THE LONG ISLAND SOUNDER

January 2009

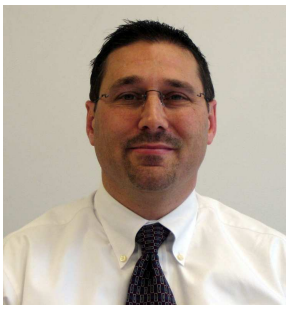
ASHRAE Long Island Chapter, Region 1...*Founded in 1957*

www.ashraeli.org

American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

Inside this issue:

President's Message



Hello fellow Ashrae members and a Happy New Year to each of you. I hope that everyone enjoyed the holidays with friends and family. While the onset of the 2008 year was very prosperous, the tail end created many economic adversities and uncertainties for us. As we endeavor into the New Year, we as a nation will strive to pull out of this economic crisis, however life goes on and we continue to put our best foot forward. While countrywide employment seems to suffer in certain business sectors, our general industry so far, has not been heavily affected. In fact, the necessity for qualified engineers continues to plague the HVAC and electrical profession, which is very encouraging due to the state of economy. We should all continue to work hard and grow so that our industry remains strong for the future.

This month, we have the pleasure of having Emerson Network Power- Liebert speak to us regarding mission critical high density precision cooling. As information technology furthers, so does the need for a proper environment. This presentation will enlighten us all on the latest technologies within our industry so that we can pass this information to our clients through design and application.

CHAPTER MONTHLY MEETING

DATE:	**Tuesday, January 13, 2009**
TIME:	6:00 PM - Cocktails/Dinner 7:00 PM - Dinner Presentation 8:45 PM - Conclusion
LOCATION:	Westbury Manor South Side of Jericho Tpke. 25 Westbury, NY 11590
FEES: Members - Guest - Student -	 $35.00 $40.00 $15.00

Reservations requested, but not required.
Call (516) 333-7117

I would like to thank our November Distinguished Lecturer, Dr. Tom Lawrence P.E, LEED AP for visiting and speaking to us on the proposed Ashrae standard 189.1 for LEED compliance in conjunction with Ashrae design standards. This standard is an indication that our great country is looking into renewable energy and recycling of materials to cut back on waste, which ultimately contributes to a cleaner environment and our dependency on foreign product consumption.

I look forward to seeing you all at our January meeting and it is also our Membership Promotion night. It is important to explain the bene fits of our organization to potential members so please bring a fellow colleague or business associate with you and have them join the Long Island chapter.

Thank you again for your continued support of the Long Island Chapter of Ashrae.

Steven Friedman, HFDP
President - Long Island Chapter

Long Island Chapter Officers & Committees

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Chapter Monthly Meeting - Program for 2008/2009

September 9, 2008 * At Westbury Manor - **1 PDH** Dinner Presentation - DDC Controls **MEMBERSHIP PROMOTION NIGHT**	**February 2009** **NATIONAL ENGINEERS WEEK DINNER**
October 14, 2008 * *At Westbury Manor* - **1 PDH** Dinner Presentation - Condensing Boiler Design **STUDENT ACTIVITIES NIGHT**	**March 10, 2009** * *At Westbury Manor* - **1 PDH** Dinner Presentation - Dedicated Outdoor Air Systems/ Energy Recovery **RESOURCE PROMOTION NIGHT**
November 18, 2008 * *At Westbury Manor* - **1 PDH** Dinner Presentation - Design/Build of LEED Projects **ASHRAE DISTINGUISHED LECTURER** **DR. TOM LAWRENCE, PH.D., P.E., LEED-AP** **RESOURCE PROMOTION**	**April 14, 2009** **FIELD TRIP - Blue Point Brewery**
December 16, 2008 Holiday Party - Westbury Manor	**May 4, 2009** * *Cherry Valley Club, Garden City, NY* **ANNUAL GOLF OUTING**
January 13, 2009 * *At Westbury Manor* - **1 PDH** Dinner Presentation - Cooling High Density Heat Loads in Data Centers **MEMBERSHIP PROMOTION NIGHT**	**May 12, 2009** Dinner Presentation - TBD **REFRIGERATION NIGHT**
January 24-28, 2009 ASHRAE Winter Meeting - Chicago, IL	**June 9, 2009** * *At Westbury Manor* **PAST PRESIDENTS & OFFICER INSTALLATION**
February 10, 2009 * *At Westbury Manor* **JOINT MEETING WITH SMACNA** Dinner Presentation - TBD **ASHRAE DISTINGUISHED LECTURER** **E. MITCHELL SWANN, P.E., LEED AP** **STUDENT ACTIVITIES NIGHT**	**June 2009 - TBD** ASHRAE Annual Meeting
August 2009 - Chapter Regional Conference Region I	

