



GEA Heat Exchangers / GEA PHE Systems

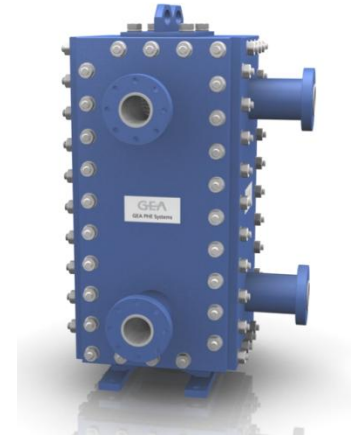
PHE University at GEA PHE Systems North America PHE 102 - Heat Exchanger Technology Selection

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Contents of this Session.

- Comparison of different heat exchanger technologies.
- What drives the decision between
 - Gasketed PHE's
 - Brazed PHE's
 - Welded PHE's
 - Shell-and-Tube HE's.
- Goal is to understand the strengths of each of the heat exchanger technologies so that you can ask for the best solution for your application.



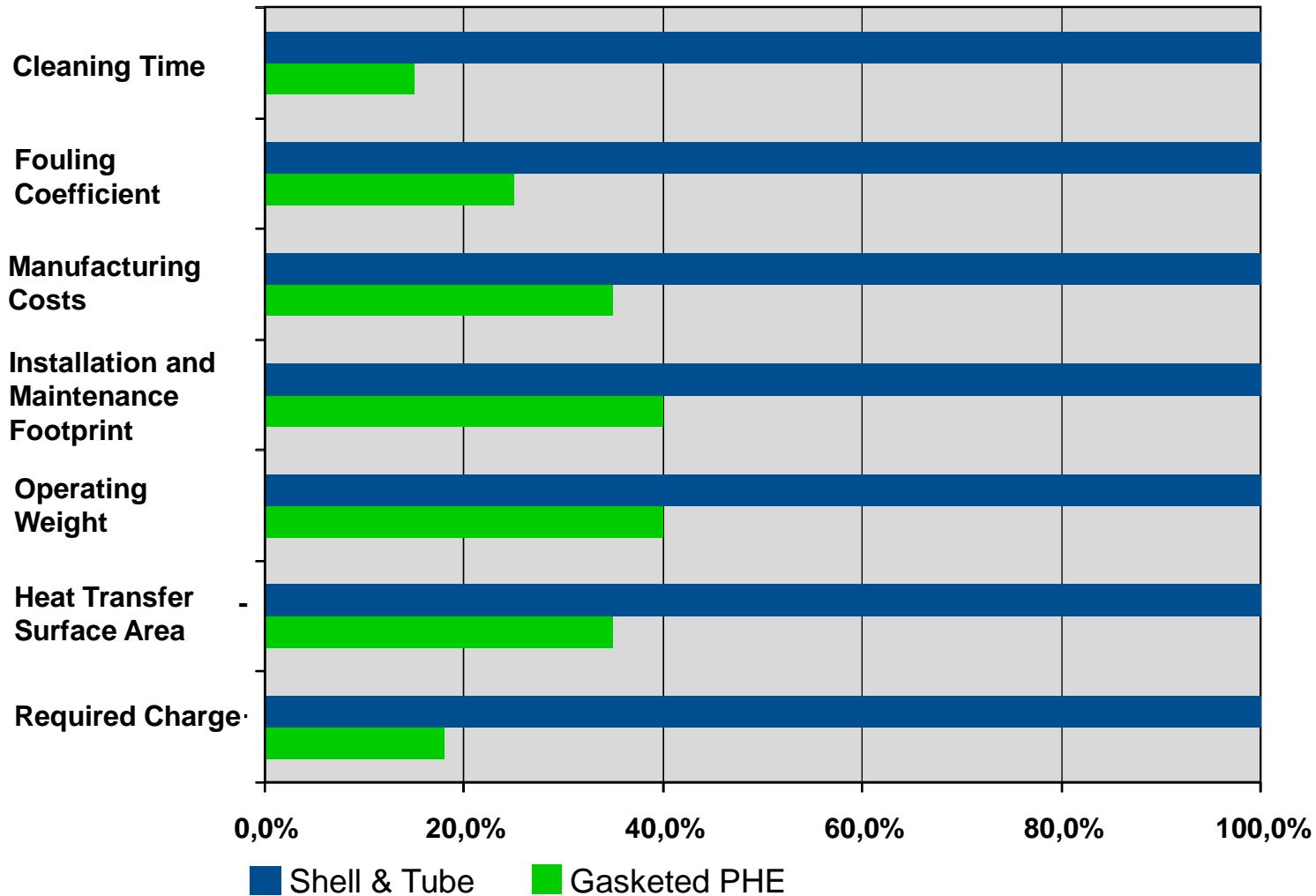


Comparison of heat exchanger technologies

- The most commonly used liquid-liquid and liquid-refrigerant heat exchanger technology used is the Shell-And-Tube heat exchanger (STHE).
- STHE's have been around the longest.
- STHE's can handle the greatest range of pressures and flow rates.
- But although a STHE can do almost anything, we don't use it for everything.
- Why?
- The chart on the following page shows a summary.



Comparison with Shell & Tube Heat Exchangers





STHE Comparison with PHE's – Cleaning Time.

- As you saw in PHE101, a gasketed plate heat exchanger (GPHE) can be completely disassembled for cleaning and inspection, usually with ordinary hand tools and no special lifting equipment.
