



Construction Heat to Pest Management: The Evolution of New Technologies for Propane

Bruce B. Lindsay, PE

TEMP-AIR





Presentation Outline

- Overview of TEMP-AIR
- Construction Heating
 - Equipment, Applications
- Thermal Remediation (Pest Management)
 - Insects, Fumigation, Heat
 - Process, Equipment, New Markets
- Commercialization Plans
- Working with the Propane Industry





Introduction to TEMP-AIR



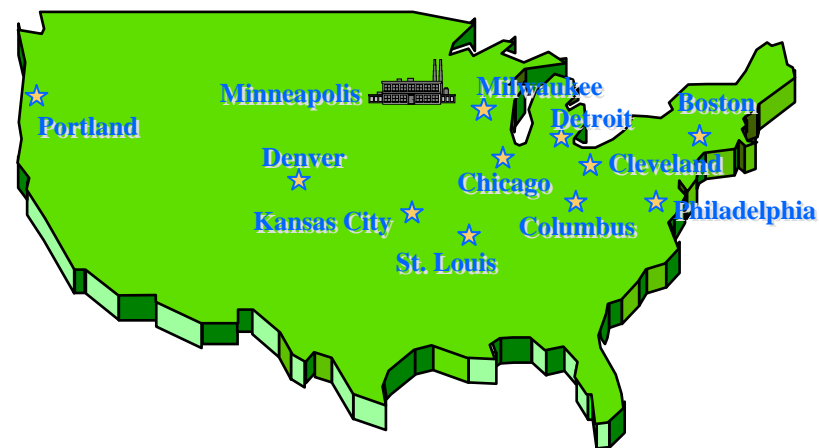
- Largest provider of temporary heating & cooling equipment to US construction industry
- Custom manufactures HVAC for rental fleet
- Projects include:
 - Mall of America,
 - O'Hare and Denver Airports,
 - Pentagon Reconstruction
 - McCormick Place Expansion





Introduction to TEMP-AIR

- Burnsville, MN headquarters
- 11 regional offices serving northern US
- Founded 1965
 - 40 years of innovation
- 125 employees
- Privately owned





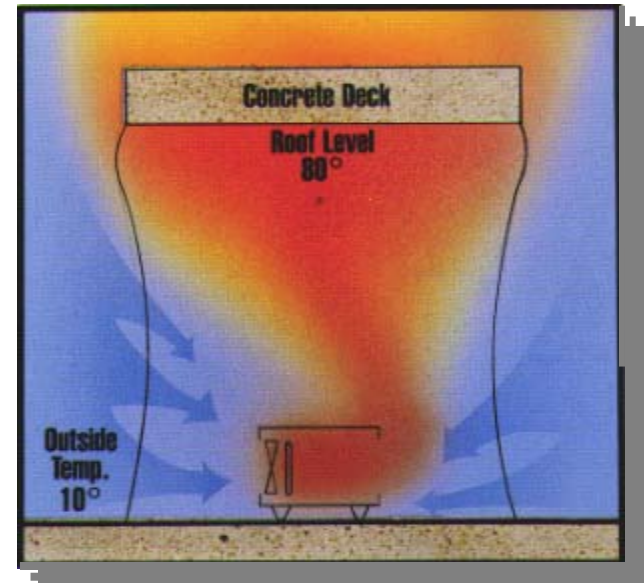
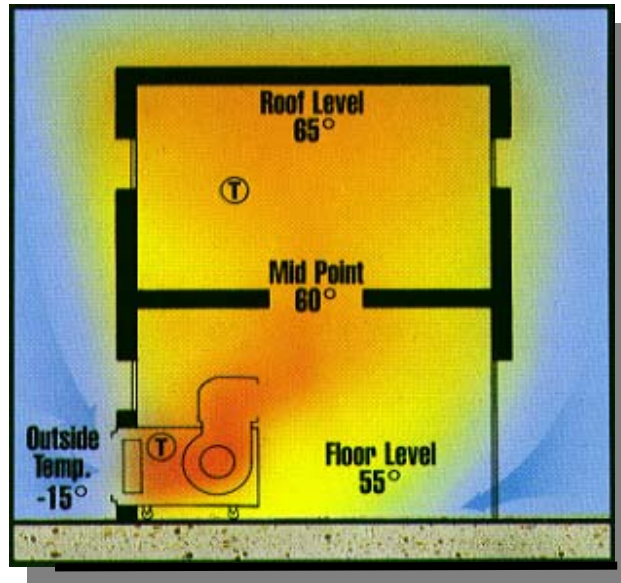
Construction Heating Equipment



