

**Covering Pools**

**A GREEN INITIATIVE UNIQUE TO NATATORIUMS**

*Statistical information and concept courtesy of Chip Harvey [harvco@mindspring.com]*

**Concept:** Energy efficiency and water stewardship are two of the world’s leading issues. Greenness, environmental practices, and climate change initiatives create world-changing transformation for most businesses. There are over 50,000 commercial indoor year-round swimming pools in the U.S. These pools are heavy energy consumers due to maintaining water temperatures between 80–86 degrees and higher. The problem is natatoriums consume over five times more energy generally than the average commercial building. Addressing comprehensive energy-water solutions has social-political-economic impact and should become a top priority for survival mode with all indoor pool operations.

Natatoriums everywhere face cost rationalization and closure when municipalities, schools, owners, and investors focus not only on the operating economics, but environmental implications of high energy consumption, water consumption, and emissions. To preserve, promote, and grow the business of swimming, embracing major energy and water conservation initiatives through the use of pool energy blankets is a responsible necessity economically and ecologically.

Facilities have an opportunity to gain recognition with distinctive energy leadership among all businesses during this critical period of the “greening of America” by launching a high visibility unique program for energy efficiency and water conservation. Clubs and facilities need to understand how good an investment blankets are. Savings of between 30% and 50% energy, water, and emissions are possible. Green leadership can benefit the sport and business of aquatics, promote sustainability of swimming pools, and highlight swimming’s unique efforts to address two of the most important issues, energy and water, of the coming decades. By advocating the use of indoor pool energy blankets to achieve economic and environmental improvements, this combined effort among facilities and others could achieve practical results and higher visibility for the sport.

With over 3300 swim clubs using 8100+ pools, USAS Clubs efforts to advocate the practice of employing energy blankets could have huge practical and promotional implications - gas and electricity combined savings of $200 million annually, water savings of $15 million, and $5 million chemical savings. That’s $1.2 billion over 10 years. Not to mention IAQ and corrosion reduction results by stopping humidity and airborne chloramines, plus the significant environmental benefits of reducing CO2 greenhouse gas emissions by an estimated 400,000 tons.

**Background:** In an effort to save operating expenses, Dynamo Swim Club Atlanta Georgia installed solar hot water heating systems and began using pool energy blankets on its indoor pools beginning in 2003. For the four years period from 2004 through 2007, the Club saved over $200,000 annually in gas, water, and chemicals. 75% of savings were energy efficiency achieved with the use of blankets, while only 25% was attributable to solar. Yet blankets were 10% of the project capital cost. It is believed this 4-year study of evaporation is one of the first of its kind ever undertaken.

While the research and monitoring methods were not ideal, the year-to-year results of gas therm consumption, water consumption, and monetary savings from the 2002 baseline show significant performance changes. Because of capital investment, cost savings, and results, Dynamo has continued to seek improvements in productivity of blankets, while solar remains a secondary energy program with higher capital, lower returns, and much slower payback. Clearly energy efficiency is a better investment for pools than alternative energy creation at this time. In a natatorium, 97% of heat loss from the water is due to evaporation (70%) and ventilation (27%). Placing a vapor barrier material on the water surface virtually stops the heat transfer physics of evaporation loss and humidity gain in the air. An energy blanket, applied for 7-8 hours at night when the outdoor differential temperatures are much greater than the indoor pool water temperature, can stop 50% of total heat, water, and chemical losses to evaporation year-round.

Based on U.S. Department of Energy (DOE) geographic climate savings calculations for indoor pool energy consumption, evaporative heat loss total costs and relative savings using blankets nationwide are surprisingly close. Dynamo’s study over four years averaged 17% better than DOE calculations for Atlanta. The DOE data shows it is economically attractive for all indoor pools to use blankets. As a very general rule of thumb, annual indoor pool water heating costs will run about $,20/square foot of surface water area, and potential 50% savings with energy blankets about $.10/sf.

