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Midwest APPLIED SOLUTIONS, Inc.

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- New or Retrofit Air Movement Solutions

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GOVERNAIR
CORPORATION

- Air Handling Equipment
- Air Cooled Custom DX Units
- Custom Heat Pump Air Handling Units

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 **HUNTAIR**®

- Air Handling Equipment
- Coils
- Computer Room Air Conditioning Equipment
- Cleanroom Products

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 **Innovent**
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- Natatorium Air Handling Equipment
- Energy Recovery Solutions
- Packaged Air Cooled and Water Cooled Air Conditioners
- Air Handling Equipment
- DOAS Systems

www.innoventair.com

TECHNICAL
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- Air Cooled Condensers
- Dry Coolers/Fluid Coolers
- Packaged and Custom Air and Water Cooled Chillers
- Mission Critical Chillers

www.rae-corp.com

RAE
COILS

- Coils
- Dry Coolers

www.rae-corp.com

 **Mammoth**
WEBCO

- Heat Pumps
- Custom Designed Chillers
- Prefabricated Mechanical Equipment Rooms
- Packaged Rooftops
- Evaporative Condensing Technology
- Vertical Self-Contained Air Conditioners

www.mammothwebco.com


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- Criterion (Food Grade) Air Handling Systems
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- Critical Process Solutions

www.cdihvac.com

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www.dimplexthermal.com

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- OEM and Replacement Coils

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- Short Absorption Distance Humidification Manifolds
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Ventrol 

- Air Handling Units
- OEM and Replacement Coils

www.ventrol.com

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- Vertical Packaged Air Conditioners and Condensing Units

www.rsicomp.com/typhoon

American
Air & Water®

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 **EMERSON**™
Industrial Automation

- Variable Frequency Drives
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- Chilled Water Cooling
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- Remote Air Cooled
- Gas Heat, HW, Steam or Electric Heat
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 **valent**
AIR MANAGEMENT SYSTEMS

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- Energy Recovery
- DOAS Systems
- Air Cooled and WSHP

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CLEANPAK
CORPORATION

- Cleanroom Products
- Surgical Suite Products
- Air Handling Units
- Data Center Cooling

www.cleanpak.com

Formulas for Fan Applications

$$\text{Mechanical Efficiency (\%)} = \frac{\text{CFM} \times \text{TP}}{6356 \times \text{BHP}} \times 100$$

$$\text{Static Efficiency (\%)} = \frac{\text{CFM} \times \text{SP}}{6356 \times \text{BHP}} \times 100$$

Total Pressure = Static Pressure + Velocity Pressure

$$\text{Velocity Pressure} = \left(\frac{\text{Velocity in FPM}}{4005} \right)^2$$

Fan Laws

$$\frac{\text{CFM}_1}{\text{CFM}_2} = \frac{\text{RPM}_1}{\text{RPM}_2} \quad \frac{\text{SP}_1}{\text{SP}_2} = \left(\frac{\text{RPM}_1}{\text{RPM}_2} \right)^2 \quad \frac{\text{HP}_1}{\text{HP}_2} = \left(\frac{\text{RPM}_1}{\text{RPM}_2} \right)^3$$

System Curve Equation

$$\text{SP}_2 = \text{SP}_1 \left(\frac{\text{CFM}_2}{\text{CFM}_1} \right)^2$$

Misc. Useful Formulas

kW = Real Power
 kVA = Apparent Power

$$\text{kW} = \text{kVA} \times \text{Power Factor} = \frac{\text{Volts} \times \text{Amps} \times \text{Power Factor}}{1000}$$

$$\text{Motor kW} = \frac{\text{Motor HP} \times 0.746}{\text{Efficiency}}$$

$$\text{Pump HP} = \frac{\text{GPM} \times \text{Total Head (Ft. Water)}}{3960 \times \text{Pump Eff.} \times \text{Motor Eff.}}$$

$$\text{kWH} = \frac{\text{Btu/Hr}}{3414} = \frac{\text{Tons}}{0.285}$$

$$\text{Btu/Hr} = 500 \times \text{GPM} \times \Delta T$$

$$\text{Tons} = \frac{\text{GPM} \times \Delta T}{24}$$

Moisture and Conversion Factors

Dehumidification Capacity	Grains/hr = 4.5 x CFM x ΔGrains/lb
Moisture Removal or Latent Work:.....	1050 Btu/Hr = 1 lb/Hr
Water Vapor:.....	7000 Grains = 1 lb of Water
Work to Watt:.....	3.414 Btu/Hr = 1 Watt
Gas:.....	1 Therm = 100,000 Btu/Hr
Tons:	12,000 Btu/HR = 1 Ton
Sensible Cooling (Btu/Hr):	1.085 x SCFM x ΔTemperature
Latent Cooling:.....	(4.5 x SCFM x ΔGrains/lb)/7000 = lb/Hr
	0.68 x SCFM x ΔGrains/lb = Btu/Hr
Total Cooling (Btu/Hr):	4.5 x SCFM x ΔEnthalpy
Pressure of Water in Feet:.....	2.31 x psi