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INSIDE THIS ISSUE

COVER STORY
Freeze Protection and Enclosure Heaters
READ THE STORY

ENGINEERING INSIGHTS
Hot Inside, Cool Outside: Refractory Lined SFI Heaters
READ THE STORY

FEATURE APPLICATION
Protecting Switchgear and Electrical Enclosures
READ THE STORY

THINKING OUTSIDE THE BOX
Heating Inside the Box: Axial and Crossflow Blowers
READ THE STORY

FEATURE VIDEO
Industrial Control Panels with Jeremy Golden
WATCH THE VIDEO

Freeze Protection for Mission-Critical Equipment

Every company has its own definition of mission-critical equipment. For a data center, it might be the backup power systems that must be ready to operate at a moment's notice. For a manufacturer, it could be a compressor that keeps a production line running. For a business operating outdoor equipment, it may be the electrical controls, pumps, or machinery that customers depend on every day. Regardless of the industry, the goal is the same: keep essential equipment operating and avoid costly downtime. As temperatures drop, even equipment designed for demanding environments can become vulnerable to cold-weather problems. Batteries lose performance, oils and fuels thicken, moisture in compressed air systems can freeze, and condensation can affect sensitive electrical components. In many cases, a relatively small heating solution can play an important role in protecting a much larger system.

Different Applications. Different Heating Solutions

TUTCO Farnam works with OEMs and equipment manufacturers to develop electric heating solutions that protect equipment from freezing temperatures and maintain reliable operation in cold environments. Our Silicone Rubber Heaters provide direct-contact heating for batteries, oil and fuel filters, and other temperature-sensitive components. Axial Fan and Crossflow Blower Heaters help maintain temperatures inside electrical enclosures, switchgear cabinets, and outdoor control systems. For applications requiring heated airflow, our Heat Torch™ and Cool Touch™ Process Air Heaters can provide supplemental heating for compressors, pneumatic equipment, and machinery operating in unheated facilities. We also offer integrated solutions like the TPC-1500, which combines an air heater, temperature controller, and flow switch into a single unit.

Freeze Protection Is About More Than Freezing

While preventing ice formation is important, effective freeze protection is ultimately about maintaining the conditions equipment needs to operate reliably. That may mean keeping a battery warm enough to deliver starting power, maintaining fluid viscosity, preventing condensation inside an electrical cabinet, or protecting a compressor from cold-weather operating problems. Every application presents different challenges, and the right solution depends on the equipment, operating environment, and temperature requirements. TUTCO Farnam brings decades of electric heating experience to these challenges, working with customers to develop standard and custom heating solutions that help protect the equipment their operations depend on.

What equipment is mission-critical to your operation?
Explore our Industrial Freeze Protection page to learn more about the heating technologies and applications we support, and how TUTCO Farnam can help protect your equipment when temperatures drop.

READ MORE

Take the Guesswork Out of Enclosure Heating with TUTCO Farnam's New Online Calculator

Electrical enclosures protect sensitive equipment from the elements, but keeping the equipment inside operating reliably can be a challenge. Cold temperatures, condensation, and moisture can lead to corrosion, electrical failures, and costly downtime. Selecting the right enclosure heater is an important part of protecting these systems, and now TUTCO Farnam has made that process easier with our new online Enclosure Heater Calculator.

Find the Right Heater for Your Enclosure

Our new interactive calculator helps engineers, OEMs, and equipment manufacturers determine their enclosure heating requirements and identify suitable TUTCO Farnam heater options. Simply enter four key pieces of information:

- Enclosure dimensions: The height, width, and depth of the enclosure.
- Desired interior temperature: The minimum temperature you need to maintain.
- Lowest ambient temperature: The coldest outside temperature the enclosure may experience.
- Existing component heat output: The heat already generated by equipment inside the enclosure.

Using these inputs, the calculator estimates the heating power required and recommends heater options that meet your application's needs.



