



# Primary Heat Exchangers 'a la Heatric'

## 2024 Supercritical CO2 Power Cycles Symposium

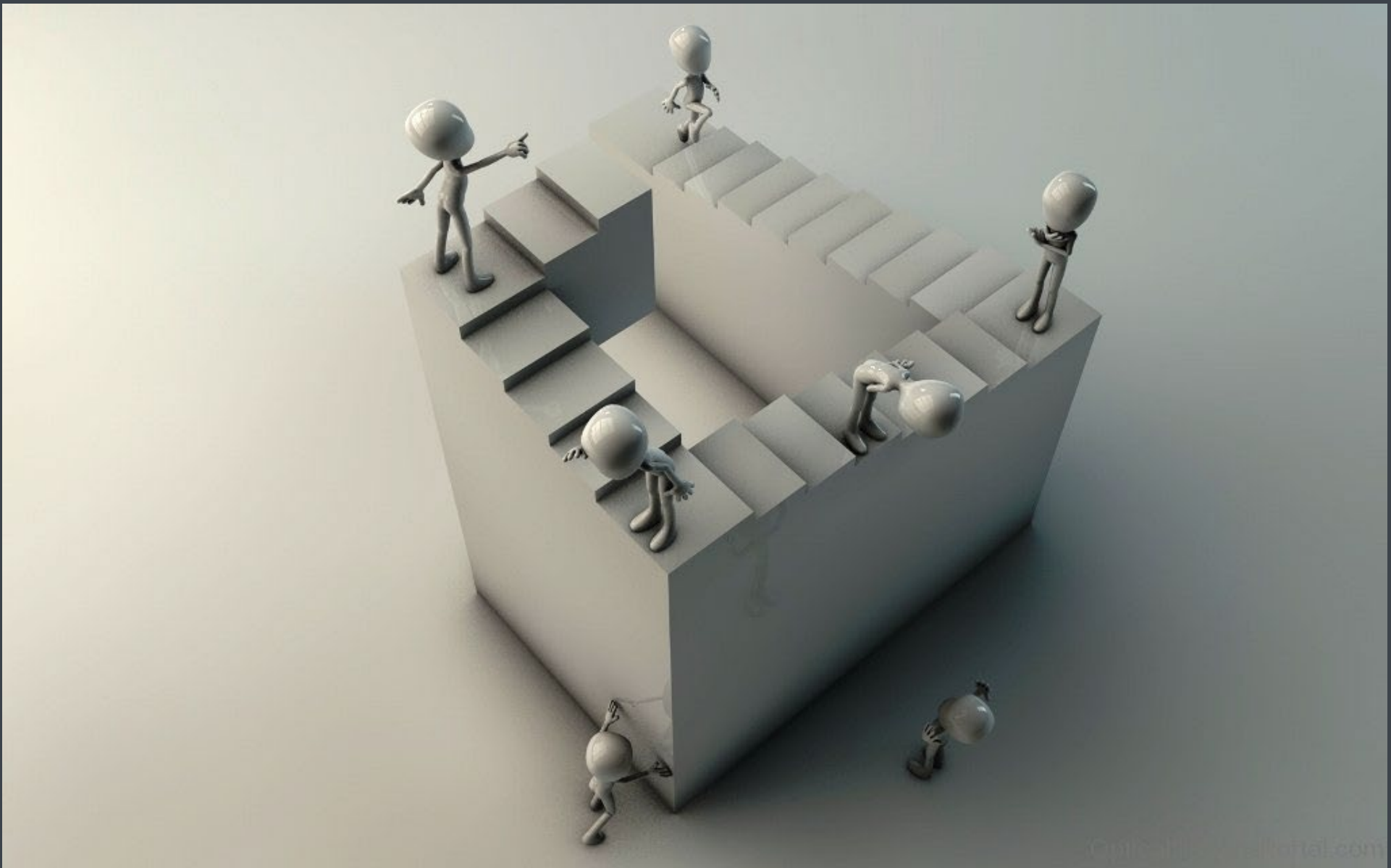
Renaud Le Pierres - Sales & Business Development Team

**February 2023**

**Heatric**

**Parker**

**MEGGITT**



**Being able to draw something does not always mean it can be made as drawn**

# Heatric Global Presence



## Poole (HQ)

Houston, TX

Singapore

Rio de Janeiro, Brazil

Busan, South Korea

**Since 1985 Heatric is  
the largest supplier of  
PCHEs globally**

with over 3,500 PCHEs  
supplied & in operation  
to date



# Heatric sCO<sub>2</sub> Project Timeline

Enabling Engineering Breakthroughs  
that Lead to a Better Tomorrow



Heatric supply their first PCHE Recuperator for Tokyo Institute of Technology sCO<sub>2</sub> loop