- 6,000+ rental units
 - Up to 4,500,000 Btu/hr
 - Fleet rating 4 BCF/hr
- Propane - and natural gas-fueled
- Steam, hot water, and electric available
- Primary market is commercial/industrial; residential growing



Construction Heat Principles: Make-Up vs. Recirculating



- Recirculating heaters promote thermal stratification and infiltration
- Make-up air heaters provide uniform temperatures, pressurize the structure, and exhaust moisture and fumes



Construction Heat Applications



Ground Thawing



Fireproofing



Concrete Pours

Enclosed Buildings





Gas Consumption During Construction

- Factors to Consider:
 - Outside and inside temperatures?
 - U-value of poly wrap vs. permanent wall?
 - Air changes (controlled and infiltration)?
 - Internal loads
 - Lights, personnel, equipment not present
- Construction heat = 3x-4x permanent heat





Why Promote Construction Heat?

- New Propane Load
 - Price insensitive, competing with kerosene and oil
- Environmentally friendly
 - Moisture control to prevent mold
 - IAQ Management Plan qualifies for LEED
- Partnering with construction leaders
 - Influence selection of permanent HVAC





Propane for Temporary Heating

■ Advantages

- Cost
- Flexibility
- Safety
- Delivery
- Reliability

■ Challenges

- Price volatility
- Tanks/Vaporizers
- Fire Code





Propane Partnership Works



- Ferrellgas, New Jersey
 - TA rep provides FG w/ construction leads
 - FG rep makes initial contact for temp heat w/ propane
 - Joint sales calls
 - TA proposal promotes propane
 - FG assures supply & delivery
 - TA rep “Rookie of Year”
 - Win! Win! Win!



What Do You Promote?

- Superior Services Required
 - Estimating Fuel
 - Design temporary system
 - Sizing
 - Placement
 - Piping
 - Power
 - Job site start up
 - Safety checks
 - Emergency service (24x7)
 - Delivery & pick up

TEMPAIR Heating Estimate Summary 7/31/2008 10:54:52 PM

Contractor Information			
Contractor name	4 story office building		
Address	4 story lane Minneapolis, Mn		
Project Name	4 story office building		

Project Information			
Natural Infiltration Rate	0.15	Inside Design Temperature	60
Roof Square Footage	30,000	Outside Design Temperature	-18
Exterior Wall Square Footage	38,000	U-Value Roof	15
Glass Square Footage	38,000	U-Value Walls	30
Temporary Enclosure	0	U-Value Glass	48
Cubic Volume	1,000,000	U-Value Temp Enclosure	175

Return Air Information	
Building Type	1 to 7 story with partitioning offices, apartments, hospitals, etc.
Enclosure Integrity	1.0 (Best)

Heat Load Information			
Makeup Air Heat Load	6,830,240	Return Air Heat Load	7,107,600
Air Change Rate	0.30	Air Change Rate	0.26

Temperature Data				
	Degrees Fahrenheit	% Relative Humidity	Degrees Fahrenheit	% Relative Humidity
January	13	72%	74	70%
February	17	72%	71	72%
March	30	72%	61	74%
April	48	69%	49	71%
May	59	69%	32	74%
June	68	69%	13	79%

Selected Makeup Air Heater		Selected Return Air Equipment	
(5) THP-1400		(7) CH-1000	