PAOE POINTS FOR 2008/2009

Chapter Members	Membership Promotion	Student Activities	Research Promotion	History	Chapter Operations	CTTC	Chapter PAOE Totals
297	325	655	460	350	850	325	2,965

January Program

You are cordially invited to our January 2009 Meeting…

Dinner Presentation

"Cooling High Density Heat Loads in Data Centers "

Presented by

Kenneth Sewell
Emerson Network Power/Liebert

Attendees Will Earn 1 PDH!

DATE:	**TUESDAY, JANUARY 13, 2009**		
Time:	6:00 PM – Cocktails and Hors D'ouevres 7:00 PM – Dinner Presentation 8:45 PM – Conclusion	**Fee:**	$ 35.00 Member $ 40.00 Guest $ 15.00 Student
Location:	**WESTBURY MANOR** (516) 333-7117 Jericho Tpke (South Side), 3/10 of mile east from Glen Cove Rd., Nassau County, NY. **Directions are posted at @ www.ashraeli.org.**		
Presentation:	With the rapid increase of rack heat density, how we look at cooling data centers has changed dramatically. The technology that is driving this increased heat density will be covered, as well as how to extend the capability of traditional cooling when the budget won't allow for immediate high density cooling upgrades. Traditional cooling does have its limitations, even in the best designed room. Once these limits are reached, supplemental cooling methods must be investigated. We will discuss high density solution implementation and feasibility, followed by a few simple case studies. **This seminar will earn professional engineers 1 PDH.**		
About our Speaker:	**Kenneth Sewell,** began his work with Emerson Network Power / Liebert in 1997 where he now works as the Sales Training Manager. Prior to his current position, he served as the senior trainer in the Environmental Services department. Ken has participated in numerous installations of high density cooling systems around the globe. He is a graduate of the U.S. Navy's Nuclear Engineering program and holds a B.S. from Urbana University in Marketing and degrees in HVAC Engineering & Design and Industrial Engineering from the Columbus Technical Institute. A former V.P. of engineering for Tokyo Tokushu NECCO Ltd. (Tokyo High Temperature Furnace Company), Ken spent twenty years developing and building computer controlled, high pressure-high temperature furnaces systems capable of processing advanced materials at pressures up to 2000 bar and temperatures above 3,000 C. Ken holds several patents in the field of high temperature, high pressure materials processing. In his spare time he is a writer of military history and a New York Times Best selling author.		

Student Activities

Happy New Year everyone please remember Student Activities night will be in February. We look forward to welcoming back all our students and an exciting joint meeting with SMACNA.

2009 Chicago Winter Conference Blasts into the Windy City.
ASHRAE Student Program:
Sunday Jan. 25, 2009, 7:30am-10:45am
Enjoy a FREE Breakfast, a warm welcome from ASHRAE President Bill Harrison, award presentations, and a career panel featuring five young engineers in ASHRAE.
ASHRAE Student Tour, McCormick Place District Energy Plant: $15
Sunday, Jan. 25, 2009
YEA/Student Mixer: FREE
Saturday January 24, 2009, 5:00pm-6:30pm
If you are a student member of ASHRAE, YEA wants to meet you!
Technical Program: FREE
Take advantage of the opportunity and learn as much as you can and earn PDHs for your attendance.
Expo: FREE
The AHR Expo is the largest HVAC show in the world. Thousands of HVAC companies gather under the same roof. The Expo begins Monday January 26, 2008 at McCormick Place Convention Center.