Heatric supply to Echogen EPS 100, the world's first commercial sCO<sub>2</sub> WHR unit



Heatric supply to NET Power's Pilot Plant in Texas



Heatric supply first application of MANs ETES technology in Denmark

1994



First PCHE using sCO<sub>2</sub> offshore re-injection

2003



Heatric supply three PCHEs to Sandia National Laboratories sCO<sub>2</sub> Brayton test loop

2009



2011



Over 200 PCHEs supplied for high pressure and supercritical CO<sub>2</sub> re-injection applications

2015



2016



Heatric supply to GTI / SWRI for the STEP facility

2019

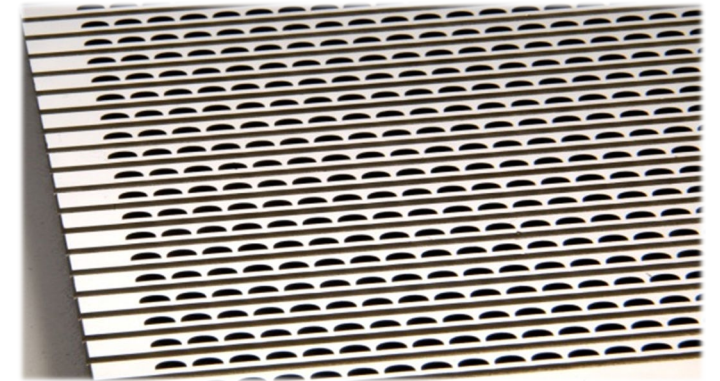
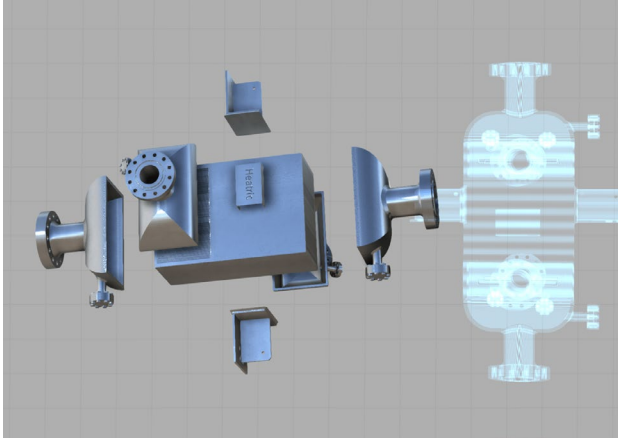


2021



■ THE HEATRIC PCHE, FPHE and *(most importantly for sCO<sub>2</sub>)* H<sup>2</sup>X

# Benefits of a **Heatric PCHE**



## Bespoke Design

Heatric **Printed Circuit Heat Exchangers** (PCHEs) are all bespoke to our customers demands and process to achieve higher performance.

## Compact and Safe

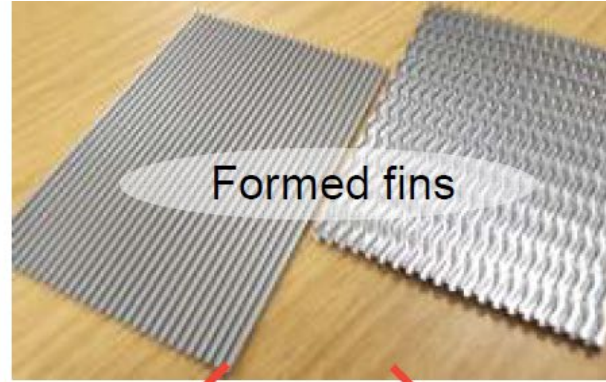
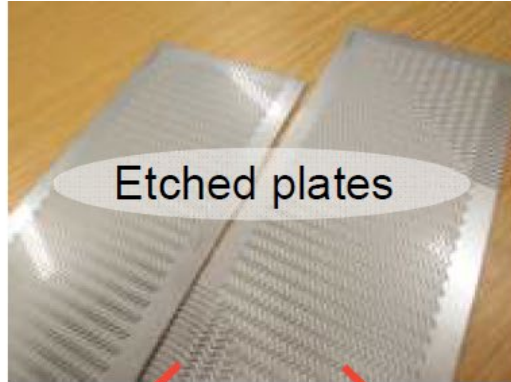
Heatric PCHEs are robust and up to 85% smaller than Shell and Tube exchangers, providing superior performance without substituting safety; as our PCHE is made from 100% fire resistant materials

## Superior Performance

Heatric PCHEs can operate at pressures up to 1000 bar, and at temperatures from cryogenic to over 900°C.

