THERFLOW
TFC - SERIES CROSS FLOW
CLOSED CIRCUIT COOLING TOWER

HVAC/R INTERNATIONAL INC.

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**WHAT IS TFC**

- TFC cross flow series cooling tower is designed to follow the development of TFW cross flow series open type cooling tower.
- Block designed heat exchanger (cooper coil parts) installed on grooves opened at the bottom of fill. This kind of design ensures that the TFC has advantages such as lower gravity center, compact construction, good stability, lower loss of pressure, higher heat exchange efficiency on unit area and convenience on release of air and water.
- TFC series has been tested by National Quality Testing Center for F.R.P. Products and every item tested accords with requirements of O/LL 002 - 2008 standard (TFC Closed Type Cooling Tower). At the same time TFC series also has passed the CTI test successfully and complies with CTI standard for Thermal Performance.
- TFC series technology has been awarded several patents.
- Factory assembled TFC series cooling tower have passed strict testing procedures. It guarantees that the TFC series is with high integrated capacity, can work with high quality and reliability under all operating conditions.

**WHY CHOOSE TFC**

- Stable structural mainframe for protection in the harshest high wind environments.
- Easy to access and sweep.
- Corrosion-free, leak free service.
- Short lead time.
- Holistic cold water basin and no water splash.
- Quick installation. Quite operation and low maintenance costs.
- Cross flow advantages.
- Simple product selection.
- TFC Series has passed technical achievement evaluation and proved to be advanced in the world market.

**INSTRUCTION MODEL**

- **TFC**
- **T / RT**
- 01 one cell
- 02 two cells
- 03 three cells
- 04 four cells
- T 1.00 m³ / h @ 37°C - 32°C - 28°C
- RT 0.78 m³ / h @ 37°C - 32°C - 28°C
- Standard water flow m³ / h
- Short for THERFLOW cross flow rectangular closed cooling tower
TFC Series Line of CTI Certified Closed Circuit Cooling towers

CTI Certified Closed Validation Number 09 - 28 - 02

<table>
<thead>
<tr>
<th>Standard Fan for Markets with 100m³/h/T at 37°C-32°C-28°C</th>
<th>Standard Fan for Markets with 100m³/h/RT at 37°C-32°C-28°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFC-60T</td>
<td>TFC-90RT</td>
</tr>
<tr>
<td>TFC-70T</td>
<td>TFC-100RT</td>
</tr>
<tr>
<td>TFC-80T</td>
<td>TFC-120RT</td>
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<tr>
<td>TFC-90T</td>
<td>TFC-135RT</td>
</tr>
<tr>
<td>TFC-100T</td>
<td>TFC-150RT</td>
</tr>
</tbody>
</table>

Footnotes:
1.-Certification includes suffixes -B, -E, -S are added to basic model to indicate the tower construction materials.
   -B FRP casing, FRP basin, and HDG mainframe and hardware.
   -E FRP casing, FRP basin, and stainless steel mainframe and hardware.
   -S Stainless Steel casing, basin, and mainframe and hardware.

2.-The basic model numbers above are for 50hz fan motor and suffixes /F is added for 60hz motor application.
   Ex. TFC-100T-B is for 50hz motor, TFC-100T-B/F is for 60hz motor.

3.-Certification includes use of side, end or bottom water inlet configuration.

4.-Certification includes units with optional gear drive in place of standard belt drive.

5.-Certification includes use of optional handrail and/or ladder cage.