Student Activities
Offers a wide range of resources to help you learn the benefits of becoming a student member of ASHRAE and about careers in HVAC&R.
See what's available
K-12 & College Resources

Please visit: http://www.ashrae.org/students/ for more information on all the Student ASHRAE activities and opportunities.

Brian Simkins - Student Activities Committee

Carolyn Cammalleri, LEED AP - Vice Chair

History - The Cost of Energy

Unless you're living under a rock someplace the cost of energy has likely impacted your life in many ways. Driving your car, heating and cooling your office or home and just keeping the lights on are a major expense. Energy was a point of topic during the recent presidential debates and our dependency on foreign oil is always in the spotlight. Most of us like to think we have made significant progress developing and using alternate energy sources, but have we? Let's take a look back 28 years to the L.I. Chapter ASHRAE dinner meeting on January 13th 1981.

"Program Chairman Tim Murphy introduced the guest speaker of the evening, Mr. Brian M. Henderson, Director of Bureau of Energy Systems, New York State Energy Office. Mr. Henderson made an extremely interesting presentation on the structure and goals of the N.Y.S. Dept. of Energy. Among some of the highlighted items which certainly affect us as a local chapter are that New York State depends on outside sources, approximately 92% of its energy comes from outside New York State and approximately $ 20,000,000.00 was spent the previous year by New Yorkers for energy. He further mentioned that N.Y. Sate oil stocks is 70% foreign sources, while the United States average is approximately 40% from foreign sources making N.Y. State extremely susceptible to OPEC pricing. Mr. Henderson pointed out that two major divisions of the Dept. of Energy are the Division of Policy Analysis and Planning & Conservation. Mr. Henderson lead a discussion on the master plan, regulatory aspects of his office, hospital and school programs and the goals of the New York State Energy Office. A question and answer period followed and Mr. Henderson left on display copies of the publications by the State Energy Office and offered to follow up with any questions directed to his office".

That night 28 years ago it was all about energy reduction, alternate sources and cost control. On the lighter side Lou Bloom won the drawing for a free dinner and Ralph Butler won the 50/50 raffle. In retrospect the cost of fuel and energy has certainly risen in the past 28 years and our dependency on foreign oil has become greater. It doesn't seem like we have accomplished much. It was an important issue and topic of discussion back then and now. Let us all work together to find and utilize energy alternatives and maybe 28 years into the future, our chapter's historian will write about us.