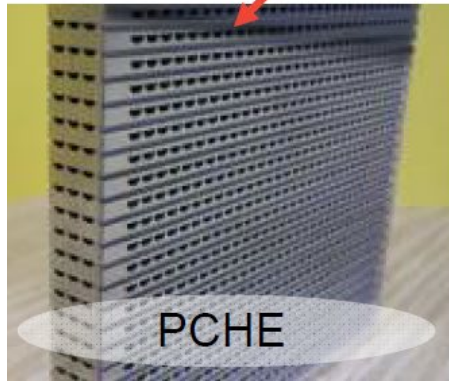


# Heatric products - Heatric PCHE (current), FPHE\*, H<sup>2</sup>X\*\* (past)



\* Formed Plate Heat Exchanger

\*\* Hybrid Heat Exchanger



1980



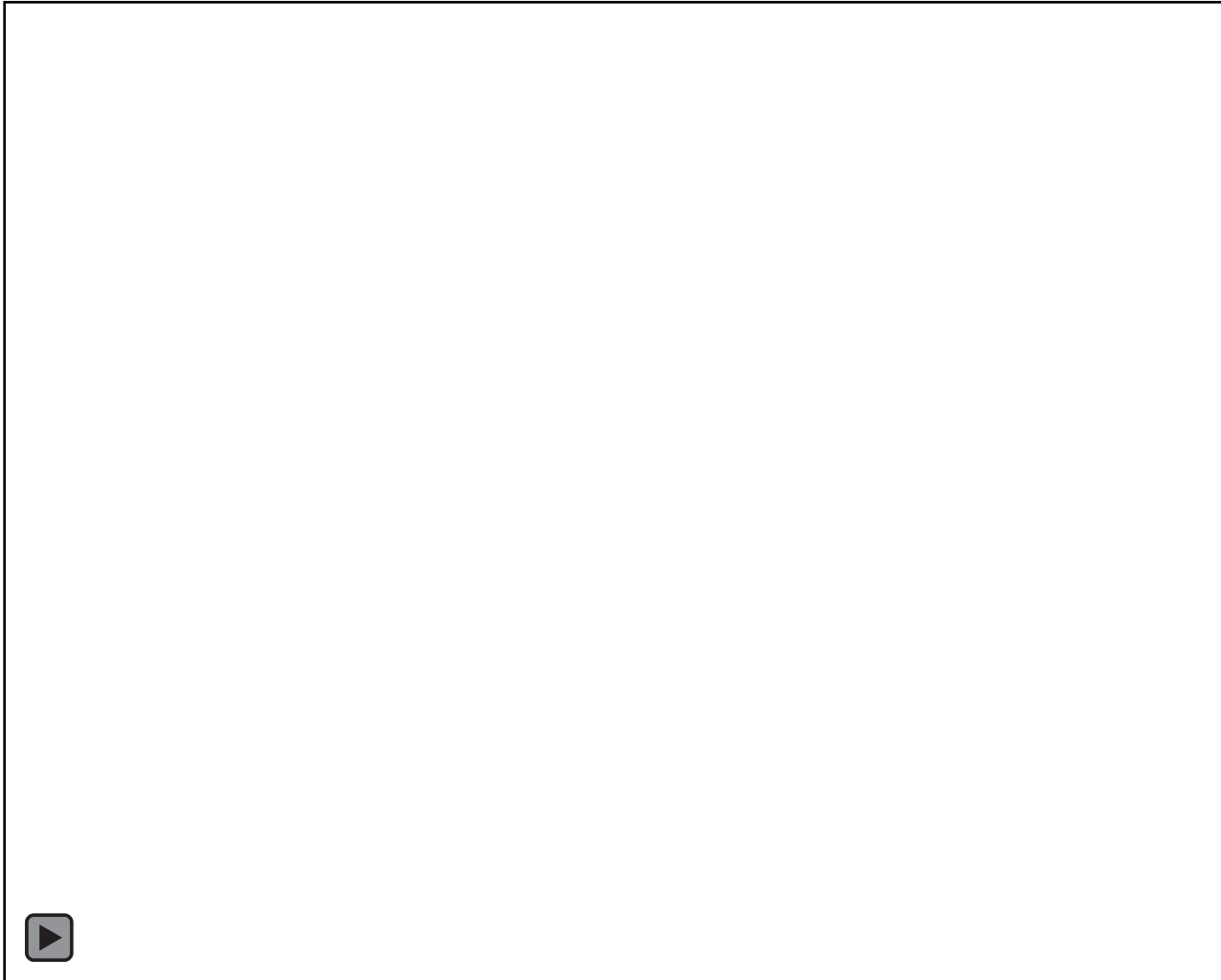
2008



2006

# How Fins pads are made

Enabling Engineering Breakthroughs  
that Lead to a Better Tomorrow





