Tube of the Month

HV-1 (A tube that sucks)

There are vacuum tubes and other devices that require additional vacuum pumping or must be completely pumped down in operation. A transmission electron microscope is like a cathode ray tube where the tube is opened up and the sample to be scanned is placed in the electron beam. The tube is then pumped down before any voltages are applied. A rotary vacuum pump and a series of valves are used to get a vacuum. The microscope I used in college had a bad habit of loosing control of the pump and sucking oil into the valve system. It would take me 3 hours to clean it out. Very large tubes like the high power klystrons have diffusion pumps built into the tube to maintain an adequate vacuum.

In 1942, Eimac developed the HV-1, a diffusion pump that was produced for over 20 years. The HV-1 has a heater element in the base that heats a special oil that is vaporized and rises into the tapered aluminum structure in the middle. It works like that stinky Vicks Vaporizer your mother made you smell as a kid.

The top of the tube has a manifold that is attached to the item to be evacuated. This area is cooled by a fan. The oil vapor rises in the column and molecules of gas diffuse into the oil before it condenses on the glass and runs into the base. There are three stages of this process with higher concentrations of molecules near the base. The neck in the side is attached to a mechanical forepump that has the ability to remove the gas. The oil is re-heated and vaporized again. The process can achieve a vacuum of 4 X 10-7 mm of mercury.

The HV-1 I have was made in 1942 and may have been the first unit ever made. It was once donated by Eimac to a museum and had a date tag.

Visit the museum at N6JV.com
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