. High percentages in any category could serve to highlight specific issues that should be addressed in the presentation of new technologies. In this case, funding was cited by 55 percent as the most serious obstacle facing the PICS (See Fig. 12). The challenges to oxy-gasoline torch implementation are more evenly distributed, with funding and management each capturing 35 percent of the respondent total (See Fig. 13).

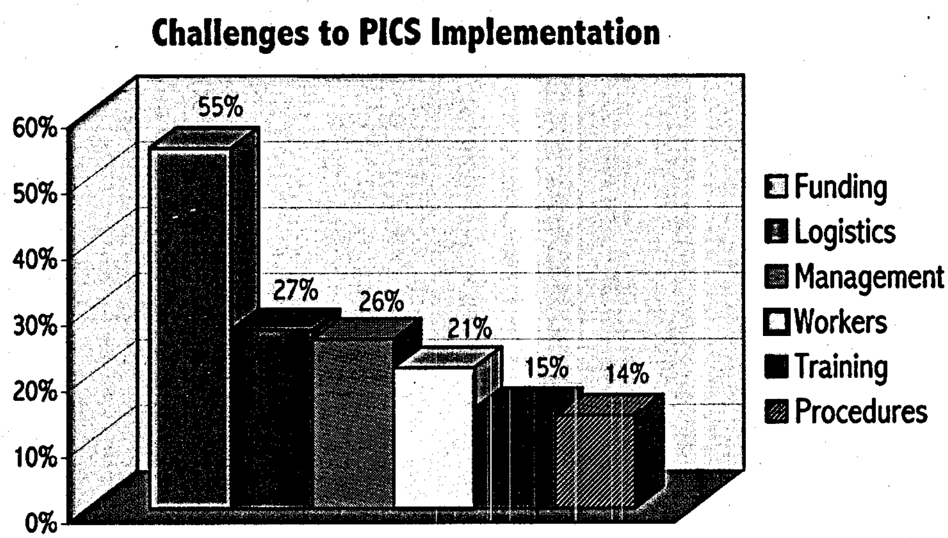

Figure 12: Elements identified by respondents as major obstacles to PICS implementation at their site.

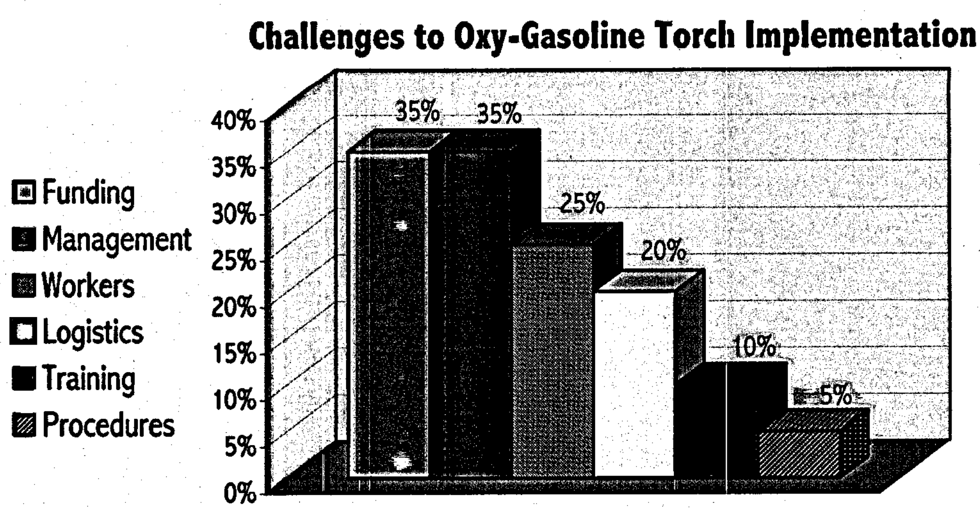

Figure 13: Elements identified by respondents as major obstacles to oxy-gasoline torch implementation at their site.

Comparing the results of questions 11 and 11(a) uncovers several potentially important issues. Question 11 asked respondents to identify the foremost challenges to PICS implementation, while question 11(a) asked the same with respect to the oxy-gasoline torch. Management is considered to be one of the two major obstacles to torch implementation, but only the third most significant impediment to PICS use. In both cases, management is considered to be a greater obstacle than workers. This result was somewhat surprising, since one might predict that workers would be more reluctant to adopt new technologies than managers, who should favor the most efficient processes. These observations could mean that managerial attitudes are based on misconceptions about new technologies. Concerns about the hazards of gasoline, for example, might prevent some project managers from using the oxy-gasoline torch, even though the oxy-gasoline torch is actually safer than the industry standard oxy-acetylene torch. Alternatively, the perceptions of survey respondents might not be entirely accurate. Workers, for example, might be reluctant to consider themselves a "challenge" to new technology implementation; far more surveys were completed by workers than by managers. It should also be noted that while 207 people responded to question 11, only 20 responded to question 11(a), since the PICS was deployed on a much wider scale than the torch.

