

# CULMI AIR-COND & REFRIGERATION PARTS SUPPLY SDN BHD

## 2 Stage or 1 Stage Vacuum Pump Design

Oil sealed rotary vane pumps generally come in either 2 or 1 stage design. In most cases a 2 stage pump will go down below 1 micron .001mm mercury vacuum. A single stage pump is generally specified out at less than 15 micron .015mm mercury vacuum. In both cases the pumps exceed 29.9 inches of mercury vacuum. In selecting either 1 or 2 stage designed pumps, consideration needs to be addressed by the user as to what vacuum pressure they want to achieve on their system. If the answer is the best vacuum without knowledge of the specific vacuum value, many times a single stage pump can do the job and for less money than a 2 stage pump. If on the other hand, a specific number like 10-15 micron is desired then the 2 stage pump is generally the pump of choice.

2 stage pumps are more expensive than a 1 stage pump because they have a high vacuum stage what we refer to as an exhaust stage. This 2nd stage serves to help speed the pumps performance curve from about 150 micron or .150mm down to below 1 micron (.001mm). Single stage pumps will take longer to get to 15 micron than a 2 stage pump will because the 2 stage pump has the high vacuum stage which boosts performance on the pump down curve under 150 micron. Some users, like in the neon production market need the 2 stage pumps. Users performing degassing of RTV rubbers probably can get by with a single stage pump. The price difference is not huge so often users decide in favor of the 2 stage pumps just to make sure.

Above, about 300, micron gas flows are pretty much laminar in action and similar to liquid flow characteristics and can be measured speed wise in basically a straight line method. As an example, a 30L pump takes 5 minutes to get the chamber down then a 60L pump will basically take half the time at least to 300 micron. On going to say 15 micron though a 60L 1 stage pump that takes 2.5 minutes may be outperformed by a 30L 2 stage pump that takes 1.5 minutes for evacuating the same space. The 2 stage pumps strut their stuff when gas flows or pumping speeds start to get into the molecular flow range. Actually the pressure range they cover in this range is really kind of a transition phase from laminar to molecular flow. You physics majors and chemistry people may understand what I am saying.