

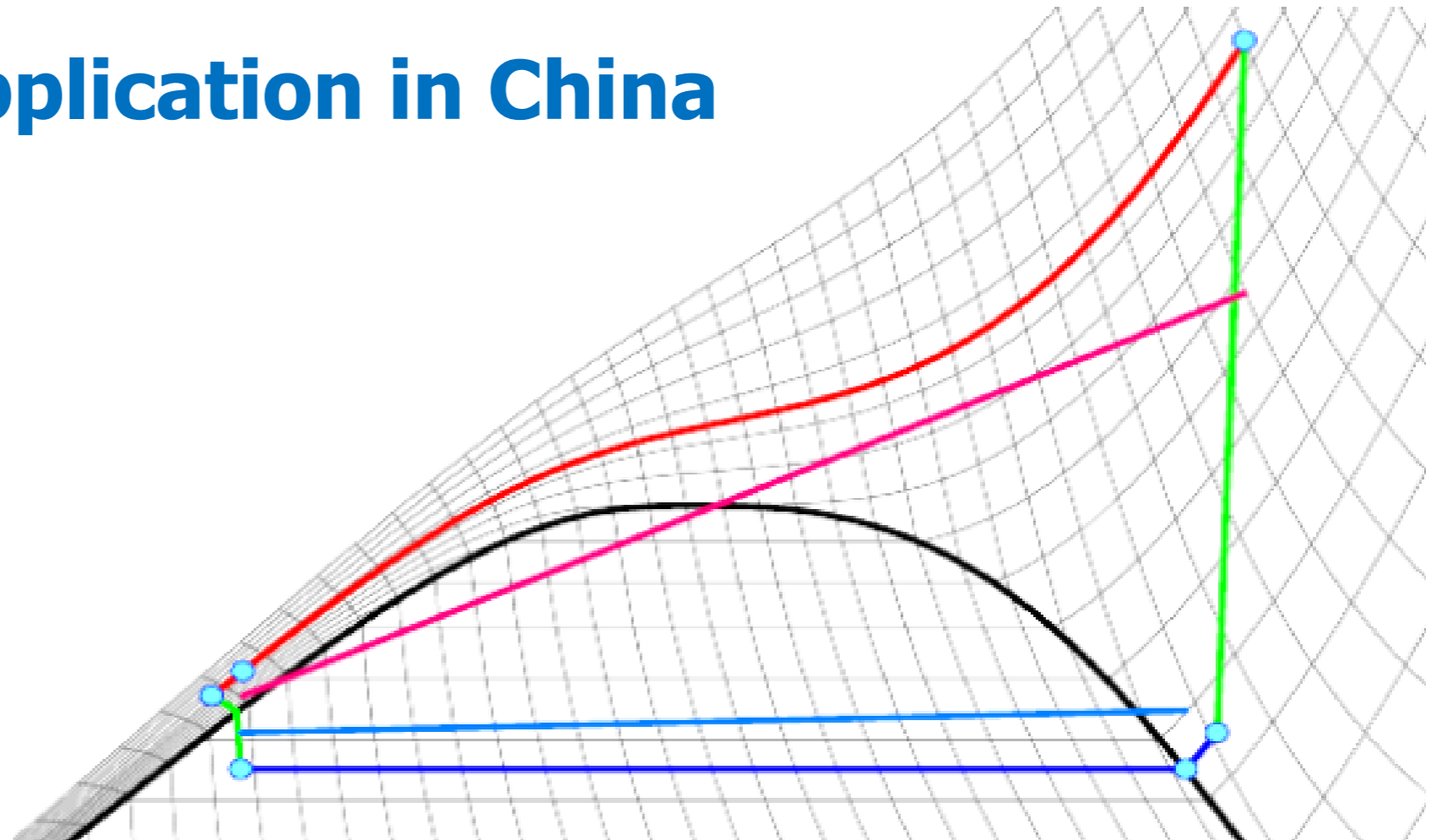


Business Case for Natural Refrigerants

11-12/04/2018 – Beijing



Castel CO2 application in China



About Castel

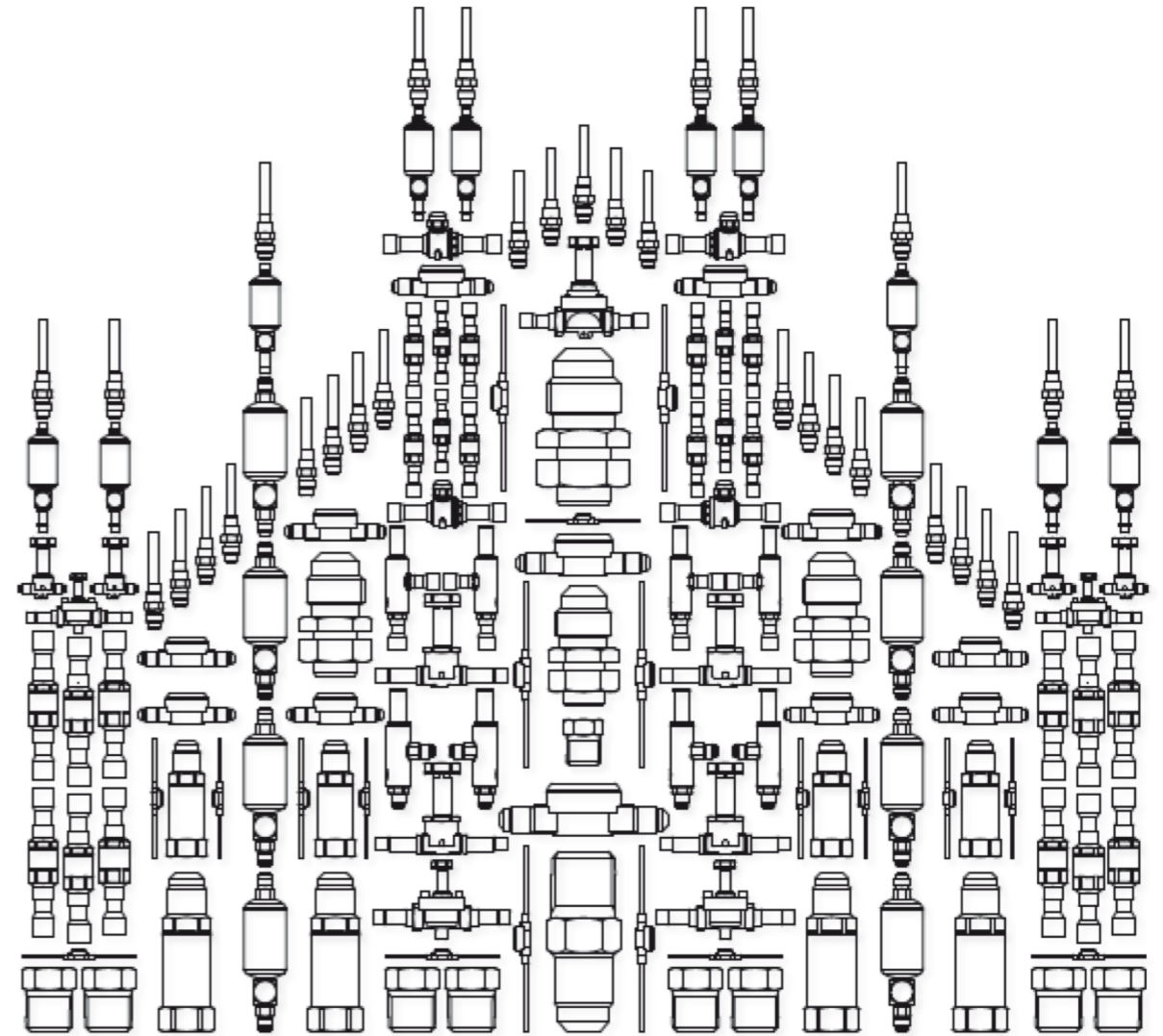


INTRODUCTION

Castel, a leading supplier of refrigeration and air conditioning components, is a 100% Italian-owned family-run company which has grown and established a name for itself since 1961, thanks to its outstanding pursuit of innovation and unwavering desire to conquer markets not only in Italy, but also abroad.

