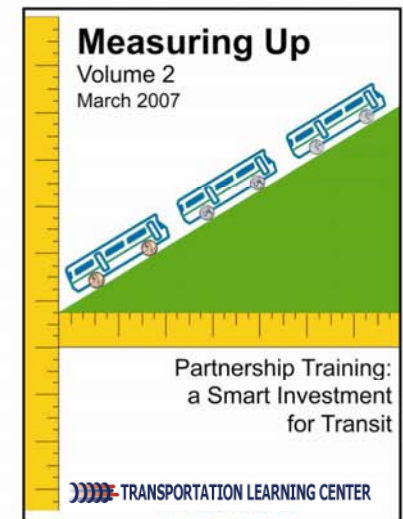
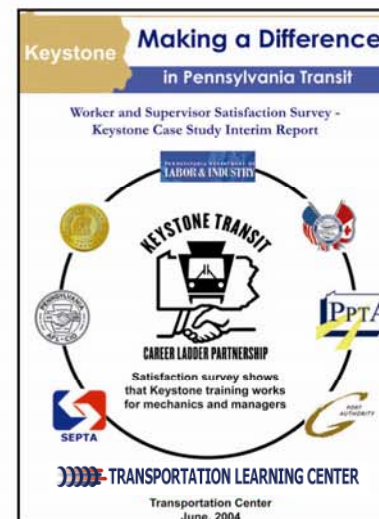
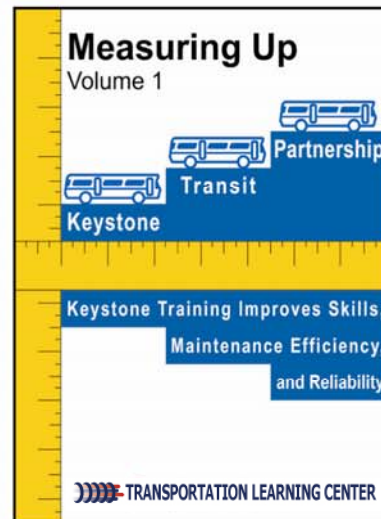


# Transit Partnership Training:

## *Metrics of Success*



# Table of Contents

p 2	Preface
p 3	Chart - Number of Trainees by Location and Year
p 4	Chart - Keystone Philadelphia Promotions and Wage Increases
p 5	Chart - Pittsburgh Worker Survey
p 6	Chart - Statewide Worker Survey
p 7	Chart - SEPTA Supervisor Survey
p 8	Chart - Keystone Philadelphia Pre-training and Post-training Test Results
p 9	Chart - SEPTA Bus Mechanic Trainee Practical Exam Pass Rate
p 10 -11	Charts - Comparison of Two-Year MDBF at Garages with and w/o Training
p 12	Chart - Average Labor and Parts Cost and Annual Savings – SEPTA Bus Preventive Maintenance Jobs
p 13	Chart - Total Annual Savings for SEPTA Bus Maintenance/Repair Categories
p 14	Table - Return on Investment (ROI) Calculations
p 15	Chart - Keystone Electric Training Helps AMTRAN Save Money on Batteries
p 16	Quotes - Perspectives from Smaller Properties in the Keystone Partnership

## Metrics of Success

You can never know how well you're doing until you find ways to measure outcomes. The Transportation Learning Center has followed through on this basic insight by developing a series of four in-depth research reports over the past four years on the work of the Keystone Transit Career Ladder Partnership – the longest operating, largest and so far the most successful of the statewide joint labor-management transit training partnerships supported by the Center.

The key findings of this research are highlighted in this overview. For employees and their supervisors, this unique partnership-based, data-driven customized approach to training at statewide scale has been a great success. It has:

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

For transit systems, it has led to significant improvements in efficiency and cost savings. It has:

- Improved equipment reliability and achieved longer mean distance between failures of vehicles
- Reduced unnecessary part replacement and improved labor efficiency
- Reduced need for high level of spare buses
- Resulted in major maintenance cost savings and fleet procurement savings of between \$6,356,977 and \$14,219,887, and a four-year return on investment (ROI) of between 142% and 442%

The Center would like to acknowledge those who made these reports possible. The research was supported by the US Department of Transportation and the Pennsylvania Department of Labor and Industry. Much of the work was done by labor-management work groups throughout the state, especially data managers at SEPTA. At the Center this research was led by Assistant Director for Research Xinge Wang and Director of Workforce Development Jack Clark. Their hard work and creativity have been exceptional in these projects.