6.-Multiple cell models of the single cell models above are also available but not listed.
COLDING TOWER SELECTION

1. DESIGN CONDITION
   - HOT WATER TEMP. : 57 °C
   - COLD WATER TEMP. : 32 °C
   - WET BULB TEMP. : 26 °C
   - WATER FLOW : 100 m³/hr
   - RANGE (HOT-OPT) = 37-32=5 °C

2. FIND CROSS POINT - A
   - CROSS POINT HOT WATER TEMP LINE AND WET BULB TEMP.

3. FIND CROSS POINT - B
   - CROSS POINT A EXPENDED LINE AND RANGE (5 °C) LINE

4. FIND CROSS POINT - C
   - CROSS POINT B EXPENDED LINE AND WATER FLOW (100 m³/hr) LINE

5. FIND SELECTION MODEL
   - CROSS POINT C EXPENDED LINE - TFC-100
TFC motors are located on the outside of the unit. Compared with the motor inside the fan section, it is easier to remove and repair. Outside installed motors are not affected with the mist. Quite operation is achieved through careful design and quality controlled manufacturing methods of components. Test results prove that our sound levels are the lowest available in the industry.

We have several different design of motors to meet customer needs.

CTI CERTIFIED COOLING TOWER

Cooling Technology Institute (CTI) is the most prestigious organization in the inspection of evaporative heat transfer systems and cooling tower thermal performance, with its headquarters located in Houston Texas, USA. CTI supplies test services all over the world for all cooling tower manufacturers seeking CTI certification. CTI certification provides quality assurance of thermal performance, to comply with government regulations and also conformity with customer specifications. Cooling tower models tested and inspected annually ensure certified continuous thermal performance.

THERFLOW TFC series closed circuit cooling tower was certified by CTI in 19th Sep. 2008. According to the CTI official website, THERFLOW is one of five manufacturers in the world of closed circuit cooling towers.

PATENT DESIGN OF HEAT DISCHARGE MODULE

Open grooves at the bottom of TFC open type tower's infill and then inserted in the coil heat exchanger inside the grooves. The sprinkling water is cooled first at the top of the infill and then across the surface of the coil pipe, which will increase the drive force of heat exchanging of the pipe coil and greatly improve the heat discharge efficiency of the units area.

The inlet and outlet pipe ends of the pipe coil cells are bell-mounted and nut-shaped. Near to the pipe end is a section of more pipe used to adjust the position of inlet and outlet pipe end. The H-shaped pipe, vertical pipe and U-shaped pipes are among the pipes that connect coil cell. There are metal anchor grooves to fix the vertical pipe certain and predetermined distances. This kind of pipe coil cell is shunt-wound for upper and lower routes and the distance & resistance are also same for each route.

This innovative design makes it easy to assembled and replace the pipe coil cell and make the construction compact, which is good for release of air or water. Also this design can combine freely between the pipe coil cells and sprinkling infill to improve the heat discharge efficiency on unit area. This pipe coil cell design has an utility model patent.
TFC cooling tower distribution system consists of gravity distribution with large orifice nozzles, which greatly reduce clogging and assure constant performance capacity between maintenance interval. When nozzle cleaning is required, each nozzle can be easily removed in place and cleaned.

Airfoil-shaped blades are totally fabricated from extrusion Aluminum Alloy. Fan hubs are fabricated with hot-dip galvanized circular plates. The aerodynamic shape together with the lower tip speed ensure a lower noise level. The fan blades are adjustable for permitting maximum utilization of rated horsepower and optimum performance.

Advantages: High efficiency, lower tip speed, light weight, lower power consumption, low noise, low vibration.

In case of most noise sensitive area, super-low noise fan application is available, made from FRP materials.

FRP basin and casing are a single piece to guarantee leak free operation and corrosion protection. The basin is leak tested at the factory with a two leak proof guarantee.

Casing contains stable material resisting ultraviolet radiation, therefore they have smooth and clean surface, it is able to bear aging, with a high polish lasting through a long time.
MECHANICAL PARTS

▶ Pulleys have passed dynamic balancing test, that will guarantee its quiet and vibrationless operation.
▶ TFC cooling tower’s grease lubricator can provide the grease automatically and continuously for the fan shaft bearings. Since it is located outside fanstack, it will save a lot of manual work and make the maintenance more efficient.
▶ Totally enclosed bearing with heavy duty self-aligning ball type is designed for a minimum 75,000 hours life span. Cast iron housing and flexible cap protect the bearing from extreme enviromental attacks.