Enclosure Heating for a Wide Range of Applications

From small electronic control boxes to large industrial electrical cabinets, TUTCO Farnam enclosure heaters help maintain internal temperatures and reduce the risk of condensation and cold-weather failures. Our heaters are used in a wide variety of applications, including outdoor switchgear, control panels, ATMs, traffic signal cabinets, security systems, telecommunications equipment, car wash controls, and automated kiosks. To meet these diverse requirements, TUTCO Farnam offers two primary forced-air enclosure heating solutions:

Axial Fan Heaters combine electric heating with an axial fan to circulate warm air throughout an enclosure, helping maintain more consistent temperatures around sensitive components.
Crossflow Blower Heaters use a blower to distribute heated air across a wider outlet, providing an alternative airflow configuration for applications with different mounting, space, and heat distribution requirements. Both product families can be configured to meet specific electrical, heating, and installation requirements. For applications that call for something different, TUTCO Farnam can also develop custom enclosure heating solutions. Read more about Axial and Crossflow Blower heaters in this month's **Thinking Outside The Box**.

Protect Your Equipment. Simplify Heater Selection

Whether you're designing a new enclosure or improving the reliability of an existing system, selecting the right heater starts with understanding your heating requirements.

Visit our **Enclosure Heaters** page to explore our heating solutions and try the new Enclosure Heater Calculator. Enter your application details, review recommended heater options, and take the next step toward protecting your equipment from cold temperatures and condensation.

USE THE CALCULATOR

ENGINEERING INSIGHT

Hot Inside, Cool Outside: Refractory Lined SFI Heaters

by Matt Drohan, SureHeat Applications Engineer



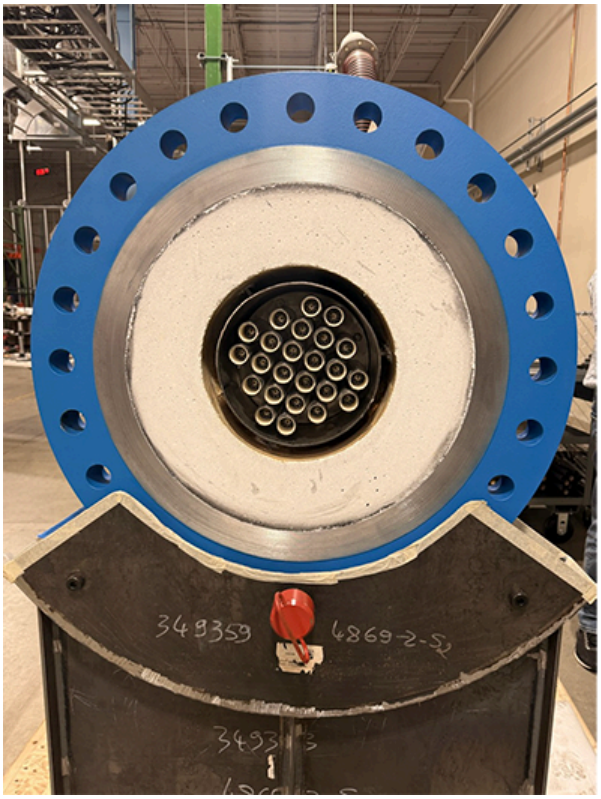
Heating a process gas sounds simple until the gas is hot, pressurized, or chemically aggressive. That's where our custom Specialty Flanged Inline (SFI) heaters come in, and it's where a refractory lining often earns its keep.

So, what is refractory?

Think of it as a specialized, high-temperature cement. It's installed inside the heater vessel, where it cures into a hard ceramic lining. Its job is insulation: keep the heat in the gas stream and away from the pressure-containing shell.

Why line carbon steel?

Carbon steel is strong, affordable, easy to fabricate, and well understood. Its weakness is that it loses strength as temperature climbs. A refractory lining lets the gas run hot while the steel shell stays comparatively cool, so we can often avoid far more expensive alloys for the vessel.





The Goldilocks problem.

