

Control Method and Apparatus for Temperature Adjusting System, Electronic Device, and Readable Storage Medium

Technical Field

5 The present disclosure relates to the technical field of air conditioners, in particular to a control method and apparatus for temperature adjusting system, electronic device, and a readable storage medium.

Background Art

10 Temperature adjusting systems such as a refrigeration station and a heating, ventilation and air conditioning (HVAC) system consume a large amount of electricity, and therefore, in order to achieve energy saving, some energy-saving temperature control needs to be performed on the temperature adjusting systems.

15 However, the current methods can hardly meet the requirement of overall control over a complex temperature adjusting system, mainly due to the influences of a complex environment, multiple influence factors, and multiple inputs, thus, a model having good adjusting and controlling effects is hard to realize.

20 **Summary**

An objective of the present disclosure is to provide a control method and apparatus for temperature adjusting system, an electronic device, and a computer-readable storage medium, so as to solve the problem of difficult control over the temperature adjusting system due to the influences of a complex environment
5 where the temperature adjusting system is located, multiple influence factors, and multiple inputs.

In a first aspect, the present disclosure provides a control method for temperature adjusting system, including: determining refrigerating capacity consumption according to a freezing parameter of a freezing pump and a
10 frequency of the freezing pump of a temperature adjusting system, wherein a freezing water temperature difference is a temperature difference between a freezing water inlet temperature and a freezing water outlet temperature of the freezing pump of the temperature adjusting system, and the frequency of the freezing pump is an operating frequency of the freezing pump of the temperature
15 adjusting system; determining a desired current percentage of a freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption; and determining a control parameter of a frequency of a cooling tower fan and a control parameter of a frequency of a
20 cooling pump according to a cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system.

In an optional embodiment, the temperature parameter includes: a wet bulb temperature and a wet bulb depression, wherein the wet bulb temperature is a wet

bulb temperature in the environment where the temperature adjusting system is located, and the wet bulb depression is a temperature difference between a dry bulb temperature and the wet bulb temperature in the environment where the temperature adjusting system is located; and the determining the desired current
5 percentage of the freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption includes: determining the desired current percentage of the freezing machine of the temperature adjusting system according to the wet bulb temperature, the wet bulb
10 depression, and the refrigerating capacity consumption.

In the above embodiment, through the relevant temperature data in the environment, the desired current percentage of the freezing machine suitable for the current environment is adaptively determined, which can make the finalized data used to adjust and control the temperature adjusting system better meet the
15 current environment.

In an optional embodiment, the determining the desired current percentage of the freezing machine of the temperature adjusting system according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption includes: constructing a second fuzzy control data set according to
20 the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption based on a second fuzzy rule, wherein the second fuzzy control data set includes: multiple wet bulb temperatures, multiple wet bulb depressions, multiple refrigerating capacity consumptions, and multiple desired current percentages of the freezing machine; and performing fuzzy reasoning on the

second fuzzy control data set, to determine corresponding desired current percentages of the freezing machine under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

5 In an optional embodiment, the second fuzzy rule is that, the smaller the wet bulb depression is, the larger the desired current percentage of the freezing machine is; the larger the wet bulb temperature is, the larger the desired current percentage of the freezing machine is, and the larger the wet bulb temperature is, the larger the desired current percentage of the freezing machine is.

10 In the above embodiments, through the fuzzy control logic, complex problems can be simplified so that the control method for temperature adjusting system can better meet the needs of more control scenarios.

 In an optional embodiment, the method further includes: performing the fuzzy reasoning on the second fuzzy control data set, to determine cooling modes under
15 different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

 In the above embodiments, through the above second fuzzy control data set, in addition to obtaining some intermediate data, it is also possible to determine a satisfactory cooling mode based on the wet bulb depression, the wet bulb
20 temperature, and the refrigerating capacity consumption, so as to select a mode of controlling the temperature adjusting system according to the cooling mode, which can better save energy while meeting the needs of the current environment.

In an optional embodiment, the method further includes: performing the fuzzy reasoning on the second fuzzy control data set, to determine the number of freezing machines to be started in the temperature adjusting system under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

In the above embodiments, through the above second fuzzy control data set, in addition to obtaining some intermediate data, it is also possible to determine the number of freezing machines to be started based on the wet bulb depression, the wet bulb temperature, and the refrigerating capacity consumption, so as to appropriately turn on or turn off some freezing machines according to the number of freezing machines to be started, which can better save energy while meeting the needs of the current environment.

In an optional embodiment, the cooling parameter includes: a cooling water temperature difference and a cooling water inlet temperature, wherein the cooling water temperature difference is a temperature difference between the cooling water inlet temperature and a cooling water outlet temperature of the cooling pump of the temperature adjusting system, and the cooling water inlet temperature is a cooling water inlet temperature of the cooling pump of the temperature adjusting system; and the determining a control parameter of a frequency of a cooling tower fan and a control parameter of a frequency of a cooling pump according to a cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system includes: determining the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the

cooling water temperature difference, the cooling water inlet temperature, and the desired current percentage of the freezing machine.

In the above embodiments, the control parameters of the frequency of the cooling tower fan and the frequency of the cooling pump can be determined by
5 selecting the cooling water temperature difference and the cooling water inlet temperature that can represent the refrigerating capacity consumption situation caused by the temperature adjustment, and the control parameter can be more accurately obtained.

In an optional embodiment, the determining the control parameter of the
10 frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the desired current percentage of the freezing machine includes: determining a deviation of the current percentage of the freezing machine according to the desired current percentage of the freezing
15 machine and an actually measured current percentage of the freezing machine; and determining the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine.

20 In an optional embodiment, the determining the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the

freezing machine includes: constructing a third fuzzy control data set according to the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine based on a third fuzzy rule, wherein the third fuzzy control data set includes: multiple cooling
5 water temperature differences, multiple cooling water inlet temperatures, multiple deviations of current percentage of the freezing machine, multiple frequencies of the cooling tower fan, and multiple frequencies of the cooling pump; and performing fuzzy reasoning on the third fuzzy control data set, to determine the control parameter of the frequency of the cooling tower fan and the control
10 parameter of the frequency of the cooling pump under different deviations of current percentage of the freezing machine, different cooling water temperature differences, and different cooling water inlet temperatures.

In an optional embodiment, the third fuzzy rule includes: the larger the deviation of current percentage of the freezing machine is, the larger the
15 frequency of the cooling tower fan is; the larger the cooling water temperature difference is, the larger the frequency of the cooling pump is; and the larger the cooling water inlet temperature is, the larger the frequency of the cooling tower fan is.

In the above embodiments, complex problems can be simplified so that the
20 control method for temperature adjusting system can better meet the needs of more control scenarios.

In an optional embodiment, before the determining refrigerating capacity consumption according to a freezing parameter of a freezing pump and a

frequency of the freezing pump of a temperature adjusting system, the method further includes: adjusting the operating frequency of the freezing pump of the temperature adjusting system, so as to control a terminal pressure difference of the temperature adjusting system to be within a pressure difference threshold interval; and acquiring the frequency of the freezing pump when the terminal pressure difference of the temperature adjusting system is within the pressure difference threshold interval.

In the above embodiments, a terminal pressure difference of the temperature adjusting system can be controlled within the pressure difference threshold interval, and it is possible to make a current state of the temperature adjusting system better meet the adjusting and controlling needs of the temperature adjusting system, so that the determined intermediate data and control parameters also can better meet the adjusting and controlling needs.

In an optional embodiment, the freezing parameter includes the freezing water temperature difference, wherein the freezing water temperature difference is the temperature difference between the freezing water inlet temperature and the freezing water outlet temperature of the freezing pump of the temperature adjusting system; and

the determining refrigerating capacity consumption according to a freezing parameter of a freezing pump and a frequency of the freezing pump of a temperature adjusting system includes: determining the refrigerating capacity consumption according to the freezing water temperature difference and the frequency of the freezing pump.

In an optional embodiment, the determining refrigerating capacity consumption according to the freezing water temperature difference and the frequency of the freezing pump includes: constructing the first fuzzy control data set according to the freezing water temperature difference and the frequency of the freezing pump based on the first fuzzy rule, wherein the first fuzzy control data set includes multiple freezing water temperature differences, multiple frequencies of the freezing pump, and multiple refrigerating capacity consumptions; and performing fuzzy reasoning on the fuzzy control data set, to determine the refrigerating capacity consumption under different freezing water temperature differences and different frequencies of the freezing pump.

In an optional embodiment, the first fuzzy rule includes: the larger the freezing water temperature difference is, the larger the refrigerating capacity consumption is; and the larger the frequency of the freezing pump is, the larger the refrigerating capacity consumption is.

In the above embodiments, complex problems can be simplified so that the control method for temperature adjusting system can better meet the needs of more control scenarios.