John Nally
Chapter Historian

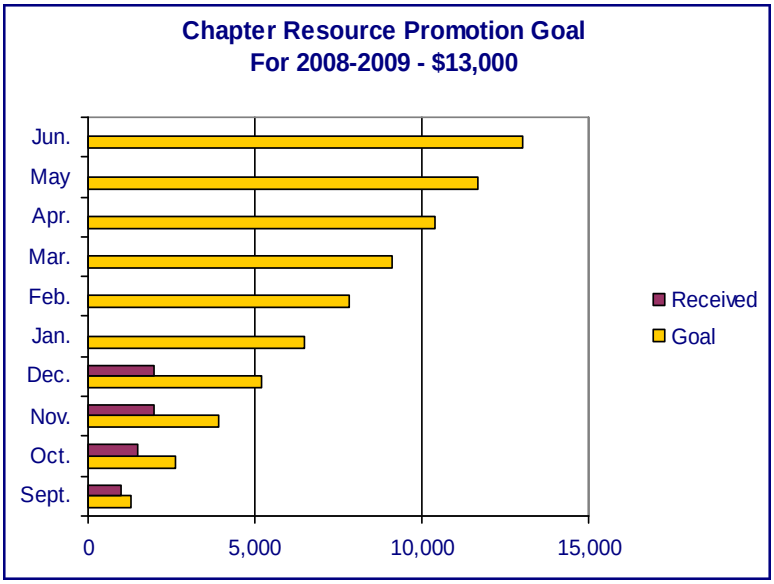
Long Island Chapter - Past Presidents

1958	H. Campbell, Jr. PE	1983	Leon Taub, PE
1959	Clyde Alston, PE	1984	Raymond Combs
1960	Sidney Walzer, PE	1985	Edward W. Hoffmann
1961	Sidney Gayle	1986	Jerome T. Norris, PE
1962	William Kane	1987	Abe Rubenstein, PE
1963	Louis Bloom	1988	Michael O'Rouke
1964	Milton Maxwell	1989	Mel Deimel
1965	Will Reichenback	1990	Robert Rabell
1966	Joseph Minton, PE	1991	Gerald Berman
1967	Irwin Miller	1992	Donald Stahl
1968	Walter Gilroy	1993	Ronald Kilcarr
1969	Charles Henry	1994	Jerald Griliches
1970	William Wright	1995	Walter Stark
1971	Louis Lenz	1996	Joe Marino
1972	Ronald Levine	1997	Norm Maxwell, PE
1973	Henry Schulman	1998	Alan Goerke, PE
1974	Myron Goldberg	1999	Frank Morgigno
1975	John N. Haarhaus	2000	Michael Gerazounis, PE
1976	Richard K. Ennis	2001	Ray Schmitt
1977	Kenneth A. Graff	2002	Steven M. Stein, PE
1978	Evans Lizardos, PE	2003	Andrew Braum, PE
1979	Albert Edelstein	2004	Claudio Darras, P.E.
1980	Ralph Butler	2005	Craig D. Marshall, P.E.
1981	Robert Rose, PE	2006	John Nally
1982	Timothy Murphy, PE	2007	Peter Gerazounis, P.E.

Research Promotion

I hope everyone had a great holiday and a Happy New Year! It was nice seeing everyone at the Holiday Party.

As we start off this new year, I hope to see all our supporters from the past contribute to this year's RP campaign. Thank you to all of you who have contributed already. I would also like to thank all the board members for their contribution towards achieving 'Full Circle' this year.



Please note: contributions can be made in three ways:

1) You can mail your checks, made out to Ashrae Resource Promotion, to:

Janeth Costa
Ashrae Research Promotion Chair
c/o Apollo HVAC Corp.
225 North Fehr Way
Bay Shore, NY 11706

2) You can bring your check to any of the meetings and give it to me. I will mail it for you.

3) You can contribute directly on-line. www.ashrae.org

**** Please make sure you accredit your contribution to the LONG ISLAND CHAPTER 006 ****

Thank you again for all your past support!

Janeth Costa
Resource Promotion Chair

Membership

Happy New Year to all…

A reminder please to those who are delinquent with your Society and Chapter dues, please send off your payment at your earliest convenience. Don't let your membership lapse.

We are having a good year with new member recruitment. We have a total of over 10 new members for this year alone. We are hoping to get some YEA members, which is any member under the age of 30. Please help us to get some new young members, as they are the future of our society. If you would like to help with recruitment please come and see me…you can join the committee.

See you at our next meeting.

Carolyn Arote
Membership Chairman

CTTC

Using Stirling Engines for Residential CHP

Most households obtain electric power from the grid, space heating from a furnace or boiler, and hot water from a gas-fired or electric-resistance water heater. In contrast, residential combined heat and power systems (RCHP) use a prime mover to generate electric power and harness waste thermal energy produced in the power-generation process to provide heat to satisfy space heating, water heating, and, po-tentially, space cooling loads (e.g., via absorption cooling). In practice, not all the waste heat is recoverable due to thermal energy radiated to the ambient air, losses from the exhaust-gas stream, low-quality heat (e.g., temperature too low to satisfy household thermal loads), and heat generation that exceeds household thermal loads at that point in time.

Stirling engines are a type of prime mover under development for deployment in RCHP applications. They use an external combustion process to provide heat to a sealed pressure vessel at temperatures of around 932℉ – 1 ,112℉ at RCHP scale. Inside the pressure vessel, a displacer piston moves a working fluid (typically helium or hydrogen) between the hot and cold sides of the engine. High engine efficiency depends heavily on the operation of the regenerator, a thermal capacitor that stores and returns heat to the shut-tling gas as it moves between the hot end and the cold end of the engine, thereby decreasing the amount of fuel needed to raise the gas temperature on the hot side, and decreasing the cooling requirements on engine cold side. As the gas is heated and cooled, the gas pressure inside the vessel oscillates about its mean value. Consequently, the gas has the potential to do work on a “power piston,” driving it back and forth against an opposing load, e.g., an electrical alternator.

