

# OPEN COIL VS METAL SHEATHED HEATERS

## 1. OVERVIEW

### OPEN COIL HEATERS

Open coil elements consist of an exposed resistance wire (typically Ni-Chrome) crimped onto terminals and strung between ceramic insulators. A variety of different wire gauges, wire types and coil diameters are commonly used depending on application needs. Due to the resistance wire exposure, they are only suitable for use in low velocity installations due to the risk of the coil coming into contact with other coils and shorting the heater. In addition this exposure can pose risks of foreign objects or personnel coming into contact with the live electrical wire. The benefit of open coil elements, however, is that they have low thermal inertia, resulting in typically very fast response times and their small surface area allows for reduced pressure drops.

### METAL SHEATH HEATERS

Metal sheathed heating elements are comprised of a Ni-Chrome resistance wire encased inside a metal sheath and surrounded with compacted MGO (Magnesium Oxide) insulation. Since the resistance coil is protected, these types of elements are ideal for low and high velocity air flows and provide protection against unintentional contact. In addition, the metal sheath can be selected in a number of materials to provide corrosion and/or environmental resistance for a long heater life. While the sheath contributes to higher pressure drop potential, these elements can be configured in a number of different styles including traditional hairpin, fold-back, or even finned for increased surface area. These customizations allow metal sheathed heating elements to be designed for a wide breadth of applications.

## 2. COMPARISON

### Advantage

Reasoning	Open Coil	Category	Metal Sheath	Reasoning
		Reliability	X	With the resistance wire protected, there is less risk to coil failure or damage from the environment.
With fewer components and less surface area, open coil heaters traditionally offer lower initial capital cost.	X	Initial Capital Cost		
		Long Term Cost	X	Metal sheathed elements are more robust and resilient leading to longer life. In turns this makes long term operating costs lower due to less repairs, replacements, and costs associated with shutdowns.
		Safety	X	Unlike open coil elements where the live resistance wire is exposed, metal sheath elements have the wire encased inside a metal sheath and embedded inside MGO insulation.
Open coil elements consist purely of the resistance wire and ceramic insulators. The reduced surface area contributes to less pressure drop.	X	Pressure Drop		
		Air Flow	X	High air velocities can potentially cause open coiled elements to come into contact shorting them out. Metal sheath elements are more robust and can withstand higher air velocities without risk.
		Customization	X	Metal sheath elements can be designed as traditional hairpin, fold-back or finned for a variety of options in any number of applications. Other modifications include, sheath material, watt density, tube diameter, terminals, and more.
The low thermal inertia of open coil elements make them respond faster than traditional heaters, but with proper SCR control metal sheathed elements are capable of responding to air temperature fluctuations rapidly as well.	X	Controllability		
		Uniformity	X	Since open coil elements can not dissipate heat across larger surface areas, they require more uniform air flow supply vs metal sheath elements that dissipate hot spots more efficiently.

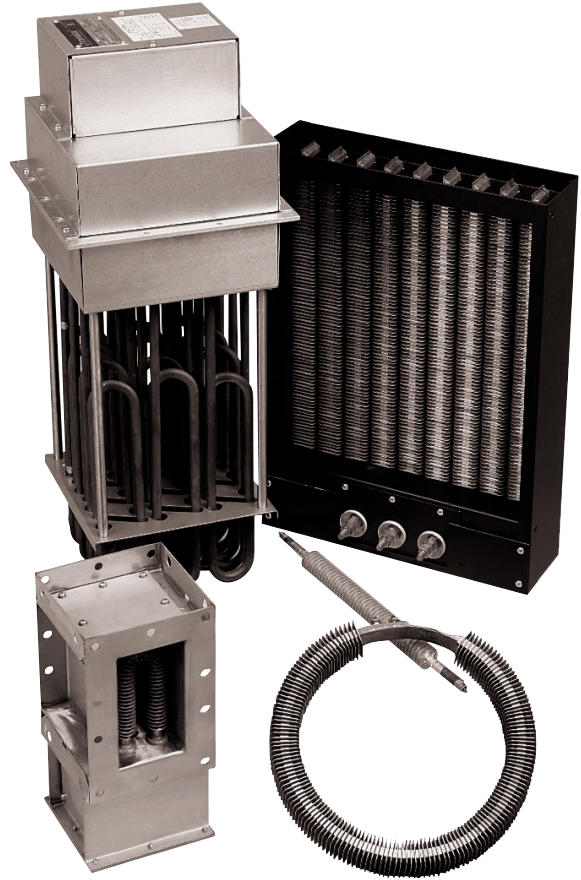
### 3. Summary

After looking at the design construction as well as benefits or pitfalls of open coil elements vs metal sheath elements, we can see that metal sheathed elements are the better alternative in a majority of applications. Instances where open coil may excel are when low pressure drops or very fast response times are required, however, the capability for design customization and precise control systems can make metal sheath suitable in these applications as well. Users must consider not only upfront capital cost for equipment, but long term costs factoring in rate of repair and replacement, maintenance costs, and possible shutdown costs. The more fragile exposed Ni-Chrome wire is more susceptible to failure or damage, which led to the development of the metal sheathed element which protects the wire and prevents unintentional contact and improved safety. The metal sheathing also contributes to increased surface area for even heat distribution and the capability to withstand a wide variety of air flows in a number of challenging applications.

### Product Offering

- FTI & FTS Finned Tubular Elements in 0.315 and 0.475" Diameter.
- SFTI & SFTS Single Ended Finned Tubular Elements Offered on 0.315 and 0.475" Diameter
- ADH & ADHT High Temperature Duct Heaters with Traditional Hair-pinned and Fold-back Style Duct Heaters
- CAB Forced Convection Air Heaters with Finned Elements
- DH UL Listed Open Coil and Fin-tubular Air Duct Heaters

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