RELIABLE MAINFRAME

▶ TFC heavy duty steel structural framework is designed to meet the customer’s requirement for bearing the extreme wind and impact circumstance. Compared with existing cooling tower, TFC decrease the parts in quantity more than 30%. Less frame parts means less labors needed on assembly and maintenance, and also means less cost.
▶ For application under extremely corrosive condition, SUS-304 steel framework is available.

HIGH EFFICIENT AIR FOIL AXIAL FAN

▶ With the increase of thermal performance, TFC series has adopted a velocity recovery fan stack.
▶ This application can be used to gain extra capacity in tight layout with same horse power.
▶ Fan guards are made in accordance with ANSI safety standards.
▶ Larger platforms allow for inspections and maintenance simpler and easier.

HIGH EFFICIENT SPRINKLING PUMP

▶ High-efficiency sprinkling pumps for closed circuit cooling tower to ensure that the TFC tower can be high efficiency low energy consuming as well as achieve the designed sprinkling water flow.
▶ The motor of the sprinkling pump is TEFC with IP55 protection class. The mechanical seal and bearing use top brand to ensure the pump can run long time at low noise position.
ITALIAN TOWER CONTINUES TO USE THE PATENTED TFW INFILL.

- It is a thermal vacuum formed from anti-ultraviolet and anti-rust PVC.
- Good rigidity, low wind resistance & excellent thermal performance.
- Integrated with eliminator & louver, TFC fills are hung by galvanized steel support bar that passes through the fill.
- Compact design makes for ease of cleaning and replacement.

RELIABLE MAINFRAME

- TFC heavy duty steel structural framework is designed to meet the customer’s requirement for bearing the extreme wind and impact circumstance. Compared with existing cooling tower, TFC decrease the parts in quantity by more than 30%. Less frame parts means less labor needed for assembly and maintenance, and also lower cost.
- For application under extremely corrosive condition, SUS-304 steel framework are available.

MECHANICAL PARTS PROTECTION

- Since cooling towers are installed outside, mechanical parts are always exposed under extreme circumstance such as rain, wind, sunbeams etc. TFC mechanical parts are perfectly protected from any danger by pulley cover, motor cover, belt cover and other protective equipment.

LARGEST WORKING PLATFORM

- For the convenience of maintenance the TFC has a very large working platform.
- The platform is located between two access doors, its width and length make it easily accessible for maintenance personnel to check all parts of the tower.
- The large access door makes it easier for maintenance personnel to go in and out without shutting down the cooling tower.
**TFC PARAMETERS**

**Design Conditions:**

<table>
<thead>
<tr>
<th>List</th>
<th>Model</th>
<th>Unit</th>
<th>TFC - SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Flow Rate</td>
<td></td>
<td>gpm</td>
<td>60T 70T 80T 90T 100T 120T02 140T02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m3/h</td>
<td>60 70 80 90 100 120 140</td>
</tr>
<tr>
<td>Heat Load</td>
<td>MBH</td>
<td>kcal/h</td>
<td>300,000 350,000 400,000 450,000 500,000 600,000 700,000</td>
</tr>
</tbody>
</table>

**Design Conditions**
- °F 99 (Hot Water) → 90 (Cold water) → 82 (Wet Bulb temp)
- °C 37 (Hot Water) → 32 (Cold water) → 28 (Wet Bulb temp)

| Pressure Drop | kPa | 56 70 96 87 56 57 |
| Pump Power | kW | 2.2 1.5 x 2 1.5 x 2 1.5 x 2 1.5 x 2 1.5 x 2 |

| Length ( L ) | inches | 165 189 165 |
| Width ( W ) | inches | 4200 87 110 |
| Overall Height | inches | 2200 94 110 |
| Height | inches | 141 151 141 |
| Diameter | inches | 3575 105 113 |
| Air Volume | cfs | 547 71 x 1 79 x 1 |
| | m3/h | 93000 1800 x 1 2000 x 1 |