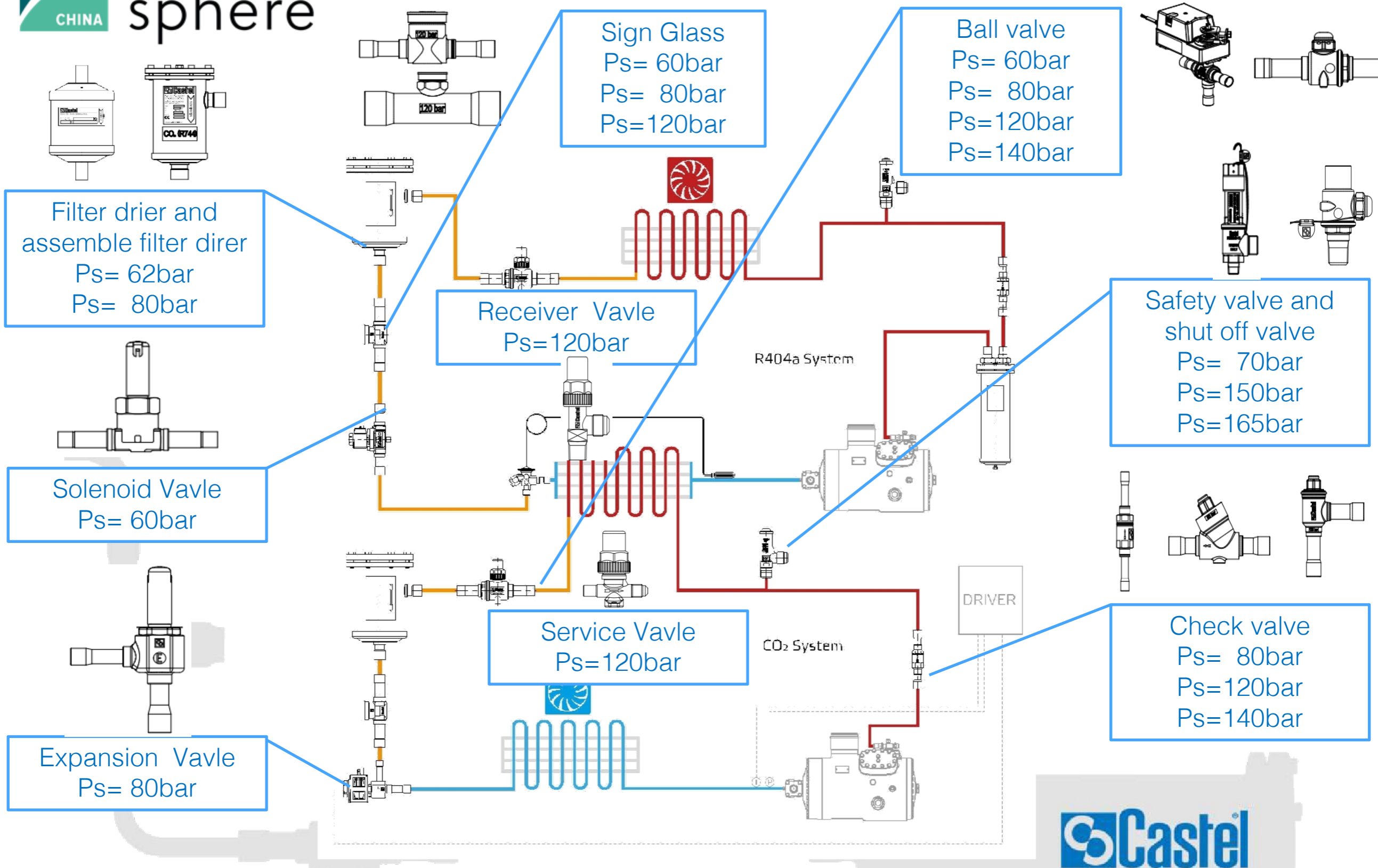
Our Mission

Supporting an increase in our customer base with reliable, durable, high quality and technologically-advanced products, manufactured with respect for the environment, and supported and improved upon by levels of service that exceed industry standards, in order to consolidate the Castel brand's presence in its existing markets, and make the brand known in emerging ones.



