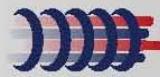


# TRANSIT PARTNERSHIP TRAINING: METRICS OF SUCCESS



TRANSPORTATION LEARNING CENTER

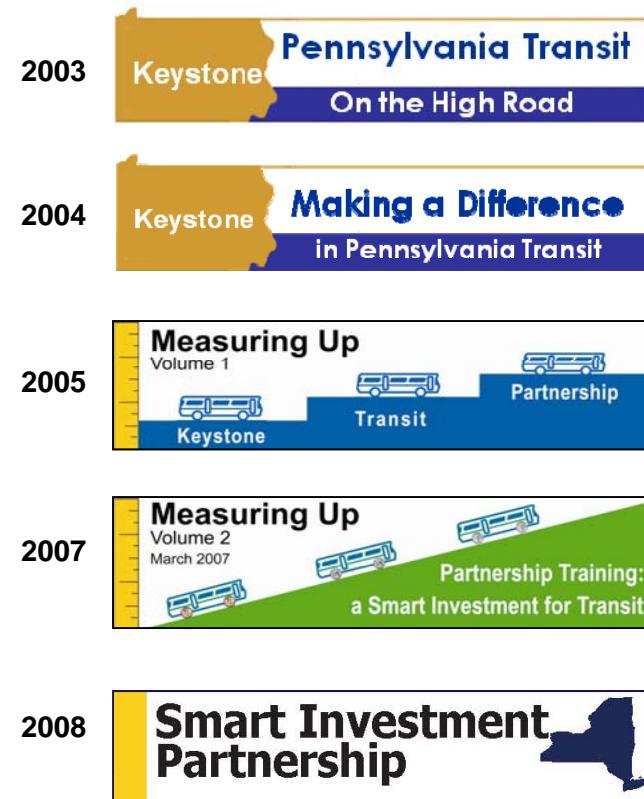


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## Reports in the *Metrics of Success* Series

The Transportation Learning Center's *Metrics of Success* series highlights measurable outcomes of transit training partnerships. This publication is a compendium of key highlights from the Center's previous *Metrics* reports, each of which is available online at [www.transportcenter.org](http://www.transportcenter.org).



# PREFACE

You never know how well you're doing until you find metrics with which you can measure outcomes. The Transportation Learning Center has capitalized on this insight through a series of in-depth research reports chronicling work by the Keystone Transit Career Ladder Partnership and Project Empire Transit Career Ladder Partnership. Find out more about these partnerships on page 3.

Key findings of the Center's research are highlighted in this report, which has been updated to reflect data available through 2009, and is designed to serve as a single-source overview of the both the quantitative and qualitative data available on partnership-based training to date. Moreover, employees and supervisors report from the field that the partnership-based, data-driven customized approach to training at a statewide scale has been a great success. It has:

- Been embraced by employees and supervisors.
- Led to quantifiable improvements in employee knowledge.
- Increased skills and facilitated significant promotions to fill maintenance department vacancies.

Partnership-based training strongly benefits transit agencies as well. In transit systems where partnership-based training has taken off, the programs have led to significant improvements in efficiency and cost savings. They have:

- Reduced unnecessary part replacement and improved labor efficiency.
- Resulted in major maintenance cost savings and fleet procurement savings of between \$10,313,567 and \$22,181,934, and a four-year return on investment (ROI) of between 293 and 745 percent.
- Improved equipment reliability and achieved longer mean distance between failures of vehicles.
- Reduced need for a high level of spare buses.

The Center would like to acknowledge the extraordinary work of those who made this research publication possible. The research has been supported by the US Department of Transportation and the Pennsylvania Department of Labor and Industry. Much work at the ground level was completed by labor-management work groups throughout the state, especially data managers at SEPTA. At the Center, this research was led by Director of Research Xinge Wang and Director of Workforce Development Jack Clark. Their hard work and creativity have made the Center's research possible.



Director

# ABOUT THE PARTNERSHIPS

## Keystone Transit Career Ladder Partnership

The Keystone Transit Career Ladder Partnership, established in 2001, is an extensive statewide training partnership encompassing 25 transit agencies from across Pennsylvania in conjunction with locals of the Amalgamated Transit Union (ATU) and the Transport Workers Union (TWU). The partnership network is anchored by strong local partnerships in Philadelphia and Pittsburgh between the Southeastern Pennsylvania Transportation Authority (SEPTA) and TWU Local 234, and Pittsburgh Port Authority Transit and ATU Local 85. The Pennsylvania AFL-CIO and the Pennsylvania Public Transportation Association bolster the partnership's statewide framework. Keystone has seen enormous successes over the last eight years, from career ladder advancement to increased return on investment by saving money on parts and equipment costs.



## Project Empire

Forged in 2006, the Project Empire Transit Career Ladder Partnership is an innovative labor-management partnership focused on improving training for bus mechanics. It addresses the skill needs of members of Amalgamated Transit Union (ATU) Locals 1321 and 580, employed at the Capital District Transportation Authority (CDTA) and Central New York Regional Transportation Authority (CENTRO).

During the first eleven months of the program, CDTA maintenance employees took advantage of more than 200 training opportunities through the Project Empire Transit Career Ladder Partnership. Average post-training test scores improved by 43 percent. At CENTRO, initial training has been offered at bus manufacturer locations and in-house training will begin in early 2009.

While the program is still in its early stages, an analysis of CDTA's vehicle maintenance performance data indicates significant gains including an 18 percent increase in Mean Distance Between Failures (MDBF), 30 percent fewer bus defects, improvements in on-time Preventive Maintenance Inspections as well as reductions in bus spare ratios and insourcing previously outsourced maintenance work. Interviews of twenty front-line supervisors, managers, workers, union officials and project staff revealed further significant benefits that come from a constructive training partnership, especially in improving labor-management relationship, boosting worker morale, increasing job satisfaction and establishing trust between supervisors and workers.

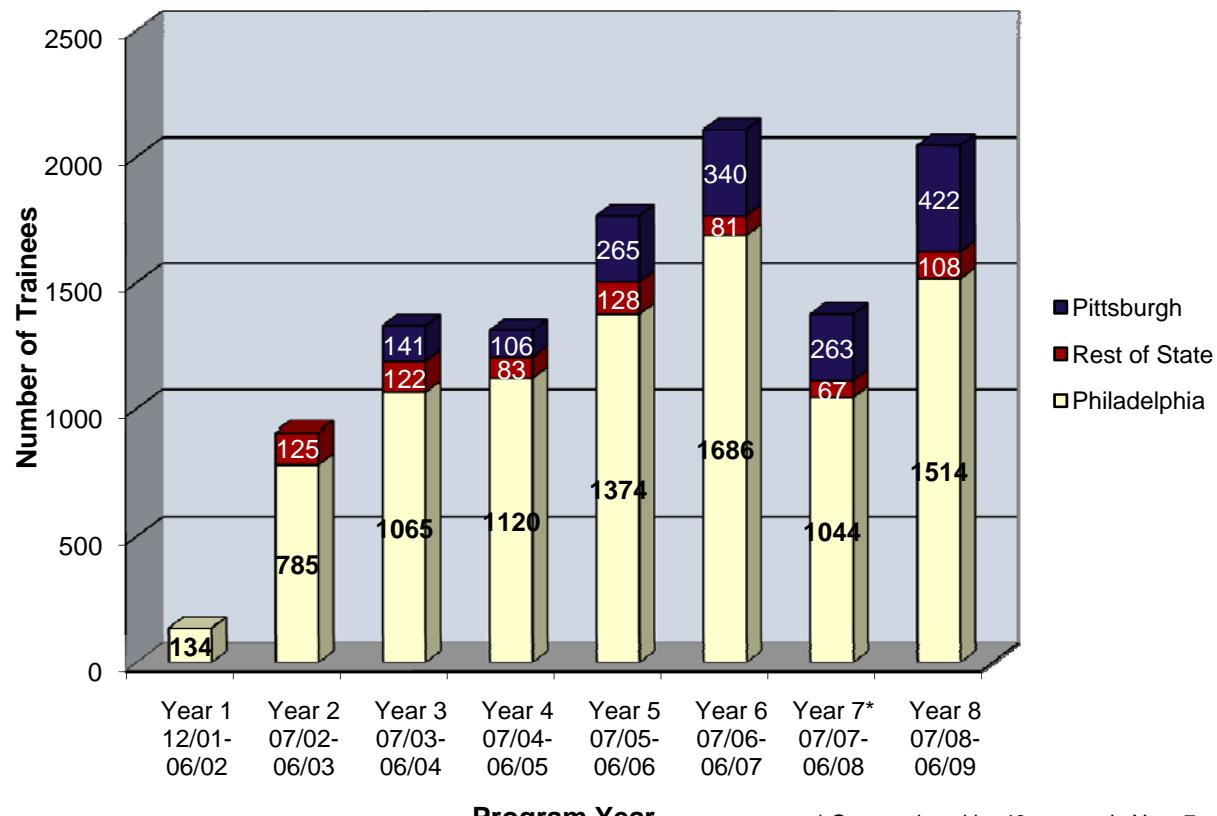
# PROGRAM GROWTH IN TRAINEES

## Keystone Transit Career Ladder Partnership



Statewide Partnership Data

Number of Trainees by Location and Year



\* Grant reduced by 46 percent in Year 7.

The largest location in a national Transit Technology Career Ladder Program, the Keystone Transit Career Ladder Partnership started in Philadelphia in the winter of 2001 and quickly expanded to become a statewide program. It has provided nearly 11,000 training opportunities to more than 2,000 Pennsylvania transit employees in bus, rail and facilities maintenance.

This chart shows the number of trainees by program year in the three Keystone locations: Port Authority in Pittsburgh, SEPTA in Philadelphia and over thirty smaller transit properties in Pennsylvania.

