

Injection Molding Chiller

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The plastics industry is one of the largest and most important industries in the world, affecting nearly every aspect of our lives, from food and medicine to entertainment and aerospace. Most plastic parts used every day are injection molded. Injection molding is a very efficient way to produce identical parts in batches with very little plastic. The injection molding machine heats the plastic pellets until they melt and then injects them into a forming mold, where the plastic parts cool. The cooling process can be lengthy; more than 80% of plastic manufacturing time is spent cooling. Injection molding chillers will significantly reduce cooling time and maintain product quality.

1.What is Injection Molding?

Injection molding is a manufacturing process of injecting plastic into a mold to create a solid part. This process determines the shape of the molded part after it cools and solidifies. The main injection molding process steps are mold preparation, melting the plastic, injection the plastic, cooling and solidifying, and ejection the part.

Mold Preparation: First, a mold is created based on the design of the desired product. This

mold is usually made of metal (often steel or aluminum) and consists of two halves that fit together. It has a cavity that matches the shape of the final product.

Melting the Plastic: Granular plastic material (often in the form of small beads or pellets) is fed into a heated hopper. Inside the injection molding machine, a screw mechanism transports the plastic material towards a heated barrel. The barrel is equipped with a reciprocating screw, which heats and mixes the plastic until it reaches a molten state.

Injecting the Plastic: Once the plastic is molten, the screw pushes it forward into the mold cavity. During the injection process, plastic particles are injected into the injection molding machine through an attached hopper. The thermoplastic resin is then placed directly into a heated barrel, where friction heating and inhibit heaters aid in the melting process. Finally, a nozzle injects the resulting molten plastic into the mold.

Cooling and Solidifying: Immediately after injection, the molten plastic is cooled at a specific rate to allow the newly formed workpiece to harden within the mold. Coolant circulates through the mold, lowering the temperature at a specific rate to ensure the plastic hardens quickly. Additionally, operators can use injection molding chiller to provide greater cooling efficiency. Other factors that affect cooling time include the type of resin used and the thickness of the workpiece.

In a typical injection mold cooling system, cooling time accounts for a large portion of the cycle time (up to 60%). It doesn't end until the molded part has solidified enough to pop out, leaving only minimal residual plastic. This temperature can be between 392°F and 572°F, dropping to around 140°F after cooling.

Ejecting the Part: Once the plastic has cooled and solidified, the mold is opened, and the newly formed part is ejected. If the mold has multiple cavities, this process is repeated for each one.



Injection Molding Machine

2.What is Injection Molding Chiller?

Injection molding chillers are specialized refrigeration systems used in the injection molding process. It plays a key role in maintaining precise and consistent temperatures in the mold and the hydraulic system of the injection molding machine. This is important for following reasons:

Temperature control: Controlling the temperature of the mold is key to producing high-quality plastic parts. Different plastics have specific temperature requirements for optimal flow and solidification. Injection Molding Chillers help keep these temperatures within a narrow range, ensuring consistent part quality.

Prevent warping and defects: Rapid and uneven temperature changes can cause plastics to warp, crack, or develop other defects. Injection molding chillers help prevent these problems by keeping molds at a stable and controllable temperature.

Improved cycle times: Maintaining precise temperatures cools and solidifies the plastic faster, which reduces cycle times and increases overall production efficiency.

Extended mold life: Temperature fluctuations can cause thermal stress on molds, which can lead to premature wear and damage. Injection molding chillers help extend the life of molds by providing consistent and controlled cooling.



Injection Molding Chiller

3. Why to Use Industrial Chiller In Plastic Injection

Molding?

