



Petro Chemical Energy

Air & Gas Leak, Steam Leak, and Steam Trap Surveys

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Company A Case Study: Reducing Site Cost through Ultrasonic Air Leak Surveys and Repairs

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March 01, 2016



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Abstract

This paper summarizes the fact that Petro Chemical Energy recommends that the Company Arrange each plant to have an annual Air leak survey conducted. In addition that they provide a Company A employee to repair the easily repairable leaks (e.g. valve packing, tubing fittings, open valves, unions, etc.) identified during the performance of the survey. By implementing this best practice **Company A will be able to see immediate savings of 10% of the compressed air system cost they are producing at each site.** This is by far the fastest pay back of any energy savings project.

Petro Chemical Energy has seen on average \$50,000.00 NET per week in annual savings for the sites we have conducted surveys for, when all leaks that could be repaired were repaired during the surveys. In five weeks at Location 1 site, we identified \$625,907.00 worth of leaks of which \$279,891.00 were associated with leaks that can easily be repaired. At Location 2, we performed a partial plant survey for five weeks and identified \$777,189.00 worth of leaks with \$224,891.00 easily repaired. At Location 3, we performed a partial plant survey and identified \$119,196.00 worth of leaks in one week and the Company A employee fixed \$50,791.00.

Petro Chemical Energy finds the leaks using ultrasonics and the Company A employee fixes the leaks that can be repaired in a quick manner. Once the leak is stopped Petro Chemical Energy will document the location and the size of the leak and the dollars saved per leak. The Ultrasonic survey can be done across your entire plant. The following pages show in detail the information we have obtained at three large Company A sites along with a projection for the Location 3 plant wide site survey for you to review. This technology will work for every Company A site small, medium and large sites alike. The following table shows Company A sites total CFM losses and total annual savings identified by Petro Chemical Energy.

Company A Sites

<u>Location</u>	<u>Total Losses CFM</u>	<u>Total Savings</u>
Location 4	728	\$259,896
Location 2	2,177	\$777,189
Location 1	3,277	\$625,907
Location 3	516	\$119,196
Location 5	989	\$274,942
Location 6	2,128	\$138,320



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Company A Case Study

Company A

For more than 117 years, Company A has strived to create value through its diversified, market-driven portfolio of specialty chemical, advanced materials, agro sciences and plastics businesses. Leveraging cost advantage, scale and geographic presence - together with close customer collaboration and industry-leading R&D expertise – Company A is delivering differentiated solutions that address unmet market needs. At the intersection of chemistry, biology and physics, Company A's team of scientists and experts are addressing the world's most pressing challenges – enhancing the quality of life for current and future generations, all while creating long-term sustainable value for the Company, its customers and its shareholders.

Petro Chemical Energy

Petro Chemical Energy, Inc. is a global leader in energy loss surveys, having over 25 years' experience making your business more efficient. Our highly trained and professional staff utilizes state-of-the-art ultra-sonic equipment to find air and gas leaks, steam leaks, and faulty steam traps. Uncorrected, these leaks cost your business time and money, and are environmentally unfriendly as well. We operate totally independent of all equipment manufacturers to ensure you receive a complete and unbiased report of your facility's leaks.

Petro Chemical Energy provides Air Leak Surveys, Nitrogen Leak Surveys, Steam Leak Surveys, and Steam Trap Surveys.

Leaks are caused by dozens, perhaps hundreds, of hard to pinpoint outflows which can be produced by vibrations and a corrosive atmosphere. Undetected air and gas leaks rob efficiency in manufacturing and processing. As a result, businesses lose millions of dollars annually in energy costs and lost production time.

Petro Chemical Energy measures leak loss by orifice size, plume length, and line pressure. We can find your leaks in areas that would be unnoticed and undetected by the human ear. We tag the leaks, document the location and size of each one in a spreadsheet, give an estimate of annual CFM and dollar loss, and provide our recommendations for repair and improvements



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Company A Case Study

The following case study will show the economic benefits of performing an Air and Gas leak survey annually for all Company A plants. We hope to make this an annual service and a best practice for Company A. Included in this study will be information gathered by Petro Chemical Energy when performing Air and Gas leak surveys at the following Company A sites. Petro Chemical Energy performed a plant-wide survey for Location 1 and partial plant surveys for Location 2 and Location 3.

Each plant will be broken down into number of CFM the plant is producing and how many CFM the plant is losing due to leakage. It will also include the number of CFM Company A employees fixed during the survey and how many leaks could have been fixed during the survey if Petro Chemical Energy had someone from Company A with them repairing the low hanging fruit such as tubing fittings, Valve Packings, Unions, Open Valves, Open Petcocks, etc. We recommend you send a Company A employee that can fix these easy leaks plant wide. On average, we see 30% of the leaks detected can be fixed on the spot.

Company A Location 1 Site

Petro Chemical Energy conducted a plant-wide Air and Gas Leak Survey for the Company A Location 1 site in June of 2013. The survey took five weeks to complete. When we use the price of compressed air provided to us by the Location 1 site (\$0.36311 per CFM), we calculate that one CFM costs \$191.00 per year to produce. We identified a total of 601 Air leaks equaling 3,277 CFM and having a dollar value of \$625,907.00.

