California Statewide Gas Emerging Technologies

Research and Analyze the Infrared Heaters Market

June 25, 2024

Agenda

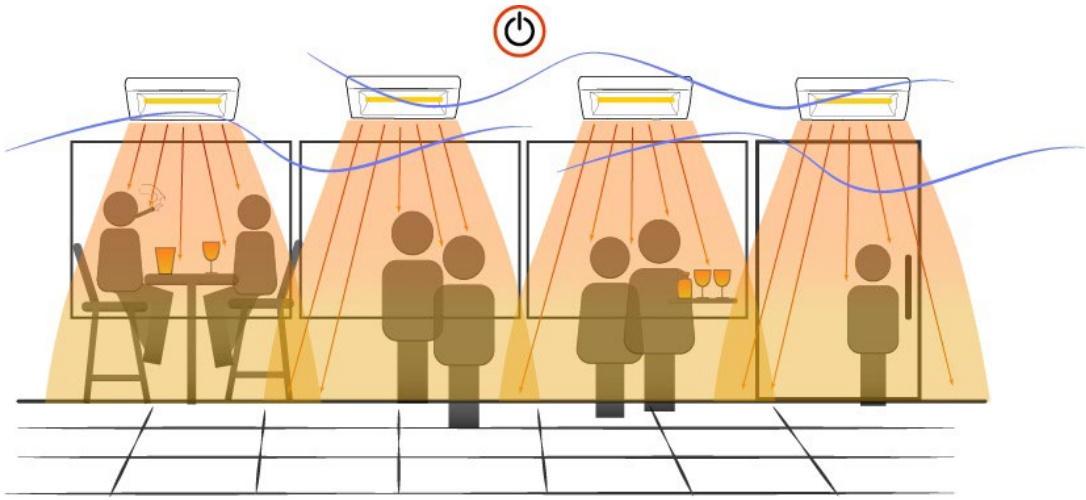
- Project Goals
- Radiant Efficiency Standards
- Types of IR Heaters
- Subject Matter Expert Interview
- Interview Findings
- Conclusions and Future Recommendations

Project Goals

- This research aimed to evaluate the gas infrared heating technology and its market status in California. This was achieved by:
  - Explaining radiant efficiency, testing, rating methods, and standards.
  - Looking into different types of IR heaters and their applications
  - Gathering market information and end-user data through subject matter expert interviews and field visits and understanding the barriers and opportunities in the market.
  - Providing recommendations for implementation.

Definition of IR heater

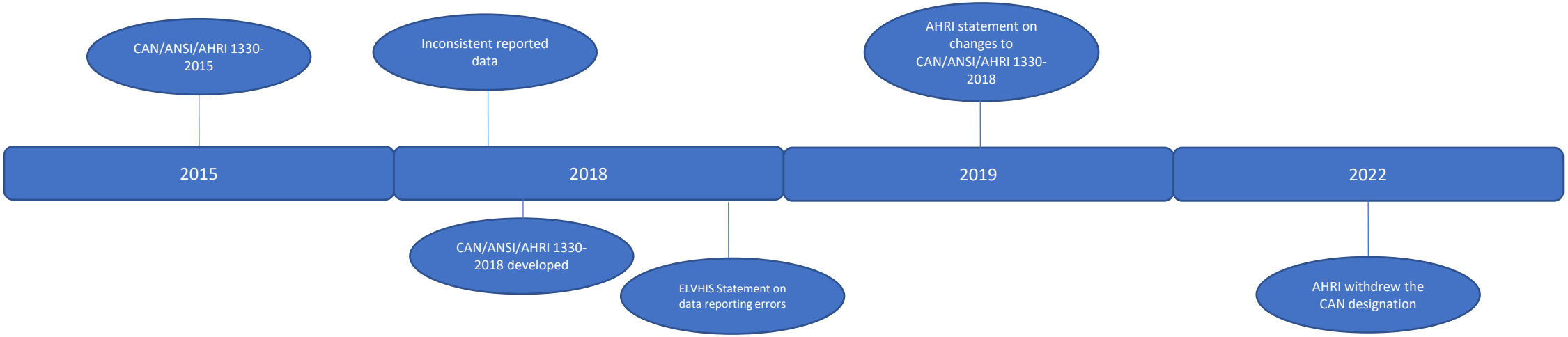
- Infrared Heaters generate and emit radiation to heat objects or people directly without heating the air.
- They use the principle of infrared technology to produce and provide targeted warmth.
    - The warmth felt is similar to what we feel from an environment warmed by the sun.
- Infrared Heaters utilize heating elements such as quartz tubes or ceramic panels to emit infrared radiation
- The emitted infrared radiation travels in a straight line and heats objects or people directly in its path



