Cryogenic Heat Exchangers for LNG Plants

Plate-Fin Heat Exchangers

Coil-Wound Heat Exchangers

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Liquefaction of Natural Gas

Why?

❖ To make it “fit for transport”

\[ V_{\text{Gas}} = 600 \]

\[ V_{\text{Liq}} = 1 \]
Cryogenic Heat Exchangers for LNG Plants

LNG chain

- NG gathering
- NG treatment
- NG liquefaction
- LNG storage & loading
- LNG transport
- LNG receiving & storage
- LNG re-gasification
- NG user
Cryogenic Heat Exchangers for LNG Plants

**LNG chain**

- NG gathering
- NG treatment
- NG liquefaction
- LNG storage & loading
- LNG transport
- LNG receiving & storage
- LNG re-gasification
- NG user
Liquefaction technology

by APCI

PC: S&T heat exchangers
LF/SC: Coil-wound heat exchangers
Cryogenic Heat Exchangers for LNG Plants

Liquefaction technology ➔ by Conoco-Phillips

PC: Plate-fin heat exchangers
LF/SC: Plate-fin heat exchangers
Cryogenic Heat Exchangers for LNG Plants

*Liquefaction technology*

*by Statoil / Linde*

PC:  Plate-fin heat exchangers  
LF/SC:  Coil-wound heat exchangers
Cryogenic Heat Exchangers for LNG Plants

Liquefaction technology ➔ by Shell

PC: Coil-wound heat exchangers
LF/SC: Coil-wound heat exchangers
Cryogenic Heat Exchangers for LNG Plants

NG liquefaction technology always based on ...

Plate-Fin Heat Exchangers

Coil-Wound Heat Exchangers

and/or
Cryogenic Heat Exchangers for LNG Plants

(A) Focus on ...

Plate-Fin Heat Exchangers

Coil-Wound Heat Exchangers
Cryogenic Heat Exchangers for LNG Plants

1. Block
2. Header
3. Nozzle
4. Width
5. Stacking height
6. Length
7. Passage outlet
8. Cover sheet
9. Parting sheet
10. Heat transfer fin
11. Distribution fin
12. Side bar
13. End bar
Cryogenic Heat Exchangers for LNG Plants

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Cryogenic Heat Exchangers for LNG Plants

Ready to go ...

single PFHE block
Cryogenic Heat Exchangers for LNG Plants

parting sheets
cover plates

headers / nozzles

fins

side-bars

raw material
measuring, cutting
washing

raw material
measuring, cutting
washing

raw material
measuring, cutting
washing

vacuum furnace

heat exchanger

testing, acceptance

TÜV

ASME

flow

x-raying

helium

leakage test

pressure

packing
Cryogenic Heat Exchangers for LNG Plants

Assembly ...

multiple blocks with manifolds

(piped battery)
Cryogenic Heat Exchangers for LNG Plants

Ready to go ... "Coldbox" with special transport device
Cryogenic Heat Exchangers for LNG Plants

(B) Focus on ...

Plate-Fin Heat Exchangers

Coil-Wound Heat Exchangers
Cryogenic Heat Exchangers for LNG Plants

~ 1950 ...

CWHE fabrication
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1973 ...

Aluminium CWHE for BASF
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Heading for the far east of Russia ...

CWHE loading
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(C) Comparison ...

Plate-Fin Heat Exchangers

versus

Coil-Wound Heat Exchangers
Cryogenic Heat Exchangers for LNG Plants

"Designed for the same performance ..."

"Coldbox" containing Coil-wound Heat Exchangers

"Coldbox" containing Plate-Fin Heat Exchangers
Cryogenic Heat Exchangers for LNG Plants

(D) As of today ...

~ 7500 PFHEs
~ 1000 CWHEs

PFHE supply 2008

CWHE supply 2006
Cryogenic Heat Exchangers for LNG Plants

Serving the industry with …

Plate-Fin Heat Exchangers

Coil-wound Heat Exchangers