

Electrification and Decarbonization

TUTCO SureHeat is Helping Power the Future of Solid Oxide Fuel Cells

TUTCO SureHeat is excited to be participating in this year's European Fuel Cell Forum (EFCF) in Lucerne, Switzerland on July 2-5. This prestigious international conference and exhibition focuses on high-temperature fuel cells, electrolysers, and hydrogen processing technologies. As a leader in electrification and decarbonization, TUTCO SureHeat has been at the forefront of developing and supplying advanced heating solutions crucial for these emerging green technologies.

Solid oxide fuel cells (SOFCs) represent a cutting-edge technology for generating electricity through the electrochemical oxidation of fuels. Traditionally, fuel cells generate electricity by reacting two gas streams—typically air and natural gas—resulting in both electricity and CO₂. However, the industry is working to develop greener solutions by using hydrogen and air, which produce electricity and water vapor, eliminating CO₂ emissions. The challenge is sourcing the vast quantities of hydrogen needed for these processes.

Research and development of reversible Solid Oxide Fuel Cells, or Solid Oxide Electrolysis Cells (SOECs) offer great potential as a green solution. These innovative cells use electricity and water to produce hydrogen. The vision is to implement these systems in areas abundant with renewable energy sources such as hydro, solar, and wind. During periods of low energy demand, the surplus energy from these renewable sources can be converted into hydrogen using SOECs. This hydrogen can then be stored and used as a clean fuel, providing a sustainable energy solution.

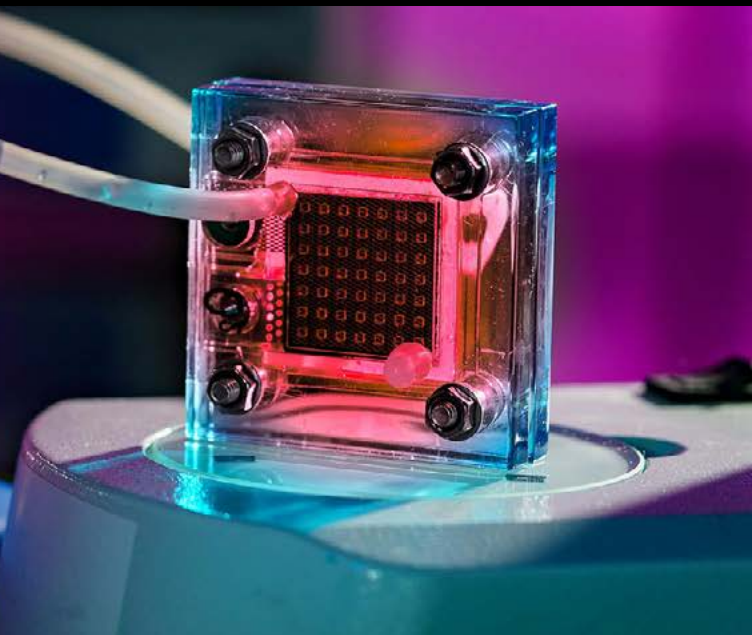
High heat and low pressure is essential for both SOFC and SOEC processes, which operate at temperatures up to 850 °C. TUTCO

SureHeat specializes in high-temperature electric air heaters, designed to meet these demanding requirements. Our Specialty Flanged Inline (SFI) heaters provide the necessary heat and maintain low pressures (5-10 psi), ensuring optimal performance and efficiency in fuel cell applications. Our heaters play a vital role in two key phases of fuel cell operation: initially heating the fuel cell to reach a steady operational state and maintaining consistent temperatures to supplement heat recovery mechanisms, ensuring minimal energy input while maintaining performance.