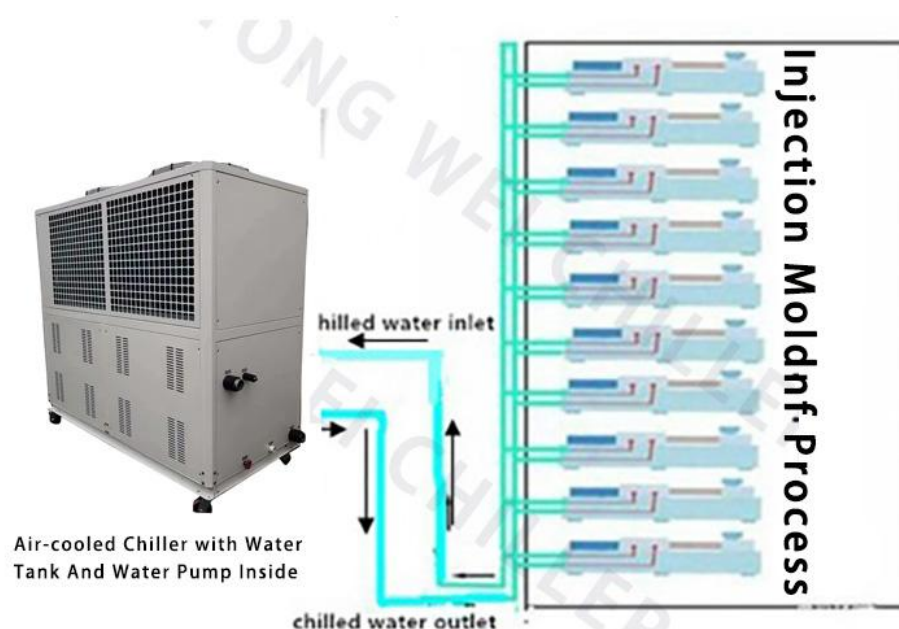
The plastic injection molding chiller provides chilled water to cool the barrel of each injection to maintain the melt temperature of the base material and additives within a specific temperature range, thereby obtaining high-quality plastic products. Manufacturers often use a chiller for intensive cooling at the end of the injection process: depending on its shape and contour, cooling is crucial for the resulting extrudate. Additionally, these chiller machines are necessary for precise temperature control of plastic injection molding lines.

4. What's the Difference Between Air-cooled & Water-cooled Injection Molding Chillers?

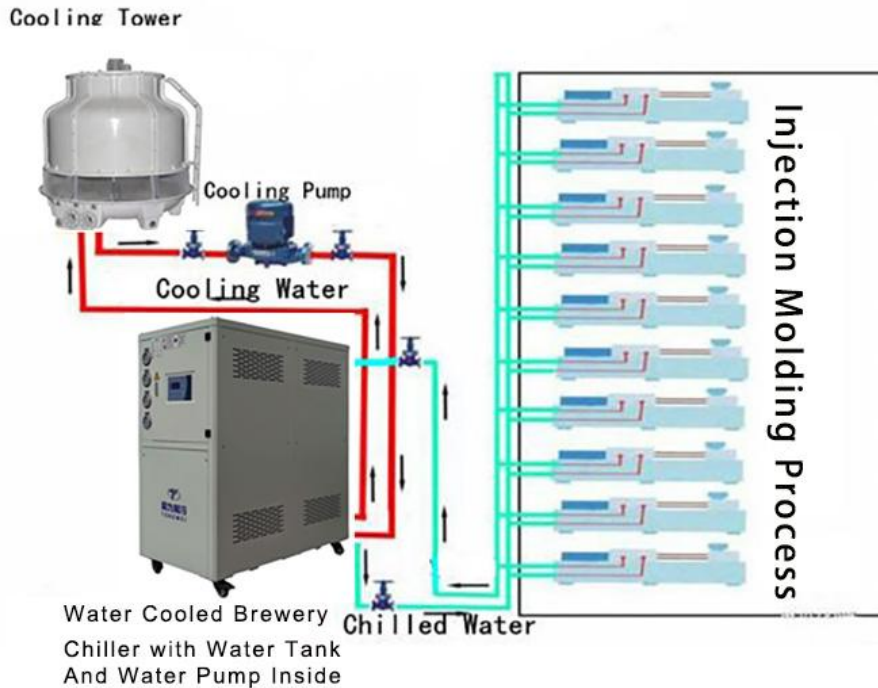
There are two types of Injection Molding chiller: one is **air-cooled Injection Molding chiller**, the other is **water-cooled Injection Molding chiller**;

Air-cooled Injection Molding chillers use ambient air to dissipate heat from the brewing processes. They are energy-efficient, space-saving, and less maintenance that helps save money.