In a second aspect, the present disclosure provides a control apparatus for temperature adjusting system, including: a consumption determination module, configured to determine refrigerating capacity consumption according to a freezing parameter of a freezing pump and a frequency of the freezing pump of a temperature adjusting system, wherein a freezing water temperature difference is a temperature difference between a freezing water inlet temperature and a freezing

water outlet temperature of the freezing pump of the temperature adjusting system, and the frequency of the freezing pump is an operating frequency of the freezing pump of the temperature adjusting system; a current determination module, configured to determine a desired current percentage of a freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption; and a parameter determination module, configured to determine a control parameter of a frequency of a cooling tower fan and a control parameter of a frequency of a cooling pump according to a cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system.

In a third aspect, the present disclosure provides an electronic device, including a processor and a memory, wherein the memory stores a machine readable instruction executable by the processor, and when the electronic device is running, the machine readable instruction, when being executed by the processor, executes the steps of the method according to any one of the preceding embodiments.

In a fourth aspect, the present disclosure provides a computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the computer program, when executed by the processor, executes the steps of the method according to any one of the preceding embodiments.

The beneficial effects of the embodiments of the present disclosure include: by processing the data of different units in the temperature adjusting system respectively in three stages, wherein freezing related data is processed in a first

stage, data related to the cooling tower fan is processed in a second stage, then cooling related data is processed in a third stage, in each stage, a subsequent stage for processing some parameters can be based on a calculation result of a preceding stage, the problem of the complex environment of the temperature adjusting system can be solved, and timing adjustment and control over the temperature adjusting system also can be realized, which improves the control effectiveness of the temperature adjusting system, and also can be adapted to control requirements of the adjusting and controlling system in more complex scenarios.

10 **Brief Description of Drawings**

In order to more clearly illustrate technical solutions of embodiments of the present disclosure, accompanying drawings which need to be used in the embodiments will be introduced briefly below, and it should be understood that the accompanying drawings below merely show some embodiments of the present disclosure, therefore, they should not be considered as limitation on the scope, and those ordinarily skilled in the art still could obtain other relevant accompanying drawings according to these accompanying drawings, without using any creative efforts.

FIG. 1 is a structural schematic view of a temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 2 is a block diagram of an electronic device provided in an embodiment of the present disclosure;

FIG. 3 is a flowchart of a control method for temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 4 is an optional flowchart of a step 310 of the control method for temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 5 is a schematic diagram of a fuzzy logic in a first stage provided in the control method for temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 6 is an optional flowchart of a step 320 of the control method for temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 7 is a schematic diagram of the fuzzy logic in a second stage provided in the control method for temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 8 is an optional flowchart of a step 330 of the control method for temperature adjusting system provided in an embodiment of the present disclosure;

FIG. 9 is a schematic diagram of the fuzzy logic in a third stage provided in the control method for temperature adjusting system provided in an embodiment of the present disclosure; and

FIG. 10 is a schematic view of functional modules of a control apparatus for temperature adjusting system provided in an embodiment of the present disclosure.

5 Detailed Description of Embodiments

The technical solutions in the embodiments of the present disclosure will be described below with reference to the accompanying drawings in the embodiments of the present disclosure.

It should be noted that similar reference signs and letters represent similar items
10 in the following accompanying drawings, therefore, once a certain item is defined in one accompanying drawing, it is not needed to be further defined or explained in subsequent accompanying drawings. Meanwhile, in the description of the present disclosure, terms such as “first” and “second” are merely used for distinguishing the description, but should not be construed as indicating or
15 implying importance in the relativity.

As the temperature adjusting system needs to consume a relatively large amount of energy, energy-saving control needs to be performed on the temperature adjusting system in order to reduce the energy consumption. For example, algorithms such as proportional integral derivative (PID for short),
20 model predictive control (MPC for short), and linear-quadratic regulator are used to realize models for energy-saving control over the temperature adjusting system. However, for the overall control over a complex temperature adjusting system,

due to the influences of a complex environment, multiple influence factors, and multiple inputs, the above models can hardly meet the control requirement of the temperature adjusting system. Moreover, the universalization of existing energy-saving control models are relatively poor, the energy-saving control models need
5 to be altered according to the environment. The inventor learned from further researches that as the machine learning requires a large number of effective data sets for training, and needs to introduce a large number of evaluation mechanisms, based on the special circumstances with more data center related factors, it may be difficult to obtain a large number of effective data sets for the training, then it
10 is hard to determine a model for adjusting and controlling the temperature adjusting system according to real-time requirements.

Based on the current situation in the above, the present disclosure provides a control method for temperature adjusting system, wherein by performing staged processing on relevant data of each unit in the temperature adjusting system, the
15 control requirements for an adjusting and controlling system in more complex scenarios can be met.

In order to facilitate understanding the present embodiment, an operating environment for executing a control method for temperature adjusting system disclosed in an embodiment of the present disclosure is first introduced in detail.

20 As shown in FIG. 1, it is a schematic view of interaction of a temperature adjusting system provided in an embodiment of the present disclosure. A temperature adjusting system 100 may include: a cooling water system 110, one

or more freezing machines 120 (only one is shown in the drawing), and a freezing water system 130.

The cooling water system 110 may include a cooling pump 111 and a cooling tower fan 112. A plurality of temperature sensors may be installed in the cooling water system 110, and the plurality of temperature sensors may be installed at different positions of the cooling water system, wherein at least one temperature sensor is installed at an outlet end of the cooling pump 111 and at least one temperature sensor is installed at an inlet end of the cooling tower fan 112. As another example, the temperature sensors may be provided at multiple positions between a heat release unit 123 and the cooling tower fan 112. As another example, the temperature sensors also may be provided at multiple positions between the heat release unit 123 and the cooling pump 111. Certainly, more or fewer temperature sensors further may be provided in the cooling water system 110.

The freezing water system 130 may include a freezing pump 131 and a freezing tower fan 132. A plurality of temperature sensors may be installed in the freezing water system 130, and the plurality of temperature sensors may be installed at different positions of the freezing water system, wherein at least one temperature sensor is installed at an outlet end of the freezing pump 131 and at least one temperature sensor is installed at an inlet end of the freezing tower fan 132. As another example, the temperature sensors may be provided at multiple positions between a heat absorption unit 122 and the inlet end of the freezing tower fan 132. As another example, the temperature sensors may be provided at multiple positions between the heat absorption unit 122 and the freezing pump 131.

Certainly, more or fewer temperature sensors further may be provided in the freezing water system 130.

The freezing machine 120 may include a refrigerating compressor 121 therein. As shown in FIG. 1, the freezing machine 120 further may include the heat
5 absorption unit 122 and the heat release unit 123.

The temperature adjusting system 100 may be a system that can adjust temperature in an environment, such as an air conditioner, a refrigeration station, and a heating, ventilation and air conditioning system.

In an optional embodiment, the temperature adjusting system may be
10 connected to an electronic device 200, and the electronic device 200 is configured to calculate and determine a control parameter for controlling each system in the temperature adjusting system.

In another optional embodiment, the temperature adjusting system also may include the electronic device 200, and the electronic device 200 is configured to
15 calculate and determine a control parameter for controlling each system in the temperature adjusting system.

As shown in FIG. 2, it is a block diagram of the electronic device. The electronic device 200 may include a memory 211 and a processor 213. A person ordinarily skilled in the art could understand that the structure shown in FIG. 2 is
20 merely exemplary, and it does not limit the structure of the electronic device 200. For example, the electronic device 200 further may include more or fewer

components than those shown in FIG. 2, or have a different configuration than that shown in FIG. 2.

The above memory 211 and processor 213 are directly or indirectly electrically connected with each other, so as to realize transmission and interaction of data.

5 For example, these elements can realize the electrical connection via one or more communication buses or signal lines. The above processor 213 is configured to execute executable modules stored in the memory.

In the above, the memory 211 may be, but not limited to, random access memory (RAM for short), read only memory (ROM for short), programmable
10 read-only memory (PROM for short), erasable programmable read-only memory (EPROM for short), electric erasable programmable read-only memory (EEPROM for short) and so on. In the above, the memory 211 is configured to store programs, the processor 213 executes the programs upon receipt of an execution instruction. The method executed by the electronic device 200 defined
15 by the process disclosed in any embodiment of the embodiments of the present disclosure can be applied to the processor 213, or realized by the processor 213.

The above processor 213 may be an integrated circuit chip, with a signal processing function. The above processor 213 may be a general-purpose processor, including central processing unit (CPU for short), network processor
20 (NP for short), etc., and also may be a digital signal processor (DSP for short), an application specific integrated circuit (ASIC for short), a field-programmable gate array (FPGA for short) or other programmable logic devices, discrete gates, transistor logic devices, or discrete hardware components that can realize or

implement various methods, steps, and logic blocks disclosed in the embodiments of the present disclosure. The general-purpose processor may be a microprocessor or the processor also may be any conventional processor and so on.

5 The electronic device 200 in the present embodiment may be configured to execute each step in each method provided in the embodiments of the present disclosure. The implementation process of the control method for temperature adjusting system will be described in detail below with reference to several embodiments.

Referring to FIG. 3, it is a flowchart of a control method for temperature
10 adjusting system provided in an embodiment of the present disclosure. As shown in FIG. 3, the control method for temperature adjusting system provided in the embodiment of the present disclosure includes following steps.

Step 310, determining refrigerating capacity consumption according to a
freezing parameter of the freezing pump and a frequency of the freezing pump of
15 the temperature adjusting system.