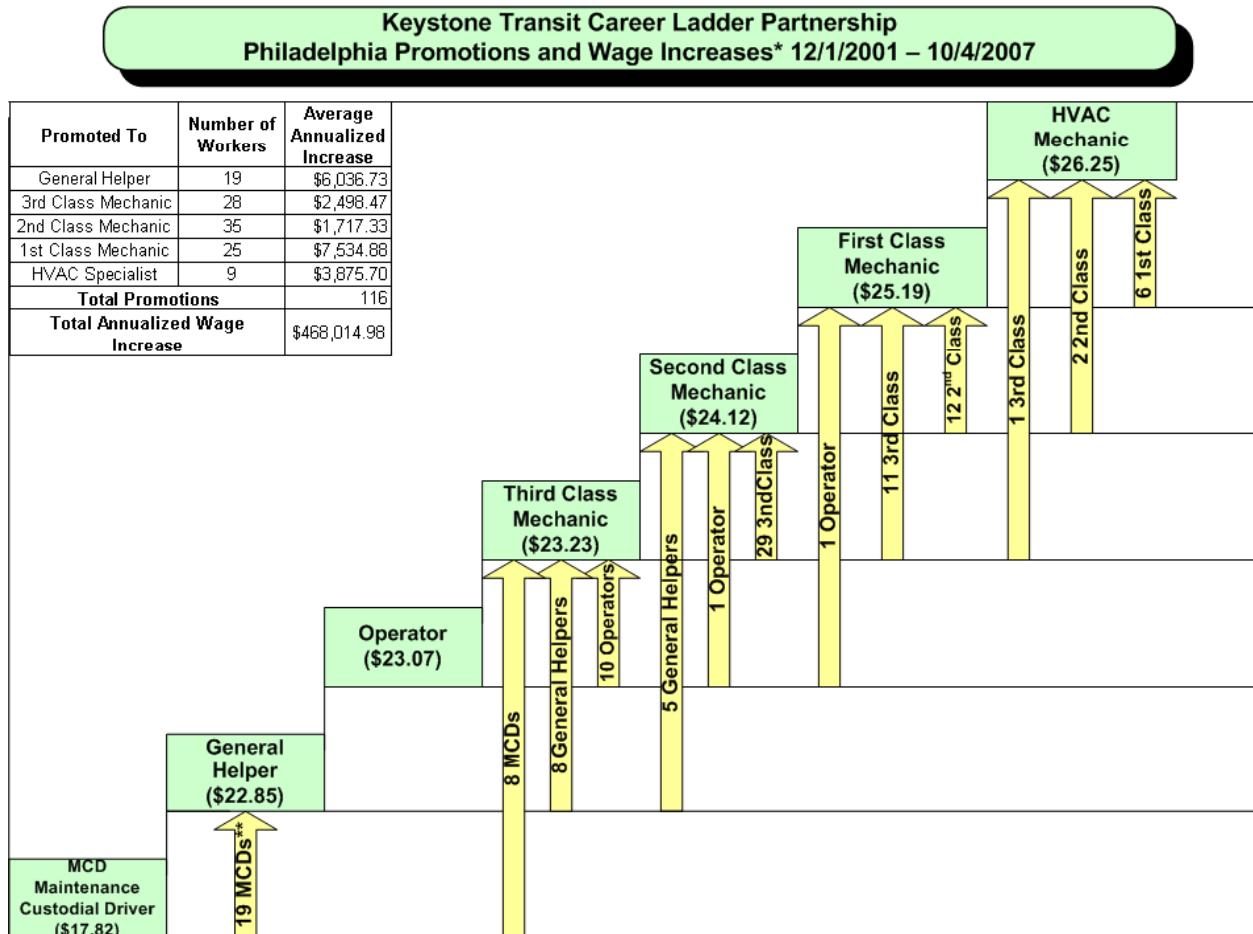
**Total training opportunities provided 2001-2009:  
10,973**

# PROMOTIONS AND WAGE INCREASES

## Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234



\* The wage rates shown in this chart are top rates in each classification. Entry rate for a classification is based on a percentage of the top rate, in most cases, 60 percent. After 48 months (108 months for MCD; 12 months for 1<sup>st</sup> Class and HVAC Specialist), the wage advances to 100 percent top rate. Wage progression is based on overall Authority seniority rather than seniority under each classification.

\*\* The upward arrows do not represent three in-grade promotions.

Community Transportation Center  
4/1/2008

Building on strong labor-management partnerships and utilizing a data-driven decision making process, Keystone has made it possible for a record number of mechanics to upgrade their skills and move up the transit career ladder in an industry facing dramatic technological change and skill shortages.

This chart illustrates examples of bus maintenance worker career ladder promotions through Keystone Philadelphia and corresponding wage increases. The 116 promotions achieved in the first six program years helped to alleviate SEPTA's skills gap caused by emerging new technologies and an exodus of senior maintenance workers due to retirement.

# WORKER SATISFACTION

## Keystone Transit Career Ladder Partnership

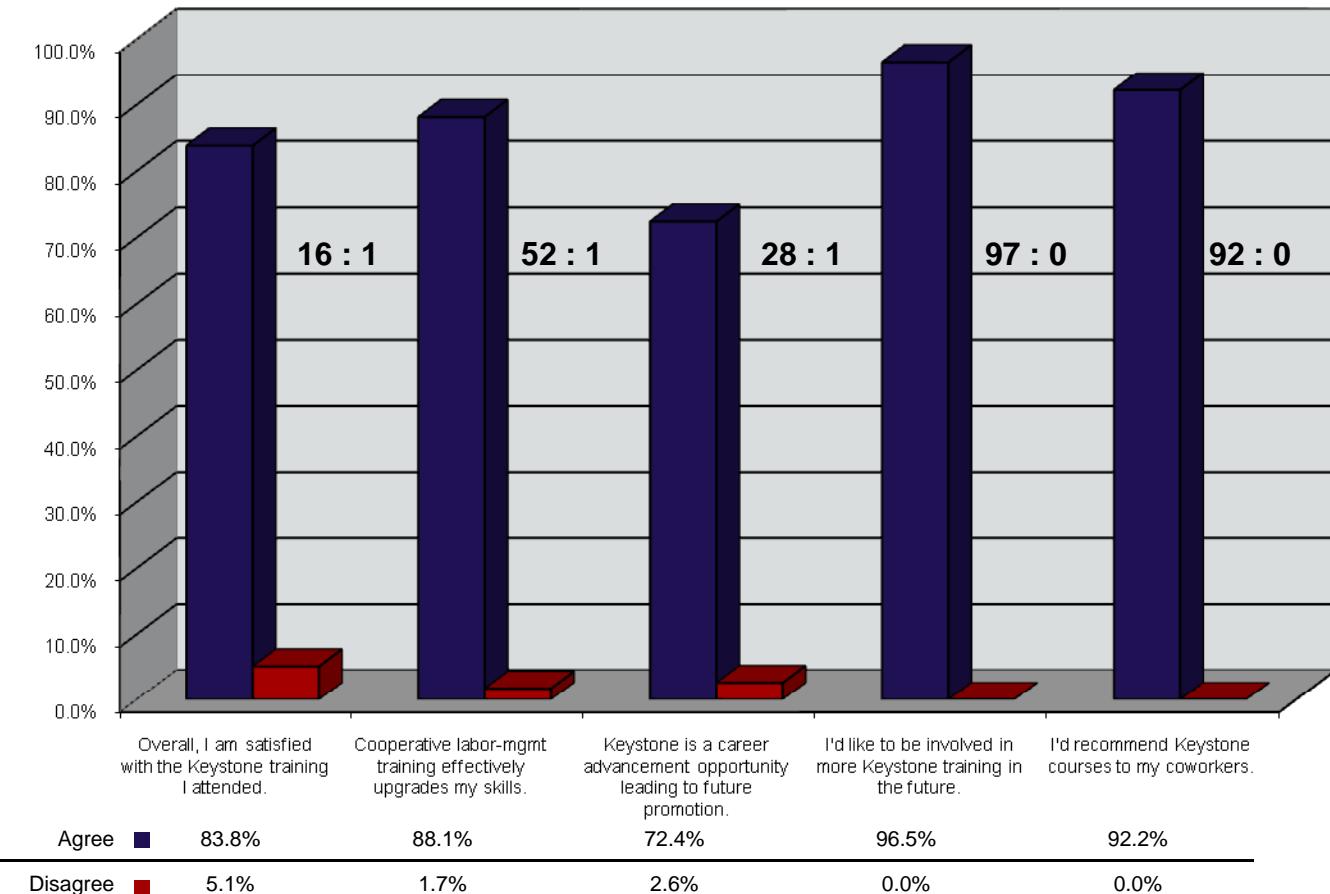
Training satisfaction surveys conducted in 24 Pennsylvania transit properties show that Keystone has generated broad support from supervisors and workers.

This chart illustrates Pittsburgh worker-trainees' positive impression of Keystone. Workers are very satisfied with the Keystone training they have received. From their training and post-training experience, they feel that labor-management training programs are an effective way to upgrade their skills. Nearly all the trainees would like to be involved in more Keystone training in the future and would recommend the courses to their coworkers.