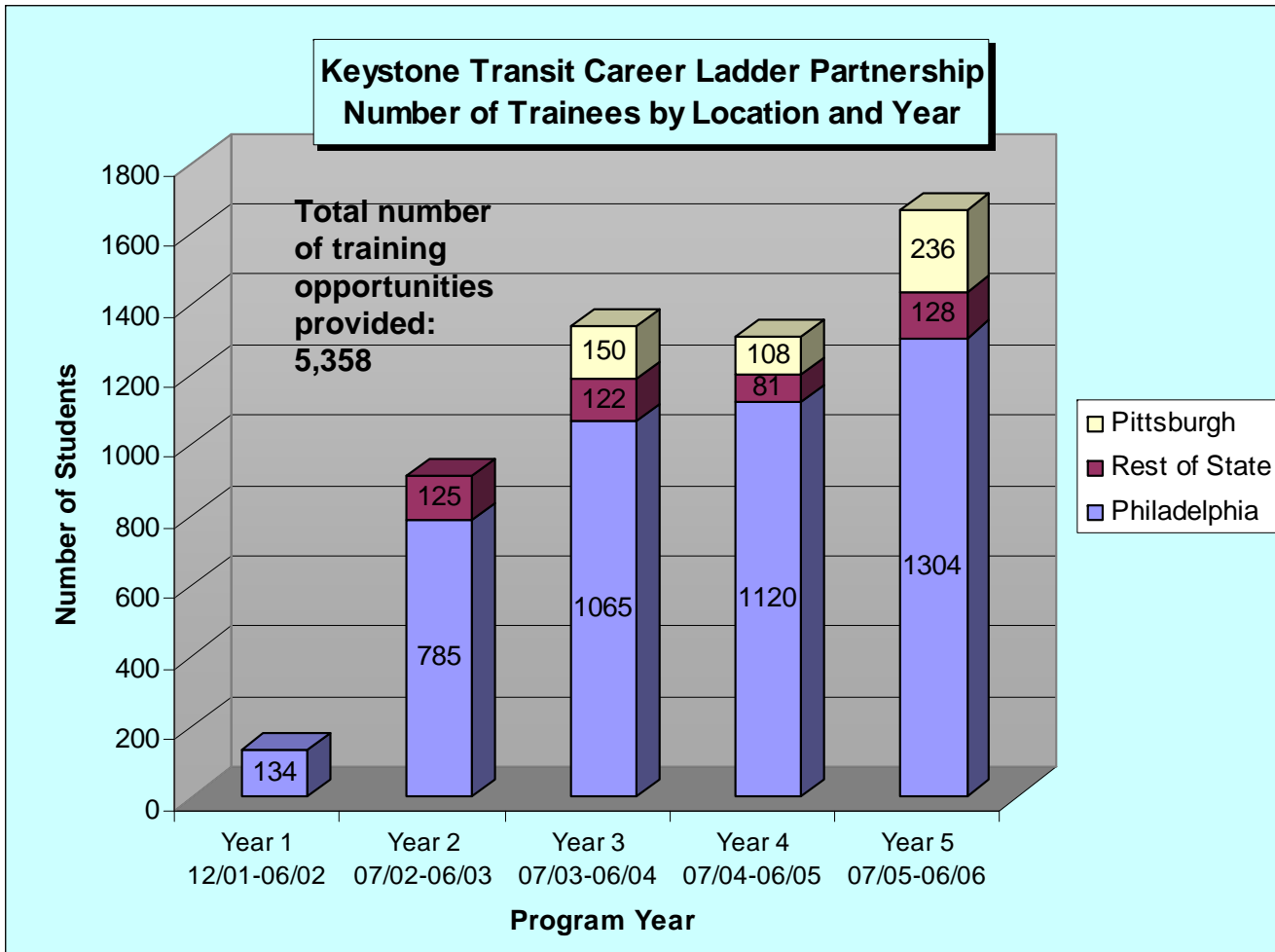
Brian J. Turner  
Director



Keystone Bus Trainees in  
Classroom

### Transportation Center Reports on Metrics of Success

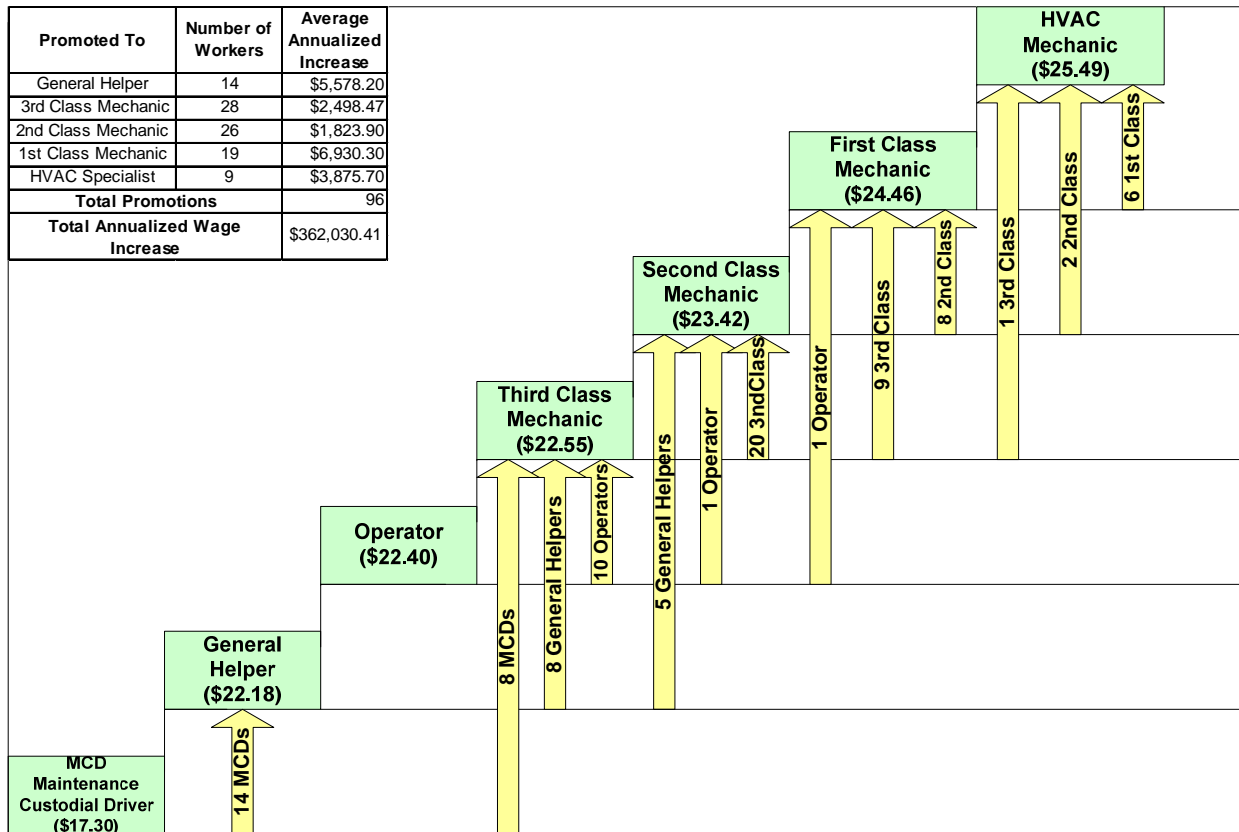
- **Pennsylvania Transit on the High Road (2003)**
- **Making a Difference in Pennsylvania Transit (2004)**
- **Measuring Up, Volume 1 - Keystone Training Improves Skill, Efficiency and Reliability (2005)**
- **Measuring Up Interim Report (February 2006 Update): Assessing the Costs and Benefits of Training (2006)**
- **Measuring Up, Volume 2 – Partnership Training: A Smart Investment for Transit (2007)**



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 over 5,000 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.

**Keystone Transit Career Ladder Partnership  
Philadelphia Promotions and Wage Increases\* 12/1/2001 – 6/30/2006**



\* 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.