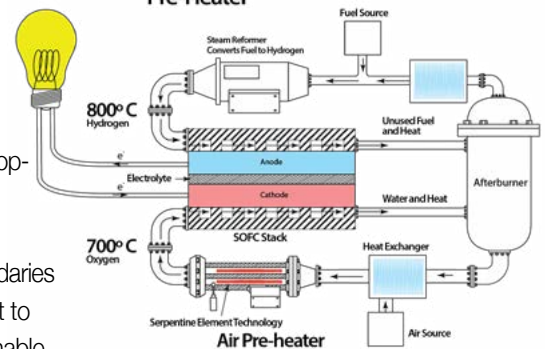
TUTCO SureHeat's high-temperature electric air heaters are integral to the research and development of fuel cells, supporting facilities that push the boundaries in the ongoing effort to create clean sustainable energy sources. By providing reliable and consistent heating solutions, we help fuel cell researchers achieve their goals of high efficiency and performance.

Visit TUTCO SureHeat at EFCF 2024 to learn more about our contributions to the fuel cell industry and explore our innovative heating solutions. For more information about our products and services, please visit our website at tutcosureheat.com.

[READ MORE ON FUEL CELLS](#)



Solid Oxide Fuel Cell (SOFC) Pre-Heater





Moisture. It's Bad for Your Electric Heater and What You Can Do About It.

by Ian Renwick

Moisture can have a very negative effect on process heaters and their applications, sometimes leading to violent heater failure. It's important to know effective solutions to safeguard your equipment, as discussed in the latest Ask Ian.

A typical heater won't fare well in a moist environment. They're not normally built to withstand the ingress of water or other liquids. The standard seal on most heaters is porous, and most high-temperature lead wire insulation may actually wick moisture into a heater. This applies to any type of heater.

In order to prevent the ingress of water, whether in liquid or vapor form, a moisture seal is required for both the heater itself and the lead wire insulation. An obvious solution for the lead wire insulation is to avoid mica or fiberglass insulation and switch to Teflon, PVC, or rubber (silicone) insulation. While these alternatives don't have temperature ratings as high as mica insulation, with careful routing of your wires, they can be effective. Additional lead wire protection, such as stainless steel armor, can help prevent wires from touching hot spots in the application, but care must still be taken.

Be aware that not every type of lead wire insulation can be used on every type of heater we make. Most lead wire insulations can be built into a cartridge heater, but it's much more difficult to do so with certain band heaters because it's challenging to keep the lead wire termination area cool enough for the lead wire insulation material to survive.

When it comes to the heater itself, you don't want a porous material that will allow moisture to enter. Typical seals like cement or some other ceramic and mica or fiberglass insulated leads are used by default because of their high temperature rating.

Alternate materials that are good in moisture situations are epoxy, RTV, or Teflon. In the cases of epoxy and RTV (which is a silicone compound), these materials are poured into the open end of the heater around the leads as thick liquids and allowed to set and harden. Teflon can be swaged into high-temperature cartridge heaters, providing its seal that way. Again, be aware that not all seals can be used on all types of heaters, so be sure to inquire if what you're looking for is possible.

As stated earlier, the temperature ratings of all these sealing materials are not as high as the default mica insulated leads with a cement seal. When a sealed heater is required, there needs to be an unheated section or length at the seal area so that the seal won't get too hot. Too much heat can degrade the seal, defeating its purpose.

Here are the temperature ratings of the materials mentioned:

LEAD WIRES:

- Mica Insulated Leads: 450°C (≈840°F)
- Teflon Leads: 200-250°C
- PVC Leads: 105°C
- Rubber Leads: 90°C

SEALS:

- Cement: 2600°F (≈1425°C)
- Teflon: 500°F
- RTV: 400°F
- Epoxy: 300-450°F

One of the most surprising places for moisture to leak into a heater is along the inside cover of a lead wire, be it Teflon, PVC, or rubber, where the moisture travels between the conductor strands. It sounds unbelievable but it's fairly easy to demonstrate. Take a piece of Teflon insulated wire, of any gauge, cut it to about 6" long, bend it in half, and hang it over the wall of a container of water so that one of the cut ends of the wire is submerged. The other end should be allowed to hang in open air outside the container. Leave it undisturbed for a few months and eventually, you'll see small crystals starting to form on the end of the wire that's outside the container. Those crystals form from moisture traveling between the conductors of the wire and evaporating at the other end of the wire. In most situations, the heat produced during use keeps this moisture away, but be aware that it is a possible moisture path.