**FAN PART SIZE**
- type & Drive Sys. Axial - Flow & V - Belt
- Type Total Enclosed Fan Cooled / 3 Phase / 4 Pole
- Power Source 3 Phase - 220V / 380V / 440V

| Rate Output | kW | 4 x 1 5.5 x 1 7.5 x 1 4 x 2 5.5 x 2 |
| Fan | Copper tubes or Eq.
| Framework | STEEL (Hot Dip Galvanized)
| Fill / Eliminator / Louver | PVC
| Distribution Panel | FRP
| Cold Water Basin | FRP
| Fan | AL- ALLOY or Eq.
| Casing / Fan stack | FRP
| Nozzle | P.P.

**WATER INLET**
- Water Inlet 5" x 1 6" x 1 5" x 2
- Water Outlet 5" x 1 6" x 1 5" x 2

**DRIP**
- Drain 2" x 1 2" x 1 2" x 2
- Over Flow 2" x 1 2" x 1 2" x 2

**Make - Up**
- Make - Up ( Auto ) 1" x 1 1" x 1 1" x 2
- Make - Up ( Manual ) 1" x 1 1" x 1 1" x 2

**LOSS**
- EVAPORATION LOSS % 0.833
- DRIFT LOSS % < 0.005

**SHIPPING WEIGHT**
- lb | 3322 3476 4752 4928 5192 6644 6952
- kg | 1510 1580 2160 2240 2360 3020 3160

**OPERATING WEIGHT**
- lb | 8910 9350 11220 11660 12100 17820 18700
- kg | 4050 4250 5100 5300 5500 8100 8500
### Design Conditions:
- **Water Inlet Temp.** - T1 = 37°C, **Water Outlet Temp.** - T2 = 32°C, **Wet bulb Temp.** - WB = 28°C, **Range.** - T = 5°C, **Barom. P** = 99400Pa
- **Water Inlet Temp.** - T1 = 99°F, **Water Outlet Temp.** - T2 = 90°F, **Wet bulb Temp.** - WB = 82°F, **Range.** - T = 9°C, **Barom. P** = 33.24 Ft w.c

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit</th>
<th>TFC - SERIES</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>160T02</td>
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<tr>
<td><strong>Water Flow Rate</strong></td>
<td>gpm</td>
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<td></td>
<td>m³/h</td>
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<td><strong>Heat Load</strong></td>
<td>MBH</td>
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<tr>
<td></td>
<td>kcal/h</td>
<td>800,000</td>
</tr>
</tbody>
</table>

### Design Conditions
- **°F** 99 (Hot Water) → 90 (Cold water) → 82 (Wet Bulb temp)
- **°C** 37 (Hot Water) → 32 (Cold water) → 28 (Wet Bulb temp)

<table>
<thead>
<tr>
<th>Pressure Drop</th>
<th>kPa</th>
<th>70</th>
<th>96</th>
<th>87</th>
<th>57</th>
<th>70</th>
<th>87</th>
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<tr>
<td><strong>Pump Power</strong></td>
<td>kW</td>
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<td>1.5 x 4</td>
<td>1.5 x 4</td>
<td>1.5 x 3</td>
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<td>4800</td>
<td>4800</td>
<td>4800</td>
</tr>
<tr>
<td><strong>Width (W)</strong></td>
<td>inches</td>
<td>189</td>
<td>189</td>
<td>189</td>
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<td>189</td>
<td>189</td>
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<tr>
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<td>mm</td>
<td>4800</td>
<td>4200</td>
<td>4800</td>
<td>4800</td>
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<tr>
<td><strong>Overall Height</strong></td>
<td>inches</td>
<td>151</td>
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<tr>
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<tr>
<td></td>
<td>mm</td>
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<tr>
<td><strong>Diameter</strong></td>
<td>inches</td>
<td>79 x 2</td>
<td>71 x 1</td>
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<tr>
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<td>mm</td>
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<td>2000 x 3</td>
<td>2000 x 3</td>
<td>2000 x 3</td>
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<tr>
<td><strong>Air Volume</strong></td>
<td>cfm</td>
<td>60588 x 2</td>
<td>65647 x 2</td>
<td>65647 x 2</td>
<td>54706 x 3</td>
<td>60588 x 3</td>
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<tr>
<td></td>
<td>m³/h</td>
<td>103000 x 2</td>
<td>111600</td>
<td>111600</td>
<td>93000</td>
<td>103000 x 3</td>
<td>111600 x 3</td>
</tr>
</tbody>
</table>