**Partnership:** Port Authority of Allegheny County & ATU Local 85

Pittsburgh Training Satisfaction Survey - Workers



**Overall, workers are satisfied with the joint training and would like to be involved in more.**

# EFFECTS OF TRAINING ON PRODUCTIVITY

Keystone Transit Career Ladder Partnership

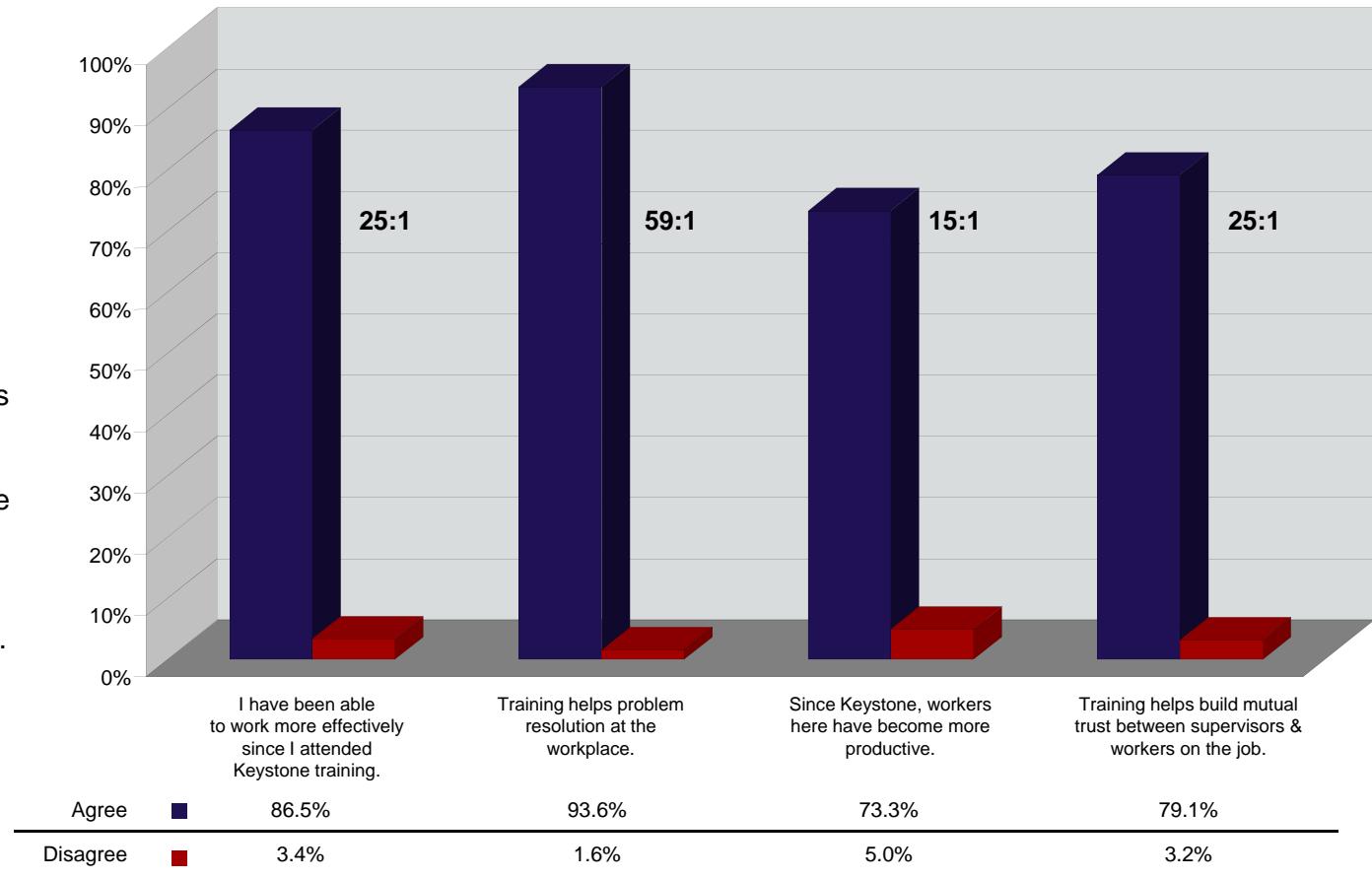


When asked about the impact of Keystone training on participating individuals and their workplace, workers from smaller properties responded very positively.

Over 86 percent of them feel that they have been able to work more efficiently since training. Three out of four trainees believe that workers in their shop have become more productive because of training and that training helps build mutual trust between supervisors and workers.

**Training helps augment individual worker skills.  
Overall efficiency and productivity improve dramatically.**

Statewide Training Survey - Workers



# SUPERVISOR SATISFACTION

Keystone Transit Career Ladder Partnership

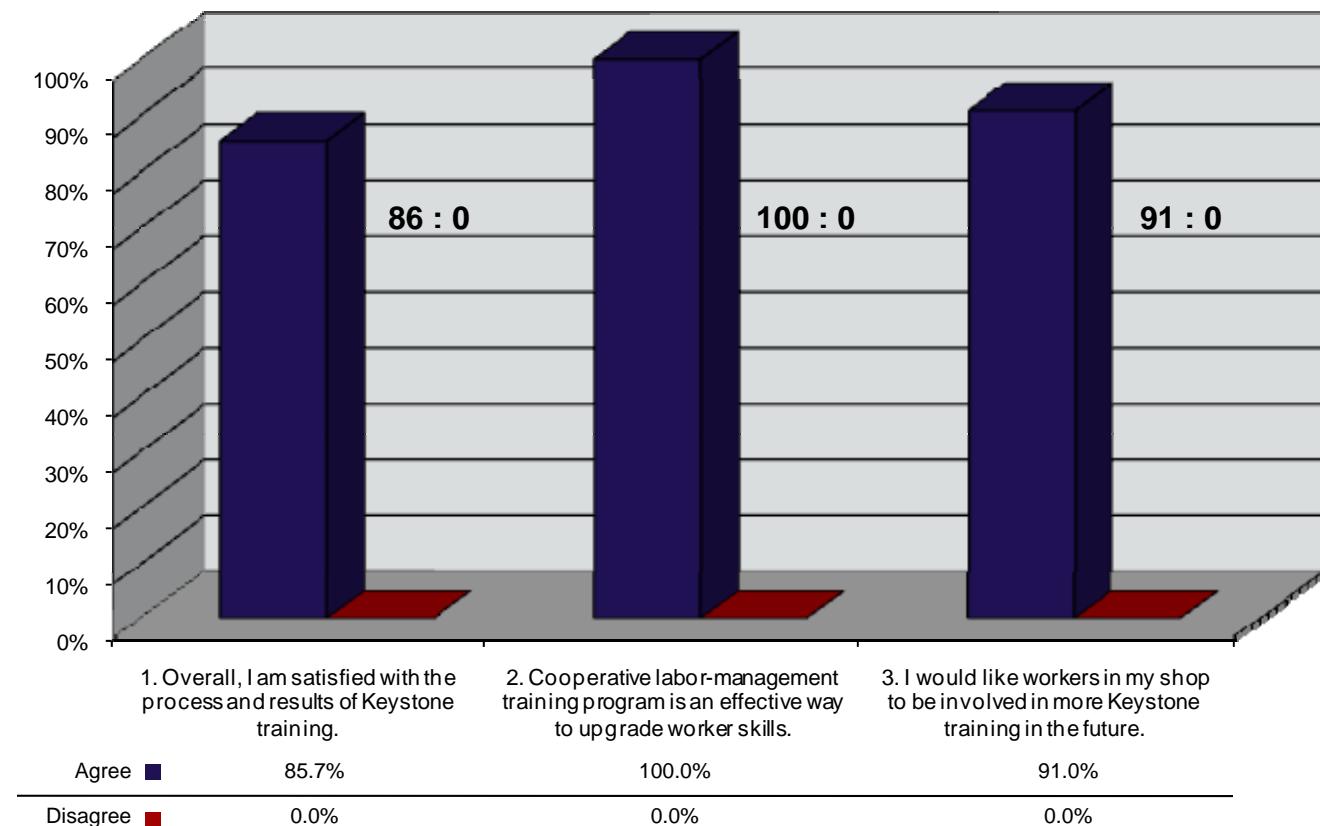


Partnership: SEPTA & TWU Local 234

Front-line supervisors at various Keystone locations were polled on their experience with Keystone. In general, they were very satisfied with the process and results of the training provided.

As indicated in the chart, all supervisors surveyed in Philadelphia believe that cooperative labor-management training programs are an effective way to upgrade worker skills. More than 90 percent would like to send workers in their shop to more Keystone training in the future.

SEPTA Supervisor Survey



Overall satisfaction with Keystone training was very high.

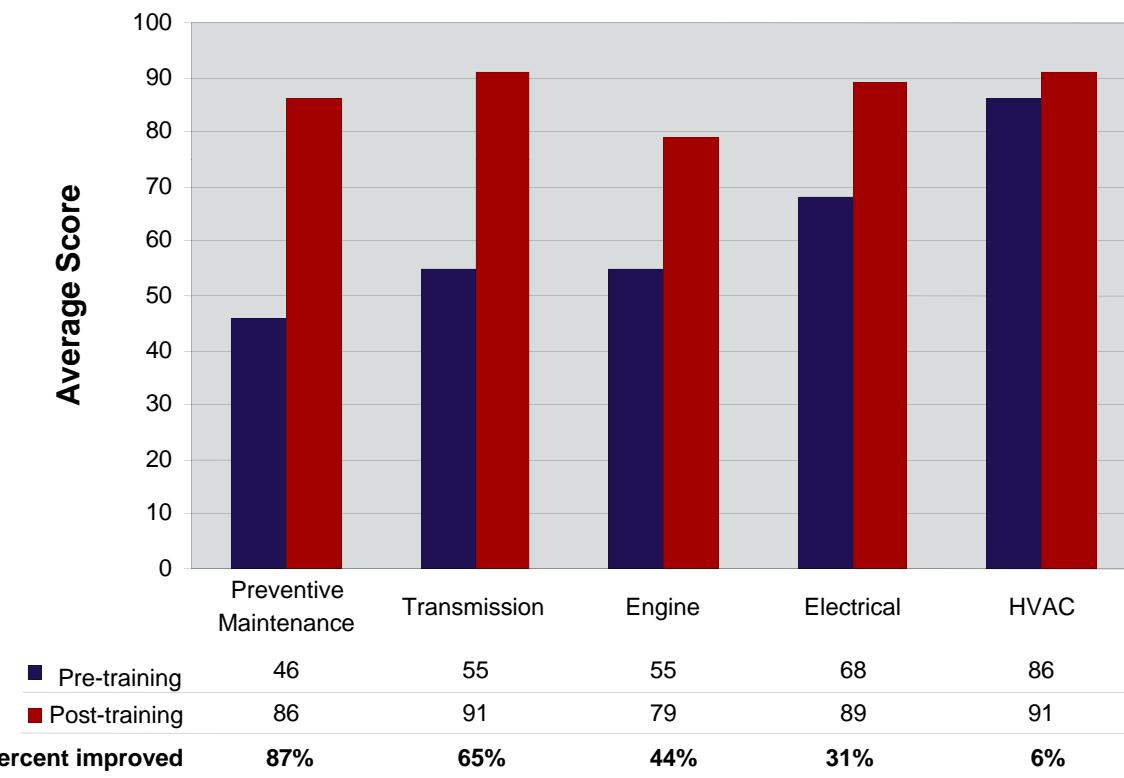
# KNOWLEDGE TEST SCORE IMPROVEMENTS

Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234

Philadelphia Pre-training and Post-training  
Test Results - Selected Courses



*Measuring Up Volume 1*, published in 2005, quantitatively investigates the impact of Keystone training on employee job task knowledge and job performance as well as changes in the practices and results of vehicle maintenance.

This chart gives an overview of pre- and post-training test results from selected Keystone Philadelphia courses.

