

## Milk Harvest

- The centerpiece of the milk harvest operation is the vacuum pump.
- The vacuum pump or pumps can consume up to 26% of the total electric energy used on a dairy farm
- Vacuum pumps not controlled by a variable speed drive (VSD) represent an excellent energy savings opportunity

## Sizing Vacuum Pumps

- ASABE Standard S518.2 Feb 03 recommends dairy vacuum pumps be sized as follows:
- Vacuum Pump cfm = base cfm + 2 cfm/milking unit + 1 cfm/milking unit
- Base cfm = 35

## Vacuum Pump Sizing Calculation

- Size vacuum pump for 8 milking units:
- Vac. Pump cfm = 35 cfm + (8 milking units x 2 cfm/ unit) + (8 milking units x 1 cfm/unit)
- Vac Pump cfm = 35 + 16 + 8 = 59 cfm

## Determining Vacuum Pump Motor Hp Requirement

$$\text{Vac. Pump Hp} = \frac{\text{Required cfm}}{10 \text{ cfm/motor Hp}}$$

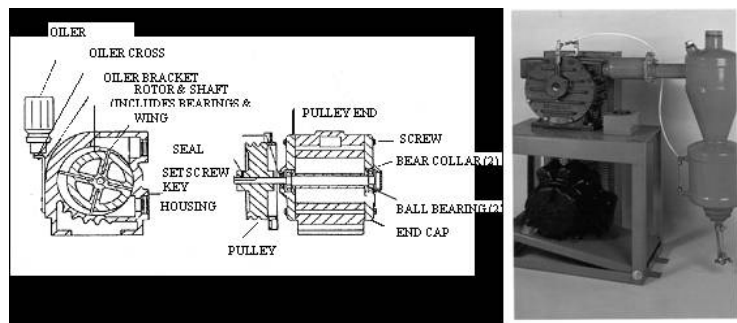
$$\text{Vac Pump Hp} = \frac{59 \text{ cfm required}}{10 \text{ cfm/Hp}}$$

$$\text{Vac Pump Hp} = 5.9 \text{ Hp}$$

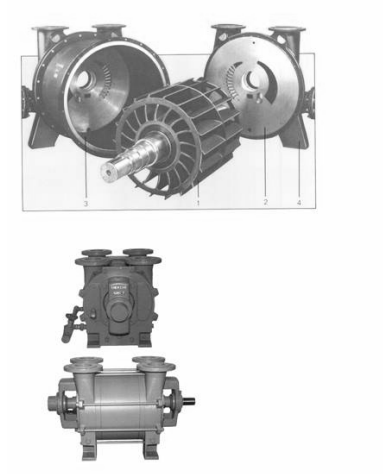
# Distribution of Vacuum Pump Types on Dairy farms

37% Oil Vane
25% Lobe/Blower
27% Water Ring
9% Turbine
2% Did not know

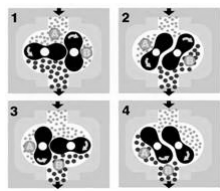
# Sliding Vane Rotary Vacuum Pump



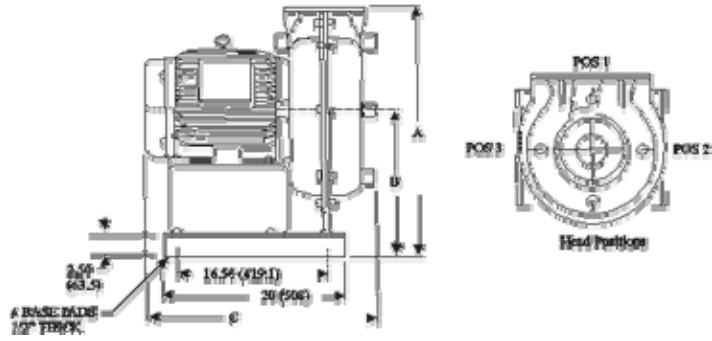
# Water Ring Vacuum Pump



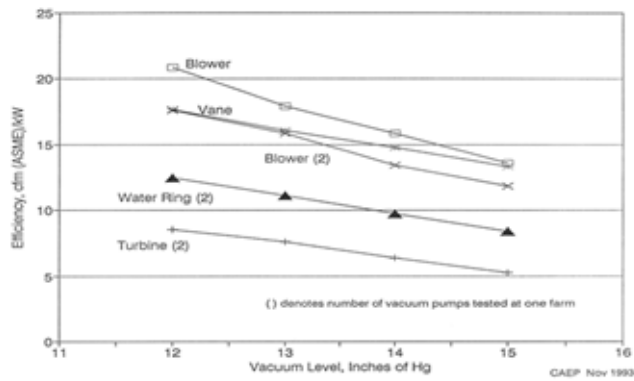
# Rotary Lobe (Blower) Vacuum Pump



# Turbine Vacuum Pump



# Vacuum Pump Efficiencies



## Saving Energy with Adjustable Speed Drives on Vacuum Pumps

- Typical energy use for operating vacuum pumps on dairy farms (without ASDs) range from 70 – 100 kWh/cow-year
- An Adjustable Speed Drive on the vacuum pump can reduce the energy use by as much as 60%, resulting in use as low as 25 to 50 kWh/cow-yr

## Calculating Energy Savings with an ASD on the Vacuum Pump

Annual Savings (kWh) =

[Hp of vac. Pump – (0.25 x no. of milking units)] x 0.9 x hrs of operation/day x 365 days per year

An. savings = [7.5 – (0.25 x 8)] x (0.9 x 6)  
x 365 = 10,840 kWh/yr

## ASD on a Sliding Vane Rotary Vacuum Pump



## Not all Vacuum Pumps work with ASDs

Only Sliding Vane Rotary pumps and Rotary Lobe pumps work well with ASDs.

If Water Ring or Turbine Vacuum pumps are used, an ASD is not an appropriate energy saving measure