### FAN PART
- **Type & Drive Sys.** Axial - Flow & V - Belt
- **Power Source** Total Enclosed Fan Cooled / 3 Phase / 4 Pole
- **Rate Output** kW 5.5 x 2, 7.5 x 2, 5.5 x 3, 5.5 x 3, 7.5 x 3

### MOTOR
- **Coil** Copper tubes or Eq.
- **Framework** STEEL (Hot Dip Galvanized)
- **Fill / Eliminator / Louver** PVC
- **Distribution Panel** FRP
- **Cold Water Basin** FRP
- **Fan** AL-ALLOY or Eq.
- **Casing / Fan stack** FRP
- **Nozzle** P.P.

### PIPING
- **Water Inlet** 6" x 2, 5" x 3, 6" x 3
- **Water Outlet** 6" x 2, 5" x 3, 6" x 3
- **Drain** 2" x 2, 2" x 3, 2" x 3
- **Over Flow** 2" x 2, 2" x 3, 2" x 3
- **Make - Up (Auto)** 1" x 2, 1" x 3, 1" x 3
- **Make - Up (Manual)** 25A x 2, 25A x 2, 25A x 3

### LOSS
- **EVAPORATION LOSS** % 0.833
- **DRIFT LOSS** % < 0.005

### WEIGHT
- **SHIPPING WEIGHT**
  - lb 9504, 9856, 10384, 10428, 14256, 15576
  - kg 4320, 4480, 4720, 4740, 6480, 7080
- **OPERATING WEIGHT**
  - lb 22440, 34980, 24200, 28050, 33660, 36300
  - kg 10200, 15900, 11000, 12750, 15300, 16500
Please note that this information may be changed without notice.
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TFC series could be hoisted in two parts as followings, and after hosting, it will be assembled at site.

- Hoist Fan Assembly with sling bands connected to the steel reducer frame. When hoisting consider for weight balance and adjust the slings to compensate for the weight of the motor.
- Seams with silicone & bolt fan assembly to the top steel frame of the cooling tower.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>TOWER BODY UNIT</th>
<th>FAN ASSEMBLY</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>TFC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W  L  H</td>
<td>Max Weight (kg)</td>
</tr>
<tr>
<td>60T</td>
<td>4200 2200 3575</td>
<td>1500</td>
</tr>
<tr>
<td>70T</td>
<td>4800 2400 3825</td>
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<td>80T</td>
<td>4200 2200 3575</td>
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<td>90T</td>
<td>4800 2400 3825</td>
<td>2300</td>
</tr>
<tr>
<td>100T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120T02</td>
<td>4200 2200 3575</td>
<td>1500</td>
</tr>
<tr>
<td>140T02</td>
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<td>210T03</td>
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</tr>
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<td>240T03</td>
<td>4800 2400 3825</td>
<td>2300</td>
</tr>
<tr>
<td>300T03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTICE POINTS WHEN ASSEMBLING, OPERATING AND MAINTENANCE**

- Cooling tower's installation, maintenance and inspection need to be done or guided by professional personnel familiar with cooling tower knowledge.
- Pay attention to some relevant measures (such as fireproof measure) when transport, hook up, install, operate, maintain and repair cooling towers.
- Be sure to read the operation and maintenance manual before operating the towers.
- Do not enter cooling tower or climb onto the top during operation.
- For tower maintenance, turn off all power. Install lock out at breaker and display safety sign.
- In cold climates energize the electric heater to avoid freezing. When tower is not in use drain the water from the basins.
Through a continual program of expansion and improvement, the factory established the new cooling tower thermal performance test lab. It is a part of 2005 CTI STD201 Thermal Performance Certification program, in compliance with CTI ATC-105 test standards.