An estimated 95% of natatoriums (indoor pools) do not use pool blankets because of two primary reasons - first, heat energy loss from pools inside HVAC climate-controlled buildings is not clearly understood by operators; and second, time and labor problems with blanket handling. While the evolution of dehumidification in natatoriums has made great progress in the last 20 years, architects, HVAC engineers, and pool operators still generally fail to address the primary source of humidity and heat loss, the open pool itself. Yet ASHRAE 90.1, the guideline for natatorium energy design and the basis for most building codes nationwide, has a mandatory requirement, “Heated pools shall be equipped with a pool cover.”

**Purpose:** Generate national attention for a practical energy and water program of efficiency and environmental improvements creating $100 million-plus magnitude of annual savings which the DOE, Federal Government, LEED, and ASHRAE have basically overlooked or misunderstood. Stimulate public awareness of swimming, reflect positive environmental contributions, highlight uniqueness of energy efficiency efforts, promote ongoing financial benefits for operating all indoor pools. Communicate awareness of low capital investment, fast payback, high ongoing returns and impact on operating budgets.

**Target:** Cover 4000 pools, 8 hours every night, conserving $100 million annually in gas (70 million therms) or electricity, $15 million in water (2.3 billion gallons), and $5 million in chemicals. A result of these savings will be a 50% reduction in CO2 emissions (400,000 tons) as a result of consuming less energy. Major deliverables are greenness and operating cost avoidance.

**Incentives:** Interestingly, though many are becoming available (federal, state, local), no supplemental tax incentives, enticing subsidies, fancy rebates, generous grants, or carbon credits are needed to financially justify investing in energy blankets. The bottom line is rapid payback (months) and pure, green, real savings (ongoing). Added energy-water incentives are added bonuses.

**What’s Unique?** Water retains heat quite effectively, and pools are very large storage vessels. However, evaporation from water surfaces, whether indoors or outdoors, results in a huge amount of heat loss as a result of the physical transformation of water from a liquid to a gas. This evaporation process can be virtually stopped by applying a vapor barrier material on top of the water. This also stops humidity. Quite simply, the huge energy cost for mechanical dehumidification can be drastically reduced when a vapor barrier is applied to the source of humidity, evaporation from the surface of the pool.

**Future:** Beyond USAS 3100+ swim clubs, other organizations like the YMCA, NCAA, prep schools, high schools, states and municipalities, and DOE may jump on board. This has the potential to grow the energy-water conservation program for commercial natatoriums to $500 million savings per year. USA Swimming’s leadership in water efficiency and energy efficiency is fundamental to the image of swimming.

**Conclusion:** Energy, environment, and water are the three cultural, political, and economic forces driving change opportunities for natatoriums. Energy blanket use must become an accepted operational practice for natatoriums. The financial savings and green-consciousness results are too big and too positive to ignore.

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**DYNAMO SWIM CLUB - ATLANTA**

**PERFORMANCE TRACKING 2004 – 2007**

**ENERGY CONSERVATION PROJECT**

Dynamo launched an Energy Project in 2003 combining energy conservation (evaporation blankets) and renewable energy (solar thermal hot water). Dynamo’s two natatoriums have five indoor pools totaling 1.8 million gallons of water with 28,700 sq. ft. of surface area. Each pool is heated year-round at constant temperatures of either 79 or 86 degrees. No HVAC/dehumidification systems are employed in the pool spaces, only ventilation essential to healthy air circulation. About 70% of indoor pool energy loss is due to evaporation, 27% due to ventilation. Blankets cover all 46 individual 25-yard lanes from 10:00 PM to 5:00 AM to stop evaporative heat loss. 500 solar panels (27,000 sq. Ft.) supplement gas heaters, exceeding hot water demand fully during May to September conditions. Savings for the past four years document an average 55% reduction in therm consumption, while gas market prices increased 100%. The DOE software model shows 40% of total savings came from solar heating replenishment, while 60% was due to blankets stopping evaporation energy heat loss 7 hours at night. These results validate other studies.

