TUTCO HEATING SOLUTIONS GROUP

TUTCONNECT
NOVEMBER · 2023

TUTCO FARNAM | TUTCO SUREHEAT | TUTCO CONDUCTIVE

Electrification and Decarbonization

Electric heaters prove to be the ideal solution for simulation test chambers.

One of our valued customers specializes in the creation of simulation chambers that meticulously replicate the enduring impact of the sun and environmental factors on specific products over extended periods. To achieve this, they initially utilized tabletop gas heaters within their testing chambers to generate the required heat. However, this approach posed certain challenges, as it necessitated the availability of multiple gas lines in laboratory setups and also raised concerns about potential gas-related issues.

Understanding that not every facility could accommodate multiple gas lines and recognizing the safety and convenience issues associated with gas heating, TUTCO Farnam was able to offer a tailored electric solution. Leveraging our expertise in electric heating, we were able to customize an existing Heat Torch™ design to seamlessly integrate into our customer's application. It was important for our solution to be designed to work within the existing structure of their test chambers, preserving the integrity of the original design.

Once, our engineers gained a deep understanding of our customer's unique requirements and the challenges they faced, we were able to craft an electric heating solution that not only overcame their previous limitations but also catered to their specific needs. Our collaborative approach and commitment to innovation resulted in the provision of an ideal electric heating solution that ensured safety, accessibility, and optimal performance for our customer's simulation chambers. At TUTCO Farnam, we thrive on adapting to challenges and delivering custom solutions that drive success for our valued partners.

To learn more about energy transition, click here.

Difference between Distributed Wattage Heaters, Zoned Heaters, and Dual Voltage Heaters

by Ian Renwick

TUTCO can provide a wide variety of heater options for many of our product lines. Some of those lesser known but very useful options are distributed wattage heaters, zoned heaters, and dual voltage heaters. They allow for better performance and better control over heaters so you can get the most out of them.

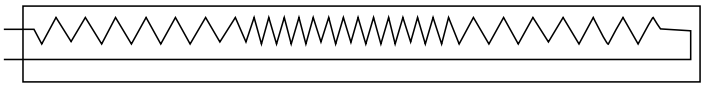
Distributed Wattage heaters are built to provide different amounts of heat over different sections of a heater while applying voltage to a single set of leadwires or screw terminals. A wattage distribution can be built into most types of heaters though it is most common in cartridge, band and some strip heaters. The purpose of the distributed wattage is usually to attain a better temperature profile (more even temperature) due to sections of a heater exhibiting greater heat loss than other sections.

Winding of resistance wire inside a heater is arranged so that it will produce different wattages over different lengths of the heater (in the case of cartridge heaters) or different wattages over different areas (in the case of band or strip heaters).

In the case of cartridge heaters, the ends are naturally cooler than the center of the heater, and applying the right wattage distribution to the heater can make the temperature more consistent over a longer length of the heater. The evenness of this temperature profile is most important for sealing applications where an even temperature is required across a sealing bar to provide a good melt across the material being sealed. The more even the temperature profile, the faster the sealing process can operate, which many customers want. There are some common wattage distributions that work in most cases. We call them 35-30-35 and 40-20-40 meaning that the heated length is split into three equal lengths and each section produces 35%, 30% and 35% or 40%, 20% and 40% of the total wattage. Those 'hotter' ends of the heater lead to a more even temperature profile. There are plenty of other distributions that a customer may want and they'll specify the unique wattages and lengths that they're looking for.

In the case of band heaters, a hole might be present in a heater to avoid a large bolt or some other obstruction. That obstruction might pull an excessive amount of heat from the heater thereby lowering its temperature near the hole. A distributed wattage can 'fix' that by putting more wattage around the hole, thereby producing a heater that generates heat with a more even temperature profile.

Figure 1 - Distributed Wattage Heater Schematic



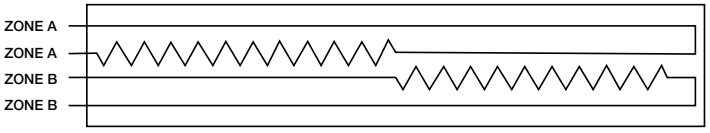
You can see the outside sections of the heater have fewer turns, meaning lower resistance. Lower resistance means more wattage.

As the name states, a distributed wattage heater is a heater where wattage has been distributed or 'moved around' so the heater can provide the best performance for your situation. Zoned heaters are used when you want to be able to control different sections of a heater independently.

There are a few different types of zoned heaters. They can be designed as cartridge heaters, most band heaters, and a few types of strip heaters.
In instances when there are two zones, there are typically 2 sets of leads (or screw terminals) where a set consists of two leads, so there are four leads in total. You could consider a band heater built with a flexible hinge option to be a zoned heater if it's a continuous single heater yet has two sets of screw terminals or leads on either side of the gap. Those zones are operated independently in the same heater.

With cartridge heaters it can be a little tricker, but in most cases a heater with four leads can be produced and it gives you two zones to control independently, where the heating occurs at each end of the heater.

Figure 2 - Zoned Heater Schematic with 2 Zones

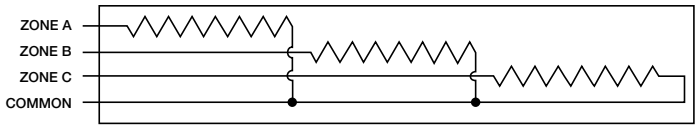


(Continued on next page)

Ask Ian Continued

If you want a three-zone cartridge heater, that's more of a challenge but still something we can offer. Due to the nature of the internal components of a cartridge heater we can only design it with 4 leads exiting at most. In that case, one of the leads would be a common lead, and the other three leads would be there for each zone. To control 'Zone A' in Figure 3, you would apply voltage from the Common Lead to the leadwire labeled 'Zone A'. To operate Zones B and C, you would apply voltage between the Common Lead and the corresponding leadwire. All three zones can be operated simultaneously, and independently.