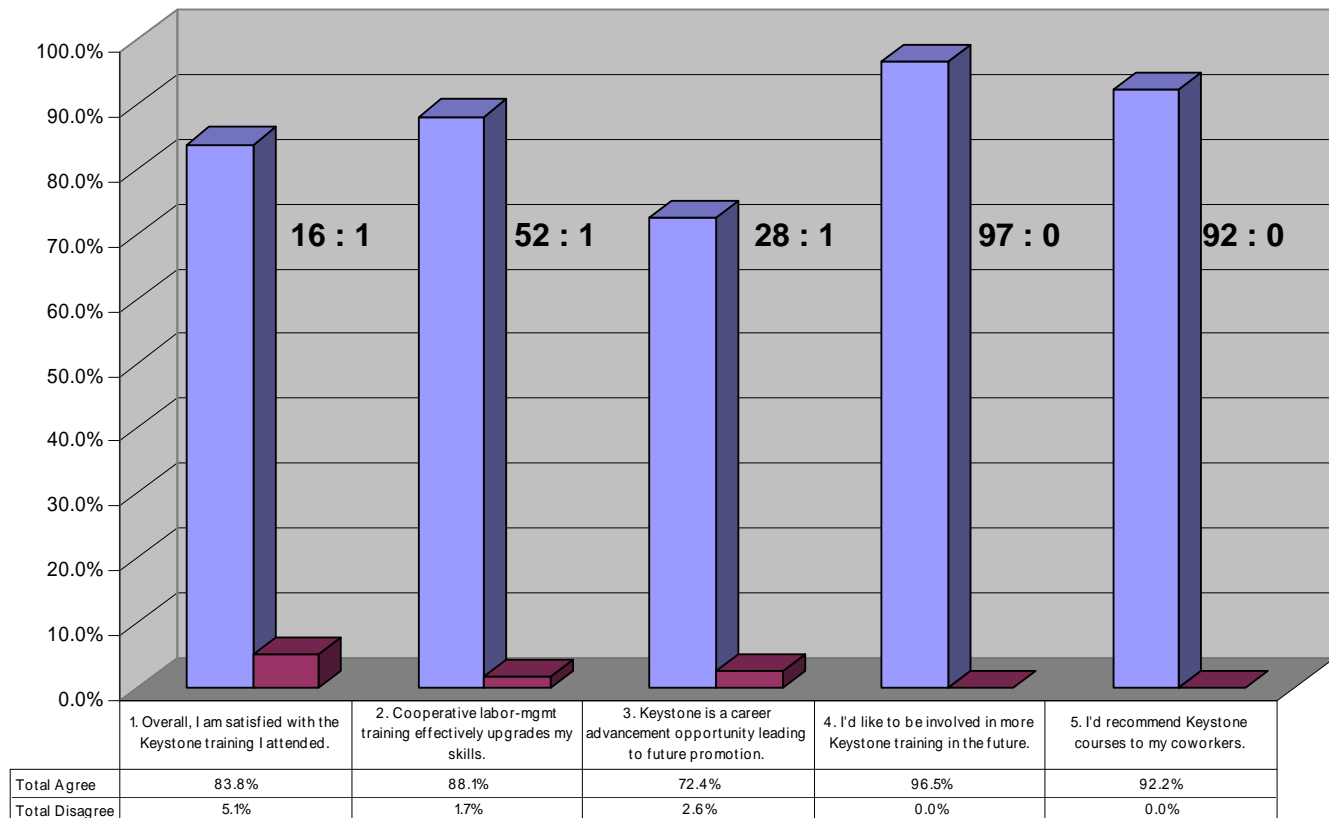
Building on strong labor-management partnerships and utilizing data-driven decision making process, Keystone has made it possible for a record number of mechanics to upgrade their skills and move up the transit career ladder in an industry facing dramatic technological change and skill shortages.

This chart illustrates examples of bus maintenance worker career ladder promotions through Keystone Philadelphia and corresponding wage increases. The 96 promotions achieved in the first five program years helped to alleviate SEPTA's skills gap caused by emerging new technologies and an exodus of senior maintenance workers due to retirement.

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

This chart illustrates Pittsburgh 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.

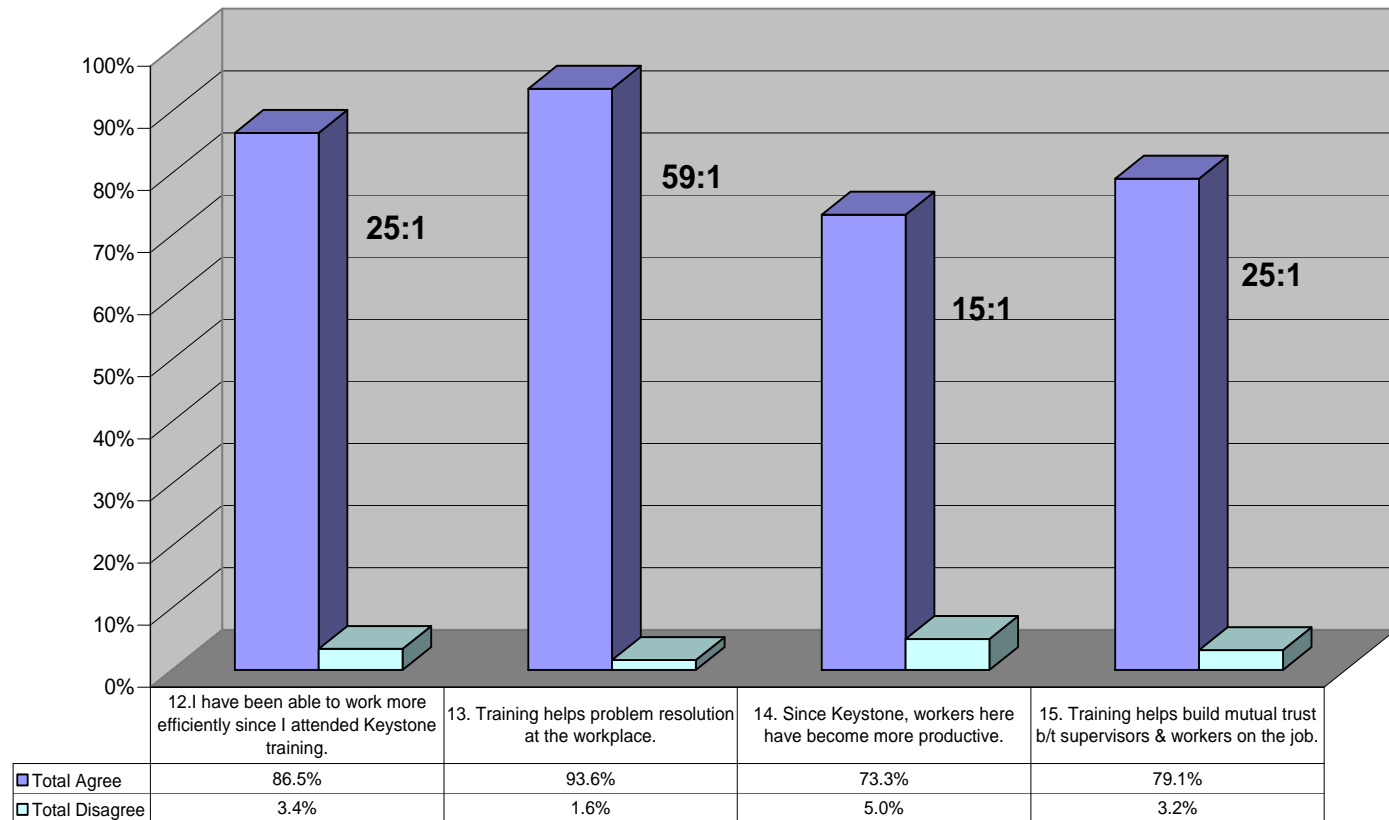
### Pittsburgh Worker Survey - Overall, workers are satisfied with the joint training and would like to be involved in more



**Statewide Worker Survey - Training helps augment individual worker skills. Overall efficiency and productivity has improved dramatically**

When questioned about the impact of Keystone training on participating individuals and their workplace, workers from smaller properties responded very positively (see chart).

