

MHR Simultaneous Heat Recovery Chillers



- 60 – 500 Tons
- Simultaneous Heating and Cooling
- Hot Water to 140°F
- Air-Cooled and Water-Cooled
- High Energy Efficiency
- Optional Pumps & Tanks

motivair™

COOLING SOLUTIONS

www.motivaircorp.com



The MHR Heat Recovery Chillers are designed for central chiller applications, larger critical industrial processes, and customized HVAC systems. The primary focus of the MHR range is to recover heat and maximize energy efficiency, while maintaining critical cooling requirements.

MHR HEAT RECOVERY

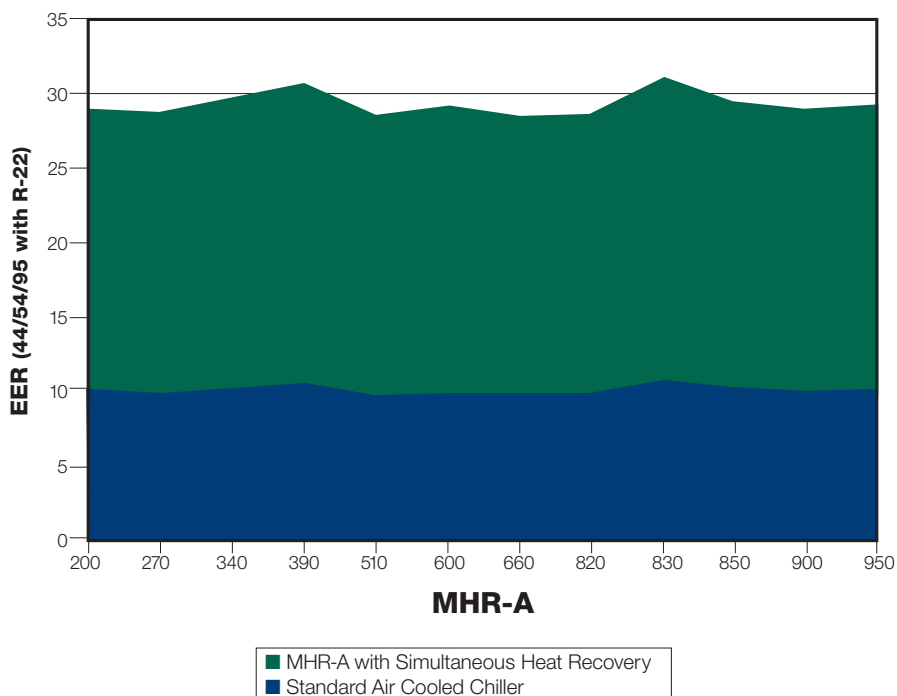
INNOVATION

The MHR chillers were developed to take advantage of energy saving for any application requiring simultaneous cooling & heating from 60 through 500 tons. These are air-cooled or water-cooled chillers with dual screw compressors designed to recover up to 100% of the available heat to a closed circuit hot water loop.

Simultaneous heat recovery produces significant benefits including but not limited to substantially reduced energy costs, reduced environmental emissions and significantly increased overall chiller efficiencies. Energy that would typically be wasted can now be transferred back into the application as FREE HEAT.



EFFICIENCIES



ADVANTAGES

- Ability to produce simultaneous heating and cooling
- Ultra high efficiency
- Reduces building energy costs
- Reduces environmental emissions
- Standard Non-CFC R-407C refrigerant
- Can be used as a key component for designing a LEED certified building

APPLICATIONS

- Hotels
- Hospitals
- Data Processing Centers
- Dormitories
- K-12
- High Rise Condos
- Correctional Facilities
- Food Processing
- Pharmaceutical Mfg.
- Industrial Mfg

MHR CHILLER FEATURES

HEAT RECOVERY

The most common and traditional method of recovering heat in a chiller is by using a single heat recovery (water-