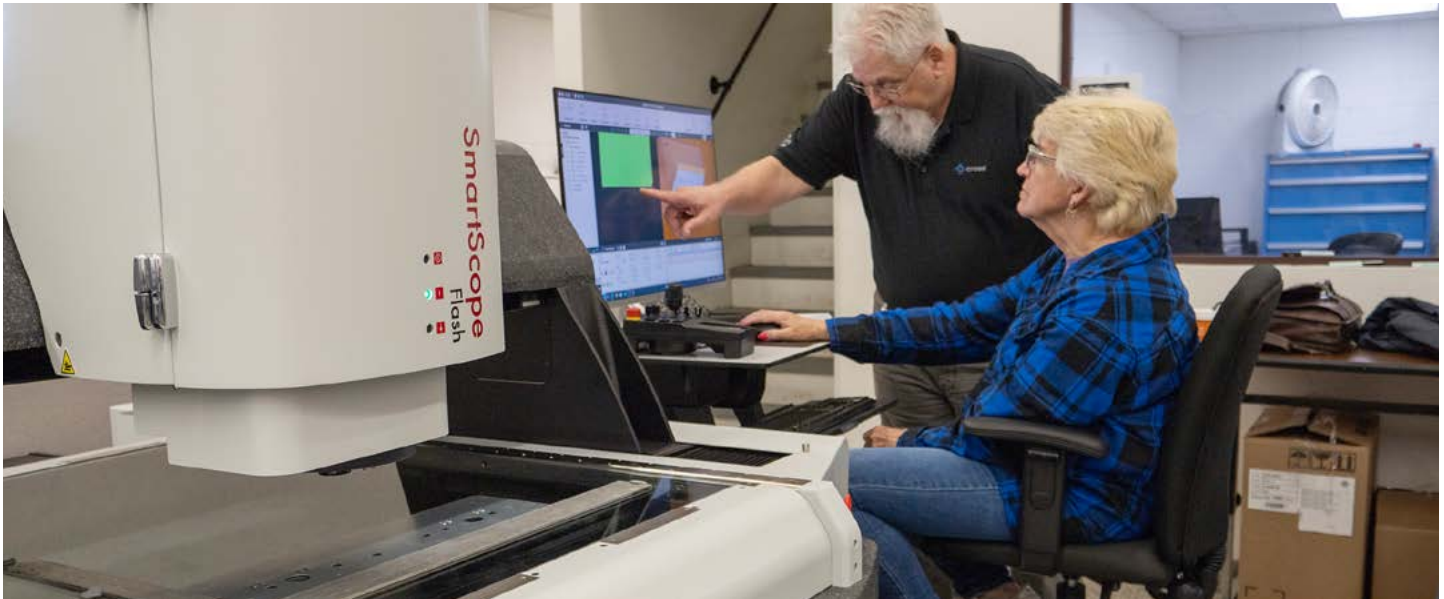
Besides the lower temperature ratings of making a heater resistant to moisture, it's important to consider if the material is compatible with the environment it will be in. Not all methods of sealing can be used everywhere. For example, using PVC insulated lead wires when they will be exposed to oil is not a great idea. Contact with oil will lead to the removal of plasticizers in the PVC, causing the wire to become brittle and crack. Not good.

With the careful selection of materials and ensuring they won't get too hot, it's possible to make several varieties of heaters resistant to the ingress of moisture. This helps prolong heater life and maintain efficiency, ensuring reliable operation in challenging environments. By understanding the limitations and capabilities of different sealing and insulation materials, you can make informed decisions to protect your equipment and enhance its performance.

[READ MORE ASK IANS](#)

TUTCO Sets the Bar on Quality Standards

The Cutting-Edge Technology of the SmartScope Flash 670



At TUTCO Heating Solutions Group, quality is a cornerstone of our operations. Our Quality Team, based in Cookeville, Tennessee, ensures that our products consistently meet the highest standards. Comprising seven full-time professionals with over 104 years of combined experience, the team excels in Quality Engineering, Quality Planning, APQP, and Reliability Testing.