1,500,000 Kcal/hr boiler is installed at the test lab, to test and certify with Inlet Temp 37°C, Outlet Temp 32°C, Wet Bulb Temp 38°C.

As an international cooling system supplier, the THERFLOW cooling tower factory has its own R & D Center, established in 2004. This center includes cooling tower self-testing system and equipments, computer simulation.

In addition to thermal testing, engineers and technicians at the factory continuously focus on the quality and durability of all components that go into THERFLOW products. Accelerated life testing of materials, stress measurement and fatigue testing of fans and performance qualifications of pumps and motors are all performed in specialized test equipment in factory R & D Center. These on-going research programs assure that only equipment of the highest quality is consistently delivered to the customers.
LOW NOISE OPERATION

- Carefully selected TFC series mechanical parts guarantee optimum thermal performance with minimal sound level.
- The low sound level generated by TFC series make them suitable for installation in almost environmental concern.
- For very sound sensitive environment, TFC series service various sound isolating solution. Super low noise fan and stack extension option significantly reduce sound levels generated from the tower with minimal thermal performance losses.
- Super low noise fan.
- Stack extension.
- THERFLOW factory proved attenuator.

LADDER, SAFETY CAGE, EXTERNAL SERVICE PLATFORM AND HANDRAILS

- TFC series provides protection while on top of the cooling tower inspecting or working on the mechanical equipment. Providing a convenient platform to perform work, heavy duty galvanized steel component are used.
- This option are shipped pre-fabricated for assembly in the field and all access to the top of the equipment must be made in accordance with applicable governmental occupational safety standards.

AUTOMATIC WATER LEVER CONTROL SYSTEM

- Automatic make-up system can adjust water level.
- Long-term continuous water level demonstration function can be connected with BMS and be monitored.
- When exceeding the upper and lower part of the normal water level, the alarm will sound automatically.
- It is not influenced by the water pressure. It saves water and it is economical.
- It can efficiently monitor the water level of the cooling tower and prevent the water level inside the cooling tower being too low. overflow.
Carefully selected TFC series mechanical parts guarantee optimum thermal performance with minimal sound level.

The low sound level generated by TFC series makes it suitable for installation in almost all environmental concerns.

For very sound sensitive environments, sound attenuation options are available. Super low noise fan and stack extension option will significantly reduce sound levels generated from the tower with minimal thermal performance losses.

- Super low noise fan.
- Stack extension.
- THERFLOW factory proved attenuator.

When operating the cooling tower at low temperature in winter, basin heater in water basin should be added to prevent freezing during tower shutdown.

For more detailed instruction, please refer to Basin Heater Operation Manual or contact HVAC/R International directly.

<table>
<thead>
<tr>
<th>OPTION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration Limit Switch</td>
<td>To limit damage to tower</td>
</tr>
<tr>
<td>Remote sensor water level display</td>
<td>It is used to observe the water level at long distance</td>
</tr>
<tr>
<td>High temperature fill</td>
<td>For entering water temperature over than 55°C.</td>
</tr>
<tr>
<td>Variable Speed Drive</td>
<td>Energy saving and low noise operation.</td>
</tr>
<tr>
<td>Corrosion resistant frame work</td>
<td>Sea water or other harsh weather conditions.</td>
</tr>
<tr>
<td>Chemical water treatment unit</td>
<td>Sea water or other harsh weather conditions.</td>
</tr>
<tr>
<td>Air inlet debris screen</td>
<td>Prevent debris from enter cooling tower water.</td>
</tr>
</tbody>
</table>