Lining thickness controls how warm the shell runs, and the target window is narrow. If the shell runs too cold, it can fall below the dew point of the gas. Moisture, or acids in some gas streams, can then condense on the steel and corrode it. If the shell runs too hot, hydrogen-bearing gases can cause High Temperature Hydrogen Attack (HTHA), where hydrogen diffuses into the steel and damages it from within. We size the lining so the shell stays warm enough to stay dry and cool enough to stay safe. Gas temperature, pressure, composition, and ambient conditions all factor in.

Not all refractories are alike.

The right material depends on what's flowing through the heater. Hydrogen can chemically reduce the silica in some refractories, forming volatile compounds that slowly erode the lining. Carbon monoxide can deposit carbon in refractories containing iron impurities, which can crack them. High-alumina, low-silica, low-iron castables generally hold up better in these environments. Matching the refractory to the gas is part of the design.

Why experience matters.

Refractory goes in wet, and even after it sets, water remains both physically trapped and chemically bound in the cement. Heat it too quickly and that water flashes to steam inside a dense material with nowhere to go. The result is spalling, where pieces of the lining break away. A safe first heat-up follows a controlled schedule with gradual ramps and holds at specific temperatures so the steam can escape. Cure time, installation quality, and dry-out all affect how long a lining lasts. This is not a place to learn on the job.

Let's talk.

If you have an inline heating application, whether it's a research test stand or a production process, our engineers can design a refractory lined SFI heater around your gas, temperature, and pressure. Learn more about our **Specialty Flanged Inline Heaters** or contact SureHeat to get started.

CONTACT SUREHEAT

FEATURE APPLICATION

Protecting Mission Critical Switchgear and Electrical Enclosures



Switchgear plays a critical role in managing and distributing electrical power. From data centers and standby generators to renewable energy installations and battery energy storage systems, switchgear and associated electrical enclosures must operate reliably to keep critical power systems running. While this equipment is designed for demanding applications, cold temperatures and condensation can create serious problems. Electrical enclosures provide physical protection from the surrounding environment, but changing temperatures can cause moisture to form inside cabinets and around sensitive components. Over time, this can lead to corrosion, electrical faults, insulation degradation, and premature equipment failure.

For mission critical power generation applications, where even a brief interruption can have significant consequences, protecting switchgear and electrical enclosures from these conditions is an important part of maintaining system reliability.One of the biggest takeaways from this project is that successful thermal design often depends on selecting the right heating technology rather than simply increasing heater size or power. Cartridge heaters remain an outstanding solution for countless applications, particularly when concentrated internal heating

is required. However, applications that demand broad, uniform surface temperatures sometimes benefit from an entirely different approach. In this case, the custom mica surface heater delivered exactly what the customer needed because it applied heat where it mattered most—directly across the entire sealing surface.

More Than Just an Enclosure Heater

TUTCO Farnam works with OEMs and equipment manufacturers to develop heating and control solutions that protect switchgear, control panels, and electrical distribution enclosures from cold temperatures and condensation. Depending on the application, the solution might involve an enclosure heater that maintains a minimum internal temperature or an axial fan heater that circulates warm air throughout a larger cabinet to help eliminate cold spots. For more demanding applications, TUTCO Farnam can provide complete thermal management systems that integrate an electric heater, digital temperature controller, flow switch, and solid-state relay into a wall-mountable steel enclosure. These integrated systems bring heating and controls together into a coordinated solution, simplifying integration and helping maintain consistent operating conditions as temperatures change.

Supporting Reliability Across Power Generation

Switchgear and electrical distribution equipment are essential components throughout the mission critical PowerGen industry. Data centers rely on switchgear and UPS systems to manage critical power loads. Standby generators depend on control panels and transfer equipment. Solar farms, wind turbines, and battery energy storage installations incorporate electrical distribution systems that may be exposed to harsh environmental conditions. While the applications differ, the challenge is often the same: keeping critical electrical equipment operating reliably despite changing temperatures and moisture. TUTCO Farnam approaches these challenges with custom engineering capabilities that go beyond standard heating products. Enclosure dimensions, airflow, available voltage, operating temperatures, and control requirements all factor into developing the right solution. From individual heaters to complete heating and control packages, TUTCO Farnam helps OEMs protect the switchgear and electrical infrastructure that modern power generation depends on.