Our efforts to continually enhance our capabilities are highlighted by the integration of technology, like the SmartScope Flash 670 into our quality assurance processes. This state-of-the-art 3D multi-sensor measurement system underscores our commitment to precision, efficiency, and excellence in every product we deliver.

A Leap Forward in Precision and Efficiency

The SmartScope Flash 670 revolutionizes our measurement and inspection processes by offering unparalleled accuracy in:

- **Dimensional Measurement:** Ensuring components and parts meet exacting tolerances and standards.
- **Quality Inspection:** Detecting defects and deviations with high precision.
- **Surface Analysis:** Providing detailed insights into surface characteristics for product improvement.
- **Geometric Verification:** Verifying the integrity of machined parts and assemblies through detailed 3D data capture.
- **Reverse Engineering:** Enabling the creation of accurate CAD models from physical objects, facilitating efficient product development.
- **Automated Measurement:** Streamlining workflows, reducing manual intervention, and enhancing overall efficiency.

The integration of the SmartScope delivers a significant improvement in our efficiency. Its advanced automation capabilities allow us to reduce manual measurement processes dramatically and complete measurements in a fraction of the time.

The SmartScope Flash 670 is not just a technological upgrade; it highlights TUTCO's commitment to operational excellence. By minimizing downtime, reducing production delays, and enhancing measurement accuracy, this innovative system supports our efforts



across various domains, from pre-production validation to new product design and development.

Technology, like the SmartScope Flash 670, allows TUTCO Heating Solutions Group to achieve unparalleled efficiency, accuracy, and competitiveness.

This advanced measurement system embodies our dedication to excellence, setting new benchmarks in the industry and ensuring our customers receive products of the highest quality. Using cutting-edge technology, TUTCO is redefining industry standards in the products we produce.

[READ ABOUT THE TUTCO DIFFERENCE](#)

TUTCO Solution is a Sign of Things to Come



TUTCO received a request from one of our customers that involved manufacturing equipment designed for a thermoforming process. The customer needed a heating solution for heating sheets of plastic, enabling them to be pressed into signs with precision. Crucially, the plastic had to be heated uniformly to achieve the desired outcome. Uneven heating would lead to inconsistent quality and potential defects in the finished signs, making uniform heat distribution a critical factor in the process.

To address the customer's specific needs, TUTCO provided a highly efficient tubular heating element designed to fit perfectly within the required envelope of the equipment. The tubular heating element was engineered to deliver consistent and even heat distribution across the sheets of plastic. The precisely controlled heaters efficiently softened the plastic sheets to the right temperature, making them pliable enough to be pressed with a die to achieve the desired sign shapes and contours.

TUTCO's expertise in heating technology and our commitment to customer satisfaction allowed us to meet the unique requirements of the equipment used in the thermoforming process. By supplying a reliable and precise heating solution, we helped our customer optimize their manufacturing process, leading to improved efficiency and superior end products. Our tailored approach ensured that the thermoforming equipment operated at peak performance, producing high-quality signs with every batch, and reinforcing TUTCO's reputation as a leader in custom heating solutions.

[MORE THINKING OUTSIDE THE BOX](#)

Feature Video

TUTCO Farnam Pressure Torch Heaters



In this month's feature video, National Sales Manager, AJ Nidek provides an overview of the features and benefits of TUTCO's line of Pressure Torch™ heaters.

Developed for applications that need more than 4 psi but not upwards of 500 psi, the TUTCO Farnam Pressure Torch™ is the evolution of our Flow Torch™ line of heaters. Enclosed in a pressure vessel, the Pressure Torch, which comes in 4", 6", and 8" diameters, is ideal for medium pressure applications up to 150 psi. It can handle high-volume airflows up to 2,000 SCFM and exhaust temperatures up to 932° F (500° C). Control packages are available and encouraged for these Pressure Torch heaters, and pressure drop charts are available for quick comparison. Learn more about the TUTCO Farnam line of Pressure Torch heaters in this month's feature video.

[WATCH THE VIDEO](#)



SOUTHEAST THERMAL SYSTEMS

WWW.SETHERMAL.COM

SALES@SEETHERMAL.COM

phone: 704-399-4248