Radiant efficiency standards

- Industry leaders in North America and Europe have developed standards and regulations to help guide manufacturers with the proper radiant efficiency test methods.
- Following the Lead of some early European testing, CAN/ANSI/AHRI 1330 was published in 2015
- Shortly after the standard was published, it was determined that the test results were faulty and not reproducible, making it unreliable.
- In July 2018, the president of ELVIS, the leading association of radiant gas manufacturers in Europe, released a letter to industry professionals highlighting these discrepancies and assuring them of finding solutions.
- Updates to AHRI 1330 were submitted in late 2018, still pending publication
- In August 2022, AHRI withdrew the CAN (Canadian Standards Council)
    - (Some manufacturers speculated that the standard's test results inconsistencies played a part)

Radiant efficiency standards timeline summary



Types of IR heaters

- Low-Intensity IR heaters
- High-Intensity IR heaters
- Construction heaters
- Patio heaters
- Chicken Brooders IR heaters

Low Intensity IR Heaters

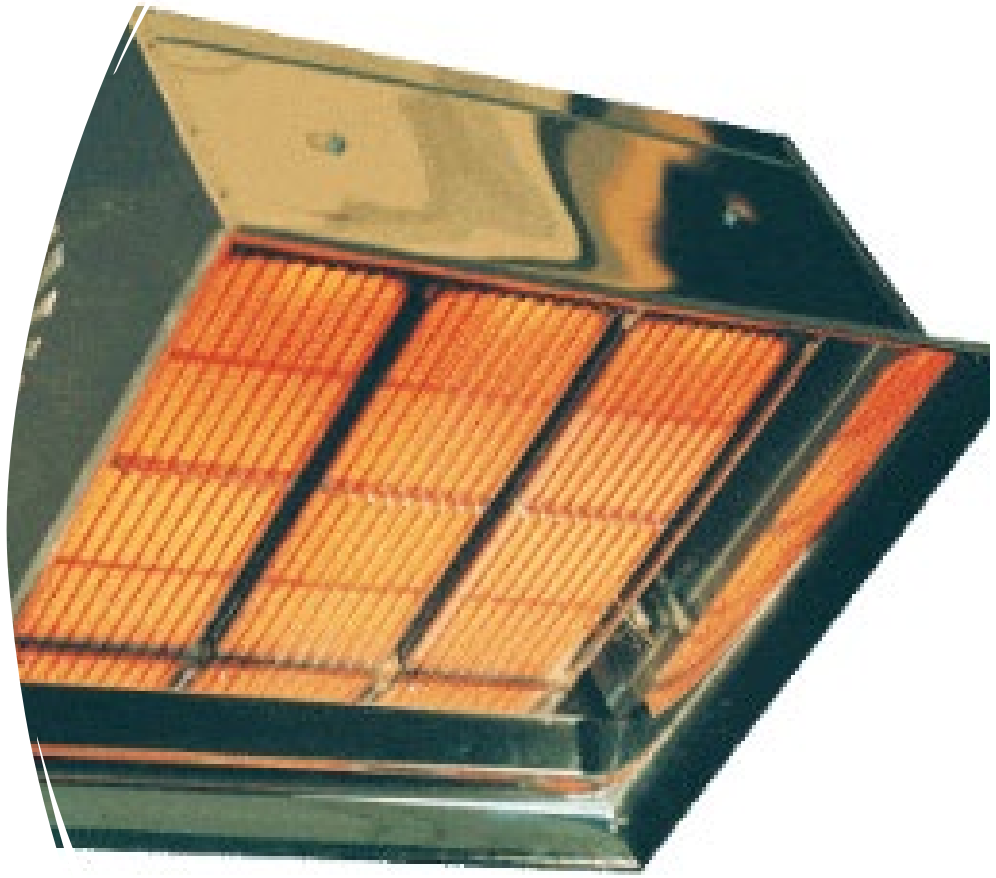
- Low-Intensity IR heaters are also known as tube heaters, positive/negative pressure heaters, radiant heaters, stick heaters, tube brooders, or pipe heaters. They operate at lower power levels compared to high intensity IR heaters.

