Vacuum Pumps and Deep Evacuation — Microns, Decay Tests and Pump Care

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Why evacuation is measured in microns at the system (not at the pump), the two-stage pump advantage, the 500-micron standing test that separates dry systems from wet ones, sizing pump flow to system volume, and the oil-change discipline that keeps ultimate vacuum honest.

The job is water, and the unit is the micron

Evacuation is not air removal theatre — it is boiling residual moisture out of a refrigeration circuit at room temperature by dropping absolute pressure to where water vaporises. Hence the vocabulary: microns of mercury absolute (760,000 µ = atmosphere; 500 µ = dry-system territory). The reading comes from an electronic micron gauge connected at the system, far from the pump — measuring at the pump flatters the pump and lies about the pipework. Stocked hardware covers the service bench: the Refco RL-4 (65 l/min, 15-micron ultimate) and RL-8 (150 l/min) two-stage pumps with dedicated vacuum-pump oil — within the 109-row vacuum range.

Method that passes the decay test

Big, short, straight hoses (or copper/steel manifold-free rigs): the pump's l/min rating dies in a long 1/4 3 charging hose — evacuation time scales brutally with conductance, which is why the SAE 3/8 3 ports on the stocked pumps exist.

Pull to target, then isolate: valve off and watch the micron gauge — the standing (decay) test. Holding under ~500 µ with minimal rise = dry and tight; a slow climb that plateaus = moisture still boiling off (keep pumping, consider gentle heat); a steady climb that never stops = a leak (leak methods guide).

Triple evacuation with nitrogen breaks remains the wet-system cure: pull, break to slight positive with dry N2 (purging guide), repeat — the nitrogen carries moisture out as vapour load.

Size the pump to the system: the l/min class matters for large-volume chillers and racks (the RL-8 class), while splits evacuate fine on the RL-4 class — but hose conductance dominates both.

Pump care is vacuum performance

Vacuum-pump oil is both lubricant and the sealing medium — and it absorbs every gram of moisture pulled through. Milky, cloudy or merely "used" oil raises the pump's ultimate pressure from 15 µ toward thousands: change oil when warm after every serious evacuation, every few jobs at minimum, with the dedicated grade (never compressor oil — vapour pressure is the spec, per the oil guide). Run with the gas ballast open on wet jobs to purge moisture through the exhaust. A pump that cannot blank itself below ~50 µ with fresh oil is due for service, not a bigger job list.

Frequently asked questions

What micron level counts as a proper evacuation?Pulling the SYSTEM below roughly 500 microns and holding there in a standing test with the pump valved off — many specifications say 500, critical work 250. The gauge sits at the far end of the circuit, never on the pump.Why does the vacuum rise after I isolate the pump?A plateauing rise means moisture is still boiling off — keep evacuating; a continuous rise with no plateau is a leak. The decay curve's shape, not the first number, is the diagnosis.How often does vacuum pump oil need changing?After every wet job and every few evacuations regardless — warm, so contaminants drain. The oil is the seal: moisture-laden oil quietly turns a 15-micron pump into a 2,000-micron one with no other symptom.Does a bigger CFM pump evacuate faster?Only once hose conductance allows it: through a long 1/4-inch hose, a 150 l/min pump performs like a small one. Short, large-bore connections (the 3/8-inch SAE ports on the stocked Refco units) buy more time than the next pump size.What is triple evacuation?Three pull-downs separated by breaking the vacuum to slight positive pressure with dry nitrogen — the nitrogen sweeps moisture-laden vapour out and dilutes what remains. It is the standard remedy for systems opened in the rain or contaminated with moisture.

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