# 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

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Reasoning</th>
<th>Open Coil</th>
<th>Category</th>
<th>Metal Sheath</th>
<th>Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>With the resistance wire protected, there is less risk to coil failure or damage from the environment.</td>
<td>X</td>
<td>Initial Capital Cost</td>
<td></td>
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<tr>
<td>Long Term Cost</td>
<td>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.</td>
<td>X</td>
<td>Safety</td>
<td></td>
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<tr>
<td>Pressure Drop</td>
<td>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.</td>
<td>X</td>
<td>Air Flow</td>
<td></td>
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<tr>
<td>Controllability</td>
<td>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.</td>
<td>X</td>
<td>Uniformity</td>
<td></td>
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</tbody>
</table>
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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