YEAR             USAGE          ANNUAL        AVERAGE  THERM         SAVINGS vs. BLANKET
                        THERMS   COST \*           $/THERM\*\*  SAVINGS  2001 Baseline SAVINGS\*\*\*

2001   253,315          $174,787     $0.69        (Baseline actual Dynamo consumption)

2002 (solar & blanket systems installed Oct/2002)

2003 (data incomplete due to start-up variables)

2004 97,030 $114,461 $1.18 (+71%) 156,285 **$184,416 $110,650**

2005             114,398          $162,778         $1.42 (+105%)  139,917 **$198,682 $119,209**2006             131,264          $179,400         $1.39 (+101%)  122,051 **$169,651 $101,791**

2007 116,540 $166,508 $1.43 (+107%) 136,775 **$195,588 $117,353**

 **Four-year cumulative gas savings: $748,337 $449,003**

**Additional conservation not included above = $27,000 water (reduction from 9MM to 4.4MM gallons) and $10,000 chemicals annually. About $150,000 added evaporation efficiency cumulatively. This brings TOTAL energy project savings-to-date to $900,000, of which $600,000 is attributable to pool blankets.**

**NOTE: Energy conservation efforts by Dynamo over these four years averaged 139,000 therms annually. This equals 55% reduction of greenhouse gas (CO2) emissions or 1.6 million pounds (812 tons) per year. The U.S. EPA calculates this as being equivalent to taking 142 passenger cars off the road each year.**

**\***  Economic value = therms reduced 55% while gas costs have increased over 100%

\*\* Average billed cost per therm = gas base, service charges, pipeline transportation fees, taxes

\*\*\* Savings variables = weather, thermodynamics, gas “mileage,” solar efficiency, blanket regimen (usage)

**GEOGRAPHIC**

**SAVINGS CALCULATOR**

**USING EVAPORATION BLANKETS AT NIGHT**

**FOR INDOOR POOLS**

**Source: U.S. Department of Energy & NOAA / NCDC annual climate data**

**Example: Calculate water surface area - 50mtr x 25yd pool (12,300 sf) = 12.3 factor**

 **Multiply 12.3 factor x cost & savings/1000sf coefficients in chart below**

 **Atlanta 50-mtr: Cost: 12.3 x $13,800 = $169,740 gas cost /year**

 **Savings: 12.3 x $5,800 = $71,340 savings using blanket**

|  |  |  |  |
| --- | --- | --- | --- |
| **CITY / REGION** | **Pool Type** | **Annual Heating Cost per 1000 square feet of surface water area -Multiply x pool factor** | **Evaporation Blanket Average Gas Savings - Multiply x pool factor** |
| Atlanta | Indoor | $13,800 | $5,800 ( 42%) |
| Boston | Indoor | $14,100 | $6100 (43%) |
| Chicago | Indoor | $14,100 | $6000 (43%) |
| Dallas | Indoor | $13,400 | $5600 (42%) |
| Denver | Indoor | $12,300 | $5500 (45%) |
| Kansas City | Indoor | $13,800 | $6000 (43%) |
| Los Angeles | Indoor | $14,500 | $6300 (43%) |
| Miami | Indoor | $12,100 | $4600 (38%) |
| New York | Indoor | $13,700 | $5900 (43%) |
| Philadelphia | Indoor | $13,700 | $5900 (43%) |
| Phoenix | Indoor | $10,900 | $5000 (46%) |
| San Francisco | Indoor | $14,600 | $6300 (43%) |
| Seattle | Indoor | $14,200 | $6100 (43%) |

NOTE: Adjust your actual +/- total gas bill x savings % for better savings estimate accuracy

(1) 2007 assumption - Delivered gas/pipeline/taxes @ $1.50 total per therm

(2) Water evaporation cost & savings not included - Add 15% to above

(3) Chemical evaporation cost & savings not included - Add 5% to above

(4) Natatoriums with dehumidifiers - Electricity savings equals gas savings above