

Cryogenic Heat Exchangers for LNG Plants



Plate-Fin Heat Exchangers



Coil-Wound Heat Exchangers



Linde AG

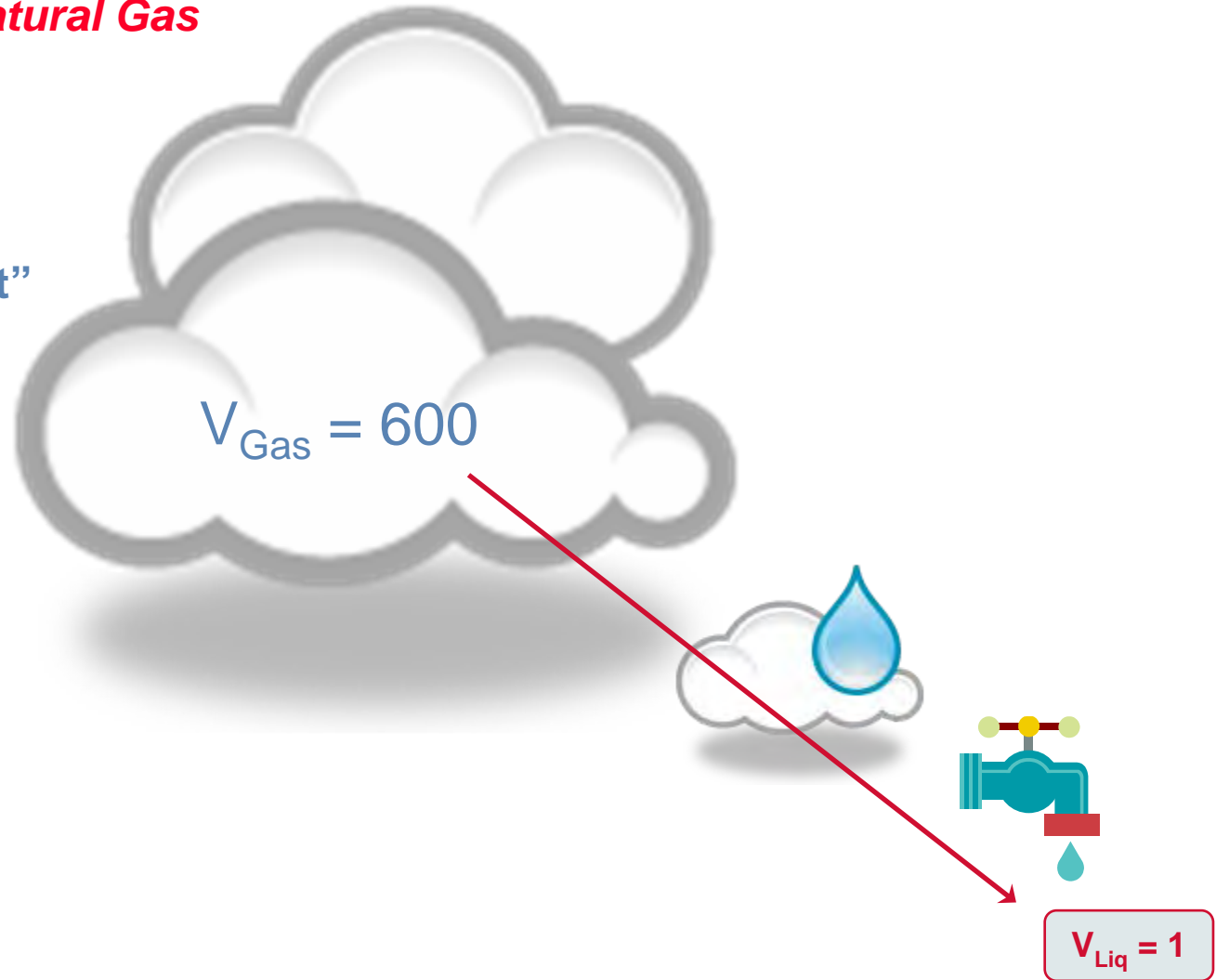
Engineering Division
Schalchen Plant
Germany

Eberhard Kaupp
Sr. Sales Manager
Heat Transfer Systems

Liquefaction of Natural Gas

Why ?

