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The Thermal Solution Company

Using plate type heat exchangers as our core technology, HiSAKA WORKS provides thermal solutions to our customers all over the world.

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The Thermal Solution Company



For energy saving

We would like to help our customers generate more profits than ever. With this goal set in sight, we had continuously making various proposals on how to save energy with our Plate Heat Exchangers. After years of study, we had compiled and categorized the energy saving methods. This will certainly be a great reference to improve the process.



Create the Infinity loop

The most simple method of the heat recovery is to create the Infinity loop. When there are two individual streams of fluids, one is to be heated up and the other is to be cooled down, we can change the its circulation of these streams as "Infinity ∞", so that we can improve this process successfully. We can save the consumption of steam and cooling water as well.



Consider heating and/ or cooling resource

When heat up and/or cool down the stream, it is very meaningful to check and consider which energy resource to be used. We need to find another resource which temperature is closer as much as possible. Higher potential energy is better to be reserved for another purpose. Because of its high heat transfer performance of PHE, temperature gap is not necessary to be wide that you expect.





P4,7,10,11 GO!



Do not miss the latent heat

Definition of the thermal energy, 1 kcal is the heat to change 1°C of the 1kg of the liquid water. On the other hand, when it comes to the vapor, 1kg of the water vapor (steam) releases about 539 kcal when it condenses. It is so-called latent heat, which is more than 500 times greater than the liquid. If you find the wasted vapor, you must try to recover the thermal energy from it.

Increase the temperature gap

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Increase the temperature gap, and reduce the flow rate

According to the formula of the heat load, $Q = p \times Cp \times W \times (t2-t1)$ $= p \times Cp \times (1/n)W \times n(t2-t1)$

when temperature gap increase n times, flow rate is decrease 1/n. By applying this way, flow rate is possible to be reduced so that electricity of the circulation pump can be cut. In addition, piping diameter can be smaller. It results cutting the piping and construction cost as well.



Doubt your common sense

When using a conventional shell & tube heat exchanger for heat recovery, usually lower potential heat resources are ignored and commonly just discharged. However, when applying PHE for heat recovery, you can utilize even such lower potential energy resources. Perfect counter current flow and single pass design can make it possible.

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Δt





P5,6,8,9,13 GO!

Chemical industries

1-1 Bleaching application for KP

Process Overview

This is for the kraft pulp (KP) bleaching process, which use CIO₂ to bleach the pulp. CIO2 is absorbed by the chilled water and heated it up to activate it. It contains a process where CIO₂ solution is heated by steam and a process where the water fed to the chiller unit is cooled down by electricity. These processes are where we can find a tip for heat recovery.





Look for the other heat resources instead of the steam. The temperature to be achieved of the CIO2 aqueous is only 40°C. Not necessary to use the steam to heat it up.

Result

Below is the flow diagram after the improvement. It results in enabling to reduce the electricity for the water chiller and steam is no longer consumed.





1-2 Multi effective column evapolator

Process Overview

This is the standard the triple effective evaporation column. which is traditional and well known process to reduce the steam consumption to approximately 1/3 from single column. Process is almost perfect, but something are still hidden.



Result

The wasted vapor temperature from the 3rd column is so low that it is usually ignored. But PHE is still applicable under much closer temperature gap because of its high efficiency. In this case, wasted vapor is used for pre-heating of the process feed. Additionally, new heat recovery network can be created by the infinity loop principle.



1-3 CO₂ absorption

Process Overview

CO₂ recovery system consists on an absorption tower and a stripper. In between two columns, a typical infinity loop can be observed. Lean amine, which absorbs CO2 gas selectively, goes back to an adsorption tower after releasing CO2 at the stripper.



Applicable Principle

Create the infinity loop



Rich amine is heated up in order to release CO2 gas and lean amine is cooled down to capture CO2 gas circulating between two towers. Rich and lean amine helps each other to cool down or to heat up.

Doubt your common sense Thanks to PHE, the initial cost can be minimized and efficiency can be maximized.