- The low-intensity gas infrared heater is the most popular choice for heating in the industrial, commercial, and agricultural sectors.

High Intensity IR Heaters

- High-Intensity IR Heaters are box, unvented, spot, luminous, or plaque heaters. For these heaters, combustion occurs on a ceramic tile surface with surface temperatures of approximately 1800°F, with 30,000 Btu/h to 160,000 Btu/h.

- They are often used in a high bay or high air change applications for complete, spot, and partial heating of commercial, industrial, sports facilities, and hospitality applications.



Construction Heaters

- Construction Heaters are specialized heaters designed for use in construction sites and building projects.

- They provide targeted heat to assist with various construction processes, including drying, curing, and heating specific areas

- This heater was not part of this study

Chicken Brooders

- Chicken brooders are a chick’s first home. They are specialized devices used to provide a controlled and warm environment for newly hatched chicks.
- They offer nurturing and comfortable space that mimics the conditions provided by mother hens.
- For adequate coverage of the brooders and the chicks' safety, manufacturers recommended a mounting height of a minimum of 6 ft.
- This type of IR heater is not part of this study; however, we investigated heating at poultry facilities.

Patio Heaters

- There are multiple types of Patios Heaters. Patio Heaters can be suspended/wall-mounted radiant, mushroom-style, Ceramic, or stainless-steel radiant emitters. They are designed to heat a concentrated outdoor area.
- These heaters are generally found suspended on the exterior walls of the buildings and were quickly adopted by restaurants when outdoor dining became prominent during COVID.

Subject Matter Expert Interviews & Field Visits

- We looked at 3 different sources to collect Data
  - A list of 14 OEMs and 11 distributors across the United States and Canada was drafted. These OEMs were chosen because they played a significant role in developing the standards for radiant efficiency
  - To understand user experience and some barriers to adoption, likely customers in California with IR heaters were contacted. End-users were selected based on the conversations with the OEMs.
  - Different utilities across the United States implementing IR heater incentives were contacted to understand the volume and deemed measure requirements.
- Three questionnaires were developed for the SMEs: one for the OEMs, the other for the customers/end users, and the last one for the utility program.

Response Rate

Audience	Total Contacted	Total Responded/Accepted to participate	Response Rate
OEMs	14	3	21%
Distributors	11	0	0%
Auto-shops	30	30	100%
Restaurants	31	31	100%
Warehouses	18	11	61%
Poultries	13	13	100%
Utility Contacts	3	2	67%

Survey Questionnaire/interviews

- The questions developed for the OEMs were divided into three sections:
  - The first section covered general information about the OEM's market presence in the United States and California.
  - The second section was focused on product and technology information.
  - The third section covered the IR heating Market and adoption barriers.
- The questions developed for the customers/end users focused on the following:
  - Market Adoption
  - Market barriers
  - Hours of use
- The questions developed for the utilities focused on the following:
  - The Requirement for the application
  - Volume of IR heater projects received.

