



Nimbus **ADIABATIC COOLERS**
Hybrid adiabatic cooling systems that reduce water consumption up to 75% and eliminate the primary breeding ground for Legionnaires' Disease. Made in the USA with materials to ensure reliability and advanced controls for maximum energy savings.

Peak +
Adiabatic pre-coolers designed to extend equipment life and lower energy usage by up to 30%. Complete with water softening system and cloud-based control network for real-time energy savings and seasonal optimization.

Berner **AIR CURTAINS/DOORS**
AMCA Certified, heated and unheated air curtains/doors. Architectural, commercial, and industrial styles for door heights up to 30' high.

TrueFIT **AIR FLOW MEASUREMENT**
Accurate and repeatable measurements for Outside, Supply, and Return airflow, unaffected by ambient weather, airborne pollutants, or bends and restriction in mechanical air delivery systems. Higher accuracy, better reliability, and more affordable than traditional air flow measurement systems.

Semco **AIR HANDLING**
Global Leader in air management with the industry's highest recovery performance (AHRI Certified) energy wheels. 3A Energy recovery air handlers 840 – 78,000 cfm. Acoustical thermal panels.

Whalen **AIR TERMINAL DEVICES**
Originator of the hydronic vertical hi-rise fan coil and the industry's only slide out hydronic chassis. Units from 200-1,200 cfm, direct-drive EC fan motors, high efficiency filtration, riser sets, and versatile piping and supply arrangements. Vertical and horizontal fan coils direct drive 300-1,200 cfm, belt drive units 600-12,000 cfm, and console units 200-1,200 cfm.

Multi-Aqua
Ductless hydronic fan coils/cassettes/high wall.

Thermal Solutions **BOILERS/BURNERS**
Extensive line of high efficiency condensing and non-condensing gas-fired, copper tube or stainless steel flexible water tube boilers to fit almost any commercial application 500MBh – 6,000 MBh.

Bryan
Steam boilers 6-600 BHP, gas, oil, dual fuel, and electric, forced draft and atmospheric, low NOx, and knockdown styles.

Sellers
Complete line of firetube boilers, D/A & feedwater systems, clean steam generators.

DuraVent Security **BOILER FLUE/STACKS**
Flues for every application, including grease duct.

Armstrong **BOOSTER SYSTEMS**
Quality engineered Design Envelope packaged booster systems.

Multi-Aqua Thermal Gas Systems **CHILLERS**
Small heat pump chillers. Refrigerant monitors, alarms and safety equipment.

Stulz **COMPUTER ROOM AIR CONDITIONING**
Designed specifically for the cooling of computer and electrical rooms. Floor-mounted, ceiling mounted, & in-row cooling units with chilled water, DX, redundancy & humidification.

Armstrong **COMMERCIAL PUMPS**
Design envelope solutions, including vertical inline pumps with factory-integrated VFDs with sensorless control. Large range of commercial pumps including vertical inline, base mounted/end suction, dual arm, and circulator pumps for many different applications.

Armstrong KMC JCI FX JCI Verasys **CONTROLS**
Hartman loop central plant optimizer. Tridium Niagara N4 open BACnet compliant systems. (Facility Explorer) Tridium Niagara N4 open BACnet compliant systems. Light commercial open BACnet building automation systems.

CanFab Thybar **CUSTOM HVAC ACCESSORIES & MODIFICATIONS**
Modifications and accessories for unitary packaged and split systems

Reznor **DEDICATED OSA UNITS**
High efficiency gas heat outdoor air units.

PoolPak **DEHUMIDIFICATION UNITS & POOL/NATATORIUM UNITS**
Specifically designed units for the crucial need of accurate temperature and humidity control for indoor pools using heat reclaim.

Wheels **ENERGY RECOVERY SYSTEMS**
SEMCO, CanFab, Thybar, MicroMetl
3 ANG, 4 ANG, plastic polymer technology offering total sensible, equal sensible and latent, and sensible only recovery. Available for new or retrofit projects for 840 – 78,000 cfm.

Genesis Air **HIGH EFFICIENCY IAQ SYSTEMS**
Photo-Catalytic Oxidation systems with near 0 PD. Ideal for the control of VOCs and biological contaminants in hospitals, schools, casinos, etc.

Carel **HUMIDIFIERS**
Isothermal and adiabatic humidification solutions for every application: electric, gas-fired, steam generators and distribution.