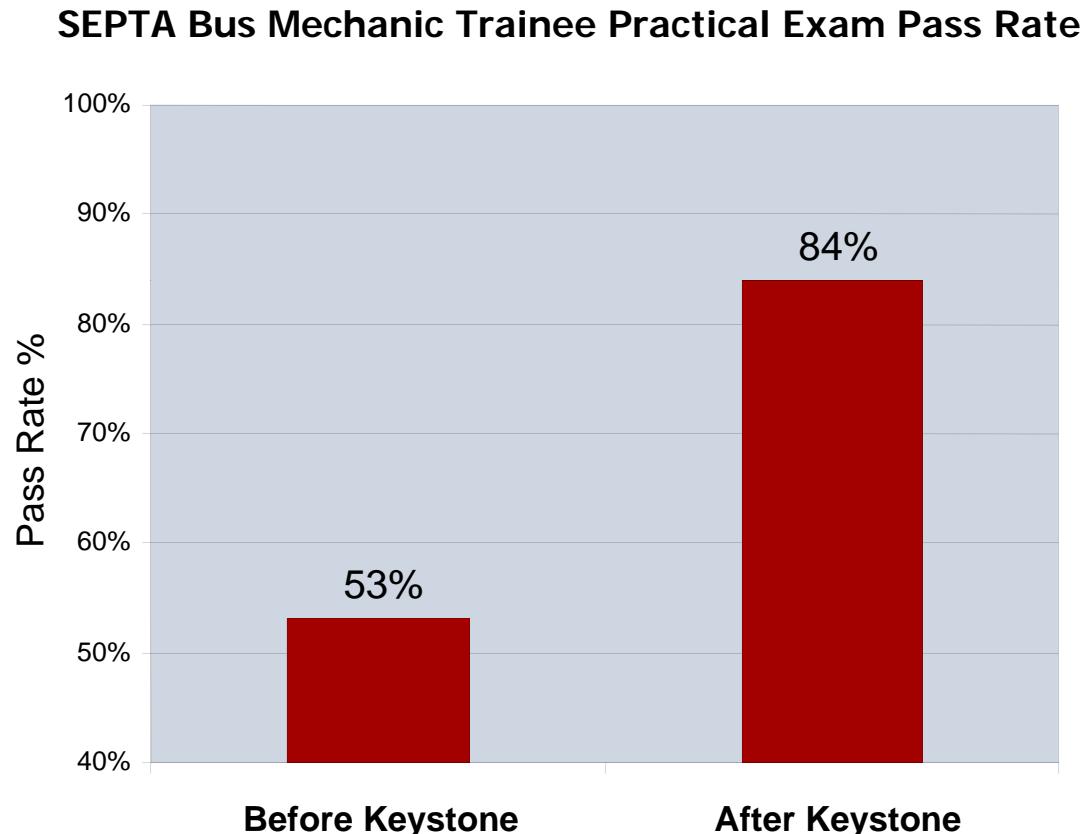
**Test score improvements of up to 87 percent indicate significant knowledge gains.**

# PRACTICAL EXAM PASS RATE IMPROVEMENTS

Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234

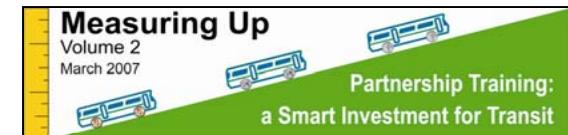


Another indicator of learning gains is success in passing practical “hands-on” exams administered on the shop floor after classroom training (see chart).

SEPTA provides 200 hours of instruction for employees who qualify to train for a promotion in bus maintenance. After the training, employees must pass a hands-on test demonstrating knowledge and skills to do the job. Prior to Keystone, only 53 percent of the employees completing classroom training passed the performance test. Two years after the beginning of Keystone, 84 percent (and around 90 percent more recently) passed and earned promotions.

# MEAN DISTANCE BETWEEN FAILURES

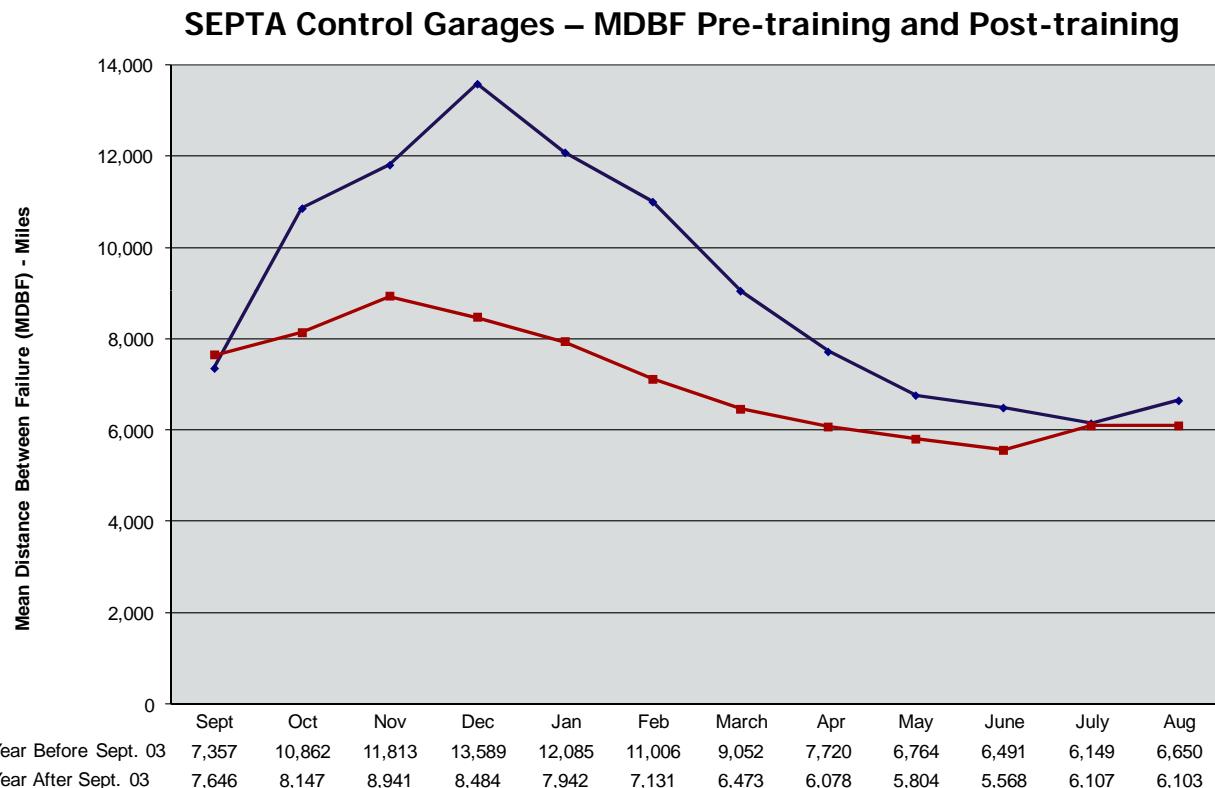
Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234

Mean distance between failures (MDBF) is an industry standard for measuring vehicle reliability. Charts on pages 11 and 12 compare trends in MDBF between SEPTA's bus garages that did not receive any preventive maintenance (PM) training and those garages that received Keystone PM training.

This chart shows declining MDBF over a two year period for SEPTA city bus garages that did not receive Keystone PM training. As an ordinary development, MDBF worsened in the second year because of equipment aging and other factors.



\* Three-month moving average MDBF (average of the month shown, 1 month before and 1 month after).

**For garages not receiving preventative maintenance training (control group), MDBF worsened between years 1 and 2 due to vehicle aging.**

# MEAN DISTANCE BETWEEN FAILURES

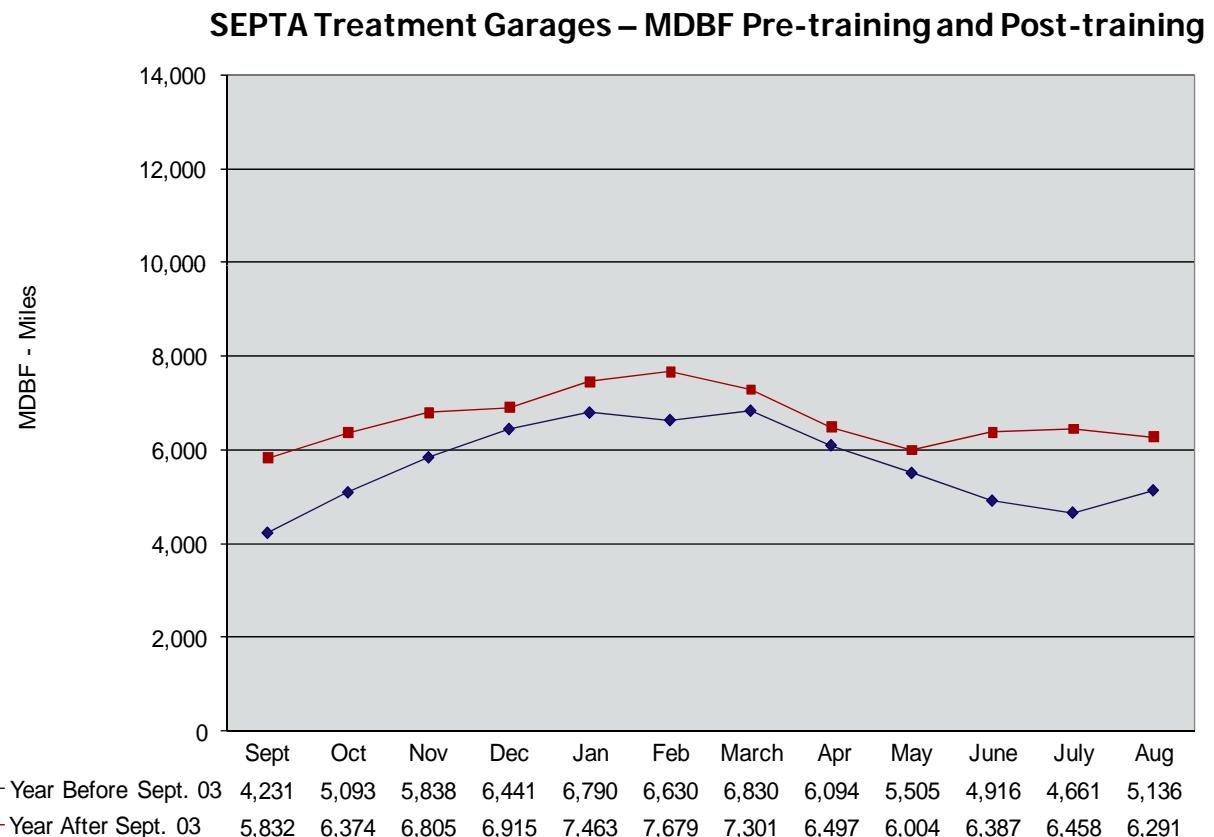
Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234

This chart illustrates the comparison of two-year MDBF for SEPTA city garages that did receive hands-on Keystone PM training between June and August 2003. Starting from September 2003 (the first month after training), MDBF improved for each month in the entire year.