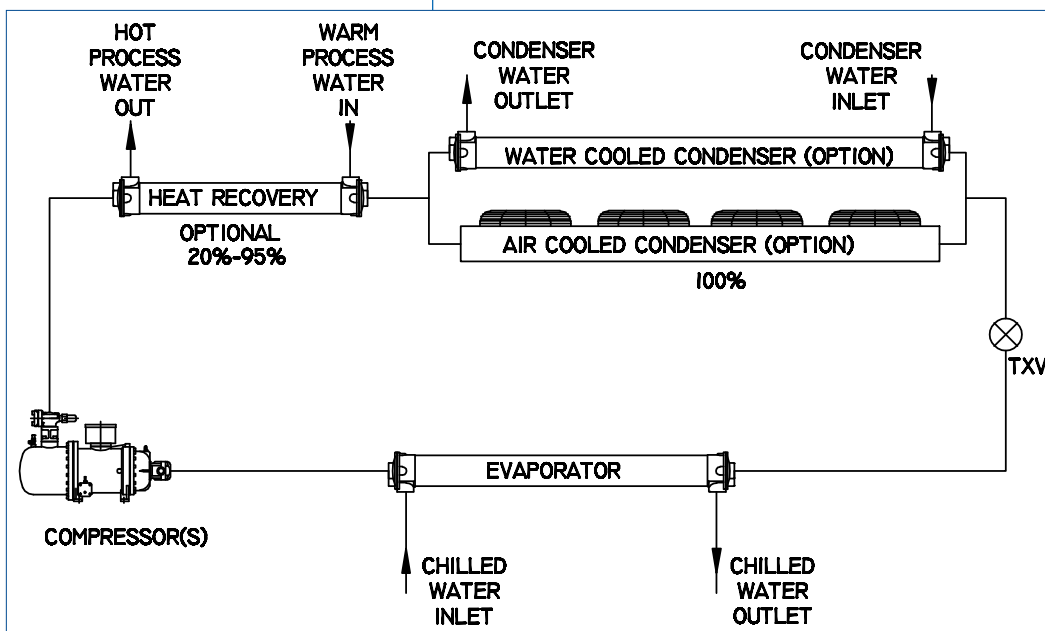


cooled) condenser, or a secondary heat recovery condenser in parallel with the standard air or water-cooled

condenser. Using this method, the amount of heat recovered, and the temperature of the hot water can adversely impact the chiller performance and operating cost. Refrigerant control valves are required to direct the hot gas to either condenser, depending on the heat required at any time. Generally, this is best suited for geothermal applications where the cooling duty is insignificant and the only useful product of the chiller is maximum continuous heat at the required temperature.

Motivair has developed a simpler and more practical way to reclaim continuous and/or variable heat from the refrigeration cycle. The MHR range uses a generously sized shell & tube or plate design heat exchanger in series with the main condenser, to heat a separate hot water loop to 95°-105F and recover up to 95% of the available heat. A reduced hot water flow can recover 20-25% of the available heat up to 140F without raising the head pressure or impacting the chiller efficiency. 100% of available heat can be recovered up to 140F using parallel heat recovery. This is available with R-407C or R134a refrigerant. *100% heat recovery is equivalent to approximately 130% of the chiller cooling capacity (Evaporator cooling capacity Btu/h + compressor power kW = total heat rejected).*

Motivair MHR chillers are available in both air-cooled and water-cooled versions. Higher temperature heat recovery may require R-134a refrigerant, so that higher condensing temperatures can be achieved at lower head pressures. Heat recovery is simply & automatically regulated in series heat recovery because when the hot water loop reaches the desired temperature the hot gas passes through the heat recovery condenser to the main air or water cooled condenser, where the surplus heat is rejected. No refrigerant valves or controls are normally required. The standard condenser controls (VFD fan speed regulation or water regulating valves) operate to maintain the design head pressure. Cold start-up on the hot water loop is easily controlled by a thermostatically controlled hot water mixing valve, which partially by-passes the heat recovery exchanger until the head pressure can be maintained at the required level.



MHR CONTROLS



PCO2 Display



PCO2 Board

PLC CONTROLS

The MHR range features the PCO2 control system, which is an advanced Programmable Logic Controller, with a base-operating platform that can be easily modified to adapt to various applications. A multi-character LCD display, and easy to follow directional prompts, gives the operator complete control over all chiller functions. Multiple digital and analog inputs as well as digital and PWM outputs offer unparalleled control possibilities. Control features of the PCO2 include:

- Highly visible LCD display
- Tactile push-buttons
- Adjustable alarm set points
- °F/°C selectable
- Compressor Lead/Lag control
- Anti-Compressor short cycle
- Compressor failure alarm
- Adjustable water set point
- Supply water temp. display
- Return water temp. display
- Low water temperature alarm
- Freeze alarm
- Low water/glycol flow alarm
- High water temperature alarm
- Low refrigeration pressure alarm
- High refrigeration pressure alarm
- Irregular voltage alarm
- General Alarm Relay
- Remote Start/Stop Relay
- Manual alarm reset
- RS 232/RS 485 communication
- Ethernet Communication
- LON, BACNET, MODBUS communication (optional)

MHR PUMP/TANK STATIONS

INTEGRATED OR STAND ALONE PUMP/TANK STATIONS

All MHR models can be supplied with internal simplex or duplex pumps, and a storage tank.