Hays **HYDRONIC SPECIALTIES**
Flow control valves for hydronic heating, circulation isolating flanges, and configured hydronic hookups.

Armstrong
Leader in HVAC expansion tanks, thermal expansion tanks, and vortex air separators.

Spirotherm
Leader in regular and high velocity air/dirt separators that are able to eliminate 100% of free air, 100% of entrained air, and up to 99.6% of dissolved air (microbubbles) in water. Particle separator down to 5 microns with a minimum pressure drop. Large & custom sizes available.

Systecon **PACKAGED CHILLER & BOILER PLANTS**
Custom-built modular central plants and packaged pumping systems for commercial and mission critical applications.

Armstrong
Pre-engineered packaged plants and pumping skids.

Armstrong **HEAT EXCHANGERS**
Shell & tube, plate and frame, and brazed plate heat exchangers for commercial and industrial applications covering a wide range of different fluids and operating pressures.

Gaylord **POLLUTION CONTROL UNITS & GREASE DUCT SUMPS**
Commercial kitchen ventilation systems including pollution control units with odor, grease and smoke removal. Grease duct sumps.

CanFab **ROOF CURBS**
One of the premier designer and manufacturers of commercial HVAC accessories.

Thybar MicroMetl
High quality roof curbs made by a leader in the sheet metal industry. High quality galvanized steel roof curbs.

Hitachi **VRF & DUCTLESS SYSTEM**
Global leader in VRF & ductless heating and cooling systems. Air and water cooled VRF heat recovery, heat pump, multi-zone, and mini-split systems. Ultra-efficient design, inverter technology, individual zoning control, and quiet operation throughout a wide range of operating conditions.

Century
Multi/single zone ductless mini-split system cooling & heat pump units up to 3 tons.

Whalen **WATER-SOURCE HEAT PUMPS**
Originator of the vertical hi-rise water-source heat pump (WSHP), and two-stage vertical stack unit, with industry leading efficiencies. Units from 200-1,200 ½ ton to 3 ton, direct-drive EC fan motors, high efficiency filtration, built-in ERV, riser sets, and versatile piping and supply arrangements. Vertical and horizontal WSHPs ¾ ton to ton, and console units ¼ ton to 1 ½ ton.

Useful Formulas

$BTUH_{total} = BTUH_{sensible} + BTUH_{latent}$
 $BTUH_{sensible} = 1.085 * SCFM * (EAT_{db} - LAT_{db})$
 $BTUH_{latent} = CFM * 0.68 * (W_{entering} - W_{leaving})$
 $BTUH_{total} = 500 * GPM * (LWT - EWT)$
 $BTUH_{total} = 4.5 * SCFM * (h_{entering} - h_{leaving})$
 Heat_{total} = enthalpy (BTU per Pound of Dry Air)
 Wet Bulb Depression = $EAT_{db} - EAT_{wb}$
 Evaporative Effectiveness = (Wet Bulb Depression) * (Media Efficiency)

Fan Laws

$CFM_2 = CFM_1 * (RPM_2 / RPM_1)$
 $P_2 = P_1 * (RPM_2 / RPM_1)^2$
 $P_2 = P_1 * (D_2 / D_1)$
 $HP_2 = HP_1 * (RPM_2 / RPM_1)^3$
 $HP_2 = HP_1 * (D_2 / D_1)$

BAROMETRIC PRESSURE 27.61 in. HG at 2,100 ft. elevation

Legend for Formulas

- BTUH_{total} = total heat
- BTUH_{sensible} = sensible heat
- BTUH_{latent} = latent heat
- SCFM = supply air CFM
- CFM_t = total CFM
- W = grains of water per lb. of dry air
- P = pressure
- D = density
- HP = horsepower
- h = enthalpy

Standard Conversions

- 1 BTUH = 0.293 Watts
- 1 kWh = 3413 BTUH
- 1 kW = 1.34 HP
- 1 HP-hour = 2545 BTUH
- 1" H₂O column = 0.03613 psi
- 1 cubic foot = 7.481 Gallons
- 1 cubic foot = 1728 cubic inches
- 1 CFM = 0.472 Liters/sec
- 1 Gallon = 8.33 Lbs.
- 1 Gallon = 2.31 cubic inches
- 1 Pound = 7000 Grains
- 1 psi = 2.307 ft. of H₂O