Step 320, determining a desired current percentage of a freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption.

20 Step 330, determining a control parameter of a frequency of the cooling tower fan and a control parameter of a frequency of the cooling pump according to a

cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system.

Through step 310 to step 330, the control over the temperature adjusting system is divided into three stages to process the data of different units in the temperature
 5 adjusting system, respectively, wherein freezing related data is processed in a first stage, data related to the cooling tower fan is processed in a second stage, then cooling related data is processed in a third stage, so that some parameters can be processed in each stage, and a subsequent stage can be based on a calculation result of a preceding stage, the problem of the complex environment of the
 10 temperature adjusting system can be solved, and timing adjustment and control over the temperature adjusting system also can be realized, which improves the control effectiveness of the temperature adjusting system, and also can be adapted to control requirements of the adjusting and controlling system in more complex scenarios.

15 In the above, the above step 310 may be implemented in the following manner.

The freezing parameter may be a parameter caused by the freezing pump in the temperature adjusting system. The freezing parameter may include one or more of a freezing water inlet temperature T3, a freezing water outlet temperature T4, a freezing water temperature difference, and so on.

20 Optionally, the freezing parameter includes the freezing water temperature difference. In the above, the freezing water temperature difference is a temperature difference between the freezing water inlet temperature T3 and the freezing water outlet temperature T4 of the freezing pump of the temperature

adjusting system. The frequency of the freezing pump is an operating frequency of the freezing pump of the temperature adjusting system.

The freezing water inlet temperature T3 and the freezing water outlet temperature T4 may be collected in real time in a calculation process.

5 Exemplarily, the freezing water inlet temperature T3 and the freezing water outlet temperature T4 can be detected by various temperature sensors installed in the freezing water system where the freezing pump is located. For example, the freezing water inlet temperature T3 can be detected by a temperature sensor installed at the outlet end of the freezing pump, and the freezing water outlet
10 temperature T4 can be detected by the temperature sensor installed between the heat absorption unit and an inlet end of the fan.

In the above, the freezing water inlet temperature T3 may be determined on the basis of data detected by a plurality of temperature sensors. The plurality of temperature sensors may be a plurality of temperature sensors installed at the
15 outlet end of the freezing pump. Exemplarily, the freezing water inlet temperature T3 may be a temperature detected by any temperature sensor installed at the outlet end of the freezing pump, or may be an average value of temperatures detected by various temperature sensors installed at the outlet end of the freezing pump.

The freezing water outlet temperature T4 also may be determined on the basis
20 of data detected by a plurality of temperature sensors. The plurality of temperature sensors may be a plurality of temperature sensors installed between the heat absorption unit and the fan. Exemplarily, the freezing water outlet temperature T4 may be a temperature detected by any temperature sensor among the plurality of

temperature sensors installed between the heat absorption unit and the fan, or may be an average value of temperatures detected by the plurality of temperature sensors installed between the heat absorption unit and the fan.

Exemplarily, the frequency of the freezing pump may be collected in real time
5 in the calculation process.

The frequency of the freezing pump may be collected when a terminal pressure difference of the temperature adjusting system is within a pressure difference threshold interval. Optionally, before step 310, the operating frequency of the freezing pump of the temperature adjusting system may be adjusted first, so as to
10 control the terminal pressure difference of the temperature adjusting system to be within the pressure difference threshold interval; and acquiring the frequency of the freezing pump in a process of adjusting the freezing pump.

Exemplarily, the operating frequency of the freezing pump can dynamically adjusted, so as to control the terminal pressure difference of the temperature
15 adjusting system to be within the pressure difference threshold interval. In the adjusting process of the freezing pump, when the terminal pressure difference of the temperature adjusting system is within the pressure difference threshold interval, the frequency of the freezing pump is acquired.

In the above, the pressure difference threshold interval may be a preset
20 numerical value interval. It can be understood that, in different use scenarios, values of the pressure difference threshold interval may also be different.

The pressure difference threshold interval may be a numerical value interval constructed by two endpoint values, and the pressure difference threshold interval also may be determined by one value.

Optionally, the larger the temperature difference between the freezing water inlet temperature T3 and the freezing water outlet temperature T4 is, the more the refrigerating capacity consumption caused may be indicated, and the higher the frequency of the freezing pump is, the more the energy consumed by the operation of the freezing pump is indicated, and the more the refrigerating capacity consumption caused may be. On this basis, a first correlative relationship among three items of data, i.e., the freezing water temperature difference, the frequency of the freezing pump, and the refrigerating capacity consumption, can be constructed according to the above law of mutual influence; and then the refrigerating capacity consumption can be determined from the freezing water temperature difference and the frequency of the freezing pump based on the first correlative relationship.

Exemplarily, the first correlative relationship among the three items of data, i.e., the freezing water temperature difference, the frequency of the freezing pump, and the refrigerating capacity consumption, can be constructed based on historical adjustment data of the temperature adjusting system. The historical adjustment data herein may include data recorded in a manual adjusting process of the temperature adjusting system over a historical period of time. For example, the historical adjustment data may include specific values of refrigerating capacity consumption in states with different freezing water temperature differences and different frequencies of the freezing pump. Optionally, the historical adjustment

data of the temperature adjusting system may be collected at different periods of time.

In some implementation modes, the first correlative relationship may be represented by a calculation model. This calculation model may be a calculation
 5 model taking the freezing water temperature difference and the frequency of the freezing pump as independent variables and the refrigerating capacity consumption as dependent variable. Exemplarily, this calculation model only includes one dependent variable, and therefore, this calculation model may be a
 10 curve-type calculation model that only contains one formula. The first correlative relationship among the three items of data, i.e., the freezing water temperature difference, the frequency of the freezing pump, and the refrigerating capacity consumption, may be expressed by a first correlation formula, for example, independent variables in the correlation formula may be the freezing water temperature difference and the frequency of the freezing pump, and the dependent
 15 variable in the first correlative relationship may be the refrigerating capacity consumption.

In some other implementation modes, the first correlative relationship also may be presented in a form of table, text document, or the like. For example, corresponding values of refrigerating capacity consumption under different
 20 freezing water temperature differences and different frequencies of the freezing pump are recorded in the table or the text document.

Optionally, the freezing parameter may include the freezing water inlet temperature T3 and the freezing water outlet temperature T4. The freezing water

inlet temperature T3 can be used to represent an initial refrigerating capacity of the freezing water system, and the freezing water outlet temperature T4 can be used to represent a terminal refrigerating capacity of the freezing water system, therefore, the consumption condition of refrigerating capacity can be determined

5 according to a change from the freezing water inlet temperature T3 to the freezing water outlet temperature T4. Further, the higher the frequency of the freezing pump is, the more the energy consumed by the operation of the freezing pump is indicated, and the more the refrigerating capacity consumption may be caused. Therefore, the first correlative relationship among the frequency of the freezing

10 pump, the freezing water inlet temperature T3, the freezing water outlet temperature T4, and the refrigerating capacity consumption is constructed. Based on the first correlative relationship, the refrigerating capacity consumption can be determined based on the frequency of the freezing pump, the freezing water inlet temperature T3, and the freezing water outlet temperature T4.

15 Exemplarily, the first correlative relationship among the frequency of the freezing pump, the freezing water inlet temperature T3, the freezing water outlet temperature T4, and the refrigerating capacity consumption can be constructed on the basis of the historical adjustment data of this temperature adjusting system. This first correlative relationship can be represented by the calculation model, and

20 this calculation model may take the frequency of the freezing pump, the freezing water inlet temperature T3, and the freezing water outlet temperature T4 as independent variables and the refrigerating capacity consumption as dependent variable.

The above step 320 may be implemented in the following manner.

The temperature parameter may represent an environment temperature parameter in an environment where the cooling water system is located. The temperature parameter includes: a wet bulb temperature and a wet bulb depression, wherein the wet bulb temperature is a wet bulb temperature in an environment
5 where the temperature adjusting system is located, and the wet bulb depression is a temperature difference between the dry bulb temperature and the wet bulb temperature in the environment where the temperature adjusting system is located.

Exemplarily, an environment temperature control effect of the freezing machine in a current state can be represented by the wet bulb temperature, the dry
10 bulb temperature, and the refrigerating capacity consumption. Thus, the desired current percentage of the freezing machine can be determined based on the wet bulb temperature, the dry bulb temperature, and a present value of refrigerating capacity consumption.

In the above, the smaller the temperature difference between the wet bulb
15 temperature and the dry bulb temperature is, the more work required to output by the freezing machine is, and at this time, the larger the desired current percentage of the freezing machine is; the larger the wet bulb temperature is, the more work required to output by the freezing machine is; and the higher the refrigerating capacity consumption is, the more work required to output by the freezing
20 machine is. Therefore, based on this relationship, a second correlative relationship among the four, i.e., the wet bulb temperature, the dry bulb temperature, the refrigerating capacity consumption, and the desired current percentage of the freezing machine, can be constructed, and then based on the second correlative relationship, the desired current percentage of the freezing machine can be

determined according to the wet bulb temperature, the dry bulb temperature, and the refrigerating capacity consumption.