Some chillers require an external pumping station and storage tank, which can be supplied separately by Motivair.

Motivair designs and builds a full range of pump stations and tank/pump station packages (See Pump Station brochure). Because every large cooling system is typically unique, Motivair designs and builds each pumping station to order.



Stand Alone
TPS 7.5 TNK

Available options include:

- Simplex, duplex or triplex pumps
- Stainless steel water circuit
- Automatic pump change over
- Visible & audible alarms
- Flow meters
- Baffled tanks
- Automatic water make-up
- Pressure & temperature gauges
- Isolation & check valves
- NEMA 4 control box
- VFD pump speed control
- High pressure pump option
- Redundant pump packages

MHR CHILLER FEATURES

REFRIGERATION COMPRESSORS

All MHR chillers feature two heavy duty, 3500-RPM semi hermetic screw compressors mounted in two completely independent refrigeration circuits. Each compressor features 3 steps of unloading for virtually unlimited capacity control. One circuit can be serviced while the second circuit remains fully operational. Positive lubrication, low oil level switch and motor over-temperature protection all combine to provide extended compressor life.



EVAPORATOR

The MHR chillers feature a dual circuited, shell and tube evaporator mounted on the chiller base. Carbon steel shell with heavy gauge copper tubes insures long life and highly efficient heat transfer under varying loads. ASME certification is available on request. All MHR evaporators feature removable end bonnets and pressure relief valves.

REFRIGERANT COMPONENTS

Each circuit includes an externally equalized expansion valve, liquid receiver, filter dryer with replaceable core, sight glass with color-change moisture indicator, pump down service valves on compressor and receiver, high and low side service access valves, HP and LP pressure safety switches, and glycerin filled HP and LP gauges.

CONDENSERS

The MHR air-cooled condensers are constructed from seamless copper tubes expanded into aluminum fins. The large face area, combined with the induced air flow from multiple fans results in 100% rated cooling capacity at 95°F ambient. Standard fan speed control permits reliable chiller operation in -20°F (glycol required). Remote air-cooled condensers feature galvanized steel or aluminum housings, compartmentalized fans, weatherproof fan motors, fan cycling/fan speed control, and independent fan motor fuses and contactors. Water-cooled shell and tube condensers feature a carbon steel shell with heavy gauge copper tubes, removable end bonnets and pressure relief valves. ASME stamp is available upon request.

CONDENSER FANS & MOTORS

Fans feature heavy-duty, cast aluminum blades, which do not flex or lose efficiency at the top of their performance curve. Motors are TEAO; suitable for outdoor use, and variable speed operation. These exceptionally reliable motors feature reversed stator and rotor, which eliminates the traditional motor shaft. The outer shell of the motor is the rotating body, to which the rigid cast aluminum blades are cast or bolted. This unique arrangement reduces torque stress on the blades, eliminates fan blade stress fractures, maximizes airflow, and maintains efficiency over the entire performance curve.



HEAT RECOVERY EXCHANGER

Copper brazed stainless steel plate exchangers or shell & tube with carbon steel shell & copper tubes with optional ASME stamp. Contact factory for potable water option.