4.0 Conclusions

Overall, analysis of the feedback survey data collected from this ASTD project indicates that people are receptive to learning about new technologies. Those surveyed particularly favor the "hands-on," seed unit approach pioneered by Fernald. It can be concluded that the Fernald approach can be profitable to all parties involved. The risk of heat stress is a potential problem common to DOE sites across the nation. Furthermore, because many sites throughout the country are in the D&D phase, there is a high demand for inexpensive, safe, and expeditious steel cutting technology. The trends that emerge through analysis of these surveys can be quite beneficial to future deployment efforts. DOE/Fernald can use this feedback to develop more effective presentation methods and to address the particular needs of a given audience.

5.0 Future Recommendations

In general, survey questions effectively targeted the critical aspects of the ASTD project. However, there is room for improvement in future efforts. Survey designers should pay particular attention to the wording of questions in order to avoid influencing responses. For example, question 9 in this survey asks, "Is there resistance to technologies that improve productivity?" Respondents may be reluctant to answer in the affirmative, simply to avoid the perception that their peers are unconcerned with productivity. A more neutral question 9 would read, "Is there resistance to new or alternative technologies?" Question 6 should be reworded to obtain more concise information. The question currently reads, "Estimate the number of employees at your site that need help with mitigating heat stress." A less ambiguous version of Question 6 would read, "Estimate the number of employees at your site that may be at risk for heat stress while performing work."

Survey planners would also benefit by ensuring that multiple choice selections are appropriate, comprehensive and congruent with the questions. Planners should restructure the answer selection in Question 3 to fit the question. Question 3 asks, "Was the presentation worth your time?" Possible answers range from "Excellent" to "Poor." The selections do not relate to the question, which could be answered with a simple yes or no. Another option might be to reword the question to fit the original selections. A better question might be, "How would you rate the quality of the presentation?" Questions 10, 11 and 11(a) ask the respondent to select from a list of items. However, no "Other" option is provided. Including an "Other" field may have prompted responses that could not have been predicted by the survey designer.

Minor modifications such as those described above can improve the quality of survey results. Carefully designed questions and prudent analyses will allow survey data to become an integral part of technology deployment projects in the future.

APPENDIX A – SAMPLE SURVEY

Site Survey of the Fernald Technology Transfer Program

Date: ________________

Group/Organization: ____

1. (check the one box that best describes you)
- ☐ Field Line Supervisor / Maintenance
- ☐ Hourly
- ☐ Management
- ☐ Other, please list ____________________

2. (check the one box that best describes you)
- ☐ Direct Operations (D&D, Construction, etc.)
- ☐ Support (Engineering, Technical, etc.)
- ☐ Other, please list ________________

3. Was the presentation worth your time?

(please circle one)

Poor Excellent

1 2 3 4 5

4. Would you attend a similar presentation on other technologies?

(please circle one)

Yes No

5. Please rate this method (presentation, hands on training) for learning about technologies.

(please circle one)

Poor Excellent

1 2 3 4 5

6. Estimate the number of employees at your site that need help with mitigating heat stress.

(please circle one)

0 to 10 11 to 20 21 to 50 50+

6(a). How many employees are trained on and use an open flame steel cutting system (e.g. oxy-acetylene torch)?

(please circle one)

0 to 10 11 to 20 21 to 50 50+

7. Identify your site's current method(s) for heat stress control:

(please circle all that apply)

A. Limited Stay Time B. Ice Vest C. Physiological Monitoring
D. Altered Work Schedule E. Vortex/air cooling F. Other, please list ____________

7(a). What is your site's current method to cut/segment steel?

(please circle all that apply)

A. Oxy-Acetylene Torch B. Plasma Arc Cutting C. Reciprocating saws
D. Hand-held hydraulic shears (emergency rescue type) E. Portable band-saws
F. Other, please list ______________________

8. Name the latest new/innovative technology that you have been made aware of or know has been deployed at your site within the last 12 months.

____

____

____

____

9. Is there resistance to technologies that improve productivity?

Yes No

10. Check the items below that you have used (or are aware of) to learn about Technologies:
(Please check all that apply)

- ☐ ITSR
- ☐ Web sites
- ☐ STCG
- ☐ Green Book
- ☐ Factsheets
- ☐ EM50

11. What do you think is the #1 challenge to implementing the cool suit technology?
(Please circle all that apply)

A. Procedures
B. Management
C. Workers
D. Funding
E. Training
F. Logistics

11(a). What do you think is the #1 challenge to implementing the oxy-gasoline torch technology?
(Please circle all that apply)

A. Procedures
B. Management
C. Workers
D. Funding
E. Training
F. Logistics

12. Who else could benefit from the technologies presented at this meeting?
(Please provide contact name and organization)

____

____

____

____

Other comments: (Please suggest improvements to this presentation)

____

____

____

THANK YOU!