Water-cooled Injection Molding chillers use water from an external water cooling tower to dissipate heat from the brewing processes. These systems are longer lifespan, Relatively quiet, and more consistent cooling performance than the air-cooled Injection Molding chiller.



Air-Cooled Injection Molding Chiller installation



Water-Cooled Injection Molding Chiller installation

Should you choose an air-cooled or water-cooled Injection Molding chiller? [Contact Us](#) for help determining the best solution for you.

5.What Are the Differences Between Injection Molding Scroll Chiller and Injection Molding Screw Chiller?

Injection Molding Scroll Chiller

- 1/2HP-60HP
- Danfoss/Panasonic Scroll Compressor
- Built with water tank and water pump

Injection Molding Screw Chiller

- Above 60HP
- Hanbell/Bitzer Screw compressor
- Without water tank and water pump



Air-cooled Injection Molding Scroll Chiller



Air-cooled Injection Molding Screw Chiller



Water-cooled Injection Molding Scroll Chiller



Water-cooled Injection Molding Screw Chiller

6.What Are The Main Components of Injection Molding Chillers?

6.1 Compressor

The compressor is the key mover in water chiller because it produces pressure variations to stir the refrigerant around.

From 1/2HP(1/2 Ton) to 60HP(50Ton) Injection Molding chiller , which is with **Panasonic** or **Danfoss brand Scroll compressor** ,

Above 60HP Injection Molding chiller,which is with **Hanbell** or **Bitzer screw compressor**;