- STHE's require specialized cleaning tools and can only be partly disassembled. Even that limited disassembly requires specialized tools and frequently special lifting equipment.
- And STHE's require a large open area at one end to remove the tube bundle.
- The result? Faster and easier maintenance with a GPHE.





STHE Comparison with PHE's – Fouling Coefficient.

- Many fluid media eventually leave a built-up deposit on the surface of the heat transfer plate.
 - In Dairy this might be milk residue.
 - In HVAC this might be mineral buildup resulting from leaching from ordinary tap water.
 - In Power this might be dirt deposits from river water used in cooling.
- The greater the turbulence, the slower the rate of fouling.
- PHE's have special corrugations to maximize the turbulence.
- Most STHE's have no corrugations in their tubes and therefore a much faster fouling rate.



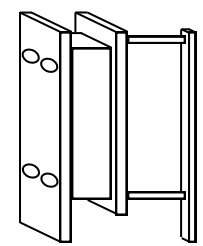
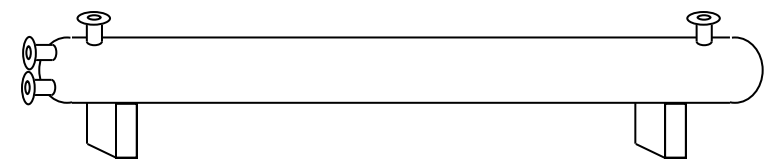
Gasketed PHE Installation Example



STHE Comparison with PHE's – Manufacturing Cost

- Because there is so much less material involved for the same performance, material costs are much less, and labor to make them is less as well.
- Because they are so much smaller and lighter, installation costs are lower.
 - Less special handling equipment required.
 - Smaller space needed, decreasing building construction cost.
- How much smaller? See the next few slides for a direct comparison of real-life examples.