In some implementation modes, the second correlative relationship may be represented by a calculation model. In the above, the wet bulb temperature, the dry bulb temperature, and the refrigerating capacity consumption can be taken as independent variables in the calculation model, and the desired current percentage of the freezing machine can be taken as a dependent variable of the calculation model.

In some other implementation modes, the second correlative relationship also may be presented in a form of table, text document, or the like. For example, corresponding values of desired current percentages of the freezing machine under different wet bulb temperatures, dry bulb temperatures, refrigerating capacity consumptions are recorded in the table or in the text document.

As the environment temperature control effect of the freezing machine in a current state can be represented by the wet bulb temperature, the dry bulb temperature, and the refrigerating capacity consumption, the desired current percentage of the freezing machine of the temperature adjusting system can be determined according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption.

In the above, the smaller the wet bulb depression is, the more work required to output by the freezing machine is, and at this time, the larger the desired current percentage of the freezing machine is; the larger the wet bulb temperature is, the more work required to output by the freezing machine is; and the higher the

refrigerating capacity consumption is, the more work required to output by the freezing machine is. Therefore, based on this relationship, the second correlative relationship among the four, i.e., the wet bulb temperature, the wet bulb depression, the refrigerating capacity consumption, and the desired current
 5 percentage of the freezing machine, can be constructed, and then based on the second correlative relationship, the desired current percentage of the freezing machine can be determined according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption.

Optionally, the second correlative relationship among the four, i.e., the wet
 10 bulb temperature, the wet bulb depression, the refrigerating capacity consumption, and the desired current percentage of the freezing machine can be represented by a calculation model. In the above, the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption can be taken as independent variables in the calculation model, and the desired current percentage
 15 of the freezing machine can be taken as a dependent variable of the calculation model.

The above step 330 may be implemented in the following manner.

The cooling parameter may include one or more parameters such as a cooling water temperature difference, a cooling water inlet temperature T1, and a cooling
 20 water outlet temperature T2. In the above, the cooling water inlet temperature T1 is a cooling water inlet temperature T1 of the cooling pump of the temperature adjusting system; and the cooling water outlet temperature T2 is a cooling water outlet temperature T2 of the cooling pump of the temperature adjusting system.

The cooling water temperature difference is a temperature difference between the cooling water inlet temperature T1 and the cooling water outlet temperature T2 of the cooling pump of the temperature adjusting system.

Optionally, the control parameter of the frequency of the cooling tower fan and
5 the control parameter of the frequency of the cooling pump can be determined according to the cooling water inlet temperature T1, the cooling water outlet temperature T2, and the desired current percentage of the freezing machine.

In the above, the cooling water inlet temperature T1 and the cooling water outlet temperature T2 can be detected by the temperature sensors installed at
10 various positions of the cooling water system. For example, the cooling water inlet temperature T1 can be detected by the temperature sensor between the heat release unit and the cooling tower fan. As another example, the cooling water outlet temperature T2 can be detected by the temperature sensor between the heat release unit and the cooling pump.

15 Exemplarily, the larger the difference between the cooling water inlet temperature T1 and the cooling water outlet temperature T2 is, the larger the frequency of the cooling pump and the frequency of the cooling tower fan that are required may be indicated, and the larger the deviation between the desired current percentage of the freezing machine and an actually measured current
20 current percentage of the freezing machine is, the larger the frequency of the cooling tower fan may be required. Then, based on this requirement, a third correlative relationship among the five, i.e., the cooling water inlet temperature T1, the cooling water outlet temperature T2, the desired current percentage of the

freezing machine, the frequency of the cooling pump, and the frequency of the cooling tower fan, can be constructed, then based on the third correlative relationship, the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump are determined
5 according to the cooling water inlet temperature T1, the cooling water outlet temperature T2, and the desired current percentage of the freezing machine.

Optionally, the third correlative relationship among the five, i.e., the cooling water inlet temperature T1, the cooling water outlet temperature T2, the desired current percentage of the freezing machine, the frequency of the cooling pump,
10 and the frequency of the cooling tower fan, can be constructed based on the historical adjustment data of the temperature adjusting system.

In an implementation mode, the third correlative relationship may be represented by a calculation model, and this calculation model may take the cooling water inlet temperature T1, the cooling water outlet temperature T2, and
15 the desired current percentage of the freezing machine as independent variables, and take the frequency of the cooling pump and the frequency of the cooling tower fan as dependent variables. Exemplarily, this calculation model includes a plurality of dependent variables, and this calculation model may be a calculation model containing a plurality of formulas, wherein each dependent variable may
20 be calculated by one or more formulas.

Optionally, the third correlative relationship among the five, i.e., the cooling water inlet temperature T1, the cooling water outlet temperature T2, the desired current percentage of the freezing machine, the frequency of the cooling pump,

and the frequency of the cooling tower fan, can be constructed based on the historical adjustment data of the temperature adjusting system. Exemplarily, the historical adjustment data herein may include data recorded in an adjusting process of the temperature adjusting system over a historical period of time. For example, the historical adjustment data may include specific values of frequencies of the cooling pump and frequencies of the cooling tower fan under different cooling water inlet temperatures T1, different cooling water outlet temperatures T2, and different desired current percentages of the freezing machine. Optionally, the historical adjustment data of the temperature adjusting system may be collected at different periods of time.

In an implementation mode, the third correlative relationship may be a calculation model taking the cooling water inlet temperature T1, the cooling water outlet temperature T2, and the desired current percentage of the freezing machine as independent variable, and the frequency of the cooling pump and the frequency of the cooling tower fan as dependent variables. Exemplarily, this calculation model includes multiple dependent variables, and this calculation model may be a calculation model containing a plurality of formulas, wherein each dependent variable may be calculated by one or more formulas.

In another implementation mode, the third correlative relationship also may be presented in a form of table, text document, or the like. For example, corresponding frequencies of the cooling pump and frequencies of the cooling tower fan under different cooling water inlet temperatures T1, cooling water outlet temperatures T2, and desired current percentages of the freezing machine are recorded in the table or text document.

Optionally, the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump can be determined according to the cooling water temperature difference, the cooling water inlet temperature T1, and the desired current percentage of the freezing machine.

- 5 Exemplarily, the larger the cooling water temperature difference is, the larger the frequency of the cooling pump and the frequency of the cooling tower fan required may be indicated, and the larger the deviation between the desired current percentage of the freezing machine and an actually measured current percentage of the freezing machine is, the larger the frequency of the cooling
10 tower fan may be required. Then, based on this requirement, the third correlative relationship among the four, i.e., the cooling water temperature difference, the desired current percentage of the freezing machine, the frequency of the cooling pump, and the frequency of the cooling tower fan, can be constructed, then based on the third correlative relationship, the control parameter of the frequency of the
15 cooling tower fan and the control parameter of the frequency of the cooling pump are determined according to the cooling water temperature difference and the desired current percentage of the freezing machine.

- Optionally, the third correlative relationship among the four, i.e., the cooling water temperature difference, the desired current percentage of the freezing
20 machine, the frequency of the cooling pump, and the frequency of the cooling tower fan, can be constructed based on the historical adjustment data of the temperature adjusting system. The third correlative relationship may be a calculation model taking the cooling water temperature difference and the desired current percentage of the freezing machine as independent variables, and the

frequency of the cooling pump and the frequency of the cooling tower fan as dependent variables. Exemplarily, this calculation model includes a plurality of dependent variables, and this calculation model may be a calculation model containing a plurality of formulas, wherein each dependent variable may be
5 calculated by one or more formulas.

By using different calculation models in each stage for the calculation in each stage, the calculation in each stage can be allowed to better meet calculation requirements in this stage, so that data determined in each stage can be more accurate, and control over the temperature adjusting system can also be more
10 accurate, thereby achieving an energy-saving effect better.

Considering that there are many parameters involved in the control process of the temperature adjusting system, the control process is relatively complex, and the fuzzy logic control has many advantages, for example, the complexity of system design can be simplified, therefore, the fuzzy logic control can be applied
15 to the control in the three stages above. The control logic implemented in step 310 to step 330 is described below with reference to the fuzzy control logic.

Based on the fuzzy logic control, as shown in FIG. 4, step 310 may include step 311 and step 312.

Step 311, constructing a first fuzzy control data set according to the freezing
20 water temperature difference and the frequency of the freezing pump based on the first fuzzy rule.