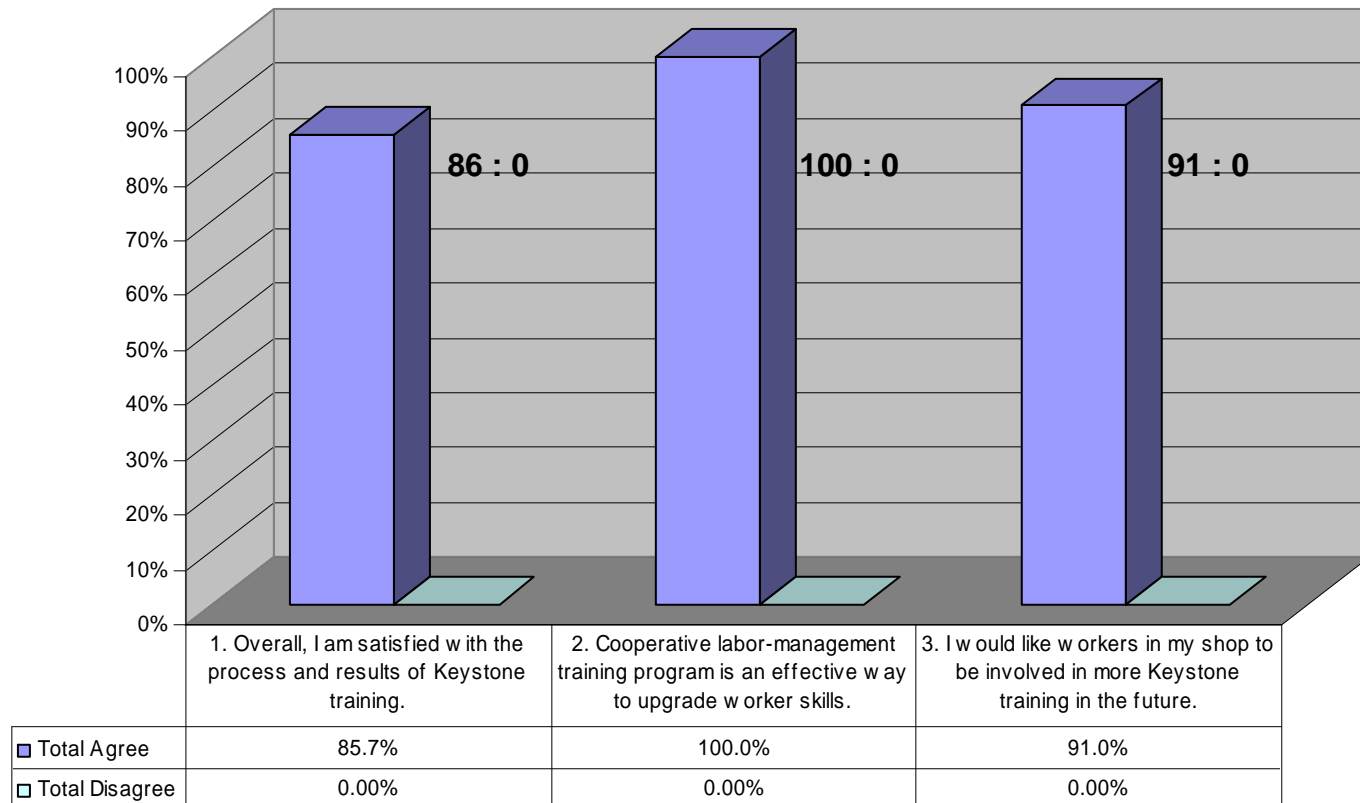
Over 86 percent of them feel that they have been able to work more efficiently since training. Three out of four trainees believe that workers in their shop have become more productive because of training and that training helps build mutual trust between supervisors and workers.

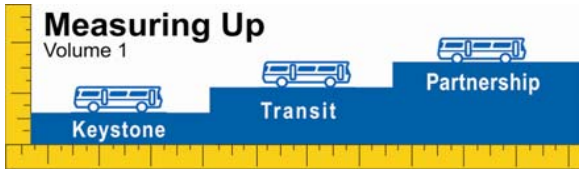


### SEPTA Supervisor Survey - Overall satisfaction with Keystone training was very high

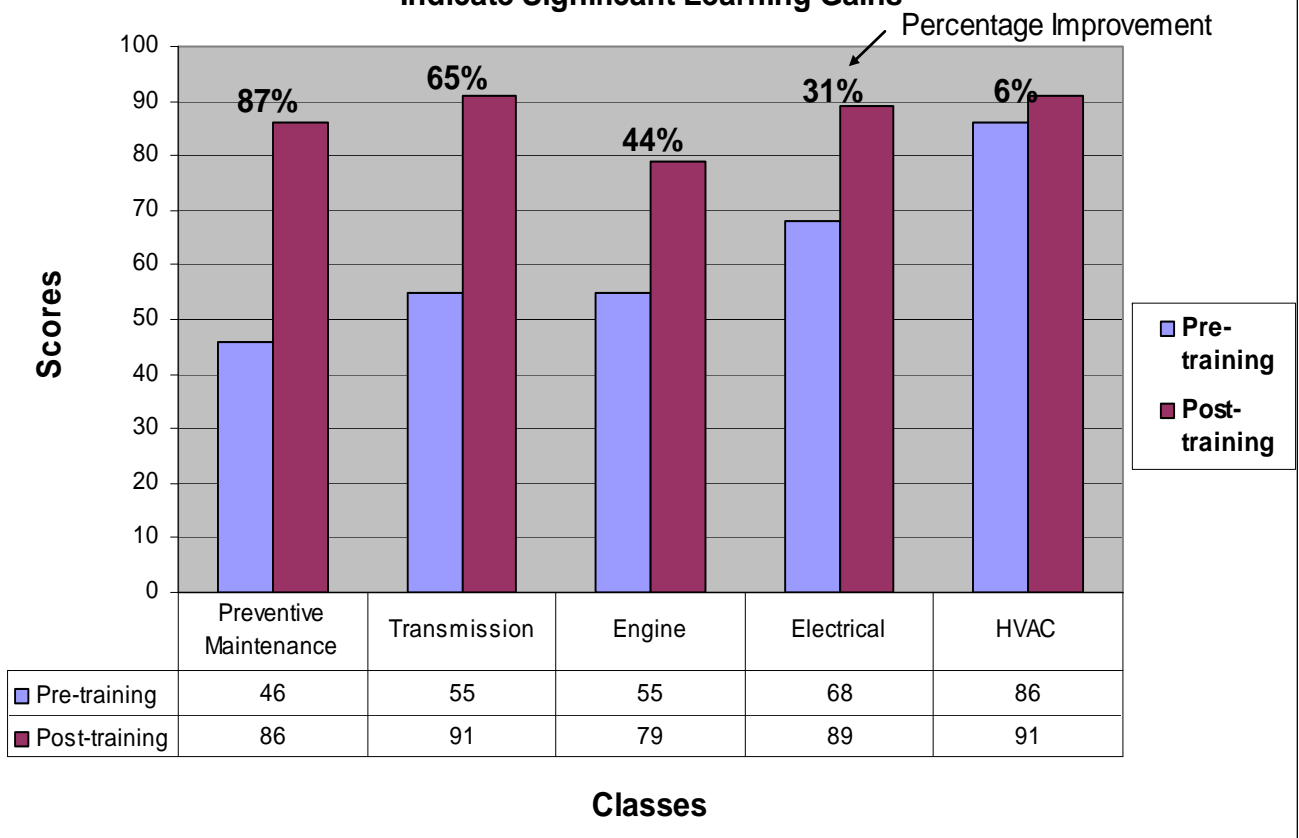
Front-line supervisors at various Keystone locations were also polled on their experience with Keystone. In general, they were very satisfied with the process and results of the training provided.