There are two main categories of Stirling engines, kinematic and free-piston. Kinematic Stirling engines (KSE) employ me-chanical linkages to coordinate displacer and power piston mo-tions and convey linear piston power to a rotary alternator. Free piston Stirling engines (FPSE) do not have mechanical linkages but, instead, employ a balance of pressure, spring and alternator load reaction forces to achieve the same functionality.

KSE and FPSE both have advantages. In one regard, KSE control is simpler since displacer and power piston motions are mechanically coordinated. The FPSE must have the means to effectively control piston excursions to avoid collisions with the pressure vessel, displacer piston, or additional power pistons in the engine. On the other hand, this also enables continuous modulation of piston stroke, offering an opportunity to optimize efficiency at partial load. An important feature for FPSE is that the elimination of mechanical linkages can enable design for maintenance-free operation for tens of thousands of hours.

When used for RCHP, a liquid cooling loop recovers reject heat from the cold end of the Stirling engine and its combustion exhaust gases. This waste heat is then transferred to a storage tank or circulated through a hydronic system to provide space and water heating. In addition, some RCHP systems nearing commercialization include an additional burner to augment the space heating capacity of the unit so it can meet all space heating loads, obviating the need for an additional space heat-ing source.

Energy Savings Potential

The electric generation efficiency of Stirling engines inte-grated with RCHP systems are appreciably less than that of the electric grid. For example, although RCHP-scale Stirling engines can achieve electric generation efficiencies on the order of 10% to 20% (low heating value [LHV]), field tests of preproduction RCHP systems indicate typical *net system* electri-cal efficiencies (i.e., taking into account pump and fan parasit-ics, the impact of transient operation) of between 6% and 8%.For comparison, the U.S. electric grid has an average efficiency of approximately 30% (high heating value [HHV], taking into account transmission and distribution losses).6 On the other hand, the liquid cooling loop can recover approximately 80% of waste heat, yielding an overall thermal efficiency of about 70% in field tests.
Consequently, for Stirling engine-based RCHP systems to reduce primary energy consumption, they must not just recover but also *use* a large portion of the waste heat to supplant space and hot water heating loads while generating a

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relatively small quantity of electricity (typically on the order of 1 kW). In turn, this underscores the importance of the RCHP operating strategy in determining when to run the Stirling engine. Specifically, to achieve energy savings, the RCHP should only operate when heating demand at least equals the thermal output of the RCHP system, i.e., a thermal load following strategy. One study found that RCHP operation that tracked electricity demand (without net metering) must have an electricity generation efficiency of at least 20% to generate any energy cost savings.

Using a thermal load following strategy, Stirling-based sys-tems can achieve moderate energy cost savings. Sufficient thermal loads to operate the system will occur more frequently in residences with higher space heating loads, typically due to some combination of a colder climate, high shell loads (due to poor insulation and/or fenestration), and/or higher floor space. Developers of Stirling RCHP products for the UK have identi-fied larger, older (pre-1920) homes as a prom-ising market.

Market Factors

Stirling engines have been under development for decades for a variety of space, solar, vehicle-propulsion, portable power, and RCHP applications. Today, approximately a dozen organizations worldwide are working to develop KSEs or FPSEs. In addition, at least one manufacturer sells a Stirling-based RCHP system in Japan, with multiple manufacturers expect-ing to launch similar products in Europe within the next year. However, both RCHP and Stirling engines comprise negligible portions of the global space heating market.

Several strengths of Stirling engines drive the interest in devel-oping Stirling engine-based RCHP systems, including low noise, fuel flexibility, low emissions, and backup power provision.