Powerful ITEMS

SX-80

SX-80 is specially developed for this application particularly, in order to contribute the carbon emission, which is being disputed the solution alobally so far

N-EPDM

Coming together with SX-80, N-EPDM which is having a special composition can prolong the gasket life with better chemical and temperature resistance rather than normal FPDM

HVAC&R

2-1 Higher NTU plate

Process Overview

NTU, the number of the heat transfer unit, describe the process temperature condition as below.

$$NTU = \frac{(T_1 - T_2)}{LMTD} = \frac{(T_2 - T_1)}{LMTD}$$

when T1, T2 is the inlet and the outlet temperature of hot side, t2,t1 is of cold side. NTU=5, 12°C->7°C and 6°C->11°C is the conventional design in HVAC application. When increase the temperature drop double between inlet and outlet, NTU=10 allows reducing the flow rate half. Consequently it results in minimizing the energy consumption of the pump. Not only this, but also in cutting the construction cost such as piping and circulation pump capacity. LMTD: Logarithmic mean temperature difference between the hot and cold sides

Applicable Principle



Increase the temperature drop

As following the formula of the heat balance, flow rate can be reduced by increasing the temperature drop.

Doubt your common senses

HISAKA achieved the value 10 of NTU by the new corrugation design of new SX series. It is available to reduce the flow rate half comparing to the conventional design condition NTU=5 case.



The table shows that the benefit brought by HISAKA, 35% of the piping size as the initial construction cost, 40% of the electricity as the running cost can be reduced. Eventually 40.9% of the carbon emission is achievable as the Green Building.

	Before	After	Benefit	
Secondary side	12→7°C	17→7°C		
Primary side	11←6°C	16←6°C		
Flow rate	500m³/h	250m³/h		
Heat Exchanged	2,907kW(800RT)			
Piping size*	350A(14")	200A(8")	-35.0%	
Power consumption	200MWh	120MWh	-40.0%	
CO2 emissions*	110kg/h	65kg/h	-40.9%	
Remarks * fluid velocity: 2-3m/s **pump head: 9.8m				

17°(16°C 10°C difference 12°C 11°C 5°C difference 7°C °C



New SX series

New SX series have the new evolutional design of the heat transfer area, vertical multi herringbone pattern, the "thunder bolt" allows all building to enjoy NTU=10 application.

AHRI400 certificate

In order to ensure the performance of the plate heat exchanger, HISAKA SX series have been applied AHRI400, liquid to liquid heat exchangers program. The performance were officially authorized and certified by the independent third party, AHRI (Air-conditioning, heating and Refrigeration Institute)

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Subsection.

2-2 Free cooling system

Process Overview

In the region where has winter season, the ambient temperature can be utilized for cooling. In the winter season, temperature of the outside is cold enough to use. So-called free cooling system invented in Japan can optimize an electricity of the refrigeration system.



2-3 Hidden potential resource

Process Overview

Resources many times often neglected are the natural resource that is surrounding us. Take chiller unit for instance, cooling tower is used for condenser. By using alternative resources such as the river water or sea water instead of the cooling tower, these are completely free of charge

> AHU (Air handling unit)/ FCU (Fan coil unit)



Applicable Principle



Consider heating and/or cooling resource

An idea seems to be a quite simple. However, to keep on looking for the alternative resources introduce such kind of the energy saving system. Shall we pay an attention on the facilities around?

Before





JUMBO

Large plate exchangers, JUMBO

HISAKA is the good in the market for the large heat exchanger. HISAKA JUMBO is capable to cater for the huge capacity of the cooling/chilled water demand.

Applicable Principle



Consider heating and/or cooling resource

If sea water is directly led into the chiller unit. the condenser inside, which is not designated for the sea water, get damaged. How to utilize it?

Powerful ITEMS

Titanium plate heat exchanger More than 50 years ago, HISAKA had successfully launched the titanium plate heat exchanger. Due to the better resistance of titanium against the chemicals, it has been spread rapidly. Sea water is also the range which is covered by titanium. HISAKA Titanium plate can completely stand for sea water.

Power & Energy

3-1 Natural gas evaporation system

Process Overview

While LNG is gasified to use as a fuel, LNG is heated up by burning itself. Focusing on the latent heat of LNG, this heat can generate chilled water. Of course no longer burner is required. This idea is applicable not only for LNG, but also for LN2, LHe, etc.