GET A QUOTE

THINKING OUTSIDE THE BOX

Heating Inside the Box:

A look at using Axial Fan Heaters and Crossflow Blower Heaters to keep Control Panels up to Temperature

When OEMs need a compact, reliable heating solution that can be integrated directly with a fan or blower, TUTCO Farnam offers two proven options: our **Axial Fan Heaters** and **Crossflow Blower Heaters**. Designed for both small and large OEM applications, these heaters provide an efficient way to heat moving air in a compact package. Our heaters are available with a wide range of customization options, including line-duty thermostats, thermal fuse links, custom lead lengths, specialized wiring, plugs, guards, grilles, and mounting brackets. For production volumes of 50 units or more, we can often supply the fan or blower assembly along with the heater, simplifying sourcing and reducing assembly time.

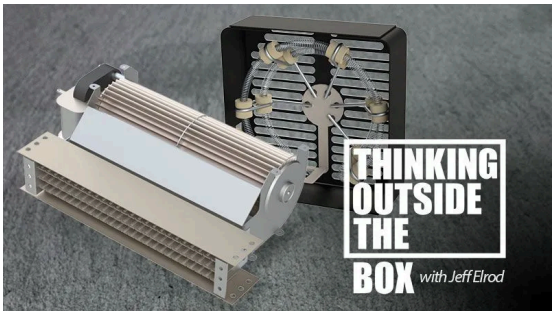
One of the fastest-growing applications for these compact heaters is enclosure heating. As more equipment is deployed outdoors or in unconditioned environments, protecting sensitive electronics from freezing temperatures has become increasingly important. Many electronic components cannot operate reliably at or below freezing temperatures, creating a need for simple, dependable thermal management solutions. In these applications, the goal is often not to heat the enclosure to a comfortable temperature. Instead, it is simply to maintain all internal components within their required operating range. Our compact fan-assisted heaters are an ideal solution, providing uniform heat distribution while requiring minimal space. Simple mounting brackets can be fabricated to accommodate a wide variety of enclosure designs and installation requirements.

As a custom control panel manufacturer, we have firsthand experience with these products. We don't just sell these heaters; we use them in the control panels we design and build every day. That practical experience allows us to better understand your challenges and recommend solutions that work in real-world conditions. Bring your control panel and heating challenges and let TUTCO Farnam Custom Products become your partner in developing the right solution. Whether the answer is straightforward or requires true out-of-the-box thinking, solving difficult thermal challenges is what we do every day.

GET A QUOTE

These heater assemblies have been successfully used in numerous applications, including:

- Medical devices
- Defrost systems
- Space heating equipment
- Air curtains
- Laboratory equipment
- HVAC systems
- Drying applications
- Battery temperature management systems
- Other applications requiring the heating of small volumes of air in limited spaces





FEATURE VIDEO

Industrial Control Panels with Jeremy Golden

Jeremy Golden is a Design Engineer with TUTCO Farnam, specializing in custom electric heating and control solutions for industrial and OEM applications. In this video, Jeremy introduces TUTCO Farnam's Industrial Control Panels and discusses how they provide precise temperature control, system monitoring, and integrated functionality for demanding industrial heating applications. Drawing on his experience in heat transfer, electrical systems, and product design, Jeremy explains how TUTCO Farnam works with customers to develop control solutions tailored to their specific equipment and processes. From straightforward temperature control to more complex systems incorporating multiple control functions, TUTCO Farnam's Industrial Control Panels are engineered to simplify operation, improve process consistency, and provide reliable control of electric heating systems.

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SOUTHEAST
THERMAL SYSTEMS
WWW.SETHERMAL.COM RFQ@SETHERMAL.COM PHONE: 704-399-4248