OVERVIEW OF NATURAL REFRIGERANT-BASED SOLUTIONS

Example-Solutions for the use of CO₂ (R744) - Cascade system

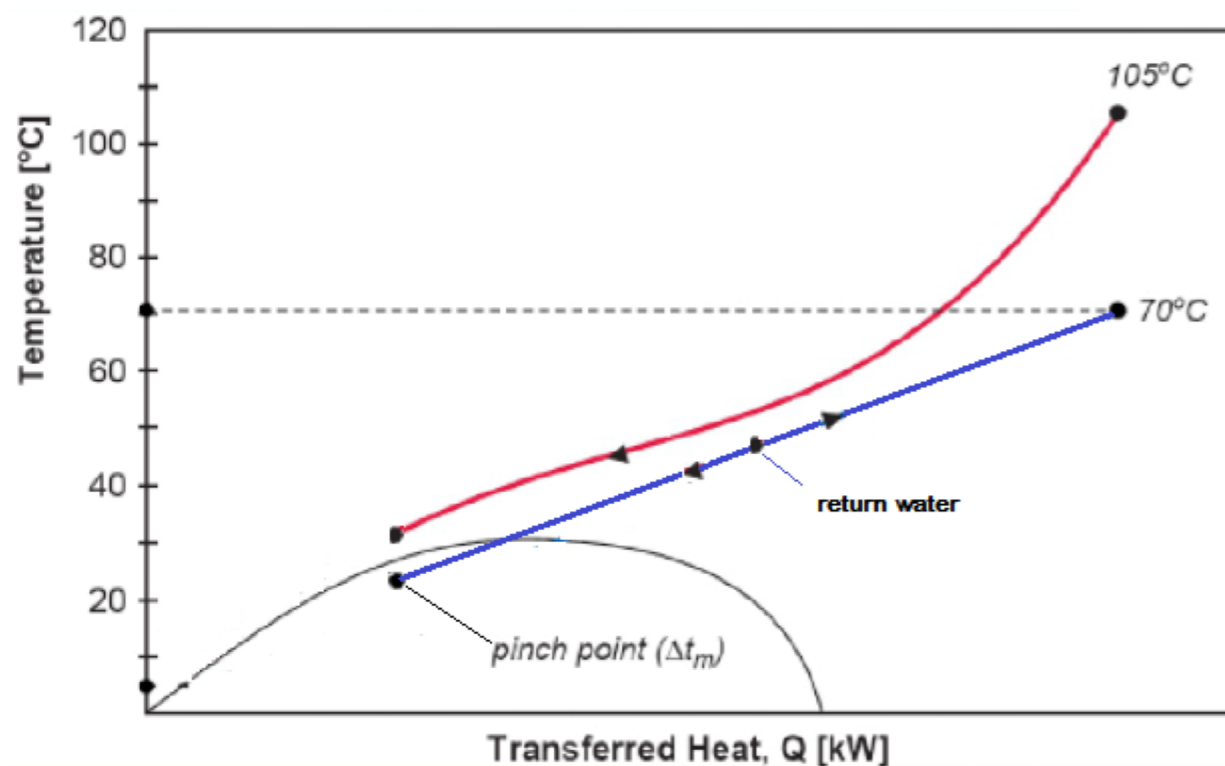


China heat pump market



Air source heat pump with circulating water

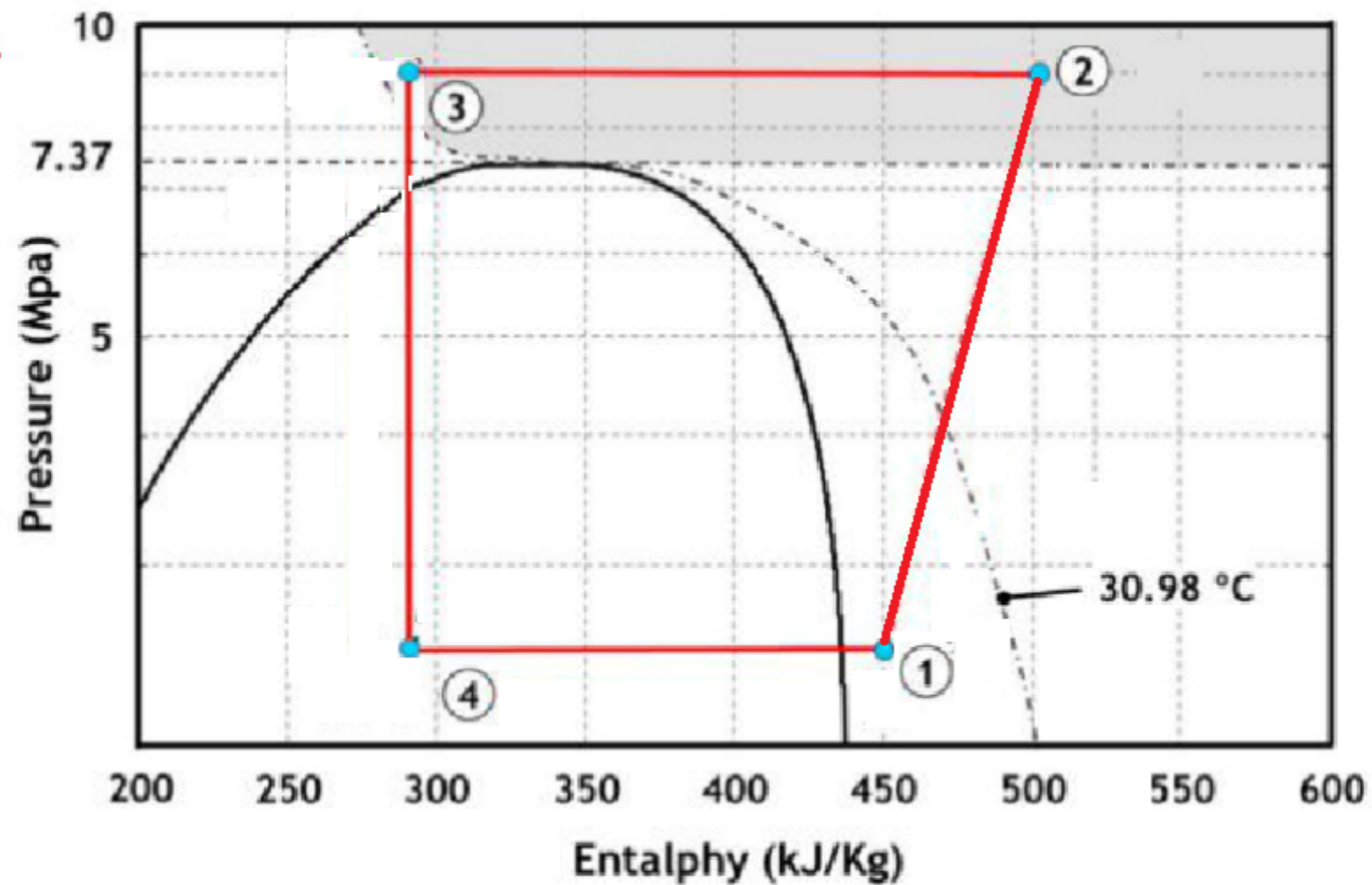
- Main point - How to solve the problems of high temperature of return water and increase CO₂ cycle efficiency
- Solution-- add control of Water Circulation or gas cooler
- Take example of Water Circulation control system