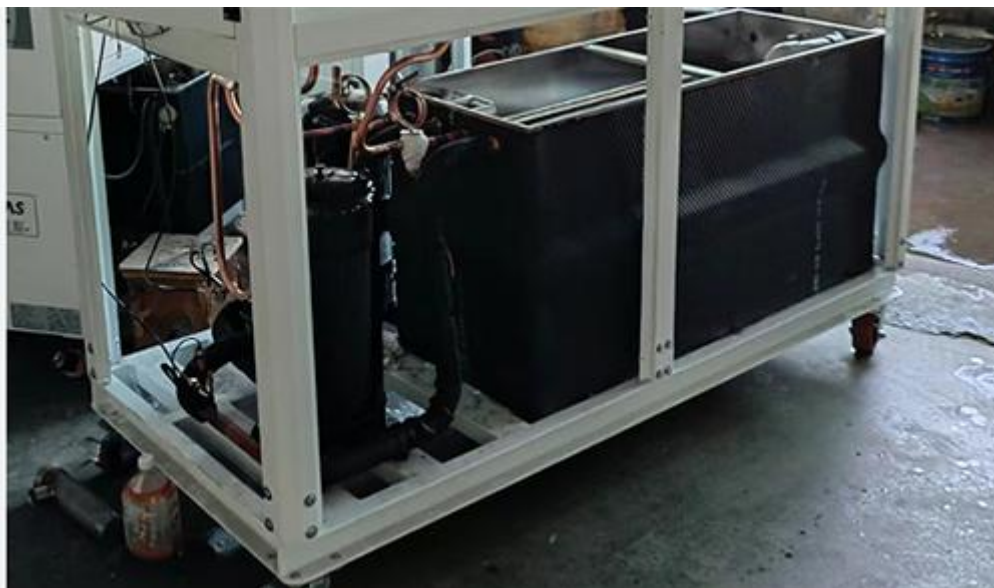
Panasonic Compressor

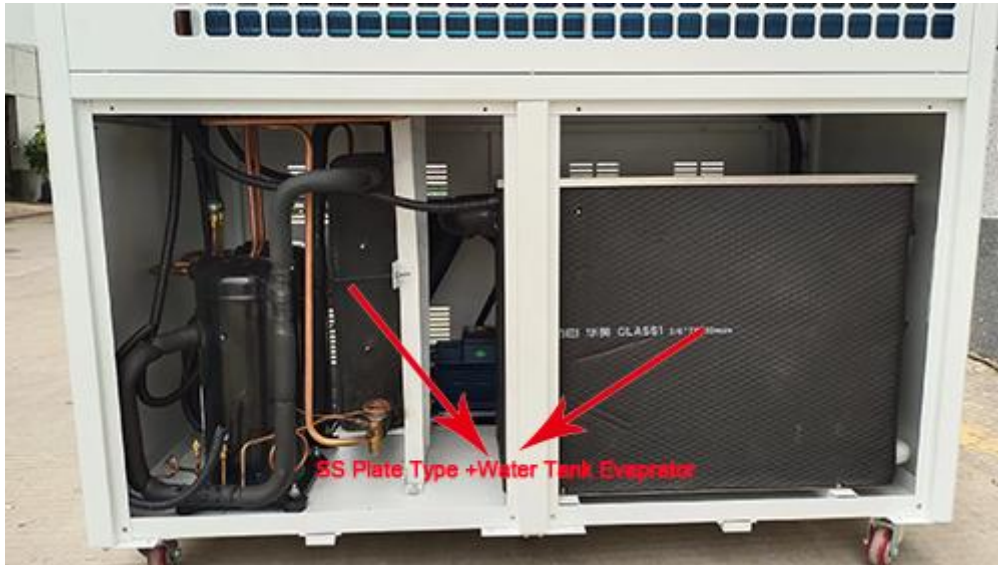


Danfoss Compressor

6.2 Evaporator

The evaporator is a crucial component of air-cooled water chiller, as it is responsible for extracting heat from the liquid being cooled, it is located between the compressor and the expansion valve. There are three types of evaporators : **coil in water tank evaporator , shell and tube evaporator, 304SS stainless steel plate type evaporator.**





SS Plate Type+ Water Tank Evaporator

6.3 Water Pump

The water pump is designed to increase the pressure and the flow of the chilled water in a closed space.

Injection Molding Chiller is used with 304 Stainless Steel Water pump.



Water Pump

6.4 Condenser

The condenser for air-cooled Injection Molding cooler is equipped with efficient cross-seam fins and female threaded copper tubes for high heat exchange efficiency and good stability. Its function is to cool down the refrigerant steam released from the compressor into a liquid or gas-liquid mixture.



Aluminum fin+fan Condenser for air -cooled Injection Molding chiller

The condenser for water-cooled Injection Molding cooler is shell and tube, with the internal copper tubes employing an outer thread embossing process. This design effectively enhances the heat exchange efficiency between the refrigerant and water during the process. Compared to traditional smooth copper tubes, the outer thread embossing process increases the surface area of the copper tubes, thereby expanding the contact area for heat exchange and improving the thermal conductivity of the condenser. This optimization design allows the condenser of the water-cooled chiller to transfer heat from the refrigerant to the water more rapidly and consistently, enabling the water to carry away the heat.



Shell and tube Condenser for water-cooled Injection Molding chiller

6.5 Controller Panel

Water chillers use precision digital temperature controller, it RS485 communication port, which can do remote monitoring and control. Simple operation, low failure rate, high safety factor, easy installation.



Controller Panel

7. What are the Key Features of An Injection Molding Chiller?

- Energy-efficient Panasonic/Danfoss/Hanbell/Bitzer compressor
- Chilled Outlet water temperature control 7°C to 25°C
- Precise temperature controller
- Environment-friendly refrigerant R407c/r410a
- PID temperature controller
- Easy installation ,operation and low cost of maintenance
- 304 Stainless Steel Coil in SS water tank /Shell And tube as evaporator

8.How to Choose Right Injection Molding Chiller for Your Injection Molding Process?

How to calculate right cooling capacity for your Injection Molding chillers?