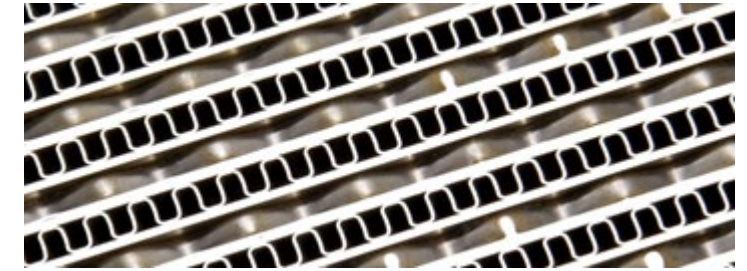
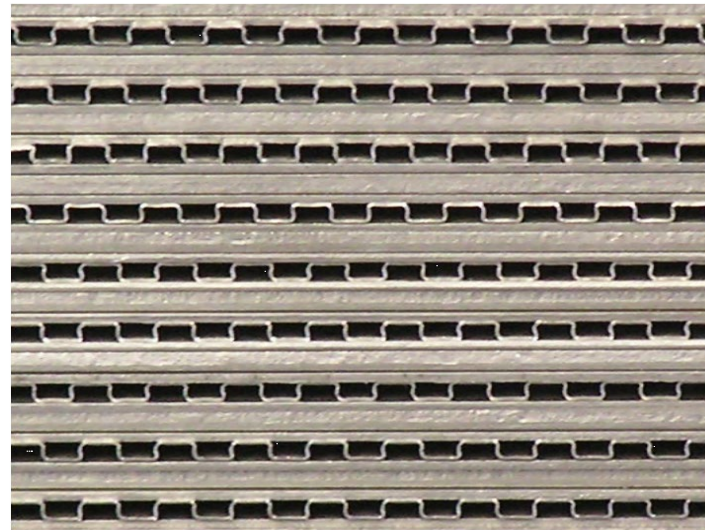
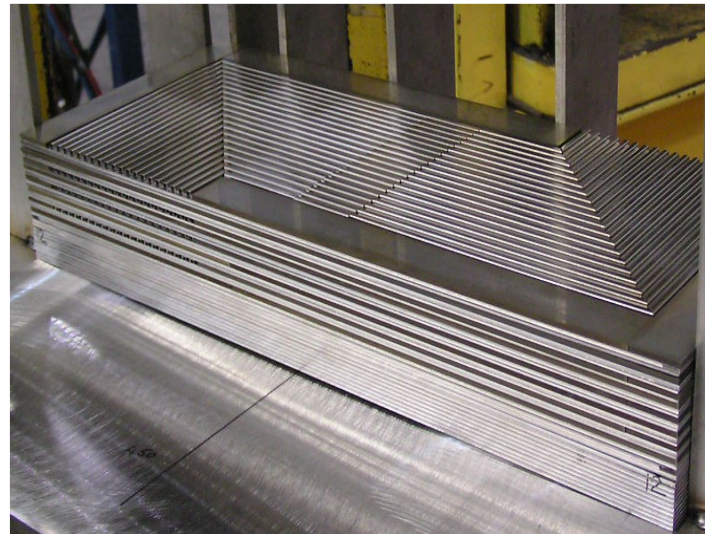
# Etched channels vs. Fins



## Photo chemically etched (PCHE)

- Etch depth – 0.5 to 1.2 mm\*
- Can produce any type of flow paths
- All features in one operation
- Material etched thrown away
- Hard to etch materials may increase cost