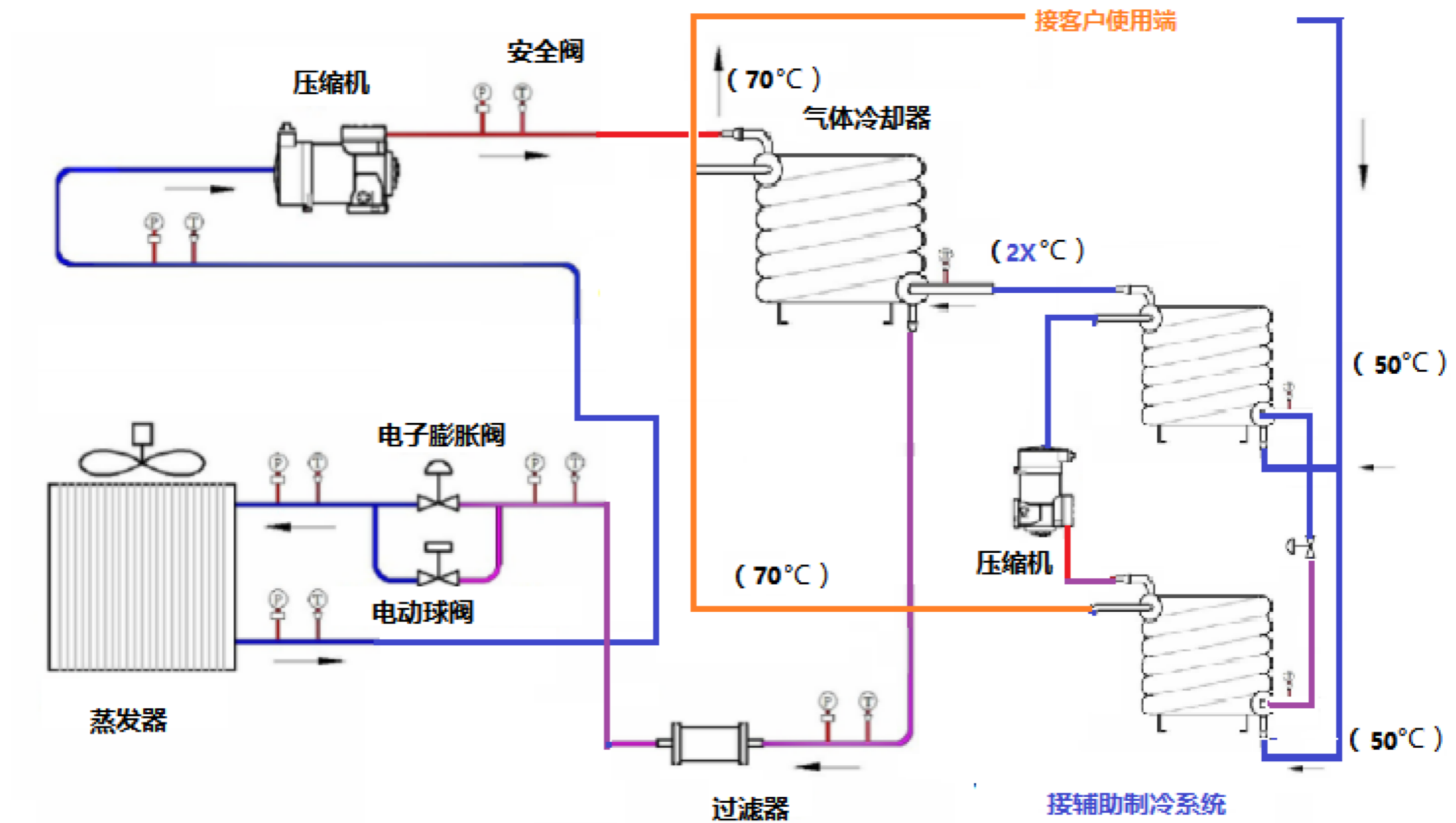
use a auxiliary refrigeration systems to cool return water