The first fuzzy control data set includes multiple freezing water temperature differences, multiple frequencies of the freezing pump, and multiple refrigerating capacity consumptions. Exemplarily, the first fuzzy control data set may be presented in a form of table, as shown in following Table 1, and the first fuzzy

5 control data set may include the following contents:

No.	Freezing water temperature difference	Frequency of the freezing pump	Refrigerating capacity consumption
1	Low	Low	L
2	Low	Mid	LN
3	Low	High	N
4	Mid	Low	LN
5	Mid	Mid	N
6	Mid	High	NH
7	High	Low	N
8	High	Mid	NH
9	High	High	N

Table 1

In the above, four columns of data are listed in Table 1, i.e., a column of reference numerals (No.), a column of freezing water temperature difference, a column of frequency of the freezing pump, and a column of refrigerating capacity consumption, respectively. In the examples shown in Table 1, the freezing water temperature difference represented in the column of freezing water temperature difference may include three states: a low demand state (Low), a normal demand

10

state (Mid), and a high demand state (High), respectively. The frequency of the freezing pump represented in the column of frequency of the freezing pump also may include three states: a low demand state (Low), a normal demand state (Mid), and a high demand state (High), respectively. The refrigerating capacity consumption represented in the column of refrigerating capacity consumption may include five states: a low temperature state (L), a low temperature and normal state (LN), a normal state (N), a normal and high temperature state (NH), and a high temperature state (H). Certainly, based on different actual requirements, the freezing water temperature difference, the frequency of the freezing pump, and the refrigerating capacity consumption also may include more or fewer states.

The first fuzzy rule includes: the larger the freezing water temperature difference is, the larger the refrigerating capacity consumption is; and the larger the frequency of the freezing pump is, the larger the refrigerating capacity consumption is.

Step 312, performing fuzzy reasoning on the fuzzy control data set, to determine the refrigerating capacity consumption under different freezing water temperature differences and different frequencies of the freezing pump.

As shown in FIG. 5, in the first stage, in the fuzzy logic control process used, two input membership functions and one output membership function may be included. The freezing water temperature difference and the frequency of the freezing pump can be respectively input into the two input membership functions, to construct an input fuzzy set; and the refrigerating capacity consumption determined according to the freezing water temperature difference is input into

the output membership function, to construct an output fuzzy set. A fuzzy control table is then determined based on the fuzzy control rule.

Exemplarily, the above two input membership functions and one output membership function may be Gaussian membership functions, general bell membership functions, S membership functions, triangle membership functions, trapezoid membership functions, Z membership functions, etc. The selection of specific membership function can be matched according to actual scenarios, and the embodiments of the present disclosure are not limited to the selection of membership function.

10 Taking the freezing water temperature difference as an example, a basic domain of discourse and a discrete domain of discourse of the freezing water temperature difference may be set according to the change condition of the temperature difference between the freezing water inlet temperature and the freezing water outlet temperature. For example, the basic domain of discourse of the freezing water temperature difference may be $[0, 5]$, and the discrete domain of discourse of the cooling water temperature difference may be $\{0, 1, 2, 3, 4, 5, 6\}$. Then, according to the discrete domain of discourse of the cooling water temperature difference, the probability of the freezing water temperature difference being in different states under different values of discrete domain of discourse can be determined.

Then, the refrigerating capacity consumption can be obtained by performing the fuzzy reasoning on the fuzzy control table. In the above, the refrigerating capacity consumption obtained by the fuzzy reasoning may include refrigerating

capacity consumption under different freezing water temperature differences and different freezing pump frequencies.

By means of the fuzzy logic control, the refrigerating capacity consumption required in this stage can be obtained without needing more detailed and more accurate data, and the processing mode can be adapted to more complex control scenarios of the temperature adjusting system.

Based on the fuzzy logic control, as shown in FIG. 6, step 320 may include step 321 and step 322.

Step 321, constructing a second fuzzy control data set according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption based on a second fuzzy rule.

The second fuzzy control data set includes: multiple wet bulb temperatures, multiple wet bulb depressions, multiple refrigerating capacity consumptions, and multiple desired current percentages of the freezing machine. Exemplarily, the second fuzzy control data set may be presented in a form of table, as shown in following Table 2, and the second fuzzy control data set may include the following contents:

No.	Wet Bulb Depression	Wet Bulb Temperature	Refrigerating Capacity Consumption	Desired Current Percentage of the Freezing Machine
1	Low	Low	Low	Free-cooling-L

2	Low	Low	Mid	Free-cooling-L
3	Low	Low	High	Free-cooling-L
4	Low	Mid	Low	Free-cooling-H
5	Low	Mid	Mid	pre-cooling-H
6	Low	Mid	High	cooling-L
7	Low	High	Low	pre-cooling-M
8	Low	High	Mid	cooling-H
9	Low	High	High	add cooling
10	Low	High plus	Low	cooling-L
11	Low	High plus	Mid	add cooling
12	Low	High plus	High	add cooling
13	High	Low	Low	free-cooling-L
14	High	Low	Mid	free-cooling-L
15	High	Low	High	free-cooling-L
16	High	Mid	Low	free-cooling-H
17	High	Mid	Mid	pre-cooling-M
18	High	Mid	High	pre-cooling-H
19	High	High	Low	pre-cooling-L

20	High	High	Mid	cooling-M
21	High	High	High	cooling-H
22	High	High plus	Low	cooling-L
23	High	High plus	Mid	cooling-H
24	High	High plus	High	add cooling

Table 2

In the above, five columns of data are listed in Table 2: a column of reference numerals (No.), a column of the wet bulb depression, a column of the wet bulb temperature, a column of the refrigerating capacity consumption, and a column of the desired current percentage of the freezing machine, respectively. In the examples shown in Table 2, the wet bulb depression may include two states: Low and High, respectively. The wet bulb temperature may include four states: Low, Mid, High, and High plus, respectively; the refrigerating capacity consumption includes three states: Low, Mid, and High, respectively; the desired current percentage of the freezing machine includes nine states: adding cooling power (add_cooling), cooling power being high (cooling-H), cooling power being normal (cooling-M), cooling power being low (cooling-L), pre-cooling power being high (pre_cooling-H), pre-cooling power being normal (pre_cooling-M), pre-cooling power being low (pre_cooling-L), free cooling power being high (free_cooling-H), and free cooling power being low (free_cooling-L), respectively. Definitely, according to different actual requirements, the wet bulb depression, the wet bulb temperature, the refrigerating capacity consumption, and

the desired current percentage of the freezing machine further may include more or fewer states.

The second fuzzy rule is that, the smaller the wet bulb depression is, the larger the desired current percentage of the freezing machine is; the larger the wet bulb temperature is, the larger the desired current percentage of the freezing machine is, and the larger the wet bulb temperature is, the larger the desired current percentage of the freezing machine is.

Step 322, performing fuzzy reasoning on the second fuzzy control data set, to determine corresponding desired current percentages of the freezing machine under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

Optionally, the fuzzy reasoning is performed on the second fuzzy control data set, to determine cooling modes under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

Exemplarily, when the wet bulb temperature is low, it may be determined that the cooling mode is a free cooling mode; when the wet bulb temperature is relatively low, it may be determined that the cooling mode is a pre-cooling mode; and when the wet bulb temperature is relatively high, it can be determined that the cooling mode is a mechanical cooling mode.

Optionally, the fuzzy reasoning is performed on the second fuzzy control data set, to determine the number of freezing machines to be started in the temperature

adjusting system under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

Exemplarily, when the desired current percentage of the freezing machine is especially low, one working freezing machine may be reduced; and when the
 5 desired current percentage of the freezing machine is especially high, one working freezing machine may be increased.

As shown in FIG. 7, in the second stage, in the fuzzy logic control process used, three input membership functions and one output membership function may be included. The wet bulb temperature, the wet bulb depression, and the refrigerating
 10 capacity consumption can be respectively input into the three input membership functions, to construct an input fuzzy set; and the desired current percentage of the freezing machine determined by the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption are input into the output membership function, to construct an output fuzzy set. A fuzzy control table is
 15 then determined based on the fuzzy control rule.

Then, the fuzzy reasoning is performed on the fuzzy control table, so that the desired current percentage of the freezing machine can be obtained. In the above, the desired current percentage of the freezing machine obtained by the fuzzy reasoning may include desired current percentages of the freezing machine under
 20 different wet bulb temperatures, different wet bulb depressions, and different refrigerating capacity consumptions.

As shown in FIG. 7, the fuzzy reasoning in the second stage further may realize mode judgment, and the cooling mode can be determined through the mode judgment.

As shown in FIG. 7, the fuzzy reasoning in the second stage further may
5 determine whether the freezing machine needs to be added or reduced. Adding or reducing the freezing machine means whether a new freezing machine needs to be started or a freezing machine in a started state needs to be turned off.

Optionally, a deviation from a desired value may be determined first based on a real-time current percentage of the freezing machine, and then the control
10 parameter is determined based on the deviation of the current percentage of the freezing machine. On this basis, step 330 may include: determining the deviation of the current percentage of the freezing machine according to the desired current percentage of the freezing machine and the actually measured current percentage of the freezing machine; and determining the control parameter of the frequency
15 of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature T1, and the deviation of current percentage of the freezing machine.

In the above, the actually measured current percentage of the freezing machine
20 may be obtained by collecting data of the freezing machine of the temperature adjusting system in the calculation process.

Based on the fuzzy logic control, as shown in FIG. 8, step 330 may include step 331 and step 332.

Step 331, constructing a third fuzzy control data set according to the cooling water temperature difference, the cooling water inlet temperature T1, and the deviation of current percentage of the freezing machine based on the third fuzzy rule.