Figure 3 - Zoned Heater Schematic with 3 Zones

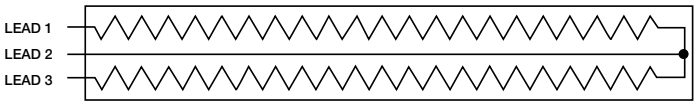


It should be noted that a three-phase power source cannot be used with this type of heater because you cannot adjust the voltage of each leg of a 3-phase power source, nor turn any of them off independently.

Zoned heaters give you the options to control separate sections of a heater as if they were their own separate heaters.

Dual Voltage heaters are built so that they can operate at one of two voltages and produce the same wattage over the entire length of the heater in both scenarios. A bit of clever wiring is how we build these types of heaters. This is helpful if a heater will be operated in the US and Europe and the customer needs to be able to account for that, by a simple wiring change. Dual voltage heaters (as either cartridge or band heaters) are built with 3 leadwires or screw terminals and voltage is applied either between only two of the connection points, ignoring the third, such as 1 and 3 in Figure 4 below or to that third terminal (2) and the other two terminals (1 and 3) connected together. It should be noted that dual voltage configurations are only possible when one voltage is exactly twice or exactly half of the other voltage. 110V/220V is a good combination, as is 230V/460V, but something like 110V/230V or 230V/480V is not possible.

Figure 4 - Dual Voltage Heater Schematic



For situations where you need to account for your applications being operated by possibly two different voltages, consider using a dual voltage heater.

As you can see there are several electric configuration options available that you may not be aware of or may have never taken advantage of. Consider the options available when you want to get the best performance out of your heaters.

MORE FROM ASK IAN

Customer looks for TUTCO brand solution.

TUTCO received a unique request from a customer seeking tubular heating elements for electric branding irons designed for wood and leather applications. However, the challenge was that they required these heating elements to be purchased in multiple straight lengths and subsequently formed with tight bends using hand tools. This bending process introduced the risk of the elements slipping within the tooling, making the task more complex.

To address the customer's specific requirements, TUTCO developed an innovative solution: a straight tubular heating element with a special anneal treatment. The key advantage of this treatment is that it renders the elements softer and more pliable, making them easier to form into the desired shapes. Additionally, the annealing process creates a slight texture on the sheath of the elements, which effectively prevents slipping within the forming tools.

The incorporation of this special anneal treatment significantly improved the overall usability and maneuverability of the tubular heating elements during the manual forming process. This solution not only minimized the risk of slipping but also enhanced the precision and consistency of the bends, ensuring the branding irons could be manufactured with utmost accuracy.

MORE THINKING OUTSIDE THE BOX

TUTCO SureHeat

Specialty Flanged Inline Heaters

MAX TEMP 1922°F (1050°C)

PRESSURE UP TO 3000 PSI (207 Bar)

TUTCO SureHeat Specialty Flanged Inline (SFI) heaters offer superior performance over conventional sheathed ("tubular" or "immersion") style heaters because they are designed specifically for air and inert gas applications. Our proprietary SERPENTINE™ technology facilitates a very high power watt density creating a compact overall heater design. SFI heaters can be as much as 8-12X smaller than equivalent tubular/immersion designs.

In today's ever-evolving technological landscape, the demand for efficient engines, reduced emissions, and the transition to renewable energy is at an all-time high, necessitating rigorous testing and research. TUTCO SureHeat's Custom Flanged Inline electric heating solutions are at the forefront of today's electrification and decarbonization efforts, delivering safe, precise, and durable performance in a wide-range of extremely demanding high-temperature, high-pressure and low-flow applications. In comparison to gas burners, electrical heaters are accurate, environmentally cleaner and safer solutions.

Custom-built to meet exacting specifications, TUTCO SureHeat SFI electric heaters integrate seamlessly into applications such as combustion research, aerospace valve and component testing, turbo machinery, wind tunnels, and solid oxide fuel cells.

With this advantage, less space is required. With a faster heat-up and cool-down ramp time SFI electric air heaters are more cost effective to operate. Whether for a research test stand, factory production line, or key component in a product or thermal energy storage system, our Specialty Flanged Inline heater and controls are the right process heating solution for the job. TUTCO SureHeat offers high-pressure (SFI-HP) and low-pressure (SFI-LP) models to meet specific research requirements.

In a world driven by precision and innovation, TUTCO SureHeat SFI Heaters offer peak performance, safety, and customization. Whether in research, production, or component development, they provide the ideal process heating solution, paving the way for the future of high-temperature research.

LEARN MORE

Feature Video

Sustainability at TUTCO

TUTCO Heating Solutions Group is committed to doing our part to positively impact the environment by limiting the negative effects human activity has on the world around us. The world has seen a shift to sustainability, especially in engineering, manufacturing, construction, and energy acquisition. In this month's Feature Video, TUTCO Vice President Dane Owen talks about TUTCO's efforts to tackle sustainability in the materials we use and the products we produce. As TUTCO continues to help customers improve their products and processes through electrification, we will continue to champion sustainability through innovation and green technology.

WATCH THE VIDEO