Natural Gas is expressed in CCF or Gallons, Propane is expressed in Gallons

Makeup Air Fuel Consumption					Return Air Fuel Consumption				
Month	Monthly Natural Gas	Monthly Propane	Daily Natural Gas	Daily Propane	Month	Monthly Natural Gas	Monthly Propane	Daily Natural Gas	Daily Propane
November	19,111	20,803	631	666	November	20,401	21,309	643	741
December	18,320	21,513	633	1,022	December	31,184	34,240	1,200	1,098
January	23,129	38,224	1,032	1,169	January	38,833	43,220	1,188	1,268
February	21,420	29,848	678	1,020	February	31,524	33,838	1,020	1,210
March	21,110	23,112	748	748	March	25,413	28,851	801	821
April	33,024	15,448	718	348	April	14,324	15,442	431	521





Thermal Remediation

Pest Management with Heat



- “Hottest” new solution for insect infestation!
- Safest, most effective, and environmentally friendly alternative to chemical fumigation for any size building
- Proven technology; seven years of industrial success
- Widespread applications



Evolution of Thermal Remediation



- “How can we use our construction heaters during the summer months?”
– Roger Johnson, VP, TEMP-AIR, 1998
- “The only alternative to structural fumigation with methyl bromide is heat or cold,”
- EPA, 1998
- US Patent #6,141,901





Fumigation with Methyl Bromide

- Kill insects, nematodes, and pests
- US 60,000,000 lb/year
 - 90 % agricultural
 - 6% structural fumigation
 - Food processing plants
- Phase out in 2005
 - Ozone-depleting substances (ODP = 0.4)
- Critical use exemptions
 - EPA OPP
- Methyl bromide
 - Toxic to humans
 - Evacuate 500'
 - Seal structure
 - 36-48 hour downtime
 - Restricted below 50°F
 - Ideal 90°F
 - Inexpensive (was)
 - Very effective





Can Heat Kill Bugs?



- “Exposure to 120°F at 25% RH for 60 minutes kills the entire life cycle of all insects,”
 - B. Subramanyam, PhD, Kansas State University
- “All insects in all 20 locations were dead,”
 - P. Fields, Agri-Food Canada



Tricks of the Trade

- Every square inch of the structure must be $>120^{\circ}\text{F}$ to kill insects
 - Eliminate cold spots
- Death is due to desiccation
 - Moisture removal critical
- High temperatures can damage structure & equipment
 - If in doubt, take it out
 - Change sprinkler heads
- TEMP-AIR patented process introduces heated outside air to pressurize structure
 - Uniform temperatures
 - Moisture exhausted through openings
- Wireless remote sensor system with real-time data logger
 - Monitor & adjust heat
 - Protect sensitive equipment