During a portion of the survey, a Company A employee accompanied our crew repairing the leaks that he could. Though he was not dedicated to us for the entire survey, he was able to work with us for three or four days. During his time with Petro Chemical Energy he was able to repair 86 leaks with a CFM total of 245 and a dollar value of \$47,795.00.

After the survey was complete we did an overview of what leaks could have been repaired during the survey and came up with an additional 213 leaks with a CFM total of 1,456 and a dollar value of \$278,096.00. When combined, the total recovered plus the total potential not recovered during the survey equal 1701 CFM and \$324,891.00. These readily repairable leaks account for 52% of the total leaks on site. The other 48% of leaks will require a work order or shutdown.

The cost of Petro Chemical Energy's services for five weeks at the Location 1 site is \$30,000.00. The cost to dedicate a Company A employee to repairing leaks 40 hours a week for five weeks is \$15,000.00, totaling \$45,000.00 for both. The total savings per year minus expenses of survey and maintenance repairs for the Company A Location 1 site is \$279,891.00.



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Company A Location 1 Site

Total CFM Produced 30,000

	<u>CFM</u>	<u>Dollar Loss</u>	<u>%</u>
Total Leaks	3,277	\$625,907.00	100%
Total Recovered During Survey	245	\$46,795.00	7.5%
Total Potential not recovered	1,456	\$278,096.00	44.5%
Total Potential plus total recovered	1,701	\$324,891.00	51.9%
Total that will require a work order or shutdown	1,576	\$301,016.00	48.1%

Total cost of Petro Chemical Energy's Survey (5 weeks 40hrs per week) \$30,000.00

Total cost for Company A employee @\$75.00 per hour x 200 hrs. \$15,000.00

Total Cost for Company A \$45,000.00

Total savings per year in dollar loss for leaks that can be repaired \$324,891.00

Minus total cost for Company A \$45,000.00

Total savings per year after expenses for Company A \$279,891.00

Company A Location 1 Conclusion and Recommendations

It is always Petro Chemical Energy's recommendation to have a plant employee accompany our crew and repair the leaks that can be repaired during the survey. On average, 30% of the leaks we identify can be repaired during the performance of the survey. Location 1 requested each unit (plant) provide a person to go with our crew and fix leaks. This worked out well for the first two units, but after that things came up for the people that the units had lined up that were more critical than the air leak survey and they were pulled away. If we had a dedicated maintenance person with us during the survey from start to finish with the authority to perform basic repairs on the air system, Company A could have stopped 52% of their leaks saving 1,701 CFM and \$279,891.00.



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Company ALocation 2Site

Petro Chemical Energy conducted a partial Air and Gas leak survey for the Company ALocation 2 site in January 2011 in the following areas: Power 3 and 3200 block at plant A, Unit 4 Polypropylene at Oyster Creek and 8400, 3700, 4100, & 2700 blocks in Plant B. The survey took five weeks to complete. When we use the price of compressed air provided to us by the Location 2 site (\$0.68 per CFM), we calculate that one CFM costs \$357.00 per year to produce. We identified a total of 560 air leaks equaling 2,177 CFM and having a dollar value of \$777,189.00.

During the majority of the survey Company Aemployees accompanied our crew repairing the leaks that they could. The Company Aemployees were able to repair 242 leaks recovering a CFM total of 671 and a dollar value of \$239,547.00.

After the survey was complete we did an overview of what leaks potentially could have been repaired during the survey and came up with an additional 30 leaks with a CFM total of 92 and a dollar value of \$32,844.00. When combined, the recovered plus the total not recovered during the survey equal 763 CFM and \$272,391.00. The Company Aemployees potentially could have repaired 35% of the leaks surveyed at the Location 2 site. The other 65% of leaks will require a work order or shutdown.

The cost of Petro Chemical Energy's services for five weeks at the Location 2 site is \$32,500.00. The cost to dedicate a Company Aemployee to repairing leaks 40 hours a week for 5 weeks is \$15,000.00, totaling \$47,500.00 for both. The total savings per year minus expenses of survey and maintenance repairs for the Company ALocation 2 site is \$224,891.00



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Company A Location 2 Site (Partial)

Total CFM Produced 7,500 EST.

<u>CFM</u>	<u>Dollar Loss</u>	<u>%</u>
Total CFM Leaking	2,177	\$777,189.00 100%
Total Recovered During Survey	671	\$239,547.00 30.8%
Total Potential not recovered	92	\$32,487.00 4.2%
Total Potential plus total recovered	763	\$272,391.00 35%
Total that will require a work order or shutdown	1,414	\$504,798.00 65%

Total cost of Petro Chemical Energy's Survey (5 weeks 40hrs per week) \$32,500.00

Total cost for Company A employee @\$75.00 per hour x 200 hrs. \$15,000.00

Total Cost for Company A \$47,500.00

Total savings per year in dollar loss for leaks that can be repaired \$272,391.00

Minus total cost for Company A \$47,500.00

Total savings per year after expenses for Company A **\$224,891.00**

Company A Location 2 Conclusions and Recommendations

It is always Petro Chemical energy's recommendation to have a plant employee accompany our crew and repair the leaks that can be repaired during the survey. On average, 30% of the leaks we identify can be repaired during the performance of the survey. The Location 2 site provided us with a maintenance person for the majority of the survey and he repaired 31%. There were still a large number of large leaks that need to be taken care of when there is a shutdown such as open valves that need to have some type of moisture trap installed and old lines that need to be replaced. Overall this survey was a success. It would have been more successful, if we would have surveyed all three plants in their entirety.



