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Solutions for Immersion Cartridge Heaters

When installing immersion cartridge heater units, it is desirable that the cylindrical sheath of the cartridge be in intimate contact with the object to be heated. Boron Nitride coatings provide this intimate contact and thus more efficient heat transfer. For this reason, our coatings

- **Boron Nitride Lubricoat**
- **Boron Nitride Lubricoat Paste**

have been used for many years for 'seating' the heaters – due to the high thermal conductivity of Boron Nitride providing better heat transfer and release along with longer heater lifetime.

Independent laboratory tests showed that, for high temperature applications circa 600°C (1112°F), the Boron Nitride "improved heat transfer can lower the internal wire temperature to provide up to 100% improvement in heater life." Boron Nitride coating is ideal when the heater sheath temperature exceeds 400°C (752°F). Boron Nitride (BN) coating does not contaminate the heater terminals or surroundings, and the nature of the coating is such to fill space between the heater sheath and the object to which it is mounted.

PROCEDURE

1. Clean surfaces of any grease or surface contamination.
2. Apply by dipping, brushing, or air-spraying.
3. Allow to dry thoroughly at ambient temperature – ideally yielding a dried layer 0.13-0.25 mm (0.005-0.01 inch or 5-10 mils) thickness. Multiple layers can be done, drying after each layer.
4. After drying, fit the heater unit into its application area (holes, grooves, etc.) where any excess coating will rub off (due to its softness) and give a good fit for the improved heat transfer. The BN coating also allows ease of removal of the unit later on.
5. Energize the heater and heat to about 93°C (200°F) to ensure water is removed from the coating.
6. Further heat to 482-500°C (900-932°F) for complete outgassing of the coating: this can be done during first heatup/use.

Boron Nitride Products - WATER-BASED COATINGS

I. Boron Nitride Lubricoat (white version)

II. Boron Nitride Lubricoat Paste

ADVANTAGES

- **Simple/Easy Coating Application Like Housepaint**
  - **Dipping**
  - **Brushing**
  - **Air-Spraying**
- **Improves Heater Efficiency**
- **Extends Heater Lifetime by 90-100%, particularly for**
  - **Higher sheath watt densities**
  - **High temperature applications, circa 600°C (1112°F)**

- **Eliminates Costly Precision Hole-Reaming (for holes into which heater is mounted)**
- **Easier Installation and Removal of Heaters**
- **Compensates for Oversized or Out-of-Round Holes (provides a nearly perfect fit)**
- **Usable with Many Heater Types**
    - **Standard immersion cartridge heaters**
    - **Metal sheathed heating elements**
        - **stud bolt heaters**
        - **strip heaters**
        - **metal sheath heater clamp-on devices**

REFERENCE (NOW EXPIRED PATENT): Donald M. Cunningham, Emerson Electric Co (assignee), 1988. *Heat transfer heating element and method*. U.S. Patent 4,733,055.