- 5 In the above, the third fuzzy control data set includes: multiple cooling water temperature differences, multiple cooling water inlet temperatures T1, multiple deviations of current percentage of the freezing machine, multiple frequencies of the cooling tower fan, and multiple frequencies of the cooling pump. Exemplarily, the third fuzzy control data set may be presented in a form of table, as shown in
- 10 following Table 3, and the third fuzzy control data set may include the following contents:

No.	Deviation	Cooling water temperature difference	Cooling water inlet temperature T1	Frequency of the cooling tower fan	Frequency of the cooling pump
1	Negative	Low	Low	L	Low
2	Negative	Norm	Low	L	Norm
3	Negative	High	Low	L	High
4	Normal	Low	Low	LN	Low
5	Normal	Norm	Low	LN	Norm
6	Normal	High	Low	LN	High
7	Positive	Low	Low	N	Low

8	Positive	Norm	Low	N	Norm
9	Positive	High	Low	N	High
10	Negative	Low	Norm	LN	Low
11	Negative	Norm	Norm	LN	Norm
12	Negative	High	Norm	LN	High
13	Normal	Low	Norm	N	Low
14	Normal	Norm	Norm	N	Norm
15	Normal	High	Norm	N	High
16	Positive	Low	Norm	NH	Low
17	Positive	Norm	Norm	NH	Norm
18	Positive	High	Norm	NH	High
19	Negative	Low	High	N	Low
20	Negative	Norm	High	N	Norm
21	Negative	High	High	N	High
22	Normal	Low	High	NH	Low
23	Normal	Norm	High	NH	Norm
24	Normal	High	High	NH	High
25	Positive	Low	High	H	Low

26	Positive	Norm	High	H	Norm
27	Positive	High	High	H	High

Table 3

In the above, six columns of data are listed in Table 3: a column of reference numerals (No.), a deviation column, a column of the cooling water temperature difference, a column of the cooling water inlet temperature T1, a column of the frequency of the cooling tower fan, and a column of the frequency of the cooling pump, respectively. In the above, the deviation column is used to represent different deviations of current percentage of the freezing machine. In the examples shown in Table 3, the deviation may include three states, i.e., Negative, Normal, and Positive, respectively; the cooling water temperature difference may include three states: Low, Norm and High, respectively; the cooling water inlet temperature T1 may include three states: Low, Norm, and High, respectively; the frequency of the cooling tower fan may include five states: a low power state (L), a low temperature and normal power state (LN), a normal power state (N), a normal and high temperature power state (NH), and a high temperature power state (H), respectively; the frequency of the cooling pump may include three states: a low power state (Low), a normal power state (Normal), and a high power state (High), respectively. Certainly, according to different actual requirements, the cooling water temperature difference, multiple cooling water inlet temperatures T1, deviation of current percentage of the freezing machine, the frequency of the cooling tower fan, and the frequency of the cooling pump further may include more or fewer states.

The third fuzzy rule includes: the larger the deviation of current percentage of the freezing machine is, the larger the frequency of the cooling tower fan is; the larger the cooling water temperature difference is, the larger the frequency of the cooling pump is; and the larger the cooling water inlet temperature T1 is, the larger the frequency of the cooling tower fan is.

Step 332, performing fuzzy reasoning on the third fuzzy control data set, to determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump under different deviations of current percentage of the freezing machine, different cooling water temperature differences, and different cooling water inlet temperatures T1.

As shown in FIG. 9, in the third stage, in the fuzzy logic control process used, three input membership functions and one output membership function may be included. The cooling water temperature difference, the cooling water inlet temperature T1, and the deviation of current percentage of the freezing machine can be input into the three input membership functions, respectively, to construct an input fuzzy set; and the frequency of the cooling tower fan and the frequency of the cooling pump, determined according to the cooling water temperature difference, the cooling water inlet temperature T1, and the deviation of current percentage of the freezing machine, can be input into the output membership function, to construct the output fuzzy set. A fuzzy control table is then determined based on the fuzzy control rule.

Then, the frequency of the cooling tower fan and the frequency of the cooling pump can be obtained by performing the fuzzy reasoning on the fuzzy control

table. In the above, the frequency of the cooling tower fan and the frequency of the cooling pump obtained by the fuzzy reasoning may include the frequencies of the cooling tower fan and the frequencies of the cooling pump under different cooling water temperature differences, different cooling water inlet temperatures
5 T1, and different deviations of current percentage of the freezing machine.

By means of the fuzzy logic processing in the above three stages, the control over the complex temperature adjusting system can be simplified, and a non-linear processing logic with multiple variables can be changed into a calculation logic with fewer variables, the optimized control over the freezing machine mode
10 switching can be realized, and a larger energy-saving space can be produced. Further, by the fuzzy logic control theory, a control algorithm under the condition of multiple influences and multiple inputs in a complex situation is realized.

Based on the same concept of application, an embodiment of the present disclosure further provides a control apparatus for temperature adjusting system
15 corresponding to the control method for temperature adjusting system. As the principle of the apparatus for solving the problem in the embodiments of the present disclosure is similar to that of the foregoing control method for temperature adjusting system embodiments, reference can be made to the description in the embodiments of the above method for the implementation of
20 the apparatus in the present embodiment, and repetition will not be made herein.

Referring to FIG. 10, it is a schematic view of functional modules of a control apparatus for temperature adjusting system provided in an embodiment of the present disclosure. Each module in the control apparatus for temperature

adjusting system in the present embodiment is configured to execute respective steps in the above method embodiments. The control apparatus for temperature adjusting system includes: a consumption determination module 410, a current determination module 420, and a parameter determination module 430, wherein
5 contents of each module are as follows:

the consumption determination module 410 is configured to determine the refrigerating capacity consumption according to the freezing parameter of the freezing pump and the frequency of the freezing pump of the temperature adjusting system, wherein the freezing water temperature difference is the
10 temperature difference between the freezing water inlet temperature T3 and the freezing water outlet temperature T4 of the freezing pump of the temperature adjusting system, and the frequency of the freezing pump is the operating frequency of the freezing pump of the temperature adjusting system;

the current determination module 420 is configured to determine the desired
15 current percentage of the freezing machine of the temperature adjusting system according to the temperature parameter of the environment where the temperature adjusting system is located and the refrigerating capacity consumption; and

the parameter determination module 430 is configured to determine the control parameter of the frequency of the cooling tower fan and the control parameter of
20 the frequency of the cooling pump according to the cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system.

In a possible embodiment, the temperature parameter includes: the wet bulb temperature and the wet bulb depression, wherein the wet bulb temperature is the wet bulb temperature in the environment where the temperature adjusting system is located, and the wet bulb depression is the temperature difference between the dry bulb temperature and the wet bulb temperature in the environment where the temperature adjusting system is located.

The current determination module 420 further may be configured to determine the desired current percentage of the freezing machine of the temperature adjusting system according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption.

In a possible embodiment, the current determination module 420 further may be configured to:

construct the second fuzzy control data set according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption based on the second fuzzy rule, wherein the second fuzzy control data set includes: multiple wet bulb temperatures, multiple wet bulb depressions, multiple refrigerating capacity consumptions, and multiple desired current percentages of the freezing machine, and the second fuzzy rule is that, the smaller the wet bulb depression is, the larger the desired current percentage of the freezing machine is; the larger the wet bulb temperature is, the larger the desired current percentage of the freezing machine is, and the larger the wet bulb temperature is, the larger the desired current percentage of the freezing machine is; and

perform fuzzy reasoning on the second fuzzy control data set, to determine corresponding desired current percentages of the freezing machine under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

5 In a possible embodiment, the control apparatus for temperature adjusting system further may include: a mode determination module, configured to perform fuzzy reasoning on the second fuzzy control data set, to determine cooling modes under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

10 In a possible embodiment, the control apparatus for temperature adjusting system further may include: a number determination module, configured to perform fuzzy reasoning on the second fuzzy control data set, to determine the number of freezing machines to be started in the temperature adjusting system under different wet bulb depressions, different wet bulb temperatures, and
15 different refrigerating capacity consumptions.

In a possible embodiment, the cooling parameter includes: the cooling water temperature difference and the cooling water inlet temperature T1, wherein the cooling water temperature difference is the temperature difference between the cooling water inlet temperature T1 and the cooling water outlet temperature T2
20 of the cooling pump of the temperature adjusting system, and the cooling water inlet temperature T1 is the cooling water inlet temperature T1 of the cooling pump of the temperature adjusting system.

The parameter determination module 430 further may be configured to determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature T1, and the
 5 desired current percentage of the freezing machine.

In a possible embodiment, the parameter determination module 430 further may be configured to determine the deviation of the current percentage of the freezing machine according to the desired current percentage of the freezing machine and the actually measured current percentage of the freezing machine;
 10 and determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature T1, and the deviation of current percentage of the freezing machine.