Utilizing its latent heat to generate 7°C of chilled water, by circulating EG brine. Excessive latent heat shall be removed by sea water or other cooling media.



3-2 Condensate recovery

Process Overview

In the power plant, the boiler feed water (deaerator suction) is needed to heat up. Usually, there is an energy saving system inside which is exchanging the heat with condensate (steam drain). Due to the high design pressure, shell & tube type heat exchanger is preferable.



3-3 Refrigeration system (a)

Process Overview

Generally, the refrigeration system has two heat exchangers, one is the evaporator and one is the condenser. To increase the performance of the system, the one of the effective way is lowering the temperature of the condenser and/or increasing the temperature of the evaporator. It can reduce the work load for the refrigerant compressor so that efficiency can be improved.



Result

BHE (Brazed plate Heat Exchanger) is one of the best selections for the refrigeration system. It can optimize and improve the total system entirely.



3-4 Refrigeration system (b)

Process Overview

The process simply shows the normal usage of the chiller unit and plate heat exchanger. Even simple, there is an idea to be shared.





Applicable Principle

Doubt your common sense

Benefit of replacing coil or S&T to PHE are not only cost wise. It is also lightweight, less holding volume and save space. When considering the working temperature and/or pressure of the refrigerant, plate heat exchanger is indispensable items for the refrigeration system.

Powerful ITEMS



BRC series Innovation, this is the appropriate words for BRC series. This is also the group of BHE's, but actually everything is different from before. The precisely designated plate arrangement provides the perfect distribution of the refrigerant, resulting in the massive high heat transfer co-efficient BBC opens the door to the new history of the BHF

Applicable Principle



Doubt your common sense

Default setting of the standard chiller is 7°C in the market. However, is it necessary to be? When increase the temperature to 8°C even 1°C, it can approximately cut 3 % of the electricity consumption. Optimize the chilled water setting to save energy by the plate heat exchanger.

General Industries

4-1 Ultrapure water (UPW) system

Process Overview

Especially in the precision industry, such as a semi-conductor, a liquid crystal screen, solar panel factory is required such high purity water in the process. Ultrapure water (UPW) is refined through RO films, which maximize its performance around 25°C. Usually plate heat exchanger is installed before the RO modules.



As shown picture, combining the infinity loop consisted on RO feed and discharge RO, and RO heater by use point return, the heat recovery system is established in the UPW system.



Powerful ITEMS



PTFE cushion gasket

Because of the purity of the UPW, PTFE cushion gasket is preferably applied in order to avoid any contamination. In addition, titanium plate is seldom required as the same reason

4-2 Rinsing Process

Process Overview

In order to clean/wash/rinse the product effectively, hot water is supplied heating up through the heat exchanger. These applications are often seen in the bottling process, plate glass process and so on.



This is the typical example how to recover the heat by the infinity loop. Always focus on the feed and discharge if it is heated up and cooling down. An another similar application is surely found.



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4-3 Boiler blow recovery

Process Overview

In common, boiler process has the continuous drain blow to maintain the water quality. Here, the pair of the feed and the discharge can be found. This is also quite simple application, but the point to be considered is how to heat up the boiler feed. If boiler feed water can be as high as possible, boiler fuel consumption can be reduced.



Result

Similar as UPW system, combining the infinity loop consisted on boiler feed and drain, and boiler feed heater by the returned drain, the heat recovery system is completed in the non-descriptive boiler system.



Create the Infinity loop

When the rinsing machine continuously discharges the wasted water after rinsing the product, consider to create an infinity loop. Feeding clean water is to be heated up and discharging wasted water is to be cooled down. It is possible to create it.

Applicable Principle

Create the infinity loop

The continuous boiler drain can be utilized as the heat resource to pre-heat the feed water up. When combine the drain and the feed water, an infinity loop can be created.

Doubt your common sense

After using the steam, it turns into the drain. But this steam drain is usually still hot enough to heat some another process. Collect such hot steam drain from the use point and must utilize it.





Food & Beverage

5-1 Sterilization system

Process Overview

This is the well-known process to sterilize the beverage. Heat it up to certain temperature and hold it to sterilize for a period (usually a few seconds to a minute). After that, it goes to be cooled down. Not only for the beverage, milk, milk product, soya sauce, liquid sugar, alcohol and any other liquor has also the same application.