MHR CHILLERS WITH SIMULTANEOUS HEAT RECOVERY SPECIFICATIONS

| MHR-A AIR COOLED CHILLERS WITH SCREW COMPRESSORS | MHR-A | 200 | 270 | 340 | 390 | 510 | 600 | 660 | 820 | 830 | 850 | 900 | 950 |
|---|--------------|--------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Nominal Cooling Capacity EWT 54F LWT 44F AMB 95F | btu/h | 696,665 | 938,575 | 1,163,833 | 1,372,026 | 1,726,978 | 1,924,932 | 2,245,754 | 2,706,509 | 2,883,985 | 3,030,744 | 3,351,566 | 3,976,145 |
| Compressor Nominal Absorbed Power Per Comp. | kW | 38.0 | 50.5 | 60.7 | 67.5 | 91.5 | 98.3 | 122.8 | 150.0 | 139.8 | 156.8 | 181.3 | 199.8 |
| Refrigerating Circuit | Qty | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Screw Compressor | Qty | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Capacity Steps Per Compressor | Qty | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Heat Recovery Circuit | Qty | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Nominal Heating Capacity - Series Circuit (1) | btu/h | 747,924 | 1,004,063 | 1,239,710 | 1,437,790 | 1,864,688 | 2,113,996 | 2,424,777 | 2,916,563 | 3,032,679 | 3,244,420 | 3,558,617 | 4,262,143 |
| Nominal Heated Water Temperature (IN/OUT) | Deg. F | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 |
| Nominal Heating Circuit Pressure Drop | PSI | 3.8 | 5.3 | 7.4 | 7.8 | 4.6 | 6.1 | 4.9 | 8.1 | 8.6 | 5.7 | 7.1 | 6.5 |
| Heated Water Connections | in | 2-1/2" | 2-1/2" | 2-1/2" | 2-1/2" | 3" | 3" | 3" | 3" | 3" | 3" | 3" | 3" |
| MHR-AIR COOLED CONDENSER | | | | | | | | | | | | | |
| Electronic Fan Speed Control | Qty | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total Air Flow | CFM | 43,013 | 67,804 | 65,685 | 86,026 | 86,026 | 102,978 | 110,605 | 128,404 | 155,314 | 155,314 | 155,314 | 195,996 |
| Fans | Qty | 4 | 6 | 6 | 8 | 8 | 10 | 10 | 12 | 14 | 14 | 14 | 18 |
| Fans Total Absorbed Power | kW | 5 | 7.5 | 7.5 | 10 | 10 | 12.5 | 12.5 | 15 | 17.5 | 17.5 | 17.5 | 22.5 |
| MHR-A NOISE DATA | | | | | | | | | | | | | |
| Sound Pressure Level | dba at 30' | 72 | 73 | 75 | 76 | 76 | 77 | 77 | 77 | 78 | 78 | 78 | 79 |
| MHR-A Power | V/Ph/Hz | -----460/3/60----- | | | | | | | | | | | |
| FLA (Full Load Amps)* | Amps | 114.8 | 156.7 | 187.7 | 211.8 | 292.8 | 304.9 | 353.9 | 432.6 | 418.7 | 438.5 | 499.7 | 594.3 |
| MCA (Minimum Circuit Ampacity)* | Amps | 127.3 | 173.5 | 208.4 | 234.6 | 325.8 | 388.4 | 393.5 | 481.2 | 464.6 | 486.9 | 555.7 | 660.3 |
| MOP (Maximum Overcurrent Protection)* | Amps | 177.4 | 240.9 | 291.3 | 325.9 | 457.5 | 472.6 | 552.2 | 675.6 | 648.4 | 680.6 | 780 | 924.6 |
| MHR-A OPTIONAL PUMPS & TANK-OPTIONAL | | | | | | | | | | | | | |
| Nominal Pump Flow (MHR-A) | GPM | 126.6 | 165.2 | 218.9 | 249.2 | 323.5 | 389.0 | 426.8 | 523.2 | 557.1 | 612.8 | 681.6 | 791.7 |
| Nominal Pump Pressure (MHR-A) | PSI | 26.1 | 27.5 | 26.1 | 23.2 | 24.6 | 27.5 | 24.6 | 23.9 | 22.5 | 27.5 | 26.1 | 21.8 |
| Pump Power | kW | 2.2 | 4 | 4 | 4 | 5.5 | 7.5 | 7.5 | 10 | 10 | 12.5 | 12.5 | 15 |
| Pump Current | Amps | 4.5 | 7.6 | 7.6 | 7.6 | 10.2 | 13 | 13 | 17.5 | 17.5 | 20.5 | 20.5 | 26 |
| Tank Volume | Gal | 290 | 290 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 530 | 790 | 790 |
| MHR-A DIMENSIONS & WEIGHTS | | | | | | | | | | | | | |
| MHR-A Length** | in | 140 | 140 | 173 | 219 | 219 | 264 | 264 | 350 | 396 | 396 | 396 | 482 |
| MHR-A Width** | in | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| MHR-A Height** | in | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 99 | 99 | 99 | 99 |
| MHR-A Weight *** | lbs | 4,961 | 5,248 | 7,166 | 8,533 | 9,261 | 9,933 | 11,124 | 12,988 | 14,332 | 15,876 | 16,240 | 18,434 |
| MHR-W WATER COOLED CHILLERS WITH SCREW COMPRESSORS | | | | | | | | | | | | | |