In a possible embodiment, the parameter determination module 430 further
 15 may be configured to:

construct the third fuzzy control data set according to the cooling water temperature difference, the cooling water inlet temperature T1, and the deviation of current percentage of the freezing machine based on the third fuzzy rule, wherein the third fuzzy control data set includes: multiple cooling water
 20 temperature differences, multiple cooling water inlet temperatures T1, multiple deviations of current percentage of the freezing machine, multiple frequencies of the cooling tower fan, and multiple frequencies of the cooling pump; and the third fuzzy rule includes: the larger the deviation of current percentage of the freezing

machine is, the larger the frequency of the cooling tower fan is; the larger the cooling water temperature difference is, the larger the frequency of the cooling pump is; and the larger the cooling water inlet temperature T_1 is, the larger the frequency of the cooling tower fan is; and

5 perform fuzzy reasoning on the third fuzzy control data set, to determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump under different deviations of current percentage of the freezing machine, different cooling water temperature differences, and different cooling water inlet temperatures T_1 .

10 In a possible embodiment, the control apparatus for temperature adjusting system further may include: a frequency acquiring module, configured to adjust an operating frequency of the freezing pump of the temperature adjusting system, so as to control a terminal pressure difference of the temperature adjusting system to be within a pressure difference threshold interval; and acquire the frequency of
15 the freezing pump when the terminal pressure difference of the temperature adjusting system is within the pressure difference threshold interval.

In a possible embodiment, the freezing parameter includes the freezing water temperature difference, wherein the freezing water temperature difference is the temperature difference between the freezing water inlet temperature T_3 and the
20 freezing water outlet temperature T_4 of the freezing pump of the temperature adjusting system; and the consumption determination module 410 is configured to determine the refrigerating capacity consumption according to the freezing water temperature difference and the frequency of the freezing pump.

In a possible embodiment, the consumption determination module 410 is configured to construct the first fuzzy control data set according to the freezing water temperature difference and the frequency of the freezing pump based on the first fuzzy rule, wherein the first fuzzy control data set includes multiple freezing
5 water temperature differences, multiple frequencies of the freezing pump, and multiple refrigerating capacity consumptions; and the first fuzzy rule includes: the larger the freezing water temperature difference is, the larger the refrigerating capacity consumption is; and the larger the frequency of the freezing pump is, the larger the refrigerating capacity consumption is; and perform fuzzy reasoning on
10 the fuzzy control data set, to determine the refrigerating capacity consumptions under different freezing water temperature differences and different frequencies of the freezing pump.

Besides, an embodiment of the present disclosure further provides a computer-readable storage medium, wherein the computer-readable storage medium stores
15 a computer program, and when the computer program is executed by the processor, steps of the control method for temperature adjusting system in the above method embodiment is executed.

A computer program product of the control method for temperature adjusting system provided in an embodiment of the present disclosure includes a computer-readable storage medium in which a program code is stored, and instructions
20 included in the program code can be used to execute the steps of the control method for temperature adjusting system in the above method embodiments. Reference can be made to the method embodiments for specific implementation, which will not be repeated herein.

In the several embodiments provided in the present disclosure, it should be understood that the apparatus and the method disclosed also may be implemented in other manners. The apparatus embodiments described above are merely exemplary, for example, the flowcharts and the block diagrams in the accompanying drawings show possible system architectures, functions, and operations of the apparatus, method, and computer program products according to multiple embodiments of the present disclosure. In this regard, each block in the flowchart or the block diagram may represent one module, program segment, or a part of code, and the module, the program segment, or the part of the code contains one or more executable instructions configured to achieve a specified logical function. It also should be noted that in some embodiments as substitution, the functions indicated in the blocks also may occur in an order different from that indicated in the drawings. For example, two continuous blocks practically can be executed substantially in parallel, and they sometimes also may be executed in a reverse order, which depends upon a function involved. It also should be noted that each block in the block diagram and/or the flowchart, and combinations of the blocks in the block diagram and/or the flowchart can be realized by a dedicated hardware-based system configured to execute a specified function or action, or can be realized by a combination of dedicated hardware and computer instructions.

Besides, various functional modules in various embodiments of the present disclosure can be integrated with each other to form one independent portion, and it is also possible that various modules exist independently, or that two or more modules are integrated to form one independent part.

If the function is realized in a form of software functional module and is sold or used as an individual product, it may be stored in one computer-readable storage medium. Based on such understanding, the technical solutions in essence or parts making contribution to the prior art or parts of the technical solutions of the present disclosure can be embodied in form of a software product, and this computer software product is stored in a storage medium, including several instructions for making one computer device (which can be a personal computer, a server or a network device, etc.) execute all or part of the steps of the methods of various embodiments of the present disclosure. The aforementioned storage medium includes various media in which program codes can be stored, such as U disk, mobile hard disk, read-only memory (ROM), random access memory (RAM), diskette, and compact disk. It should be indicated that in the present text, relational terms such as first and second are merely for distinguishing one entity or operation from another entity or operation, while it is not required or implied that these entities or operations necessarily have any such practical relation or order. Moreover, terms “include”, “contain” or any other variations thereof are intended to be non-exclusive, thus a process, method, article or apparatus including a series of elements not only include those elements, but also include other elements that are not listed definitely, or further include elements inherent to such process, method, article or apparatus. Without more restrictions, an element defined with wordings “include...” does not exclude presence of other same elements in the process, method, article or device including said element.

The above-mentioned are merely for preferred embodiments of the present disclosure and not used to limit the present disclosure. For one skilled in the art,

various modifications and changes may be made to the present disclosure. Any modifications, equivalent substitutions, improvements and so on, within the spirit and principle of the present disclosure, should be covered within the scope of protection of the present disclosure. It should be noted that similar reference signs
5 and letters represent similar items in the following accompanying drawings, therefore, once a certain item is defined in one accompanying drawing, it is not needed to be defined or explained in subsequent accompanying drawings.

The above-mentioned are merely specific embodiments of the present disclosure, but the scope of protection of the present disclosure is not limited
10 thereto, and any modification or substitution that may be easily conceived by those skilled in the present art within the technical scope disclosed in the present disclosure should fall within the scope of protection of the present disclosure. Therefore, the scope of protection of the present disclosure should be determined by the scope of protection of the claims.

Claims:

1. A control method for a temperature adjusting system, comprising:

determining a refrigerating capacity consumption according to a freezing parameter of a freezing pump and a frequency of the freezing pump of the temperature adjusting system, wherein a freezing water temperature difference is a temperature difference between a freezing water inlet temperature and a freezing water outlet temperature of the freezing pump of the temperature adjusting system, and the frequency of the freezing pump is an operating frequency of the freezing pump of the temperature adjusting system;

determining a desired current percentage of a freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption; and

determining a control parameter of a frequency of a cooling tower fan and a control parameter of a frequency of a cooling pump according to a cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system.

2. The control method according to claim 1, wherein the temperature parameter comprises: a wet bulb temperature and a wet bulb depression, wherein the wet bulb temperature is a wet bulb temperature in the environment where the temperature adjusting system is located, and the wet bulb depression is a

temperature difference between a dry bulb temperature and the wet bulb temperature in the environment where the temperature adjusting system is located; and

5 the determining a desired current percentage of a freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption comprises:

10 determining the desired current percentage of the freezing machine of the temperature adjusting system according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption.

3. The control method according to claim 2, wherein the determining the desired current percentage of the freezing machine of the temperature adjusting system according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption comprises:

15 constructing a second fuzzy control data set according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption based on a second fuzzy rule, wherein the second fuzzy control data set comprises: multiple wet bulb temperatures, multiple wet bulb depressions, multiple refrigerating capacity consumptions, and multiple
20 desired current percentages of the freezing machine; and

performing fuzzy reasoning on the second fuzzy control data set, to determine corresponding desired current percentages of the freezing

machine under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

4. The control method according to claim 3, wherein the second fuzzy rule is that, the smaller a wet bulb depression is, the larger a desired current percentage of the freezing machine is; and the larger a wet bulb temperature is, the larger a desired current percentage of the freezing machine is, and the larger a wet bulb temperature is, the larger a desired current percentage of the freezing machine is.
5. The control method according to claim 3, wherein the method further comprises:

performing the fuzzy reasoning on the second fuzzy control data set, to determine cooling modes under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.
6. The control method according to claim 3, wherein the method further comprises:

performing the fuzzy reasoning on the second fuzzy control data set, to determine the number of freezing machines to be started in the temperature adjusting system under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.
7. The control method according to claim 1, wherein the cooling parameter comprises: a cooling water temperature difference and a cooling water inlet temperature, wherein the cooling water temperature difference is a

temperature difference between the cooling water inlet temperature and a cooling water outlet temperature of the cooling pump of the temperature adjusting system, and the cooling water inlet temperature is a cooling water inlet temperature of the cooling pump of the temperature adjusting system;

5 and

the determining a control parameter of a frequency of a cooling tower fan and a control parameter of a frequency of a cooling pump according to a cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system comprises:

10 determining the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the desired current percentage of the freezing machine.

8. The control method according to claim 7, wherein the determining the
15 control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the desired current percentage of the freezing machine comprises:

determining a deviation of current percentage of the freezing machine
20 according to the desired current percentage of the freezing machine and an actually measured current percentage of the freezing machine; and

determining the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine.