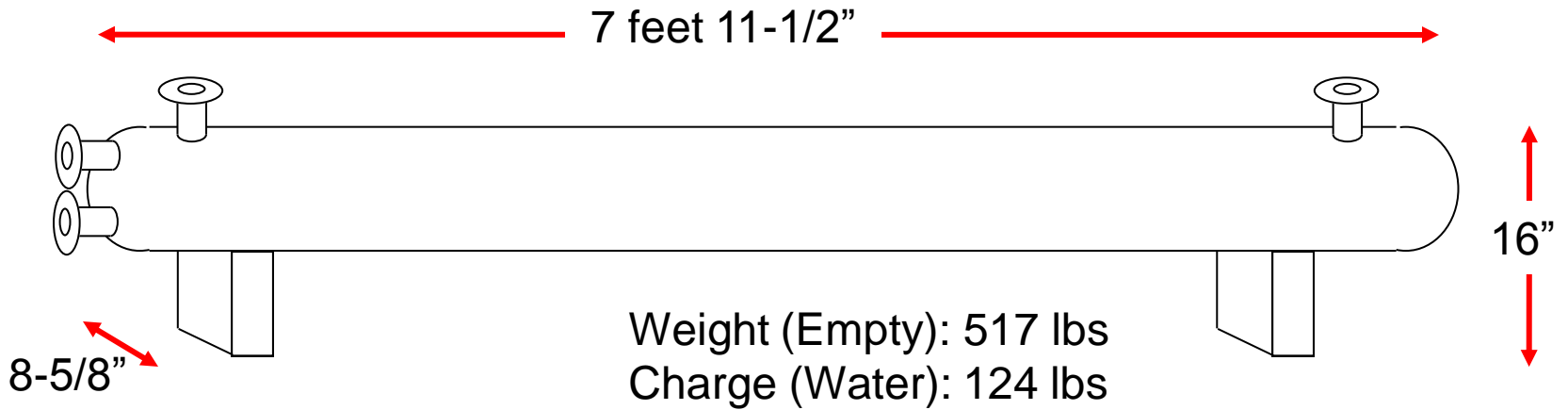
Shell and Tube Heat Exchanger



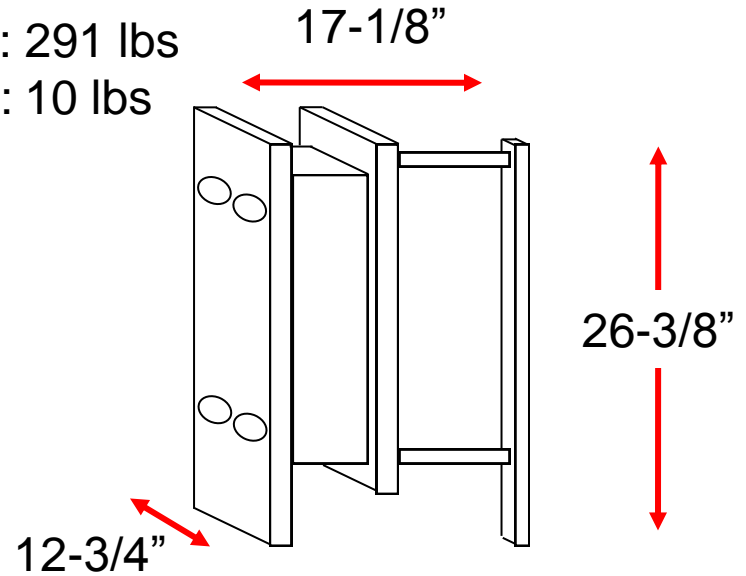
Gasketed Plate Heat Exchanger



STHE Comparison with PHE's –Size



Weight (Empty): 291 lbs
Charge (Water): 10 lbs

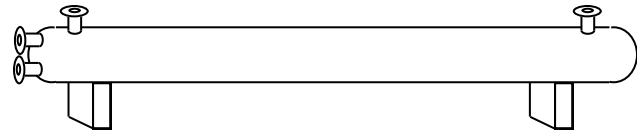


■ HVAC Example

- Flows are 50gpm and 25 gpm
- Temperature approach is 16°F
- The GPHE weighs (full) less than half the STHE.