As shown in this 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.



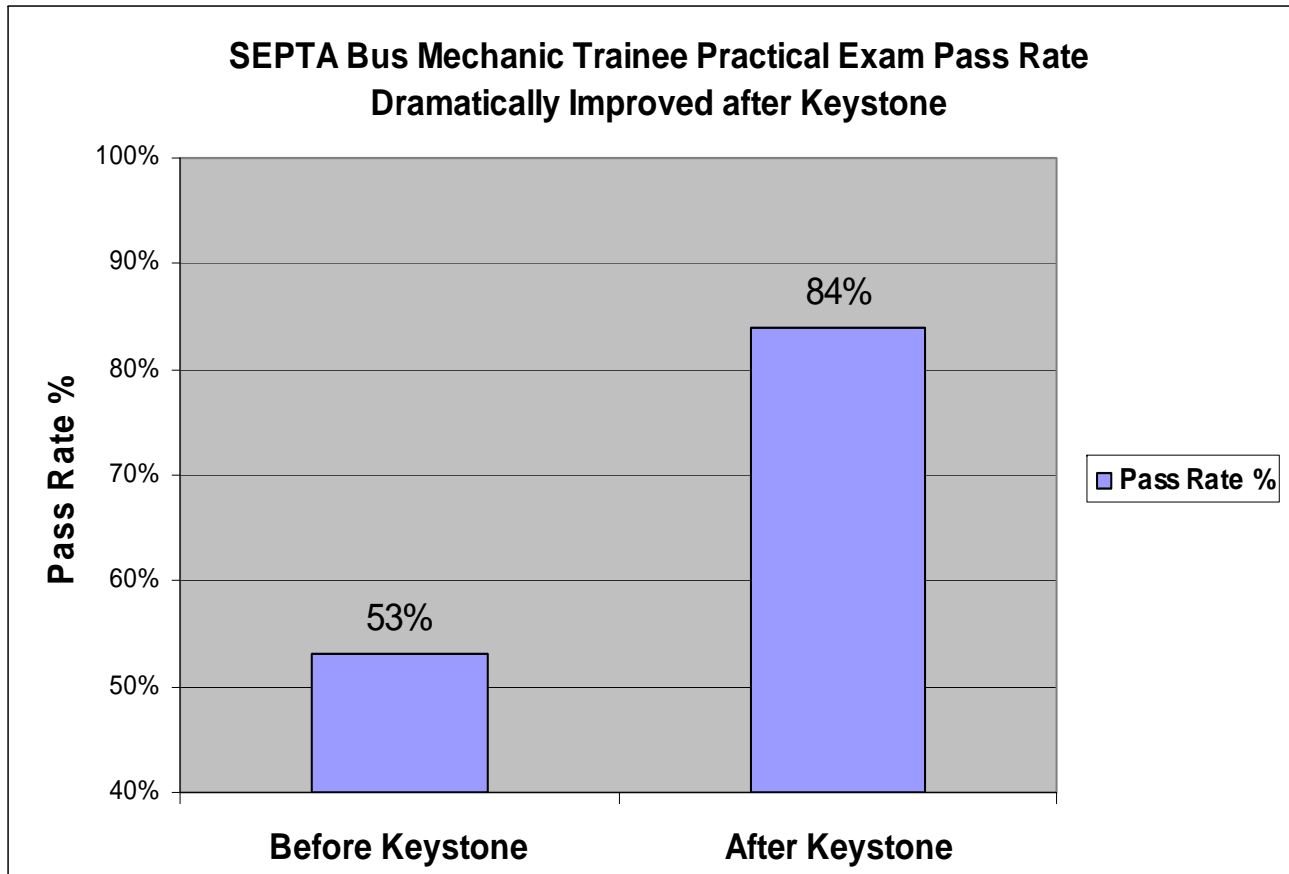
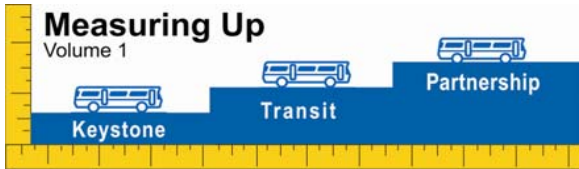


**Keystone Philadelphia Pre-training and Post-training Test Results for Selected Courses Indicate Significant Learning Gains**



The Center's report *Measuring Up Volume 1* published in 2005 goes beyond the earlier work by quantitatively investigating 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. Learning improvements of up to 87 percent indicate significant knowledge gains.