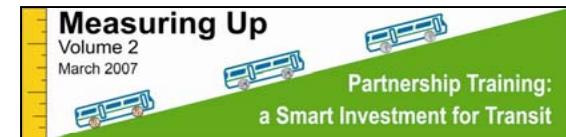
During the summer months (June, July and August) when MDBFs are historically lower because of the large number of senior mechanics on vacation leave, the post-training MDBF improvement was particularly significant. This improvement in vehicle reliability (and in comparison to the control group, previous page) provides strong evidence that the special training was effective in standardizing the previously inconsistent PM practices in different garages and augmenting mechanics' knowledge and skills to perform proper procedures.



\* Three-month moving average MDBF (average of the month shown, 1 month before and 1 month after).

# PARTS & LABOR COSTS: ANNUAL SAVINGS

## Keystone Transit Career Ladder Partnership

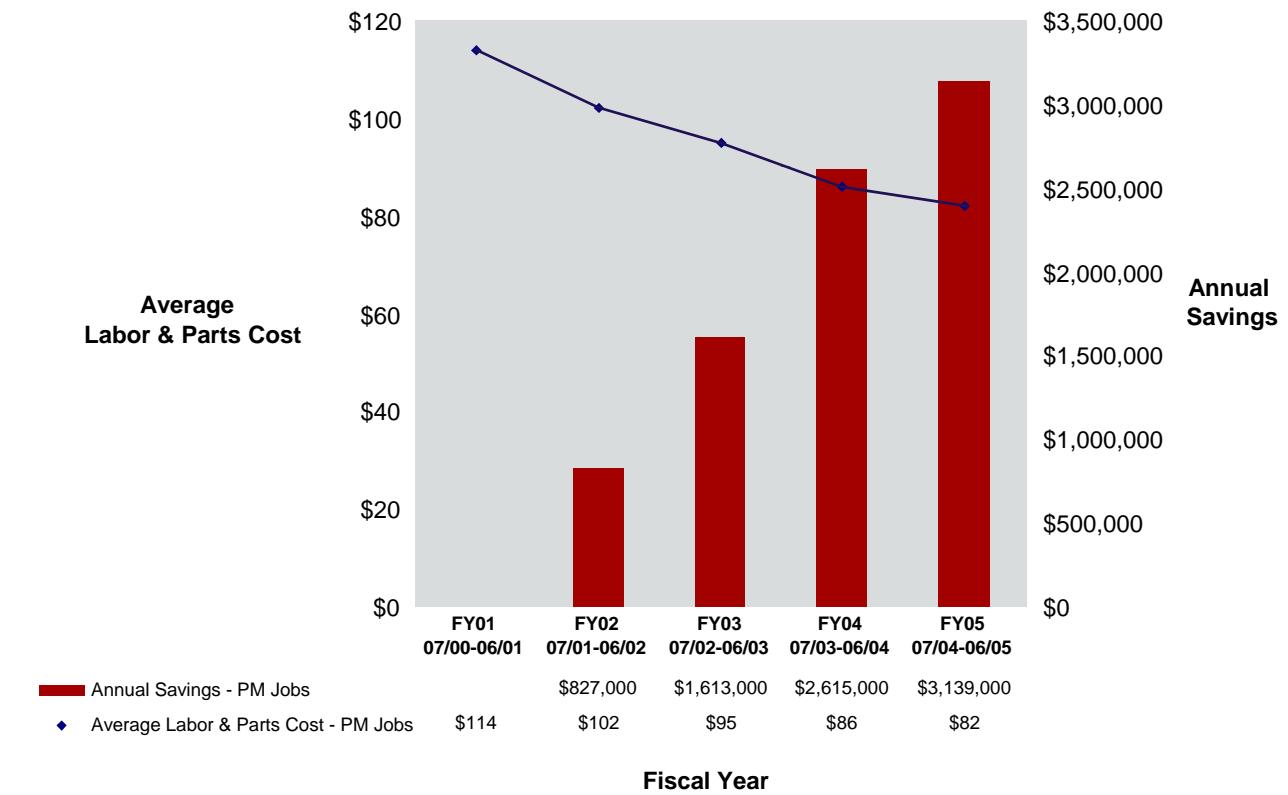


Partnership: SEPTA & TWU Local 234

Early in 2006, the Center released *Measuring Up: Interim Report*, the first comparison of the value of savings in SEPTA's maintenance program with the costs of this innovative partnership training program. Research findings were later incorporated in *Measuring Up, Volume 2*.

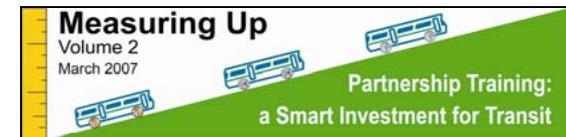
This chart showcases an example of bus maintenance labor and parts cost savings from higher labor efficiency and better maintenance skills in the years since Keystone training began. A preventive maintenance (PM) job that used to cost \$114 in labor and materials cost only \$82 after four years of Keystone training. SEPTA has saved a total of over \$8 million on bus PM jobs.

Average Labor & Parts Cost and Annual Savings - SEPTA Bus Preventive Maintenance (PM) Jobs



# PARTS & LABOR COSTS: ANNUAL SAVINGS

## Keystone Transit Career Ladder Partnership

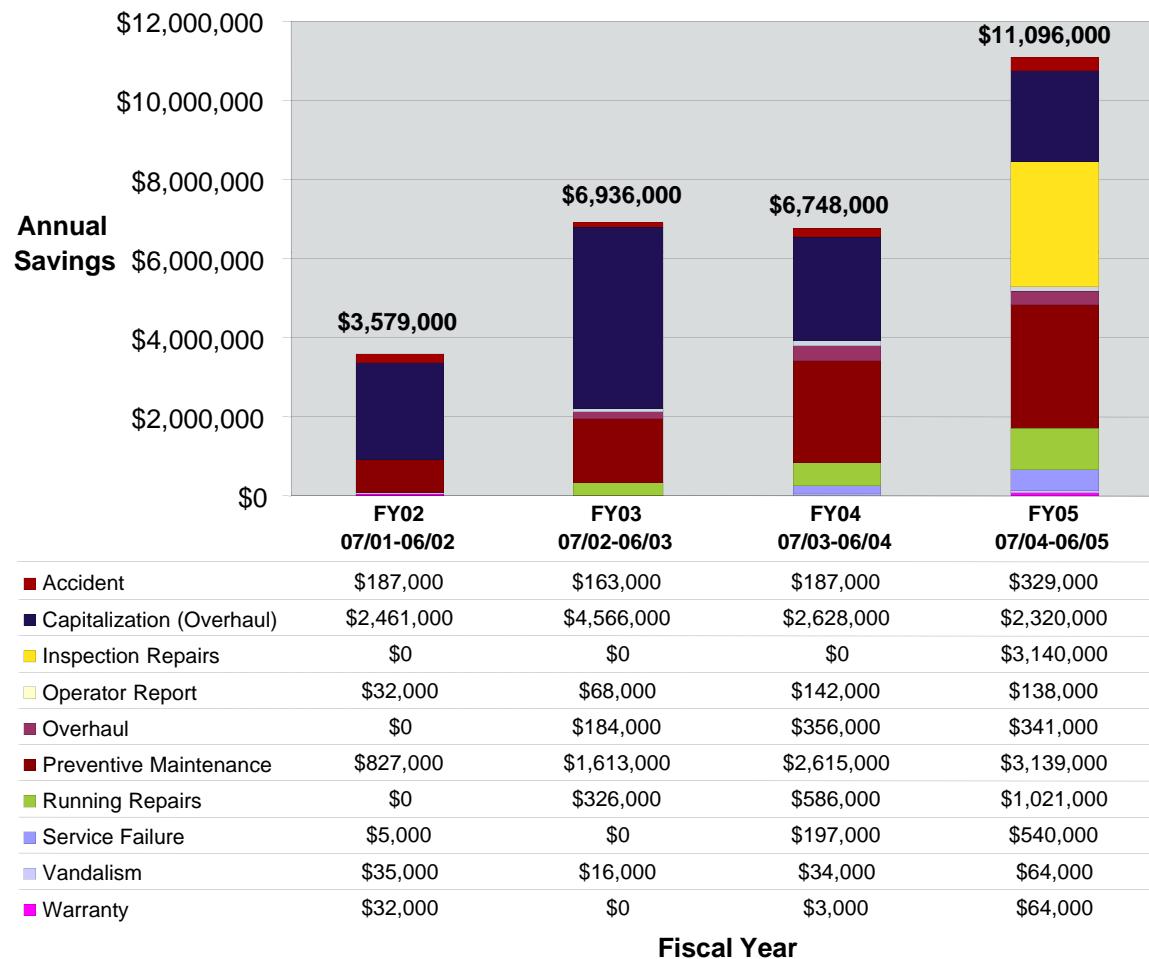


Partnership: SEPTA & TWU Local 234

This chart summarizes the total savings from reduced labor time and materials needed for maintenance work orders at SEPTA. The annual savings in all bus maintenance/repair categories rose rapidly from \$3.6 million in 2002 (the first year of Keystone) to \$11 million in 2005.

Furthermore, during that time period, SEPTA's spare bus ratio was reduced from 21.7 percent in 2001 to 16 percent in 2005. A lower spare bus ratio helped SEPTA save a total of \$22.5 million in fleet procurement costs. Though non-training factors may be direct contributors to these savings, strong anecdotal evidence and existing industry research suggest that the continuous and effective Keystone training for the maintenance staff has played an essential role in enabling the full returns from these other factors through a more skilled workforce and the positive labor-management dialogue.