STHE Comparison with PHE's – Size



Maintenance: 5.7 ft² (0.53 m²)

Install: 5.7 ft² (0.53 m²)

Total: 11.4 ft² (1.06 m²)

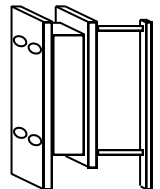
Total: 3.02 ft² (0.28 m²)

Same HVAC Example

- The GPHE Footprint is about ¼ the STHE Install Footprint.
- This saves valuable space in the mechanical room.
- And the STHE requires special lifting equipment to pull the core.

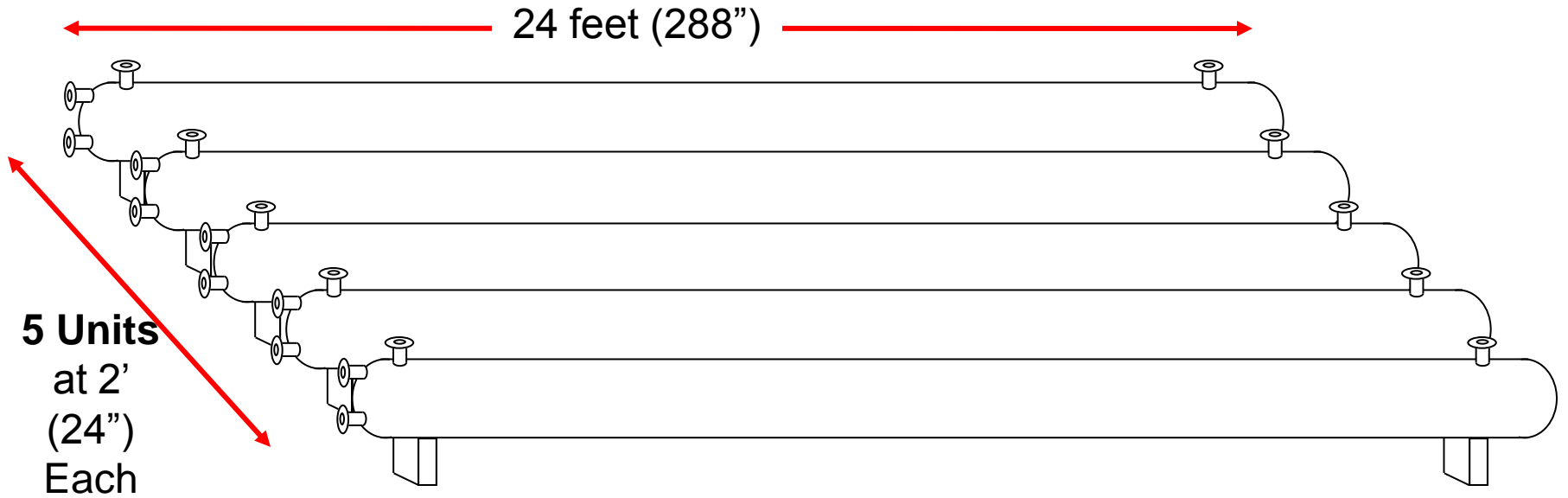
Install: 1.51 ft²
(0.14 m²)

Maintenance:
1.51 ft² (0.14 m²)