Virtual Tour



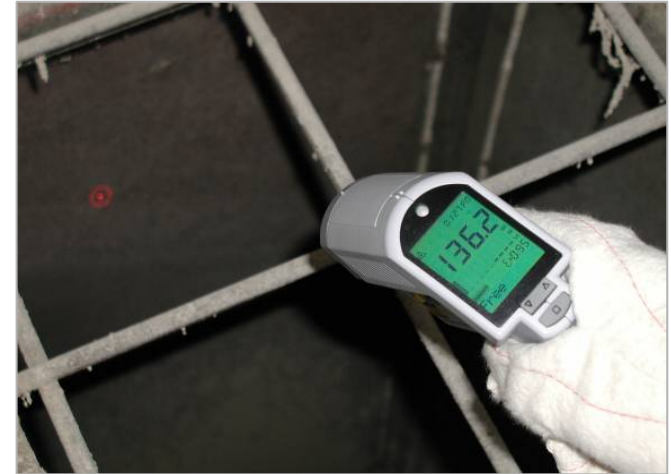


Virtual Tour



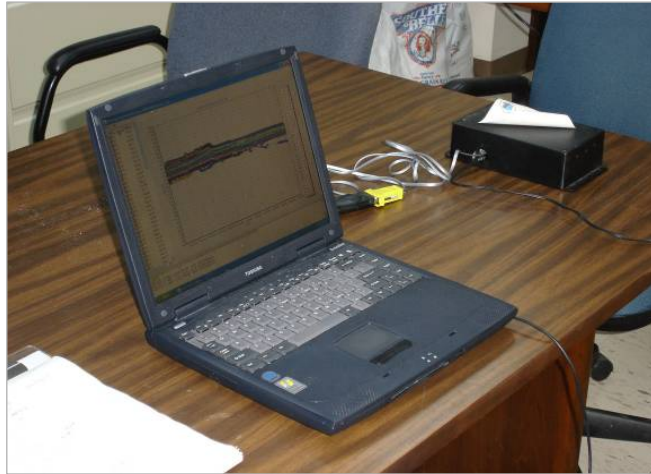


Virtual Tour



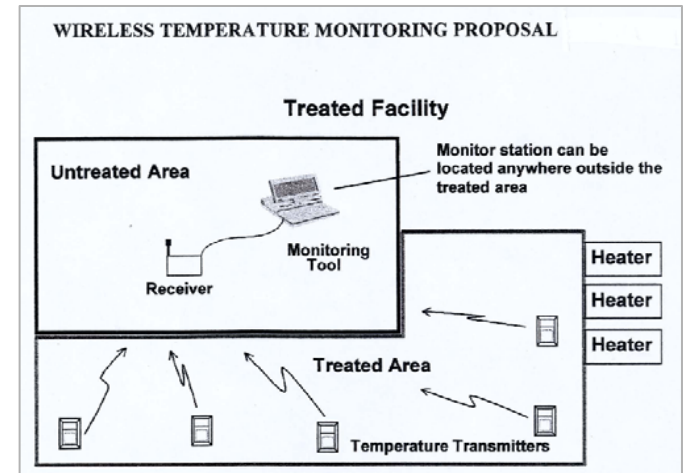
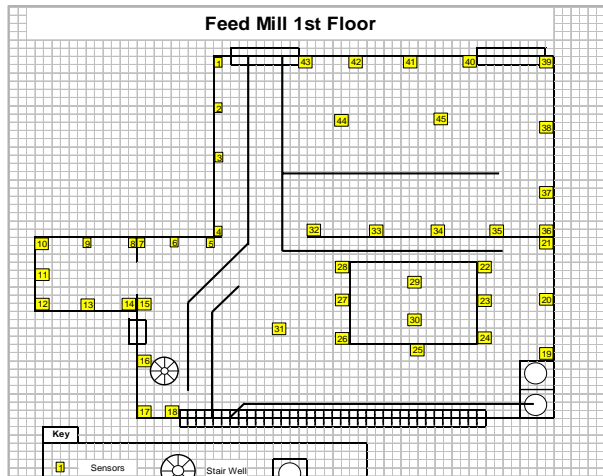
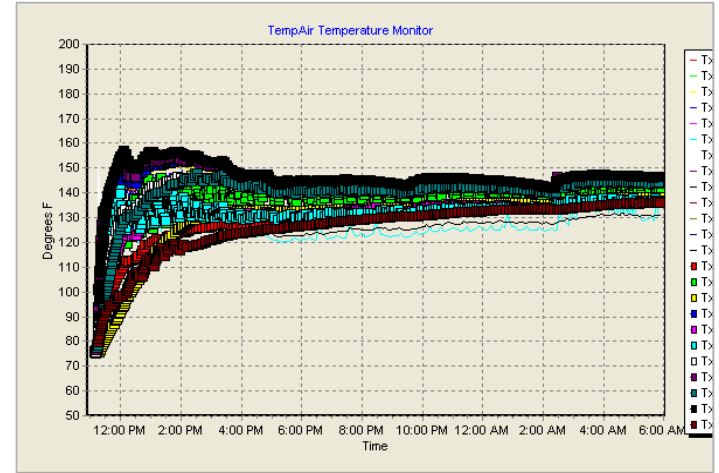


Virtual Tour





Control! Control! Control!





Potential Propane Gas Sales

- 1 Million cu ft plant requires 32-42 MMBtu/hr
 - 8 hours full fire & 24 hours hold at 50%
 - 8,400 gal.
- Plants historically fumigate holiday weekends
 - Memorial Day, 4th of July, and Labor Day
- 25,000 gal/yr – Summer load!
 - 1 gal/sq ft?





Propane Success Story

■ Pacific International Rice Mill Inc.