Total Labor and Parts Savings in Bus Maintenance/Repair Categories



# BUS SPARE RATIOS DECREASE

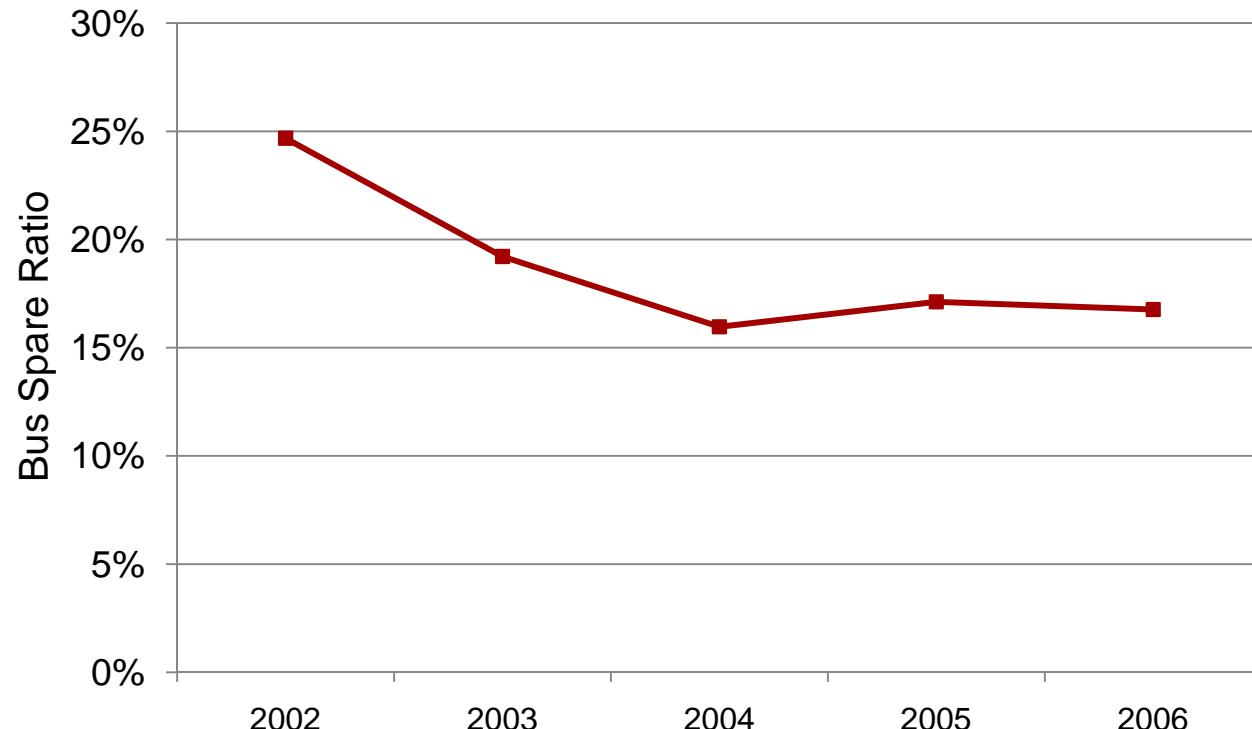
Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234

Between 2002 and 2006 SEPTA was able to reduce its bus spare ratio from 24.7 percent to 17.1 percent. Lower spare bus ratios helped SEPTA save an estimated \$48 million in fleet procurement costs. Though non-training factors may be direct contributors to these savings, strong anecdotal evidence and existing industry research suggest that the continuous and effective Keystone training for the maintenance staff has played a key role in enabling the full returns from these other factors through a more skilled workforce and the positive labor-management dialogue.

**Bus Spare Ratio Decline FY 2002-2006**



**SEPTA has successfully reduced its bus spare ratio from 24.7 percent in 2002 to 17.1 percent in 2005.**

# RETURN ON INVESTMENT

## Keystone Transit Career Ladder Partnership



Partnership: SEPTA & TWU Local 234

After quantitatively isolating the effect of non-training factors, the Center estimated a range of return on investment (ROI) for Keystone training in *Measuring Up Volume 2*. The ROI analysis indicates that the unique partnership-based, data-driven training program has produced very positive results for SEPTA and in turn, for the state of Pennsylvania that funded the project. A combined investment of \$2.6 million in this training through state government funding and employer match has produced an estimated cost savings of between \$10 million and \$22 million in bus maintenance and fleet procurement over a four year period. The resulting four-year ROI is estimated between 293 and 745 percent. The annual ROI rate, though initially low (101 percent to 336 percent in the first 18 months), has climbed to a stable 5 to 12 times the investment in subsequent years.

	Year 1&2 (18 months) 12/01-06/03	Year 3 07/03-06/04	Year 4 07/04-06/05	Total
Savings from Reduced Labor and Part Costs	\$10,515,000	\$6,748,000	\$11,096,000	\$28,359,000
Savings from Reduced Spare Ratio (from 24.7 percent to 17.1 percent)	\$11,277,102	\$17,792,572	\$19,041,130	\$48,110,804
Total Savings	\$21,792,102	\$24,540,572	\$30,137,130	\$76,469,804
<b>High Estimate of Savings from Training (30 percent contribution)</b>	<b>\$6,295,585</b>	<b>\$7,131,541</b>	<b>\$8,754,808</b>	<b>\$22,181,934</b>
<b>Low Estimate of Savings from Training (15 percent contribution)</b>	<b>\$2,903,995</b>	<b>\$3,329,008</b>	<b>\$4,080,654</b>	<b>\$10,313,657</b>
<b>ROI = (Training Benefits – Costs)/Costs * 100%</b>				
Internal Training Investment	\$803,855	\$341,271	\$402,257	\$1,547,383
Grant Investment	\$640,448	\$197,362	\$239,934	\$1,077,744
<b>Total Training Investment</b>	<b>\$1,444,303</b>	<b>\$538,633</b>	<b>\$642,191</b>	<b>\$2,625,127</b>
<b>High Estimate of ROI</b>	<b>336%</b>	<b>1224%</b>	<b>1263%</b>	<b>745%</b>
<b>Low Estimate of ROI</b>	<b>101%</b>	<b>518%</b>	<b>535%</b>	<b>293%</b>

The 4 year ROI is between 293 and 745 percent.

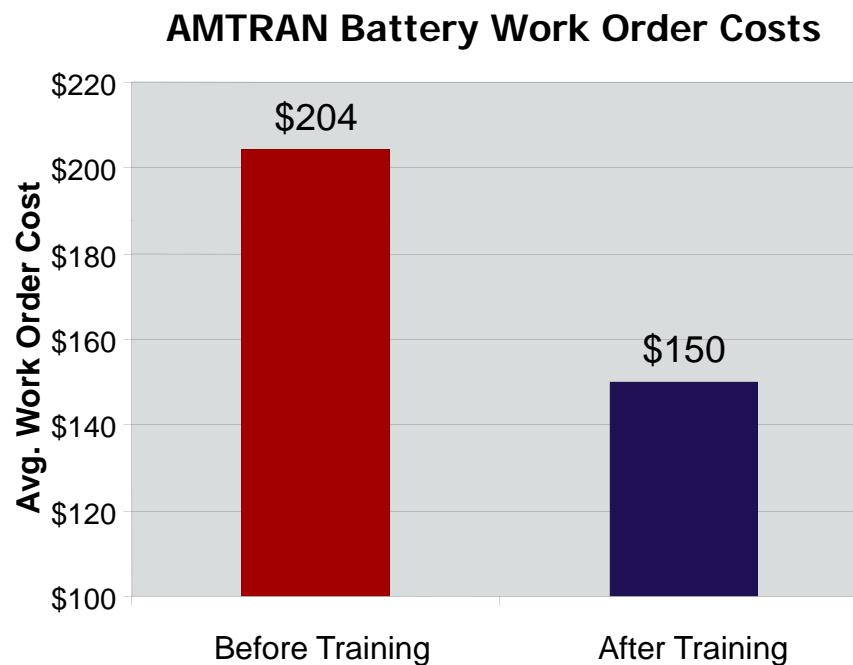
Annual ROI rate has climbed to a stable rate of 5 to 12 times the investment.

# SMALL PROPERTY RESULTS

## Keystone Transit Career Ladder Partnership



**Partnership:** AMTRAN & ATU Local 801



Though no large-scale quantitative study has been conducted in the smaller properties due to data limitations, substantial anecdotal evidence suggests significant improvements in maintenance operations since Keystone training.

This chart shows savings on battery replacements at AMTRAN, a smaller transit property in Altoona, PA. The maintenance manager at AMTRAN traced the savings on battery replacement after sending five mechanics to a Keystone basic electric course. Because the workers could understand the whole system and perform some basic maintenance tasks such as fixing the wiring, the frequency of jobs replacing two batteries dropped sharply, resulting in a \$54 saving for each work order involving battery replacement.

Anecdotal evidence of other positive outcomes are represented on the next page.

# SMALL PROPERTY RESULTS

## Keystone Transit Career Ladder Partnership



**I believe skills have improved, absolutely. Diesel mechanics are not afraid to explore. They now know why preventative maintenance is needed. Their skill level is really going to impact future maintenance work.**

**John Remark**  
**Former Keystone Statewide Coordinator**

Everyone we sent [to Keystone training] has come back home showing results. Our electrical problems are fewer with faster repairs because they now know what to look for. Our A/Cs have become more reliable. All in all, this program is a plus.

*Doug Greenwood  
Director of Maintenance  
Cambria County Transit Authority, Johnstown*

Keystone Career Partnership has been a God-sent program to the smaller Class 4 and Class 5 properties across the Commonwealth. The Authority is experiencing fewer A/C failures and our repairs are lasting longer through multiple cooling seasons. A side bar to fewer A/C failures is fewer customer complaints. The mechanics that have attended classes come back to the Authority with their “batteries charged” and ready to go. They feel good about themselves, their jobs and bring back a wealth of knowledge garnered from the training session they attended. The entire Keystone program has been a “win-win” program for ATA.

*Charlie Shilk, Director of Maintenance  
Johnsonburg Area Transportation Authority*

The changes we have seen [since Keystone training] include the reduction of batteries being replaced, better troubleshooting of our electrical problems with a small decrease in down time, which I think will get better with time and experience.