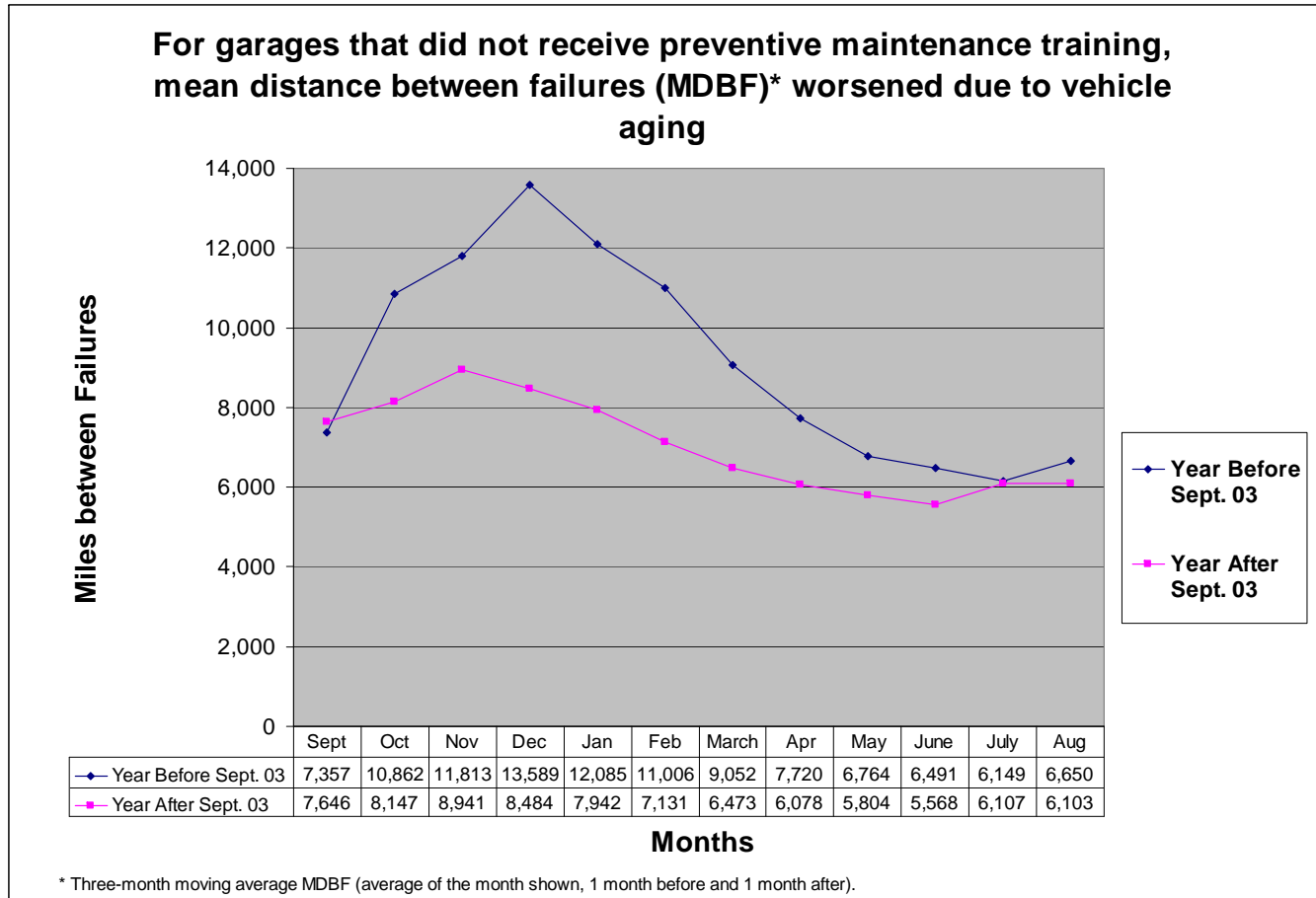


Another indicator of learning gains is success in passing the practical “hands-on” exams administered on the shop floor after classroom training, as shown in this chart.

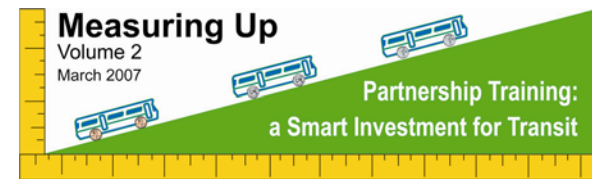
SEPTA provides 200 hours of instruction for employees qualifying to train for a promotion in bus maintenance. After this training, employees must pass a hands-on test demonstrating knowledge and skills to do the job. Prior to Keystone, only 53 percent of the employees completing classroom training passed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

Mean distance between failures (MDBF) is an industry standard for measuring vehicle reliability. Charts on pages 10 and 11 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.

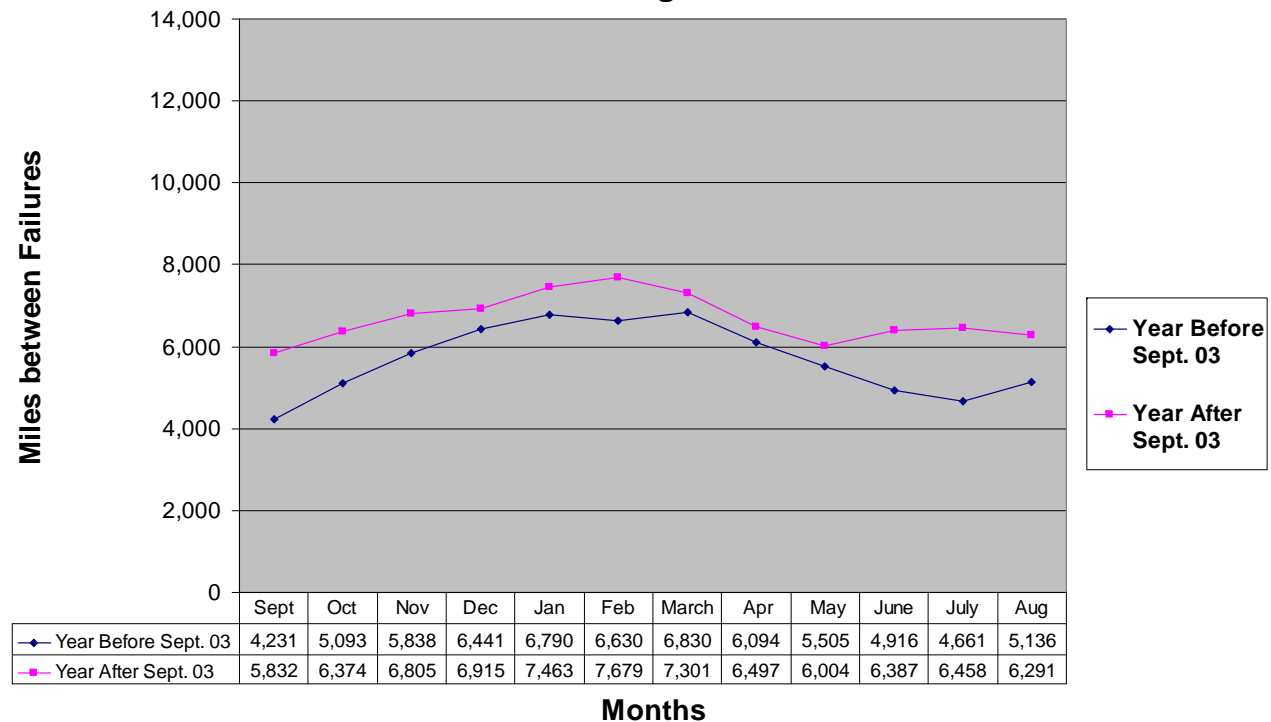
This chart shows declining MDBF over a two year period for SEPTA city bus garages that did not receive Keystone PM training. As an ordinary development, MDBF worsened in the second year because of equipment aging and other factors.



This chart illustrates the comparison of two-year MDBF for SEPTA city garages that received 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 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.



