

Re: CFD – software

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- *From:* sms@xxxxxxxxxxxxx (Steven M. Schweda)
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From: "David J. Dachtera" <djesys.no@xxxxxxxxxxxxxxxxxxxx>

Oh, boy. I really should know better...

No argument there.

Question: Why can you not "suck" mercury all the way up a 35 inch column at sea level under standard conditions? (Vacuum pump at one end, other end open.)

Mostly because, unlike air pressure, "suck" is not a real physical concept. Removing air at the top of such a column reduces the air pressure there. (Remove all the air, and there's no air pressure there.) What moves the liquid up the column is the outside air pressure pushing on the liquid at the bottom of the column.

Before you start pumping air out, the air pressure on the liquid at the bottom of the tube on the inside is the same as the air pressure on the liquid outside the tube, so the liquid just sits there. Reduce the air pressure inside the tube, and the air pressure outside the tube will force the liquid to rise until the combination of the air pressure inside the tube and the liquid pressure inside the tube (at the bottom of the column) matches the air pressure outside the tube.

Even when all the air has been removed from the tube, the air pressure outside the tube can only raise the column of liquid until the pressure at the bottom equals atmospheric pressure, because atmospheric pressure is all there is to do the pushing. "Suck" is not pulling the liquid up, air pressure is pushing it up, and air pressure is finite. This gives you about 30 inches of mercury or about 34 feet of water. (Quick: what's the ratio of the density of mercury to the density of water?)

It is frequently the case that an "air conditioning system" is a

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"closed" system. Typically, this is mostly true in homes (though some do provide for air replacement using the outside air), especially in the case of a window ("room") air conditioner which may provide for a little bit of venting to the outside.

In datacenters, however, it is more common to find that chillers take ambient air in and discharge it (cooled) into the plenum floor, or the reverse: take air in from an overhead plenum and simply discharge it (cooled) back into the room. In this case, the supply of cooled air is usually approximately the same as the supply of warmed air. Local codes may require some air replacement if the conditioned space is considered "occupied".

The fact remains that the primary consideration is the rate at which the equipment adds heat to the environment, and how fast the refrigerator can remove the heat. Especially for a closed system. Blowing the air faster doesn't change this.

Steven M. Schweda sms@antinode-org
382 South Warwick Street (+1) 651-699-9818
Saint Paul MN 55105-2547