\*some sold PCHE used as small as 0.15mm and as large as 2.5mm etch depth

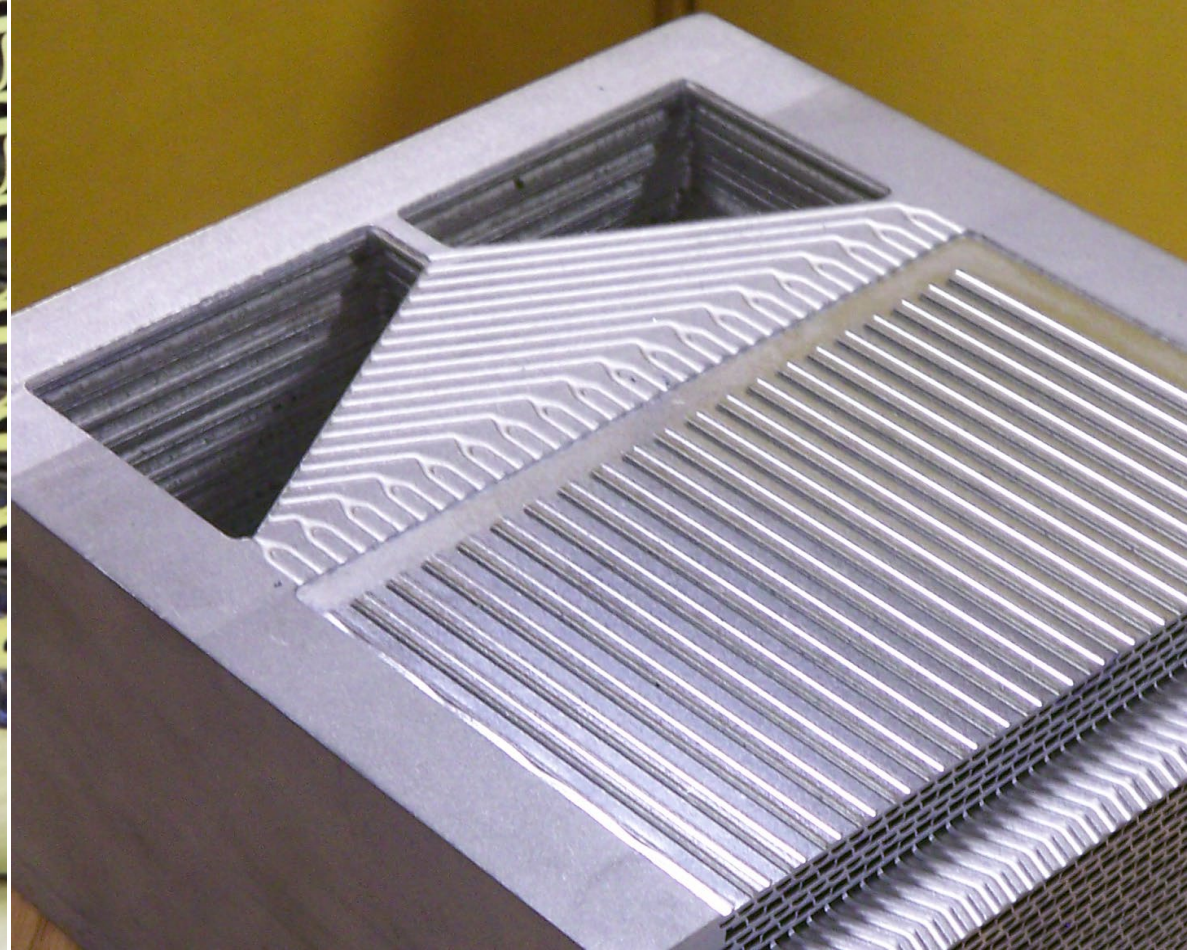


## Formed (FPHE – H<sup>2</sup>X)

- Fin height – 2, 3 and 4 mm
- Nearly no material wastage
- Can be made out of most materials
- One tool per fin geometry
- Need side and end bars, parting sheet
- More parts to make one sheet as fin pads small
- Jigsaw type construction