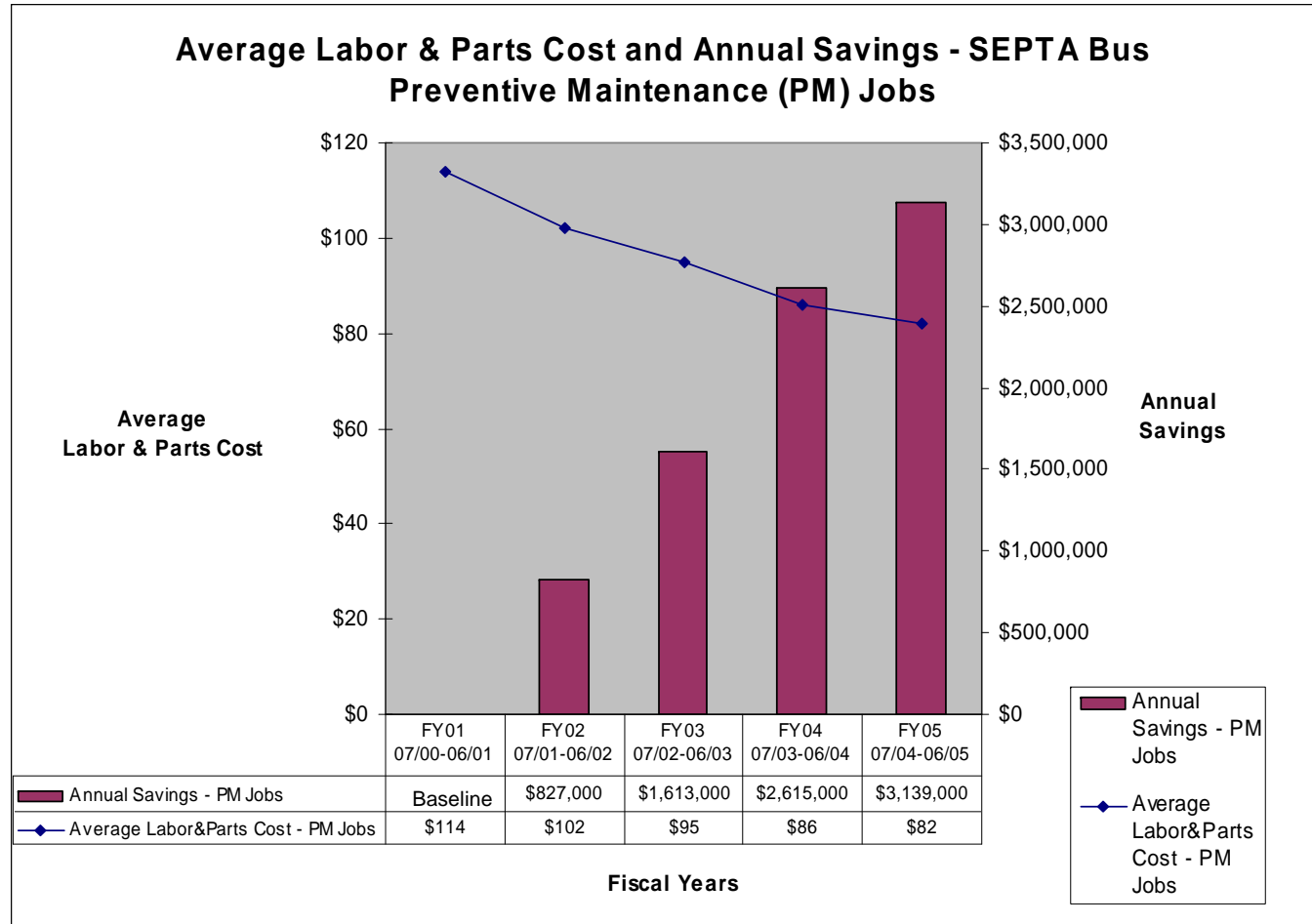
**For garages that had preventive maintenance training, mean distance between failures (MDBF)\* improved in the year following training**



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

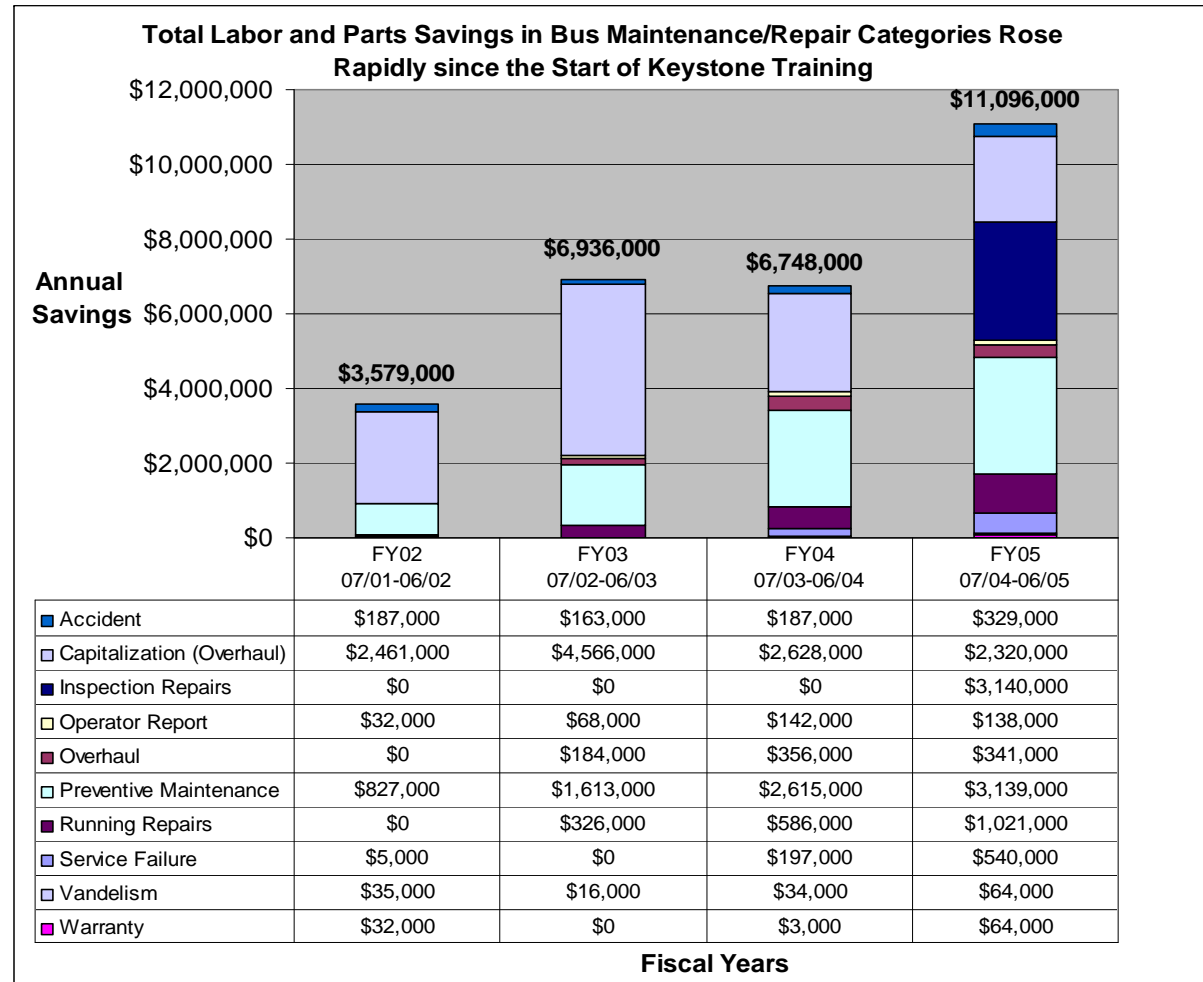
Early in 2006, the Center released *Measuring Up: Interim Report*, the first attempt to compare the value of savings in SEPTA's maintenance program with the costs of this innovative partnership training program. Research findings were later incorporated in *Measuring Up, Volume 2*.

