



## Case studies – BioPCM® in Practice

# Case 1: Two Shelters with no HVAC

LOCATION: Asheboro, NC



- Two identical metal buildings tested in Asheboro-NC
- One with BioPCM<sup>®</sup>, the other used as control
- Both buildings had standard fiberglass insulation

## Controlling Temperature **with No HVAC**



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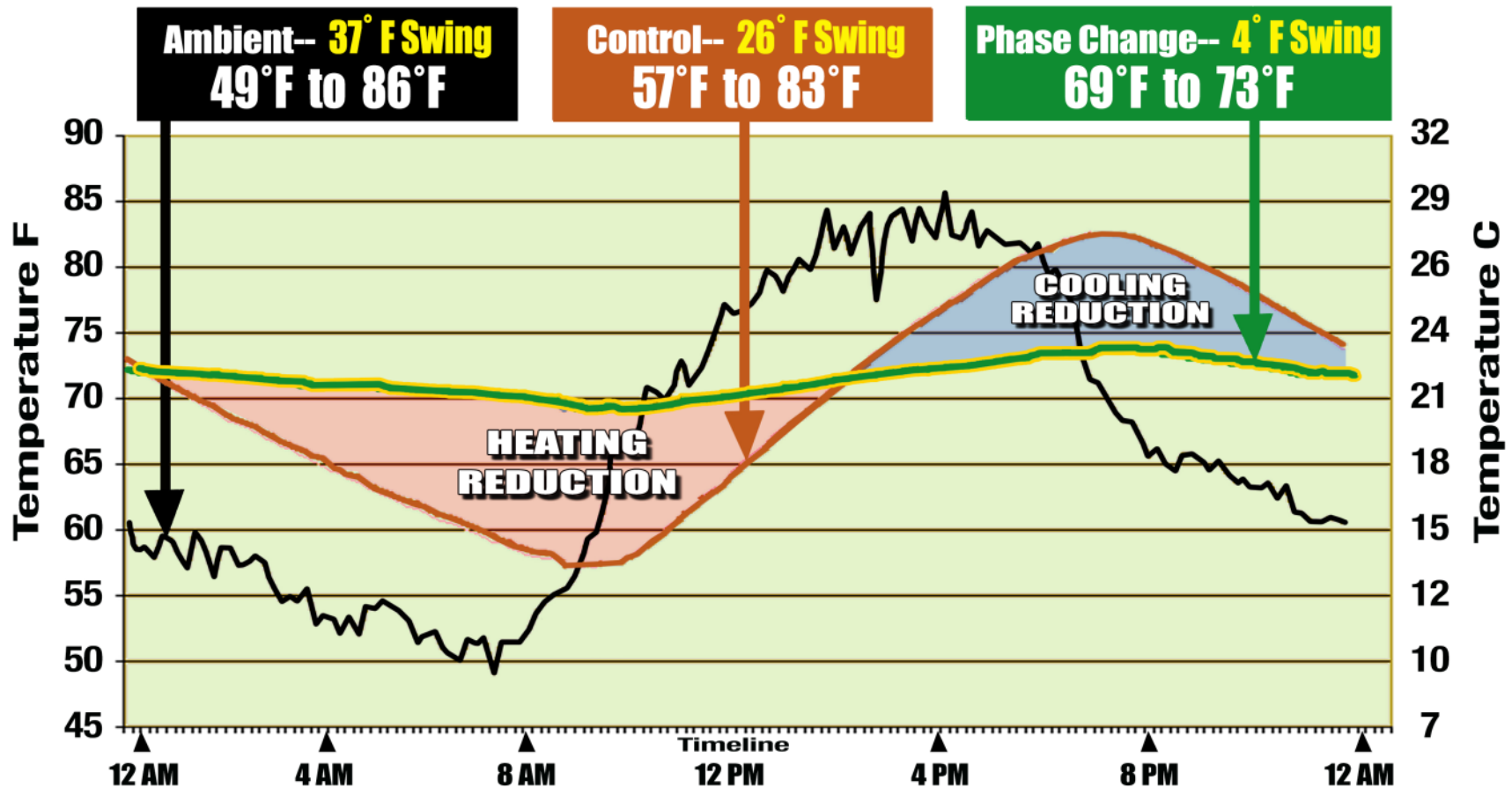


## Controlling Temperature **with No HVAC**



# Why BioPCM® saves HVAC costs

## Controlling Temperature **with No HVAC**





# Case 2: STAR Test - APS

**LOCATION:** Phoenix, AZ

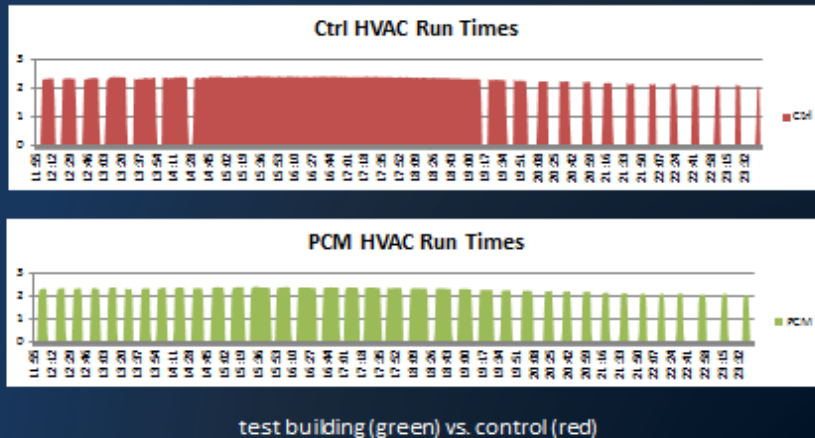


- Two identical wooden buildings tested at the STAR test facility for 12 months
- One had BioPCM® and the other was used as a control
- The buildings were heated and air conditioned and their energy usage was recorded