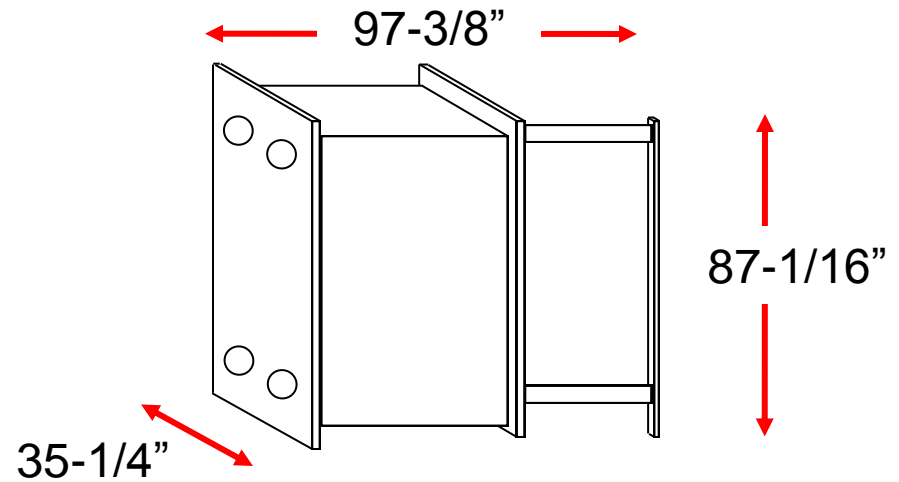


STHE Comparison with PHE's - Size



Power Example

- Flow rate is 4,000gpm
- Temperature approach is 5°F.
- A single GPHE does the same job as 5 STHE's, totaling 120 feet in length.