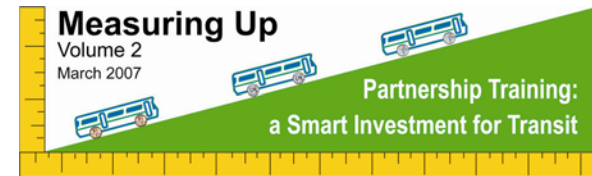
This chart showcases an example of bus maintenance labor and parts cost savings from higher labor efficiency and better maintenance skills in the years since Keystone training began. A preventive maintenance (PM) job that used to cost \$114 in labor and materials cost only \$82 after four years of Keystone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



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.

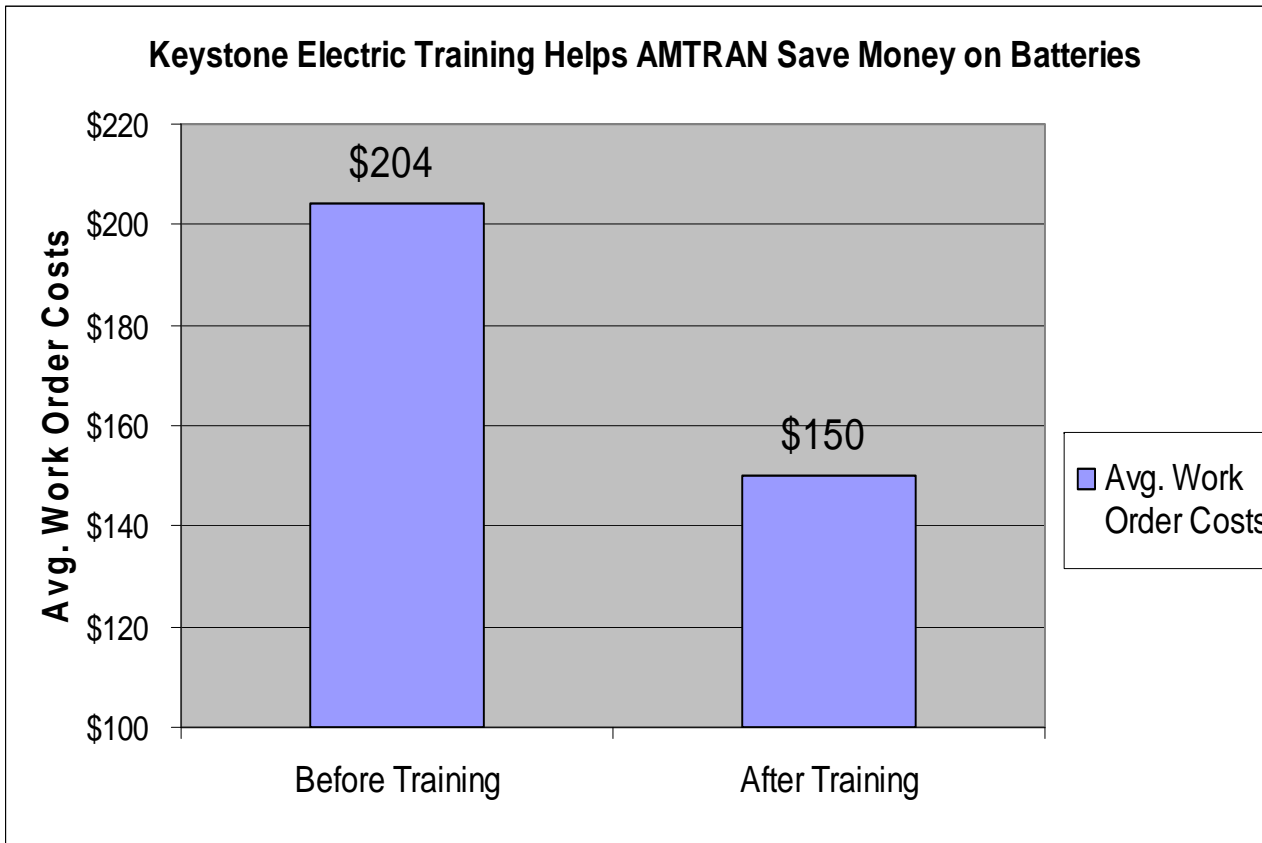
Furthermore, during the time period of Keystone, SEPTA's spare bus ratio was reduced from 21.7% in 2001 to 16% in 2005. A lower spare bus ratio helped SEPTA save a total of \$22.5 million in fleet procurement costs. Though non-training factors may be direct contributors to these savings, strong anecdotal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





After quantitatively isolating the effect of non-training factors, the Center estimated a range of return on investment (ROI) for Keystone training in its latest paper *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 \$6.5 million and \$14.5 million in bus maintenance and fleet procurement over a four year period. The resulting four-year ROI is estimated between 146% and 452%. The annual ROI rate, though initially low (36% to 198% in Year 1), has climbed to a stable 2 to 6 times the investment in subsequent years.

	Year 1 12/01-06/02	Year 2 07/02-06/03	Year 3 07/03-06/04	Year 4 07/04-06/05	Total
Total Savings	\$8,966,628	\$12,323,628	\$12,135,628	\$16,483,628	<b>\$49,909,512</b>
<b>High Estimate of Savings from Training (30% contribution)</b>	\$2,573,824	\$3,571,794	\$3,412,086	\$4,662,183	<b>\$14,219,887</b>
<b>Low Estimate of Savings from Training (15% contribution)</b>	\$1,170,748	\$1,660,602	\$1,477,441	\$2,048,186	<b>\$6,356,977</b>
<b>ROI = (Training Benefits – Costs)/Costs * 100%</b>					
Internal Training Investment	\$451,114	\$352,741	\$341,271	\$402,257	<b>\$1,547,383</b>
Grant Investment	\$436,644	\$203,804	\$197,362	\$239,934	<b>\$1,077,744</b>
<b>Total Training Investment</b>	<b>\$887,758</b>	<b>\$556,545</b>	<b>\$538,633</b>	<b>\$642,191</b>	<b>\$2,625,127</b>
<b>High Estimate of ROI</b>	<b>190%</b>	<b>542%</b>	<b>533%</b>	<b>626%</b>	<b>442%</b>
<b>Low Estimate of ROI</b>	<b>32%</b>	<b>198%</b>	<b>174%</b>	<b>219%</b>	<b>142%</b>



Though no large-scale quantitative study has been conducted in the smaller properties due to data limitations, substantial anecdotal evidence exists suggesting 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 of his 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.

Relevant quotes from smaller properties are found on the next page.

## Perspectives from Smaller Transit Properties in the Keystone Partnership

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  
Area Transportation Authority, Johnsonburg

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

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

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



**Graduates of Keystone funded  
Classes for promotions**



For additional copies and information contact:

Transportation Learning Center

8403 Colesville Road

Suite 825

Silver Spring, MD 20910

Tel: 301-565-4713

Fax: 301-565-4712

Email: [info@transportcenter.org](mailto:info@transportcenter.org)

Web: [www.transportcenter.org](http://www.transportcenter.org)