- 5 9. The control method according to claim 8, wherein the determining the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine comprises:

10 constructing a third fuzzy control data set according to the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine based on a third fuzzy rule, wherein the third fuzzy control data set comprises: multiple cooling water temperature differences, multiple cooling water inlet temperatures, multiple deviations of current percentage of the freezing machine, multiple frequencies of the cooling tower fan, and multiple frequencies of the cooling pump; and

performing fuzzy reasoning on the third fuzzy control data set, to determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump under different deviations of current percentage of the freezing machine, different cooling water temperature differences, and different cooling water inlet temperatures.

10. The control method according to claim 9, wherein the third fuzzy rule comprises that the larger a deviation of current percentage of the freezing machine is, the larger a frequency of the cooling tower fan is; the larger a cooling water temperature difference is, the larger a frequency of the cooling pump is; and the larger a cooling water inlet temperature is, the larger a frequency of the cooling tower fan is.
11. The control method according to claim 1, wherein before the determining a refrigerating capacity consumption according to a freezing parameter of a freezing pump and a frequency of the freezing pump of the temperature adjusting system, the method further comprises:
- adjusting the operating frequency of the freezing pump of the temperature adjusting system, so as to control a terminal pressure difference of the temperature adjusting system to be within a pressure difference threshold interval; and
- acquiring the frequency of the freezing pump when the terminal pressure difference of the temperature adjusting system is within the pressure difference threshold interval.
12. The control method according to claim 1, wherein the freezing parameter comprises the freezing water temperature difference, wherein the freezing water temperature difference is the temperature difference between the freezing water inlet temperature and the freezing water outlet temperature of the freezing pump of the temperature adjusting system; and

the determining a refrigerating capacity consumption according to a freezing parameter of a freezing pump and a frequency of the freezing pump of the temperature adjusting system comprises: determining the refrigerating capacity consumption according to the freezing water temperature difference and the frequency of the freezing pump.

13. The control method according to claim 1, wherein the determining the refrigerating capacity consumption according to the freezing water temperature difference and the frequency of the freezing pump comprises:

constructing a first fuzzy control data set according to the freezing water temperature difference and the frequency of the freezing pump based on a first fuzzy rule, wherein the first fuzzy control data set comprises multiple freezing water temperature differences, multiple frequencies of the freezing pump, and multiple refrigerating capacity consumptions; and

performing fuzzy reasoning on the fuzzy control data set, to determine refrigerating capacity consumptions under different freezing water temperature differences and different frequencies of the freezing pump.
14. The control method according to claim 13, wherein the first fuzzy rule comprises that the larger a freezing water temperature difference is, the larger a refrigerating capacity consumption is; and the larger a frequency of the freezing pump is, the larger a refrigerating capacity consumption is.
15. A control apparatus for a temperature adjusting system, comprising:

a consumption determination module, configured to determine a refrigerating capacity consumption according to a freezing parameter of a freezing pump and a frequency of the freezing pump of the temperature adjusting system, wherein a freezing water temperature difference is a temperature difference between a freezing water inlet temperature and a freezing water outlet temperature of the freezing pump of the temperature adjusting system, and the frequency of the freezing pump is an operating frequency of the freezing pump of the temperature adjusting system;

a current determination module, configured to determine a desired current percentage of a freezing machine of the temperature adjusting system according to a temperature parameter of an environment where the temperature adjusting system is located and the refrigerating capacity consumption; and

a parameter determination module, configured to determine a control parameter of a frequency of a cooling tower fan and a control parameter of a frequency of a cooling pump according to a cooling parameter of the cooling pump and the desired current percentage of the freezing machine of the temperature adjusting system.

16. The control apparatus according to claim 15, wherein the temperature parameter comprises: a wet bulb temperature and a wet bulb depression, wherein the wet bulb temperature is a wet bulb temperature in the environment where the temperature adjusting system is located, and the wet bulb depression is a temperature difference between a dry bulb temperature

and the wet bulb temperature in the environment where the temperature adjusting system is located; and

the current determination module is further configured to determine the desired current percentage of the freezing machine of the temperature adjusting system according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption.

17. The control apparatus according to claim 16, wherein the current determination module is further configured to:

construct a second fuzzy control data set according to the wet bulb temperature, the wet bulb depression, and the refrigerating capacity consumption based on a second fuzzy rule, wherein the second fuzzy control data set comprises: multiple wet bulb temperatures, multiple wet bulb depressions, multiple refrigerating capacity consumptions, and multiple desired current percentages of the freezing machine; and

perform fuzzy reasoning on the second fuzzy control data set, to determine corresponding desired current percentages of the freezing machine under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

18. The control apparatus according to claim 17, wherein the second fuzzy rule is that, the smaller a wet bulb depression is, the larger a desired current percentage of the freezing machine is; and the larger a wet bulb temperature is, the larger a desired current percentage of the freezing machine is, and the

larger a wet bulb temperature is, the larger a desired current percentage of the freezing machine is.

19. The control apparatus according to claim 17, wherein the control apparatus for a temperature adjusting system further comprises:

5 a mode determination module, configured to perform fuzzy reasoning on the second fuzzy control data set, to determine cooling modes under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

20. The control apparatus according to claim 17, wherein the control apparatus for a temperature adjusting system further comprises:

10 a number determination module, configured to perform fuzzy reasoning on the second fuzzy control data set, to determine the number of freezing machines to be started in the temperature adjusting system under different wet bulb depressions, different wet bulb temperatures, and different refrigerating capacity consumptions.

21. The control apparatus according to claim 15, wherein the cooling parameter comprises: a cooling water temperature difference and a cooling water inlet temperature, wherein the cooling water temperature difference is a temperature difference between the cooling water inlet temperature and a cooling water outlet temperature of the cooling pump of the temperature adjusting system, and the cooling water inlet temperature is a cooling water
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inlet temperature of the cooling pump of the temperature adjusting system;
and

the parameter determination module is further configured to determine the control parameter of the frequency of the cooling tower fan and the control
5 parameter of the frequency of the cooling pump according to the cooling water temperature difference, the cooling water inlet temperature, and the desired current percentage of the freezing machine.

22. The control apparatus according to claim 21, wherein the parameter determination module is further configured to:

10 determine a deviation of current percentage of the freezing machine according to the desired current percentage of the freezing machine and an actually measured current percentage of the freezing machine; and

determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump according to
15 the cooling water temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine.

23. The control apparatus according to claim 22, wherein the parameter determination module is further configured to:

construct a third fuzzy control data set according to the cooling water
20 temperature difference, the cooling water inlet temperature, and the deviation of current percentage of the freezing machine based on a third fuzzy rule, wherein the third fuzzy control data set comprises: multiple

cooling water temperature differences, multiple cooling water inlet temperatures, multiple deviations of current percentage of the freezing machine, multiple frequencies of the cooling tower fan, and multiple frequencies of the cooling pump; and

5 perform fuzzy reasoning on the third fuzzy control data set, to determine the control parameter of the frequency of the cooling tower fan and the control parameter of the frequency of the cooling pump under different deviations of current percentage of the freezing machine, different cooling water temperature differences, and different cooling water inlet temperatures.

10 24. The control apparatus according to claim 23, wherein the third fuzzy rule comprises that the larger a deviation of current percentage of the freezing machine is, the larger a frequency of the cooling tower fan is; the larger a cooling water temperature difference is, the larger a frequency of the cooling pump is; and the larger a cooling water inlet temperature is, the larger a
15 frequency of the cooling tower fan is.

25. The control apparatus according to claim 15, wherein the control apparatus for a temperature adjusting system further comprises:

a frequency acquiring module, configured to adjust the operating frequency of the freezing pump of the temperature adjusting system, so as to control a
20 terminal pressure difference of the temperature adjusting system to be within a pressure difference threshold interval; and acquire the frequency of the freezing pump when the terminal pressure difference of the temperature adjusting system is within the pressure difference threshold interval.

26. The control apparatus according to claim 15, wherein the freezing parameter comprises the freezing water temperature difference, wherein the freezing water temperature difference is the temperature difference between the freezing water inlet temperature and the freezing water outlet temperature of the freezing pump of the temperature adjusting system; and the consumption determination module is configured to determine the refrigerating capacity consumption according to the freezing water temperature difference and the frequency of the freezing pump.
27. The control apparatus according to claim 15, wherein the consumption determination module is configured to:
- construct a first fuzzy control data set according to the freezing water temperature difference and the frequency of the freezing pump based on a first fuzzy rule, wherein the first fuzzy control data set comprises multiple freezing water temperature differences, multiple frequencies of the freezing pump, and multiple refrigerating capacity consumptions; and
- perform fuzzy reasoning on the fuzzy control data set, to determine refrigerating capacity consumptions under different freezing water temperature differences and different frequencies of the freezing pump.
28. The control apparatus according to claim 27, wherein the first fuzzy rule comprises that the larger a freezing water temperature difference is, the larger a refrigerating capacity consumption is; and the larger a frequency of the freezing pump is, the larger a refrigerating capacity consumption is.

29. An electronic device, comprising a processor and a memory, wherein the memory stores a machine readable instruction executable by the processor, and when the electronic device is running, the machine readable instruction, when being executed by the processor, executes the steps of the method according to any one of claims 1 to 14.
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30. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the computer program, when executed by a processor, executes the steps of the method according to any one of claims 1 to 14.