*Gary Williams  
Director of Maintenance  
AMTRAN, Altoona*

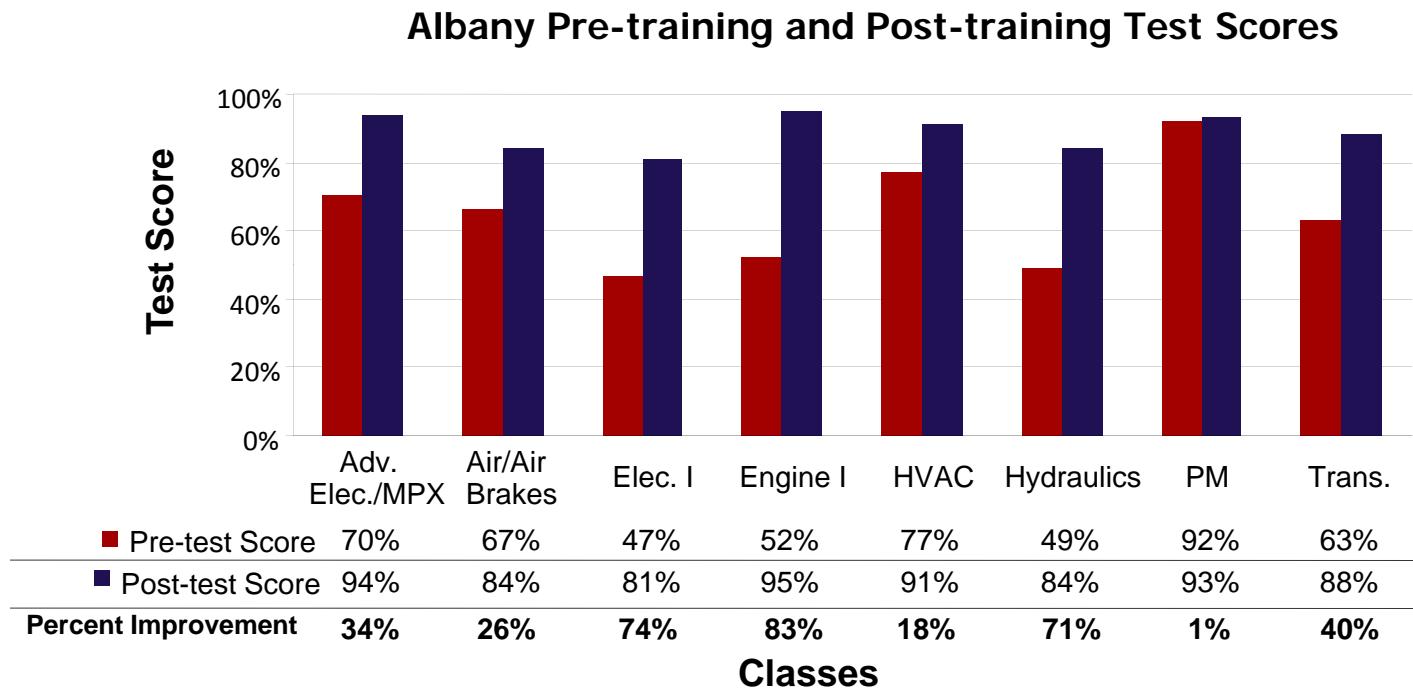
# KNOWLEDGE TEST SCORE IMPROVEMENTS

Project Empire Transit Career Ladder Partnership



Partnership: CDTA & ATU Local 1321

**Post-training scores improved 43 percent on average, with some training achieving over 80 percent improvement.**



Project Empire trainees are routinely tested on their subject knowledge at the beginning and end of a class using the same test. This graph shows the test score comparisons before and after training for all in-house courses provided at CDTA. Average test scores improved by 43 percent after training, indicating significant learning gains. In areas where employee pre-training knowledge was very limited such as Electrical, Engine and Hydraulics, post-training scores improved by over 70 percent.

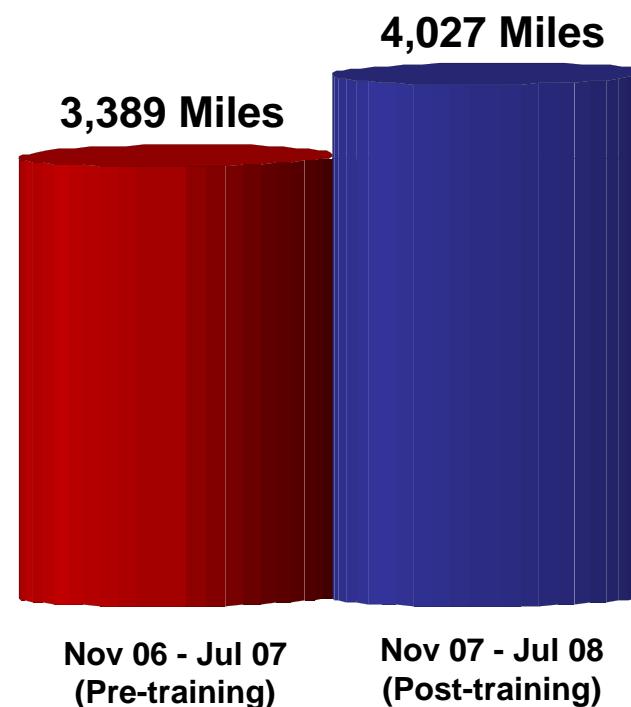
# MEAN DISTANCE BETWEEN FAILURES

Project Empire Transit Career Ladder Partnership



Partnership: CDTA & ATU Local 1321

CDTA System-wide Monthly Average MDBF, Pre and Post Training



Without any addition of new fleet, CDTA improved its monthly average MDBF by 638 miles, or 18 percent, following the joint training program.

# BUS MAINTENANCE DEFECTS DECREASE

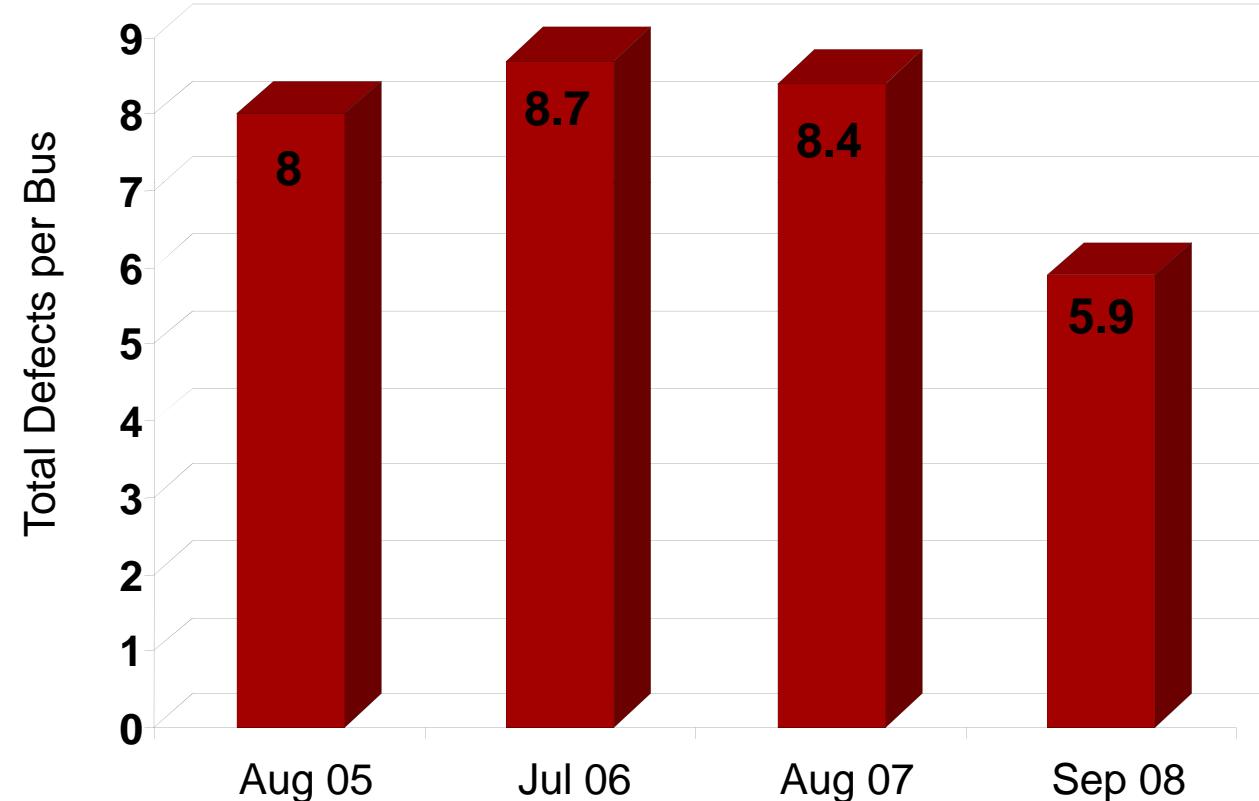
Project Empire Transit Career Ladder Partnership



Partnership: CDTA & ATU Local 1321

Total Bus Maintenance Defects Over Time

After initiating the data driven training partnership, there was a decrease in the number of defects found in CDTA buses. According to the Vehicle Maintenance Audit report conducted by an independent auditor in September 2008, the 5.9 defects per bus for the year following training (2008) represents a 30 percent decrease when compared to the average of 8.4 defects in previous years (2005, 2006 and 2007).



Maintenance defects decreased 30 percent August 2007 – September 2008.