# STAR Test Facility- Results

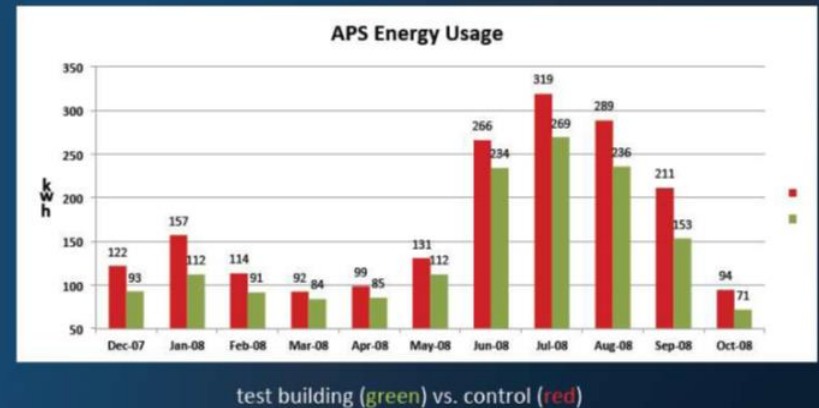
## Test HVAC Run Times

STAR Test Facility – Arizona  
Two Identical Buildings Except One Has bioPCmat™ added



## Annual Energy Savings

STAR Test Facility – Arizona  
Two Identical Residential Buildings- One With bioPCmat™ and One Without



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual Savings
Without BioPCM® (kWh)	157	114	92	96	126	273	319	293	189	94	60	153	1,966 kWh
With BioPCM® (kWh)	112	91	84	82	109	240	268	234	140	71	43	116	1,590 kWh
Savings (%)	29%	20%	9%	15%	14%	12%	16%	20%	26%	24%	29%	24%	20%



- “The investigation showed significant energy and cost savings with BioPCM® as well as peak load time shift and a reduction in energy usage during on-peak hours during the summer months.”
- “BioPCM® is a proven technology for prospective energy conservation in buildings.”



# Case 3: Jordanian Telecom Shelter

**LOCATION:** Amman, Jordan

- BioPCM<sup>®</sup> was installed in a telecom shelter in a 12 month study to explore the potential to reduce HVAC costs
- The installation of BioPCM<sup>®</sup> resulted in a 20+% reduction in HVAC energy consumption
- This study demonstrates a 1.5 Year ROI (based on electric cost of 15¢ per kWh)!



# BioPCM® Telecom Shelter Integration

BioPCM® was installed by attaching it to the interior walls of the shelter and around electronics racks



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual Savings
Without BioPCM® (kWh)	2,703	2,765	2,808	2,927	3,088	3,429	3,411	3,576	3,208	2,905	2,813	2,689	36,322 kWh
With BioPCM® (kWh)	1,965	2,013	2,184	2,317	2,597	2,985	2,833	2,994	2,699	2,191	2,075	1,984	28,837 kWh
Savings (%)	27%	27%	22%	21%	16%	13%	17%	16%	16%	25%	26%	26%	21%

# Telecom Shelter – ROI Analysis

	Jordan Actual Case	Assuming the same Annual kWh Reduction at different representative rates in the US				
Annual kWh Reduction	7,485	7,485	7,485	7,485	7,485	7,485
kWh Cost (\$)	\$0.24	0.18	0.15	0.12	0.10	0.08
Annual Savings	\$1,796	1,347	1,123	898	749	599
Cost Including Installation (314 s.f. of BioPCM®)	\$1,590	1,590	1,590	1,590	1,590	1,590
ROI (years)	0.885	1.180	1.416	1.770	2.124	2.655

# Case 4: JP Morgan Chase

**LOCATION:** Elmhurst, NY



- 2000 Sq. Ft. of BioPCM® installed
- Covering 70% of the surface area above the ceiling tiles
- No disruption to normal operations



## Installation above drop ceiling





## Financial Summary - First Year Results

Daily kWh Reduction.....	109*
kWh Cost .....	<u>\$.1847</u>
Daily Savings .....	\$20.13
Annual Savings .....	\$7,347
Cost of BioPCM® @ \$4.69 Sq. Ft.** .....	\$9,380
Payback BioPCM® .....	1.28 Yr.

\* As Tracked via Noveda Technologies Energy Dashboard

\*\* Cost of 2000 sq. ft. Open Plenum product plus installation and shipping.

# Case 5: University of Washington

LOCATION: Seattle, WA



- Designed by Zimmer Gunsul Frasca Architects
- Construction completed in 2012. 2<sup>nd</sup> building under construction.
- Building uses BioPCM® for passive cooling (no HVAC cooling used)
- Energy Design by Affiliated Engineers, Seattle, Washington

# Proven passive cooling method

Energy Planning

Detailed Systems  
Analysis

Sustainability  
Consulting

Performance  
Modeling

Building Systems  
Engineering

Master Planning

Climate Action  
Planning

Commissioning

Measurement  
and Verification

 **Affiliated  
Engineers®**



Night Mode - Recharging

*“During a 2 week period where the outside temperature exceeded 90F, the interior never exceeded 75F. Many people commented on our great AC system and were shocked when I told them that the building had none.”* **Christopher Adams, Building Coordinator**

# Case 6: Easton Archery Center

LOCATION: Chula Vista, CA



- Expected ROI <12 months (cost avoidance plus energy usage reductions)
- 43,800 sq. ft. BioPCM® installation
- Bob Easton Architect, Kiewit Corporation