- Woodlands, CA (Sacramento)
- Anheuser Busch owned; high QA standards
- Fumigate w/ methyl bromide 3x per year
- \$32,500 for TR heat treatment in 2001 for part of plant (4.2 million cubic feet)
 - 17,000 gal. of propane
- Ferrellgas developed custom manifold for bobtail – guarantees fuel availability
- Serving Arkansas plant; potential 12 breweries

■ Hawaiian Luxury Resort

- 470-room hotel
- Insect problem in tiki bar/restaurant – palapa roof, wood posts/beams, kitchen
- Chemical fumigation not an option – evaluate rooms?
- Coordinate with local propane supplier – butane?
- Transport heaters by barge; tent bar, heat & hold
- In and out in 2 days!
- No special guests for one year





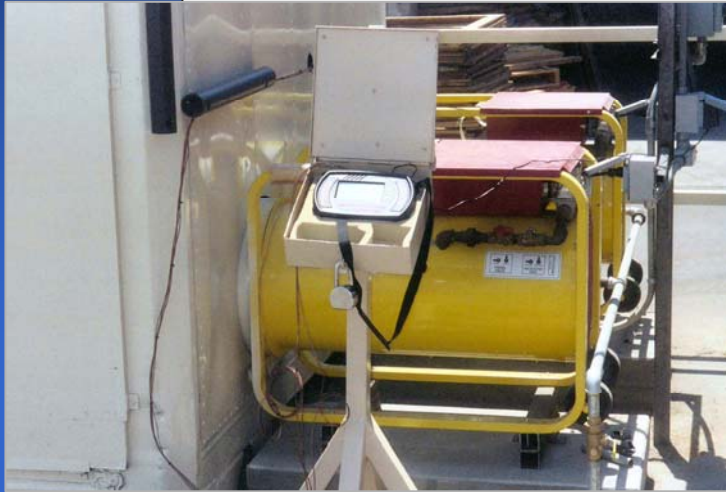
Promoting Thermal Remediation

- Food processing plants need alternative to methyl bromide
- TR is safest, most effective, environmentally-friendly
- Alternative chemicals available, but costly, less effective, and still toxic
- Low customer awareness
 - Restrictions on publicizing “insect infestation”
- Applications now expanding to bakeries, restaurants, hotels, institutions, pallet manufacturers, pork & poultry
- Licensing pest control companies to expand service
- TEMP-AIR has 25 sales people, need 250!
- Who also wins with successful marketing campaign?





Expanding Thermal Remediation Markets for Propane



■ Insect

- Food processing plants
- Storage bins and silos
- Wood pallet treatment (import requirement)
- Restaurant & hotel
- Schools
- Apartment, dormitory, nursing home (future)
- Aircraft and cargo ships
- Transport vehicles

■ Sterilization

- Livestock transport trailer
- Poultry, pork, beef facilities
- Military applications





Equipment Development



- Meeting PCO needs
 - Simplified & mobilized
 - Self-contained fuel, power, heat
- Meeting WPM needs
 - Certified to meet IPPC ISPM-15
 - Export wood pallets to EU and Asia

PCO: Pest Control Operator

WPM: Wood Packaging Material





PERC #11958: Testing & Demonstration of Propane-Fueled Mobile “Thermal Remediation” Pest Management System for Farms



- Fabricate trailer-mounted system with 1,500,000 Btu/hr heater, propane generator, and 150 gal. Propane storage
- Conduct tests at Purdue University to confirm efficacy and long-term results
- Evaluate use of grain dryer as an alternative



Commercialization Plans

- Food Processing Plants
 - Servicing for 7 years
 - Licensing PCOs
- WPM
 - 200 systems sold
- Restaurant/Hotel
 - Licensing PCOs
 - Developed mobile unit
 - Bed Bugs?
 - Demonstration/efficacy
- Transportation
 - Sanitization system tested





How Can Propane Industry Assist?

- Demonstration of process & equipment
- Missionary work – spread the word!
 - Flyers, website, seminars
- Develop internal procedures to simplify delivery/hook up
- Customer focus groups
 - Guide product design





Questions?

- For more information on temporary heating & cooling
 - Scott Brainard
952-707-5113
- For more information on thermal remediation
 - Raj Hulasare
952-707-5123
 - Greg Grabow
952-707-5224