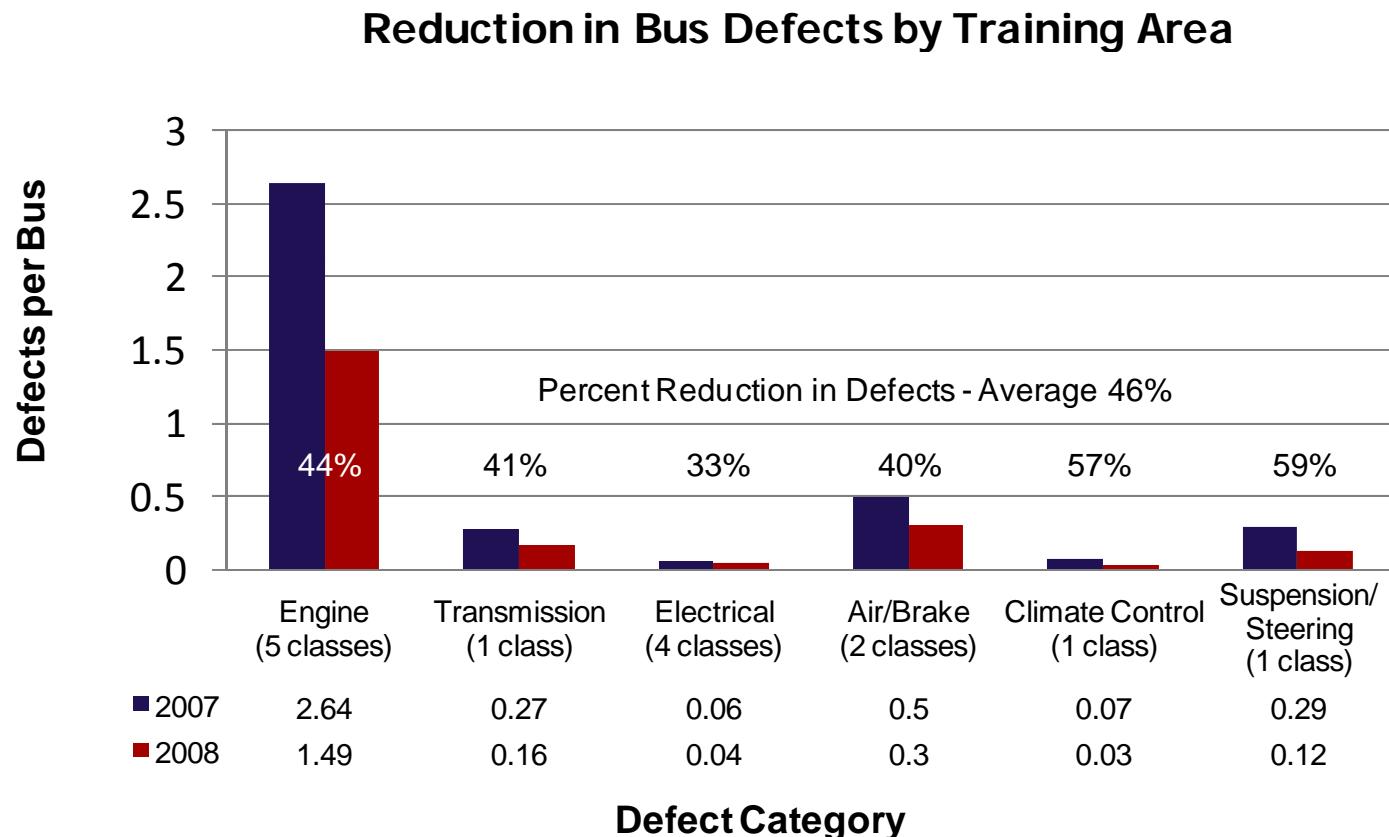
# BUS MAINTENANCE DEFECTS DECREASE

Project Empire Transit Career Ladder Partnership



Partnership: CDTA & ATU Local 1321

In areas where there is focused training, such as engine and electrical, defects per bus have dropped by as much as 59 percent.



# BUS SPARE RATIOS DECREASE

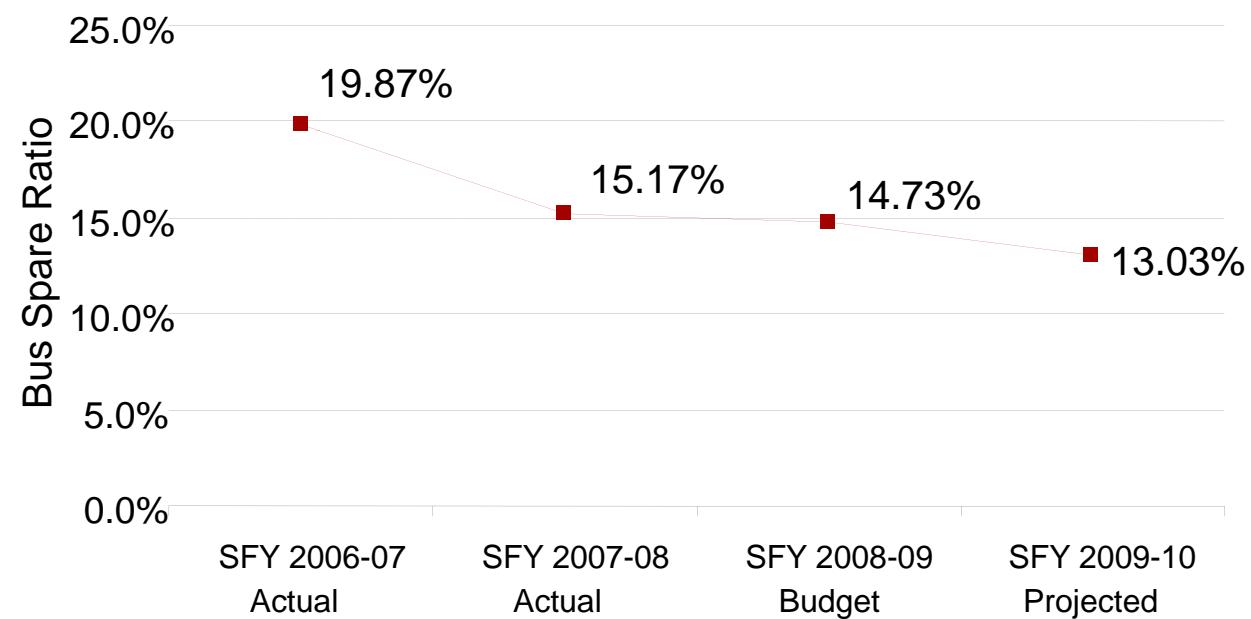
Project Empire Transit Career Ladder Partnership



Partnership: CDTA & ATU Local 1321

With joint training alongside an intensive fleet management campaign, CDTA has successfully reduced its bus spare ratio from close to 20 percent in FY 07 to 15 percent in FY 08. As a result, eight additional buses are available for service, even as the total fleet size is reduced by seven. The spare ratio is projected to drop even further in the next two fiscal years. With a smaller number of vehicles kept in reserve to meet maximum service needs, potential savings on fleet procurement, inventory and non-beneficial maintenance costs for out-of-service buses may add up to hundreds of thousands of dollars.

## Bus Spare Ratio Decline FY 2007-2010



**CDTA has successfully reduced its bus spare ratio from close to 20 percent in FY 07 to 15 percent in FY 08.**

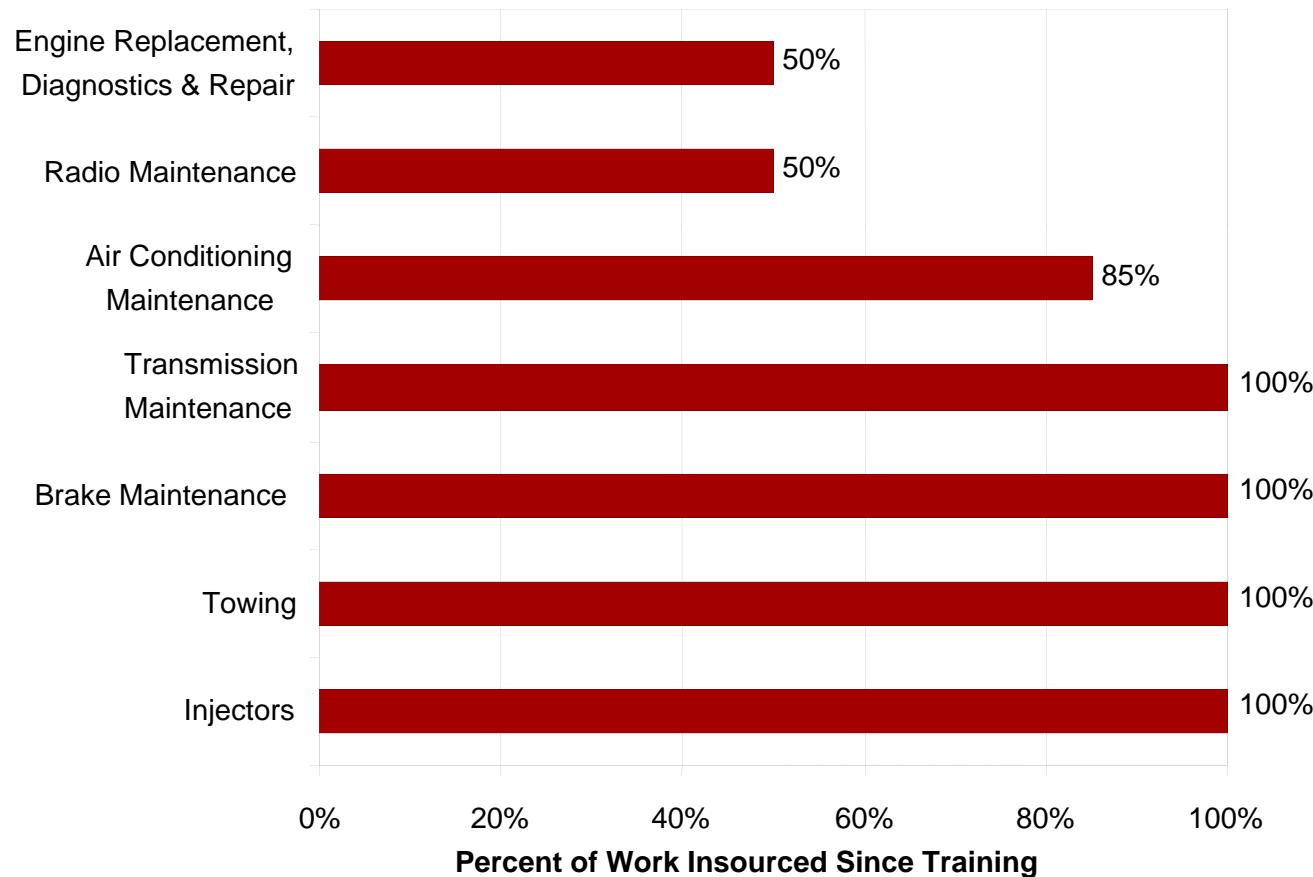
# MAINTENANCE WORK INSOURCING

Project Empire Transit Career Ladder Partnership



Partnership: CDTA & ATU Local 1321

## Maintenance Work Insourcing



Prior to the initiation of the Project Empire partnership, a substantial amount of CDTA's maintenance work was performed by outside contractors. With the partnership-based training program, CDTA has raised the level of competence of its maintenance workforce, allowing previously outsourced maintenance work to be brought back in house. According to the maintenance department, nearly 50 percent of the engine replacement, diagnostics and repair and 100 percent of the transmission, brake and injector repair jobs have been insourced since the beginning of Project Empire.

**100 percent of transmission, brake and injector repair jobs have been insourced since Project Empire began.**



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