Project Findings

OEM Findings

- **Market Presence:** Their presence is primarily seen in the colder regions of the United States, such as the east coast and mid-west states.
  - They manufacture IR heaters for restaurants, warehouses, auto shops, and poultry brooders
- **Product Standards:** The OEMs collaborate with the Air Conditioning Heating and Refrigeration Institute (AHRI) and ELVHIS to develop AHRI 1330-2015, the radiant efficiency standard.
- **AHRI 1330 Concerns:** This standard was developed in 2015 to streamline and guide manufacturers to utilize proper methods of radiant heater testing; compliance is currently voluntary.
  - In 2018, the President of ELVHIS drafted a letter to point out some discrepancies found with AHRI 1330-2015. They stated that the test data was inaccurate and was not reproducible.
  - AHRI updated the standard in 2018: publication is pending.
- **Barriers:** Lack of IR knowledge; The push to electrification; Initial costs

Customer Findings

- Based upon the conversation with the OEMs, customer surveys were targeted to four primary customer types: Warehouses, Auto shops, Restaurants, and Chicken brooders.
- These sectors were chosen based on the feedback obtained from the OEMs. The locations surveyed were selected randomly but weighed to northern California, where the expected usage of gas IR heaters would likely be higher.
- Looking at the end users, eighty-five customers were surveyed:
  - 13% were warehouses
  - 35% were auto shops
  - 36% were restaurants (some chains)
  - 15% were chicken brooders

Warehouse Findings

- 11 warehouses Contacted
- There is a lack of demonstrated need for the sector.
- Managers claimed to have refrained from using any heating system at their facilities.
  - Most claimed the weather in northern California (where most warehouses were inspected or contacted) did not warrant any heating.
  - When it got cold, Hats, beanies, and jackets are used.

Auto Shop Findings

- 30 Auto Shops were surveyed
- Limited use of IR (or any) heating was also observed with the auto shops in Northern California;
  - 2 locations had gas IR heating; one had theirs in operation, and at the other location, it was not used.
    - Where the heater is not being used, the manager said that the previous owner had it installed before they acquired the space more than five years ago, and they have not had to use it.
    - At the shop with the heater being used, the store manager has had good experiences with them; he stated that the heaters are primarily used when temperatures outside get below 60°F, regardless of the season.
- All The other locations did not have any heating.

Chicken Brooders

- 13 Poultry facilities were surveyed
- Multiple facilities used different versions of heating.
- A few looked at IR heaters; however, the high implementation costs force them to choose other heating.
    - Some use heat blowers, while others use a type of heating known as little giant red lamps (Some claimed that the little giant lamps are more convenient for their application than the IR heaters) because they are less expensive and can be moved around in the barn more easily

Restaurant Findings

- 31 Restaurants Varying from small fast-food spots to larger chains of restaurants
- The surveys showed that the restaurant industry dominated the utilization of IR heaters in Northern and Southern California.
    - Much of the work in Northern California was done in person, while chains in Northern and Southern California were contacted via phone.
- During COVID, many restaurant owners had to restructure the layout of their restaurants as outside dining became the norm. With this came the need for exterior heating.
    - One hundred percent of the restaurants surveyed had some patio heating, with about 70% having gas IR heaters.

Restaurant Findings cont.

- We obtained data for operating hours as part of the surveys/audits.
  - The noted run time for the heaters varied per location, and it was difficult to quantify how long they were on and what season they were operated.
  - Some restaurants have the heaters turned on upon customer request, while others have them on soon as temperatures fall below a specific degree range (the mid-50s °F in some cases).
- **Heater Controls**: Many heaters are integrated into the building's energy management system, while others are entirely controlled manually.
- **Energy Efficiency:** Although the implementation cost is a barrier to adopting the patio heaters, 39% of the surveyed restaurants highly favored energy efficiency options; Some managers asked if rebates were offered.
- **Cost-Effectiveness:** Based upon the standards evaluation, there is no clearly defined baseline standard for the patio heaters; thus, we did not calculate the cost-effectiveness beyond the estimated hours of use.