Choosing the right size of an injection molding chiller is crucial for ensuring optimal performance and efficiency in your injection molding process. How to calculate the correct cooling capacity for your injection molding chiller,pls see below:

A: Simple formula

Every 90 Ton clamping force of injection molding machine requires 1HP cooling capacity(2.5-3kw)

180T × 2 units

300T× 4 units

1000T × 3 units

The required chiller size is $(180 \times 2 + 300 \times 4 + 1000 \times 3) / 90 = 50.66$, that is, 50HP chiller is needed. When used for the cooling of other equipment, depending on the specific flow of the cooling water cycle and outlet water temperature to determine.

B: The advanced formula

$$q = w \times c \times \Delta t \times s$$

- q is the required cooling capacity in kcal/h.
- w is the weight of the plastic material in kg/h.
- c is the specific heat capacity of the plastic material kcal/kg°C.
- Δt is the temperature difference between the melt material temperature and the temperature at which the product is released from the mold in °C
- s is a safety factor (generally take 1.35-2.0), when a single injection machine matching, we can choose a small value, and when a chiller matches with multiple molds, we can choose a large value.

For example: a pair of molds to produce PP products, the hourly production capacity is 400kg, what cooling capacity is needed?

$$q = 400 \times 0.48 \times 200 \times 1.35 = 51840 \text{ (kcal/h)}$$

Every hour the molds need 51840kcal/h=60KW cooling capacity, we can choose a chiller with cooling capacity bigger than 51840kcal/h.

In the actual selection of chillers, it is difficult to obtain complete data. According to our many years of experience, $\Delta t = 200 \text{ }^\circ\text{C}$, it is an average value of many common plastic products.

If the mold has hot rubber channel, hot rubber channel energy should also be considered in the calculation of cooling capacity.

The unit of hot rubber channel heat is usually kw, so the calculation should be converted into kcal / h. (1kw = 860kcal / h)

(Air-cooled chillers are most used for injection molding machine, learn the difference between air-cooled and water-cooled chiller.)

Annexed Table of Common Material Properties

Material	Injection temperature°C	Mold temperature°C	Specific heat capacity Kcal/kg°C
PE	160~310	0~70	0.55
ESP	185~250	0~60	0.35
Nylon	230~300	25~70	0.58
PC	280~320	70~130	0.03

PP	200~280	0~80	0.48
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ABS	180~260	40~80	0.4
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Types of Injection Moldingchiller system?

There are two types of chiller :**Air Cooled Injection Molding Chiller** and **Water Cooled Injection Molding Chiller**.

Water cooled chiller needs a separated water cooling tower and water cooling pump ,if you don't have exsiting water cooling tower,we suggest you use air cooled chiller; But if your ambiemt temperature is very high above 55°C ,we suggest you use water cooled chiller , as it is easier to dissipate heat for water cooled chiller with water cooling tower.

But Most customers use air cooled Injection Moldingchiller ,which is more easily install and save space.

Whether chillers need built-in Tank or not?

In a chiller system, a tank is usually equipped to buffer the thermal load of the chiller.

But should we choose a built-in type of tank or an external type of tank?

A chiller with a built-in tank is easier to install and can be used simply by connecting a water pipe to your application.

But it has a limited capacity and is not suitable for applications with larger chilled water demands.External tank's capacity can be customized according to specific needs.

It can buffer a larger heat load, store more chilled water, but the installation will be more troublesome.

If you don't have external water tank ,we suggest our chiller built-with water tank ,which is easy for you to install.

Cooling capacity unit conversion?

1 KW=860 kcal/h ;



Guangdong Tongwei Machinery Co.,Ltd. www.refrigerationchillers.com

1 TON=3.517 KW;

1 KW=3412 Btu/h;

9.Get a Quote on Industrial Injection Molding Chillers Now

As a leading *industrial chiller manufacturer*, we engineer and produce high-quality process chillers compatible with a broad range of industrial processes.

Depending on your needs, we also offer *custom chillers* to ensure that each client receives the industrial chiller best suited to their unique process.

Request a quote now on our Film Blowing water chillers or learn about the other *air-cooled chillers* and *water-cooled chillers*.