



### Vacuum As Leak Test

During pre-evacuation of sealed units in HVAC&R applications, achieving a low vacuum level (<100 microns) indicates system dryness, signifying that residual moisture is at acceptable levels to introduce refrigerant into the circuit (see more on Residual Balance Pressure in VTech's paper [Understanding Pressure and Vacuum](#)). A Vacuum Decay test is also used during the refrigerant charging cycle as another way of determining residual moisture levels and/or leaks in the circuit.

The following considerations apply when evaluating the use of vacuum as a leak test:

- Vacuum systems are automatic and therefore operator-independent.
- Vacuum stresses the refrigeration system opposite to operating conditions (i.e. under pressure).
- Leaks vs. Outgassing (removal of residual moisture) can show similar initial curves as per fig. 1 below. It is important to profile a "good" unit in order to identify a typical vacuum curve in order to discriminate between the two.
- While the theoretical sensitivity, based on the high sensitivity of the vacuum sensors, can be in the 10-5 mbar range, due to outgassing, the max. detectable leak rate is realistically in the 10-3 mbar range, which corresponds to a leak rate of a few tens of refrigerant ounces per year.
- During the Vacuum Decay test, atmospheric pressure is essentially used as a test media and is therefore limited to 14.7 psi differential between outside and inside the circuit.
- Sensitivity is proportional to system size, so for test units with smaller internal volumes the sensitivity will be greater than a unit with a larger internal volume.
- Vacuum is less sensitive to temperature changes than Pressure Decay as it is conducted below atmospheric pressure and therefore there is no heat generated from expansion.

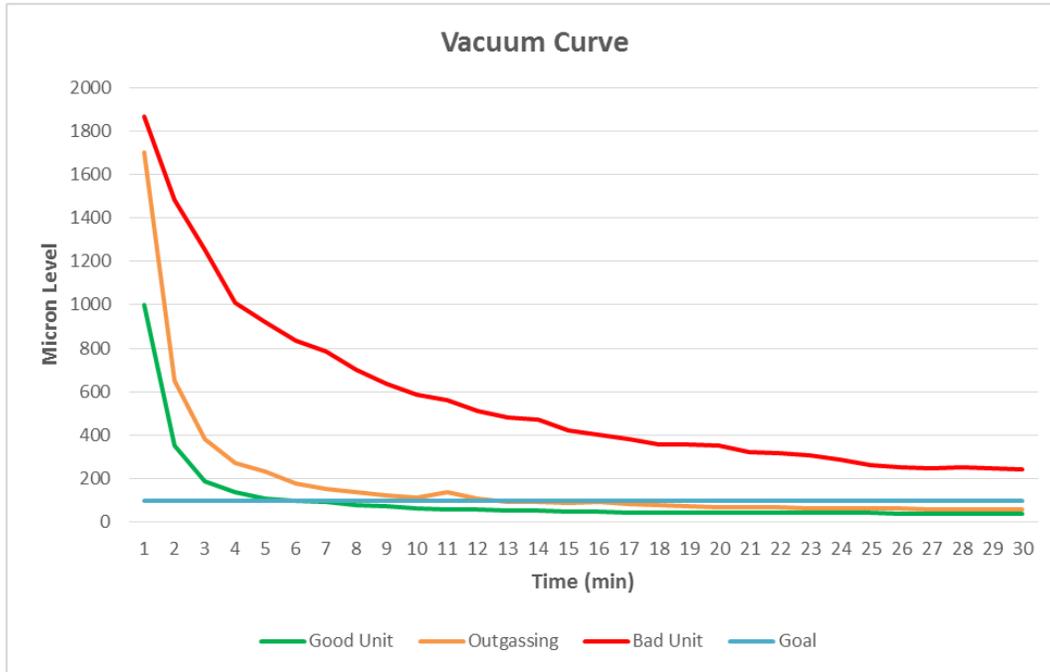


Fig.1 Typical Behavior of Vacuum Curve

The above article is an example of the technical information that can be found in the **Process Technology Fundamentals** section of the VTech website at [www.vtechonline.com](http://www.vtechonline.com).

**Questions?**

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**About VTech**

VTech combines over 50 years of experience in equipment design and process engineering of HVAC&R assembly lines. Our equipment range includes Leak Detection, Refrigerant Charging and Recovery, Pre-Evacuation, and Electrical Safety/Performance Test. Our Process Software provides an integrated solution for data management and process control. Please visit our website at [www.vtechonline.com](http://www.vtechonline.com) to browse our catalog and of course, feel free to contact us with any questions.