Pressure-Enthalpy diagram and system diagram

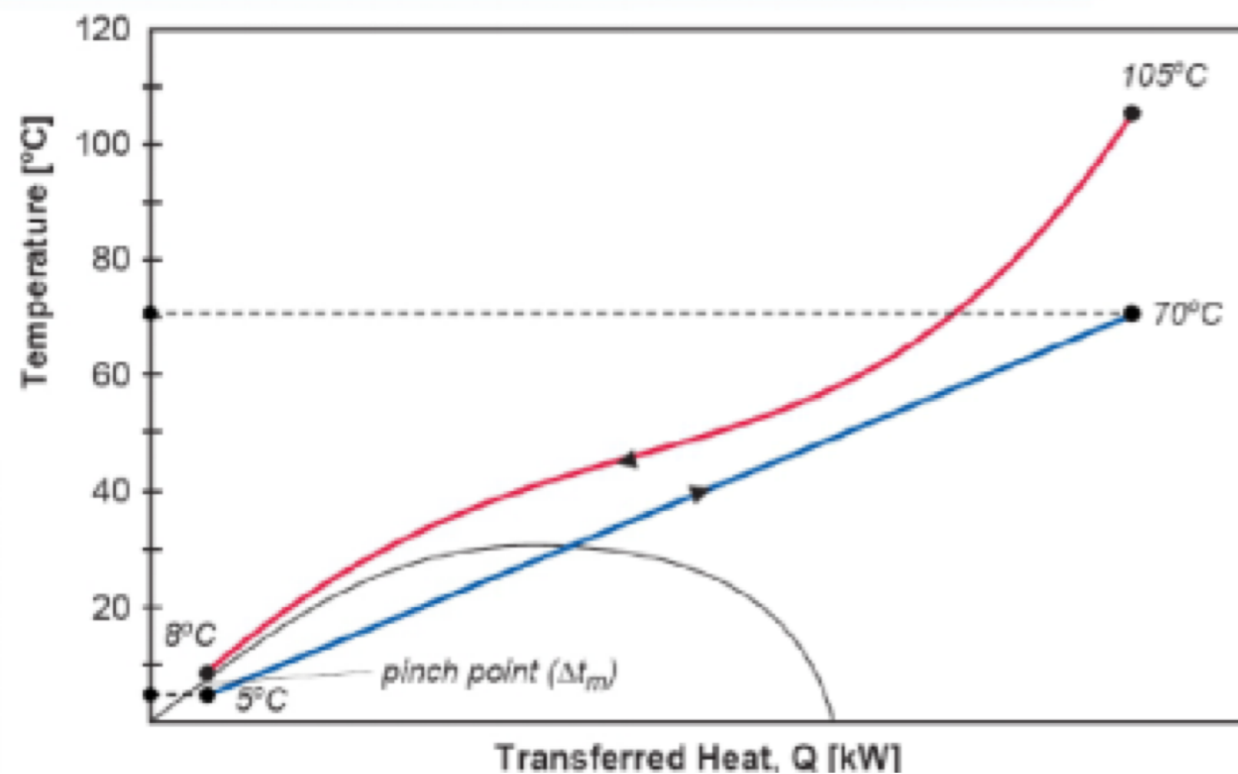


Pressure-Enthalpy diagram and system diagram

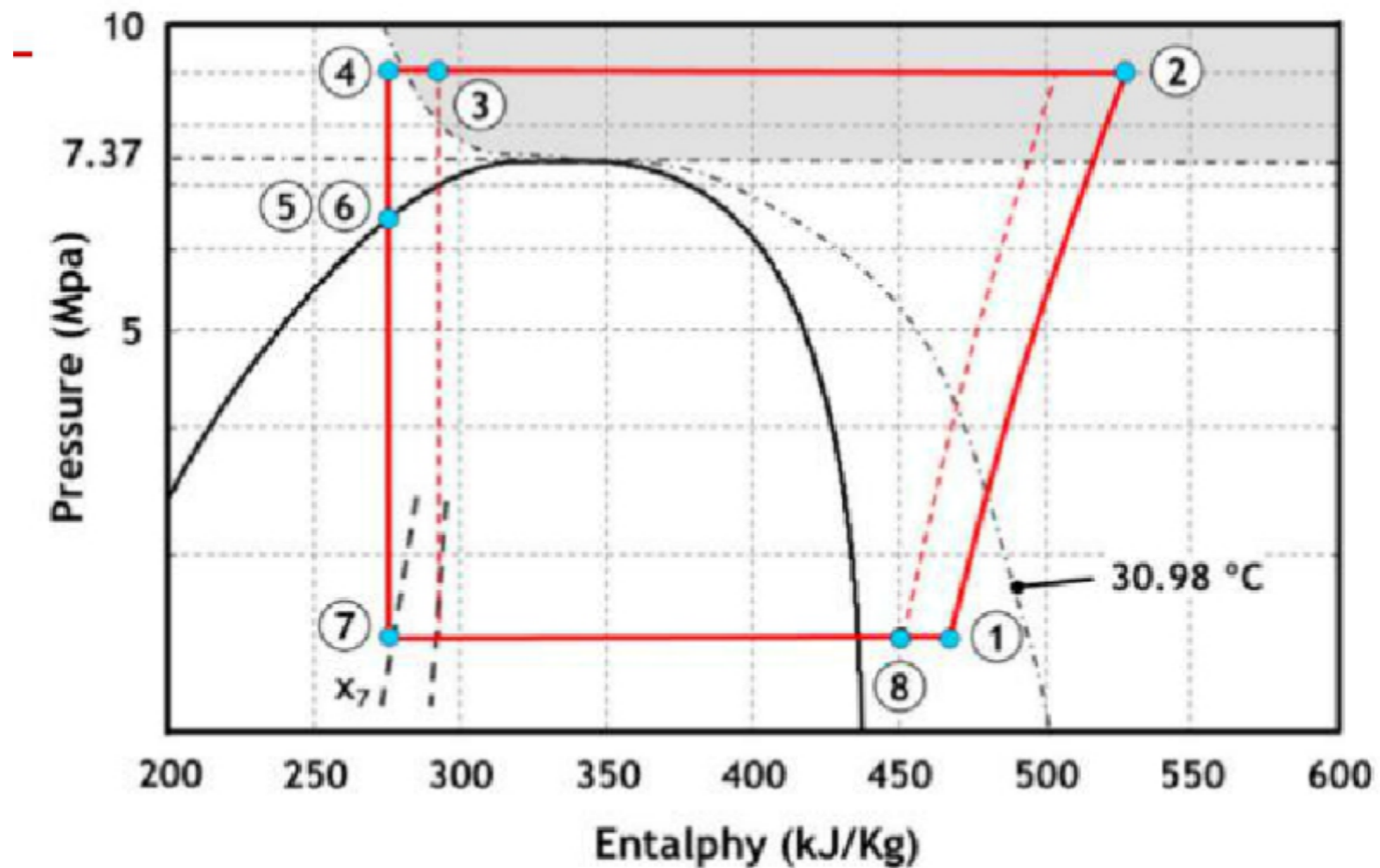


Air source heat pump with tap water

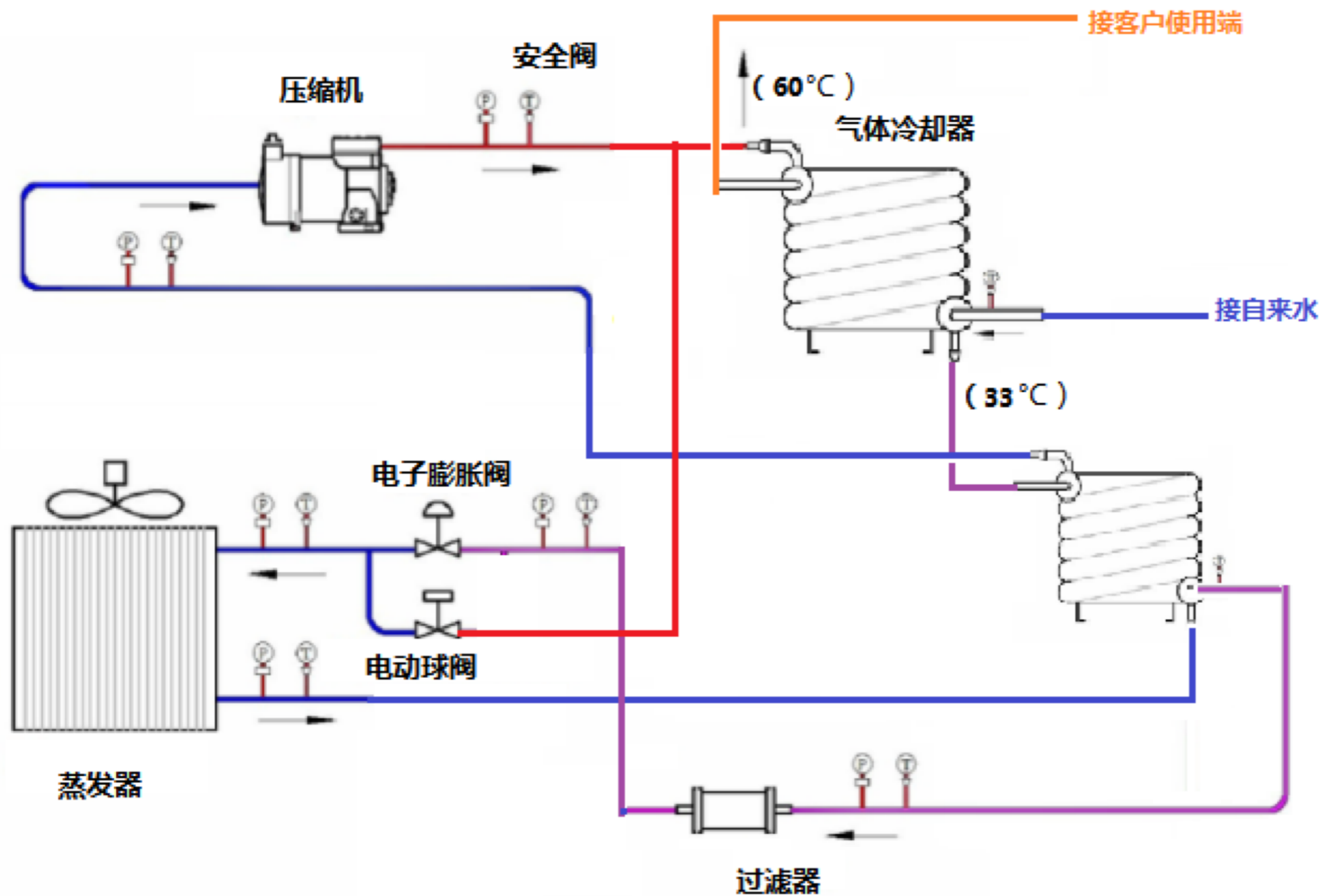
- Key point - how to improve the efficiency of CO₂ cycle
- Take example of a transcritical CO₂ heat pump with IHX



Pressure-Enthalpy diagram and system diagram



Pressure-Enthalpy diagram and system diagram



If want to understand the CO₂ heat pump opportunity in China, we have to understand heat pump market in China first.

- In South of China, people first accept air source Heat pump 15 years ago .
- The application includes commercial hot water, direct fired dryer, family heating, etc. The main refrigerants is R22, R410a and R134a
- The manufacturer is concentrated in the south of China at least 300 factories.
- In the recent 5 years , to solve the pollution of air in North of China, government invested a lot of money for residential heat pump.
- Regarding CO₂ heat pump, universities such as Xi'an, Tianjin, Qinghua have researched CO₂ refrigeration system for some years. I think universities and manufacturing factories have mastered the core technology of CO₂ system. And they are ready for mass production.

? The severe cold area in China is large ,but most of these area is underdevelopment. How can people buy CO₂ heat pump machine.

? Government has invested huge money for normal heat pump market, can he invest more for CO₂ heat pump.

? Can find more opportunity for cold chain , commercial refrigeration, container refrigeration , transportation etc application ?

picture of mass production
from customer's production
line



- continue to develop more products for transcritical system.
- cooperate and support more factories to develop CO₂ heat pump.
- cooperate and support more factories to develop CO₂/NH₃ Cascade system .
- try to get opportunity about cold chain , commercial refrigeration, container refrigeration , transportation etc application with CO₂ .



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Thank you very much!