Result

Plate heat exchanger is able to combine multiple units into one unit. In the food and beverage industries, it is commonly applied. Installing an additional heat recovery section, steam and cooling water can be reduced consequently in this case.





FX series

The FX series developed specifically for food products utilizes many unique ideas, and leads the industry with its fluorinated cushion gasket(TCG) that do not give off a rubber odor.

HISAKA FX was specially developed for beverage process, benefitting on anti-fouling, easy cleaning in place (CIP) and less holding volume. The plate shaped longer than normal type of plate heat exchanger to improve the maldistribution, which triggers the serious fouling and contamination.

5-2 Wort pan vapor recovery

Process Overview

When the crushed malt germinated wheat comes to the hot water, an enzyme is activated and the fermentation, which starch in the malt is discomposed into the sugar, starts. Adding the hop and boiling it up together, the wort is born. While boiling the wort, the wort pan vapor comes from the top of the wort pan.



Applicable Principle



Do not miss the latent heat The wort pan vapor contains the water vaper partially. During the condensation, changing its phase from gas to liquid, huge amount of the heat is released. There is no doubt to be worth to recover its heat.





Doubt your common senses

Sometimes, shell and tube heat exchanger can be seen for this application. However replacing it by PHE maximizes the temperature of the hot water. Besides, light weight, compact size and easy maintenance are an additional benefit.



Powerful ITEMS YX series HISAKA YX is one of the unique models applicable

for vaper condenser. Having a different diameter of the connection and the plate gap between vapor and cooling water side maximize the efficiency. YX has contributed to recover the huge latent heat from the vapor, since it had been launched until now.

How much is the cost of energy?



Performance drop, but also losing money

Although improved the process successfully, the efficiency will drop after the long time operation. The fouling may cover whole plate surface, assuming the U value drops 20% of total. When total benefit by recovering heat is 10,000kJPY/y, 20% down means that we are loosing 2,000kJPY/y. If the maintenance cost is less than 2,000JPY/y, it should be planned regularly and be carried out





Maintenance

In order to extend the lifetime of the plate heat exchanger, it is important to watch changes in conditions. Frequently observed faults and causes are summarized below. If those faults are detected, please contact us and inform manufacturing number of the unit.



HISAKA Web-Simulator(HWS)



https://www.hisaka-asia.com/Web-simulator

If necessary to help for selection of Plate Heat Exchanger, please fax the form below to us.

Malaysia-Fax: +6 03-8081 7185 or Email: heatexc@hisaka-asla.com

1. Heat duty	kW		
	Hot side	Cold side	
2. Fluid name			
3. Inlet temperature	D°	C°	
4. Outlet temperature	C°	۵°	
5. Flow rate	m³/h	m³/h	
6. Pressure drop	MPa or less	MPa or less	
7. Operating pressure	MPaG	MPaG	
8. Special notes (*Fluid properties)			



Heat transfer performance It is necessary to clean the plates and remove scale, because of supposing scaling on the heat transfer surface. -2 Flow performance Clogging of the port holes inlet and/or scale deposition on the heat transfer surfaces may be supposed. It is necessary to clean the unit and remove scale. 8 From plate pack Insufficient tightening the plate pack, damage or deterioration of gaskets, plate gasket groove or double seal area corrosion, wrong plate arrangement, foreign object caught between gasket seal surfaces, gasket twisting or overlapping from the groove may be the supposed. Correct each fault or replace gaskets and/or plate. • From S-Frame The D-plate gasket, rubber boots, D-plate or S-nozzle may be damaged. Replace the damaged part. -6 From E-Frame The E-nozzle gasket, E-nozzle, rubber boots, or E-plate may be damaged. Replace the damaged part. 6 It is possible that corrosion or damage to the intermediate plate has pin holes or cracks. Replace the damaged plate.

The world's first website for simulating Plate Heat Ex- changer is now launched on the Internet. By accessing the following URL and entering your design requirements according to the instructions on the screen, you can get your own plate heat exchanger. In addition, you will be able to download the specification with outline drawing for installation work.

The most appropriate simulation of plate heat exchanger is possible 24-hours a day anytime.