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Company A Location 3 Site

Petro Chemical Energy conducted a partial Air and Gas leak survey for the Company A Location 3 site in October 2010. The survey took one week to complete. With the price of compressed air provided to us by the Location 3 site (\$0.44 per CFM); we calculate that one CFM costs \$231.00 to produce. We identified a total of 247 Air leaks equaling 516 CFM and having a dollar value of \$119,196.00.

During the entire survey a Company A employee accompanied our crew and repaired the leaks that he could. The Company A employee was able to repair 143 leaks recovering a total of 261 CFM and a dollar value of \$60,291.00. These leaks accounted for 50.5% of the total leaks identified. The other 49.5% of leaks will require a work order or shutdown.

The cost of Petro Chemical Energy's services for one week is \$6,500.00. The cost to dedicate a Company A employee to repairing leaks for 40 hours a week is \$3,000.00, totaling \$9,500.00 for both. The total savings per year minus expenses of survey and maintenance repairs for the Company A Location 3 site is \$50,791.00.



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Company A Location 3 Site

Total CFM Produced 14,000

CFM Dollar loss%

Total CFM Leaks	516	\$119,196.00	100%
Total Recovered During Survey	261	\$60,291.00	50.5%
Total Potential not recovered	0	\$0	0%
Total Potential plus total recovered	261	\$60,291.00	50.5%
Total that will require a work order or shutdown	255	\$58,905.00	49.5%

Total cost of Petro Chemical Energy's Survey (1 week 40hrs per week) \$6,500.00

Total cost for Company A employee @\$75.00 per hour x 40hrs. \$3,000.00

Total Cost for Company A \$9,500.00

Total savings per year in dollar loss for leaks that can be repaired \$60,291.00

Minus total cost for Company A \$9,500.00

Total savings per year after expenses for Company A **\$50,791.00**

Company A Location 3 Conclusions and Recommendations

It is always Petro Chemical energy's recommendation to have a plant employee accompany our crew and repair the leaks that can be repaired during the survey. On average, 30% of the leaks we identify can be repaired during the performance of the survey. Location 3 provided us with a maintenance person for the entire survey and he repaired over 50% of the leaks identified. There were a couple of large leaks that needed to be addressed after the survey was complete. The biggest recommendation is to let Petro Chemical Energy come in on a yearly basis and conduct this survey plant-wide.



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Company A Sites

Proposal and Estimated Savings

Petro Chemical Energy recommends that each Company A sites conduct a plant wide Air and Gas leak survey annually and that they provide a Company A employee to repair the easily repairable leaks identified during the performance of the survey such as valve packing, tubing fittings, open valves, unions, etc. Making this a best practice in all Company A facilities.

During the survey Petro Chemical Energy will identify and document all compressed Air and Gas leaks and the Company A employee will repair any leaks that he can. On average a plant is losing 30% of the compressed air they produce and of that 30% around 30% of the leaks can be repaired during the survey. This means you should be able to recoup an average of 10% of compressed air produced.

This is by far the fastest pay back of any energy savings project. You are always going to have leaks in your system but it is ideal to have as few as possible. This is why we recommend doing a survey annually. We can help get your system in top shape in as little as three years with annual surveys. This will help your air system run more efficiently and be more reliable. In addition to being a source of wasted energy, leaks can also contribute to other operating and reliability issues such as low system pressure and moisture issues. Leaks shorten the life of almost all system equipment such as piping and instruments. Finally, leaks can lead to adding unnecessary compressor and drying capacity. Below is a projected savings graph for the Location 3 site based on our initial finding. (See Chart Below)



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Company A Location 3 Site

Projection

Based on 14,000CFM Production

CFM Dollar loss%

Total CFM Leaks	4,200	\$970,000.00	100%
Total Recovered During Survey	1,680	\$388,080.00	40%
Total Potential not recovered	0\$	0%	
Total Potential plus total recovered	1,680	\$388,080.00	40%
Total that will require a work order or shutdown	2,520	\$582,120.00	60%

Total cost of Petro Chemical Energy's Survey (10wks 40hrs per week) \$65,000.00

Total cost for Company A employee @\$75.00 per hour x 40hrs.\$30,000.00

Total Cost for Company A\$95,000.00

Total savings per year in dollar loss for leaks that can be repaired \$388,080.00.00

Minus total cost for Company A\$95,000.00

Total savings per year after expenses for Company A\$293,080.00