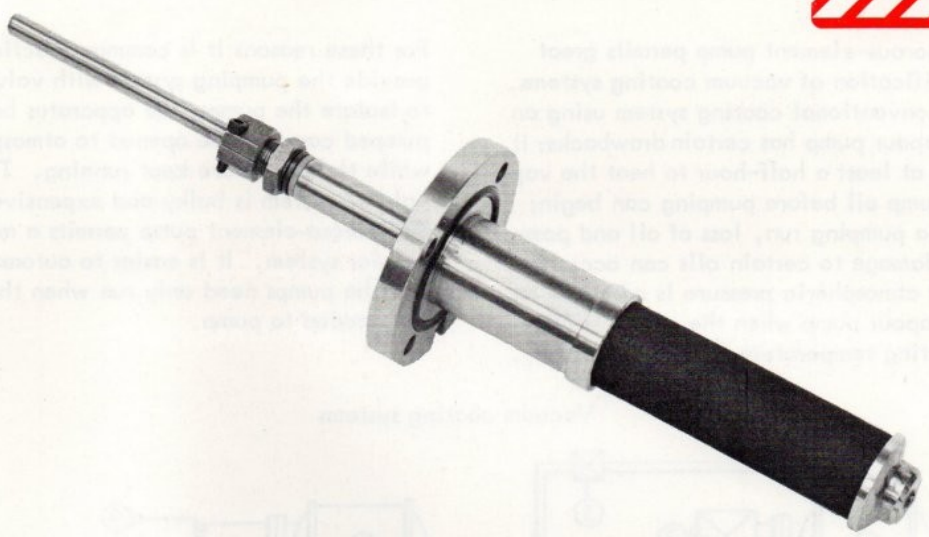


Porous Element Heated Vacuum Pumps (1976). Edwards High Vacuum, Publication 06681

Edwards



POROUS-ELEMENT HEATED VAPOUR PUMPS

A FLASH BOILER VAPOUR PUMP WITH RAPID START-UP AND SHUT-DOWN

What is a porous-element heater?

The element consists of a porous material of high internal surface area, having interconnecting pores. The material can be heated by the passage of an electric current. If a liquid is pumped through the element, it can be heated and vaporised during its passage and can emerge as either a wet or a superheated vapour as required.

Such an element used in a vapour pump provides quick start-up and quick processing cycles; it eliminates the need for vacuum valves and the running cost is low.

* Quick start-up

Since the porous-element has a low thermal capacity, it functions as a flash evaporator. Cool-down is rapid too - so there is no need for isolation valves.

* Low running cost

Rapid warm-up and cool-down means that pumps need not be kept working while the process chamber is at atmospheric pressure (during unloading and reloading), so a substantial saving in electricity can be made. On a coating plant this can be up to 50%.

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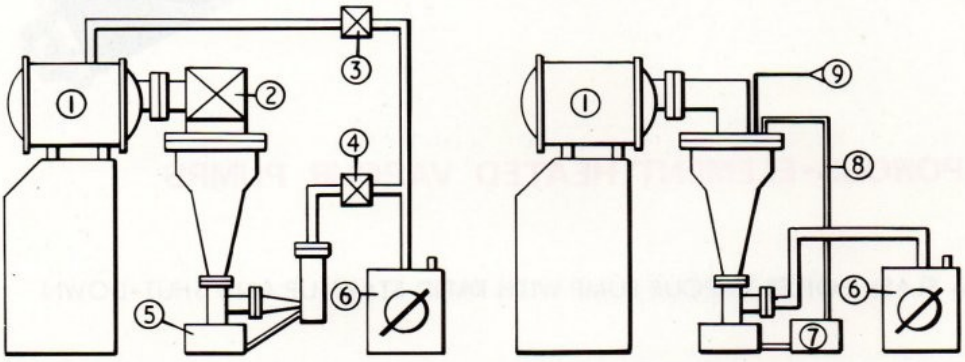
ELECTRICALLY HEATED POROUS-ELEMENT VAPOUR PUMPS

The porous-element pump permits great simplification of vacuum coating systems. The conventional coating system using an oil vapour pump has certain drawbacks: it takes at least a half-hour to heat the vapour pump oil before pumping can begin; after a pumping run, loss of oil and possible damage to certain oils can occur if air at atmospheric pressure is admitted to the vapour pump when the oil is still at operating temperature (typically 250°C).

For these reasons it is common practice to provide the pumping system with valves to isolate the pumps: the apparatus being pumped can then be opened to atmosphere while the pumps are kept running. The valving system is bulky and expensive. The porous-element pump permits a much simpler system. It is easier to automate and the pumps need only run when they are needed to pump.

Vacuum coating systems



Conventional

Porous-element heated

1 Vacuum chamber
2 High vacuum valve
3 Roughing valve
4 Backing valve
5 Sump and boiler
6 Rotary pump
7 Oil circulating pump
8 Oil feed line
9 Low voltage heater supply

OTHER POSSIBLE APPLICATIONS

The porous-element heating system has been developed by Harwell in collaboration with Edwards High Vacuum for application in the vacuum field. Development has reached an advanced stage: based on existing technology, porous element fluid heating systems can be designed for heating, vaporizing, and superheating a range of industrial fluids under conditions of relatively short residence time and rapid heating. Harwell and Edwards as the licensees for this technology are willing to discuss such applications and to collaborate with potential users in developing suitable systems.

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