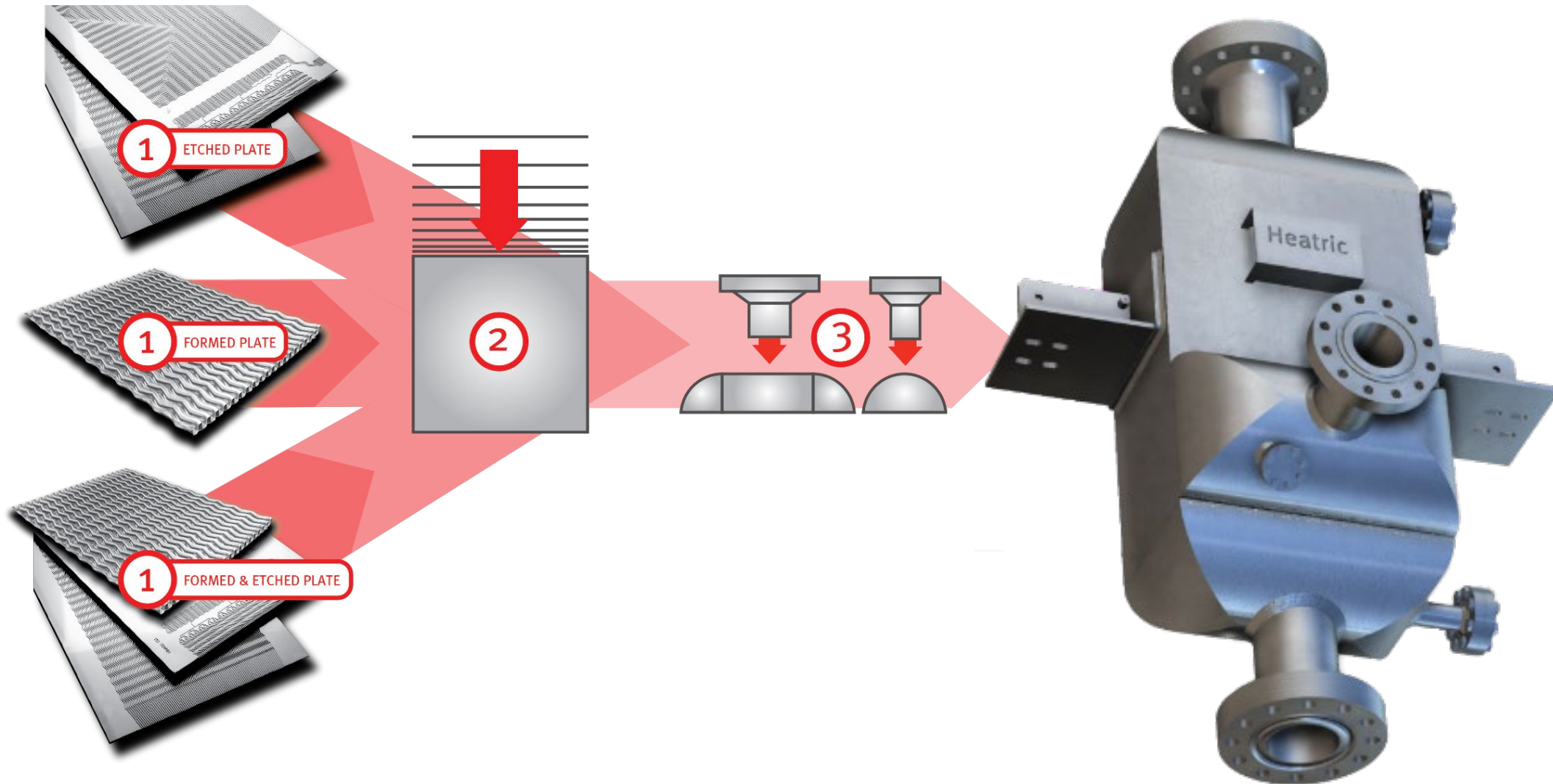


# Heatric products - Heatric H<sup>2</sup>X





# Heatric products - Heatric PCHE (current), FPHE, H<sup>2</sup>X (past)



# Heatric Primary Heat Exchanger supplied - FPHE

Exhaust to compressed air heat exchanger (air/air) – 2011 delivery

## Design:

Temperature: 1,118F (607C)

Pressure: 6 Psi vs 330 Psi (0.04 MPa vs 2.07 MPa)

Allowable dP: 0.5 Psi vs 2 Psi (3 kPa vs 14 kPa)

Duty: 9,639 kBTU/Hr (2,825 kW)

Area provided: 11,637 ft<sup>2</sup> (1,056 m<sup>2</sup>)

Core size: 47" x 23" x 106" (1,196 x 596 x 2,688 mm)

Weight (dry): 17,901 Lbs (8,120 kg)

Stainless Steel 316L







# Heatric