| Nominal Cooling Capacity EWT 54F LWT 44F CWT 85F | btu/h | 894,200 | 1,143,350 | 1,450,520 | 1,689,430 | 2,385,690 | 2,508,550 | 2,968,900 | 3,511,980 | 3,675,800 | 4,041,000 | 4,334,500 | 5,338,000 |
| Compressor Nominal Absorbed Power Per Comp. | kW | 36.5 | 45.5 | 57.0 | 64.5 | 88.0 | 100.5 | 110.0 | 129.5 | 134.5 | 147.5 | 157.5 | 192.5 |
| Refrigerating Circuit | Qty | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Screw Compressor | Qty | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Capacity Steps Per Compressor | Qty | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| MHR-W HEAT RECOVERY CIRCUIT | | | | | | | | | | | | | |
| Nominal Heating Capacity - Series Circuit (4) | btu/h | 955,484 | 1,217,922 | 1,539,299 | 1,766,703 | 2,561,876 | 2,732,900 | 3,188,095 | 3,764,916 | 3,856,026 | 4,307,138 | 4,586,694 | 5,696,190 |
| Nominal Heated Water Temperature (IN/OUT) | Deg F | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 | 105/115 |
| Nominal Heating Circuit Pressure Drop | PSI | 6.2 | 7.1 | 9.1 | 10.4 | 9.5 | 10.8 | 9.3 | 6.8 | 7.4 | 7.4 | 7.4 | 11.6 |
| Heated Water Connections | in | 2 x 2.5" | 2 x 2.5" | 2 x 2.5" | 2 x 2.5" | 2 x 3" | 2 x 3" | 2 x 3" | 2 x 4" | 2 x 4" | 2 x 4" | 2 x 4" | 2 x 4" |
| MHR-WATER COOLED CONDENSER | | | | | | | | | | | | | |
| Condenser Quantity | Qty | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Required Water Flow at 85F | GPM | 228 | 290 | 368 | 426 | 597 | 638 | 743 | 878 | 918 | 1008 | 1081 | 1329 |
| Condenser Connections | in | 2.5" | 2.5" | 2.5" | 2.5" | 3" | 3" | 3" | 4" | 4" | 4" | 4" | 4" |
| MHR-W NOISE DATA | | | | | | | | | | | | | |
| Sound Pressure Level | dba at 30' | 58 | 58 | 59 | 59 | 61 | 61 | 62 | 63 | 64 | 64 | 64 | 65 |
| MHR-W POWER | | | | | | | | | | | | | |
| FLA (Full Load Amps) | Amps | 105 | 125 | 153 | 191 | 249 | 263 | 296 | 364 | 371 | 402 | 438 | 527 |
| MCA (Minimum Circuit Ampacity) | Amps | 118 | 141 | 172 | 215 | 280 | 296 | 333 | 410 | 417 | 452 | 493 | 593 |
| MOP (Maximum Overcurrent Protection) | Amps | 170 | 204 | 248 | 311 | 404 | 427 | 480 | 592 | 603 | 653 | 712 | 855 |
| MHR-W DIMENSIONS & WEIGHTS | | | | | | | | | | | | | |
| MHR-W Length | in | 134 | 134 | 134 | 134 | 126 | 126 | 126 | 134 | 134 | 154 | 154 | 154 |
| MHR-W Width | in | 31 | 31 | 31 | 31 | 56 | 56 | 75 | 75 | 75 | 79 | 79 | 79 |
| MHR-W Height | in | 79 | 79 | 79 | 79 | 85 | 85 | 87 | 87 | 87 | 89 | 89 | 89 |
| MHR-W Weight | lbs | 3,275 | 3,540 | 4,553 | 4,995 | 6,196 | 6,384 | 7,177 | 8,335 | 8,379 | 9,746 | 10,286 | 10,760 |

* Does not include optional pump(s)

** Optional Pumps & Tank may effect dimensions

*** Does not include Optional pump(s) or tank

(1) Series heat recovery configuration.

Pumps and tank not available on MHR-W

APPLICATION, INTEGRATION & SOLUTIONS FOR ALL YOUR COOLING NEEDS:



MPC

1/2-50 ton packaged air-cooled or water-cooled chillers for Industrial cooling, Medical cooling or custom HVAC applications. Includes integrated microprocessor, pump station, and storage reservoir.



MLC

60-500 tons air-cooled, water-cooled & split system chillers for industrial or HVAC applications. Available Integrated Free-Cooling.



CTC

10-200 ton low temperature process chillers with integrated pump/tank stations.



PTS

Pump/Tank Stations for chillers and cooling systems.



PFS

Plate & Frame water to water cooling systems.



MOT & MEC

Open draft or closed loop evaporative cooling towers for process cooling or HVAC applications.



MFC

Closed loop dry-coolers for process cooling and remote "Free-Cooling" applications.

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COOLING SOLUTIONS

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