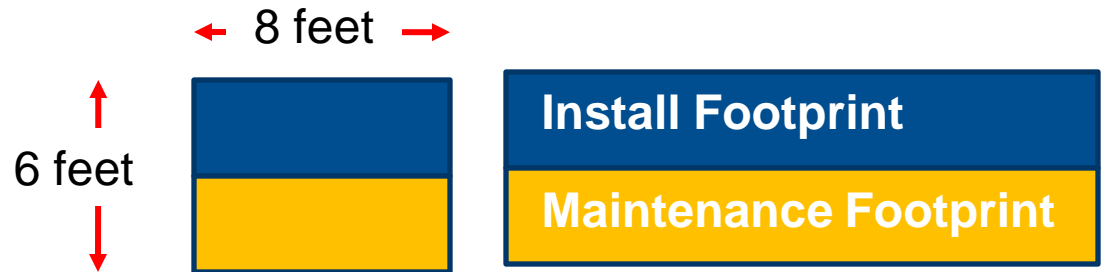


STHE Comparison with PHE's - Size



Same Power Example

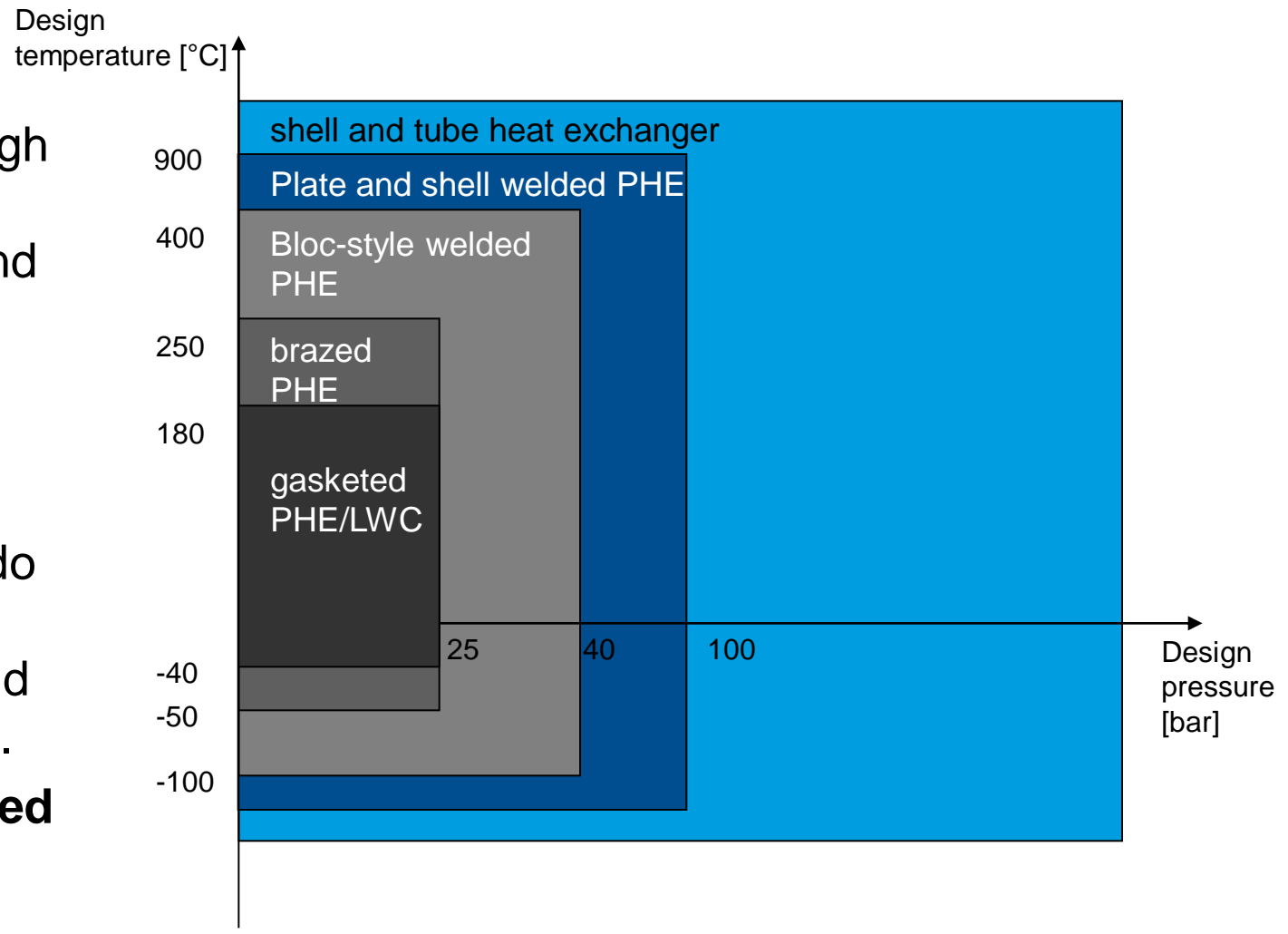
- 48 ft² (GPHE) compared to 720ft² (STHE).
- Which one do you have room for in your plant?





STHE Comparison with PHE's – Pressure and Temperature

- Shown is a rough comparison of the pressure and temperature ranges of various HE technologies.
- STHE's really do have a greater temperature and pressure range.
- **But do you need it?**





Overall

- It is important to take into account all factors when selecting the right technology.
- Ask yourself these questions:
 - Is the installation space an issue?
 - Is maintenance space an issue?
 - Are maintenance equipment requirements an issue?
 - How important is unit weight (empty and charged)?
 - What are my pressure, temperature and flow requirements?
 - How important is charge volume?
 - How important is cleanability and part replacement?
 - What is the makeup of the two media? What special considerations need to be taken into account?
- Once you know the answers to these questions, you can easily pick the right solution, not a “good enough” solution.



Gasketed PHE, Welded PHE Brazed PHE and STHE Overview

- Here is an overview of the different technologies. (Numbers are approximate)

Design Parameter	Gasketed PHE	Welded PHE	Brazed PHE	Shell & Tube HE
Pressure Limit	360 psig	600 psig	650 psig	> 1,000 psig
Lower Temp Limit	-40°F	-20°F	-320°F	< -150°F
Upper Temp Limit	+410°F	700°F	1,000°F	> +1650°F
Liquid Flow Limit	~20,000 gpm	~30,000 gpm	800 gpm	No Limit
Cleanability	Easy	Medium	CIP Only	Difficult
Part Replacement	Easy	Medium	None.	Difficult
Footprints	Small	Small	Small	Large
“Charge” Size	Small	Small	Small	Large
Weight	Low	Medium	Low	High
Cost	Lower	Medium	Lower	Higher



More Information

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 - Fax: 717-268-6119
- Or go to our web site:
 - www.gea-phe.com/usa
- Select Brazed PHE's directly at:
 - www.flatplateselect.com