Many of the attrac-tive qualities of a Stirling engine derive from the external combustion process it uses. Because its combustion is steady instead of intermittent and explosive (as in an internal combus-tion engine [ICE]), the combustion process can be quiet, e.g., similar to a flame on a gas range. Similarly, because Stirling engines simply require a steady heat source, their combustors can be designed to operate using multiple fuels, such as natural gas, propane, heating oil, and diesel fuel, over a wide heat input range. In practice, the potential for pollutants in the combustion products that can corrode the system limit the range of fuels used by most systems.

Furthermore, Stirling engines can achieve low emissions of criteria pollutants relative to ICEs. This enables them to sat-isfy national emissions requirements and to approach emissions levels acceptable in regions of the U.S. with the most stringent emissions criteria, such as California.

Finally, the systems could include the capability to provide backup electric power during interruptions in service from the grid. If the system is installed indoors, it requires a reliable, safe, and cost-effective method to reject excess waste heat to the outdoors when providing backup power in situations with limited or no heat demand.

Despite these advantages, Stirling engine-based RCHP faces several major challenges in realizing appreciable market penetration.

The net electrical efficiency of the Stirling engine poses the greatest barrier to widespread use of RCHP for grid-connected applications. To significantly reduce energy costs, the prime mover should have electricity generation effi-ciency similar to that of the grid. Neither field-tested systems, nor systems un-der development, approach these perform-ance levels at RCHP scales. Increasing electricity generation efficiency is possible, but would require operating at higher high-end temperatures. Unfortunately, this usually requires using higher performance (and cost) materials for the heat input por-tion of the engine, and also increases emis-sions challenges.

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The limited energy savings of the current systems also makes their economics less favorable. For exam-ple, a field study of 1 kW (electric) Stirling engine-based RCHP in the UK estimates that the system re-duces energy costs for a house with an annual heating demand of 22,000 kWh (ther-mal) by between $70 and $165. The utility rate structure has a significant impact on the savings, i.e., the values (low-end-value) electricity sold to the grid at 50% of the retail electric price, while the high-end-value values electricity at the full residential rate (i.e., net metering). Based on a projected $1,100 cost premium (relative to a condensing boiler) at larger production volumes, a system would pay back (simple payback period [SPP]) in approximately seven and 16 years for the two rate structures described.

Another study evaluated the potential energy cost savings of Stirling engine-based RCHP for a 3,000 ft2 house located in a Washington, D.C. climate (generally representative of entire country), using higher utility rates. Assuming a 1 kW (electric) Stirling engine operating at 15% (LHV) electricity generation efficiency and using a thermal and electric load following strategy, the system would reduce annual energy costs by about 12%. With net metering, the energy cost savings increased to about 17%. This study also estimated an installed system cost (when produced at significant volume) of around $7,000, with two important changes: it does *not* serve service water heating loads and provides back-up power via lead-acid bat-teries. Assuming that the backup power capability adds $1,000 to the cost, the RCHP system has a cost premium of around $2,250 relative to an Energy Star boiler. Based on the utility cost structure noted earlier, it would realize annual cost savings of around $280, yielding a payback of about eight years.

Of course, energy cost savings will decrease—and SPP will increase—as heating demand decreases, e.g., for more efficient homes.

Both analyses reinforce how greater availability of net me-tering would improve the economics of RCHP; in essence, net metering allows the system to always follow the thermal load because any excess electricity will always be used. Although the Energy Policy Act of 2005 requires public utility commissions to consider net metering, it is not clear that this legislation will increase net metering availability for nonrenewable generation technologies.

Achieving the long lifetimes characteristic of furnaces and boilers, e.g., on the order of 20,000 to 40,000 hours, is another challenge for Stirling engine-based RCHP. Because the engines are sealed, the internals of Stirling engines cannot be lubricated, which makes achieving such long lifetimes very challenging. Although both KSE and FPSE configurations have demon-strated operation in excess of 5,000 hours, it is not clear is that they have demonstrated the longevity required for RCHP.

Finally, European and Japanese RCHP products typically use IC engines, Stirling engines, or fuel cells, but these products are not compatible with the forced hot-air heating systems that dominate the U.S. housing stock. Furthermore, these products cannot provide backup power.

Andrew Manos
Chapter Technologies Transfer Committee Chair

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