Utility Program Findings

- 2 program managers in colder states provided insight on the IR heaters and the volume of projects they received for them
- **Baseline Technology:** conventional gas-fired unit heaters baselines
- **Requirement for rebate:** Installing low-intensity IR heaters is the minimum requirement to receive an incentive.
  - Hight-Intensity IR heaters have negative incremental measure costs, and utility programs are advised against providing rebates for those.
- **Volume of Projects:** In colder states, the volume of projects is low; in the last 5 years, a program received 53 projects for IR heaters, while another program received 16.
  - **Project Locations:** Warehouses, Auto Shops, manufacturing plants, and school bus garages (none from restaurants)

Recommendations and Summary

Recommendations

- Although the initial focus of this research was the High-intensity and low-intensity infrared heaters, the field visits and customer interaction showed that their **utilization in California is limited**. Of the types of heaters we studied, patio wall mounted/ suspended IR heaters, mainly observed at restaurants, were the type primarily observed.
  - There is an opportunity to study these further and establish clear standards.

- There currently is no apparent means to establish the baseline or measure cases to create a clean efficiency offer, so we **would not recommend moving forward with offers for these measures**.

Summary of Findings

- The study findings paint a **picture of a limited IR heater market** in California that appears mostly focused on IR heating for restaurants.
- A common concept discussed was the ambiguity of standard AHRI 1330. Due to its complexities, **the standard is not enforced, and compliance is voluntary**.
- The last observed barrier was the **low volume of IR heater rebate application utilities in the colder states received**. So even in places that have a much larger IR heater market, **interest in incentive programs for IR heaters was relatively low**.

Q&A

Next Event: TBD

Invitation to be sent soon

CalNEXT

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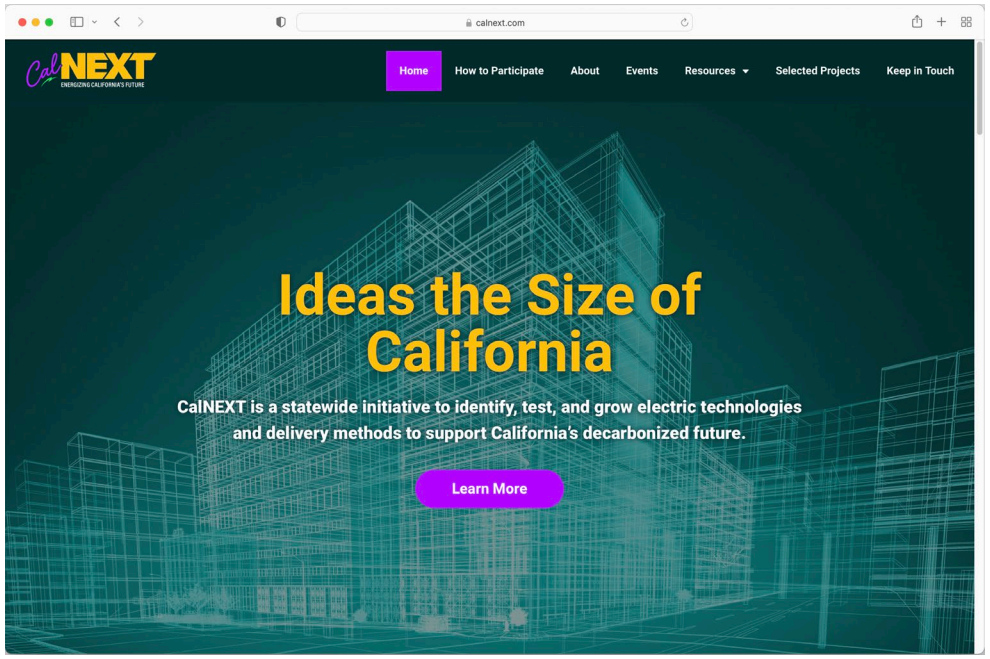

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