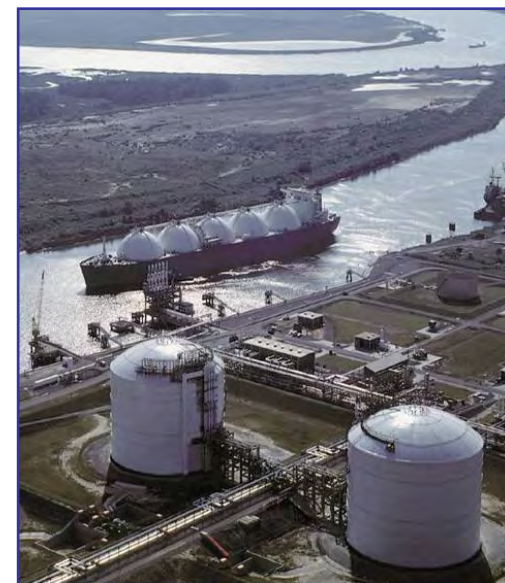
↳ To make it
“fit for transport”



Cryogenic Heat Exchangers for LNG Plants

LNG chain

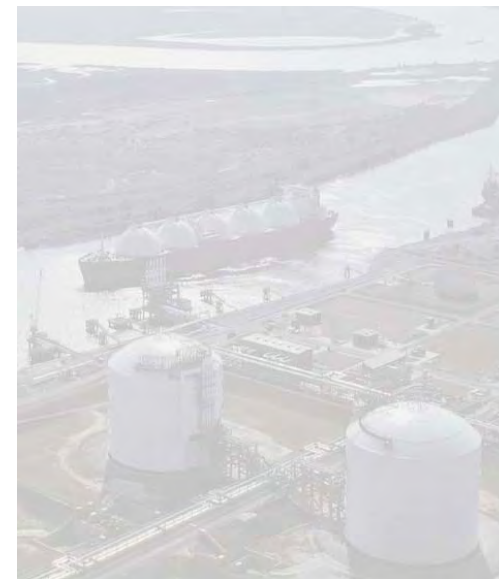
- ↗ NG gathering
- ↗ NG treatment
- ↗ NG liquefaction
- ↗ LNG storage & loading
- ↗ LNG transport
- ↗ LNG receiving & storage
- ↗ LNG re-gasification
- ↗ NG user



Cryogenic Heat Exchangers for LNG Plants

LNG chain

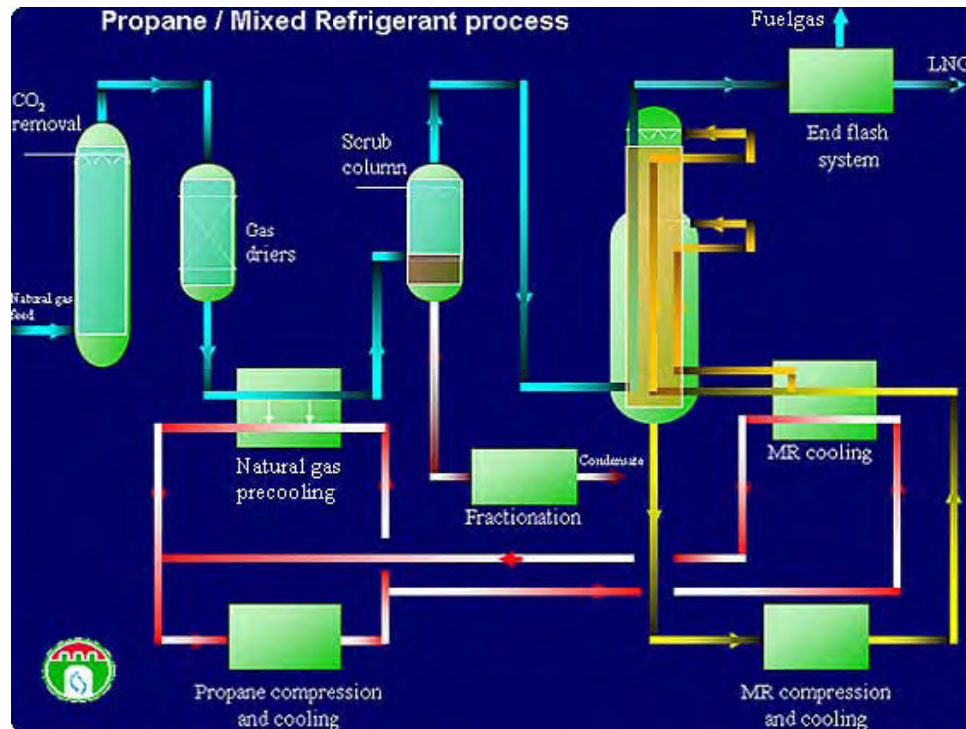
- NG gathering
- NG treatment
- NG liquefaction
- LNG storage & loading
- LNG transport
- LNG receiving & storage
- LNG re-gasification
- NG user



Cryogenic Heat Exchangers for LNG Plants

Liquefaction technology
→ by APCI

PC: S&T heat exchangers
LF/SC: Coil-wound heat exchangers

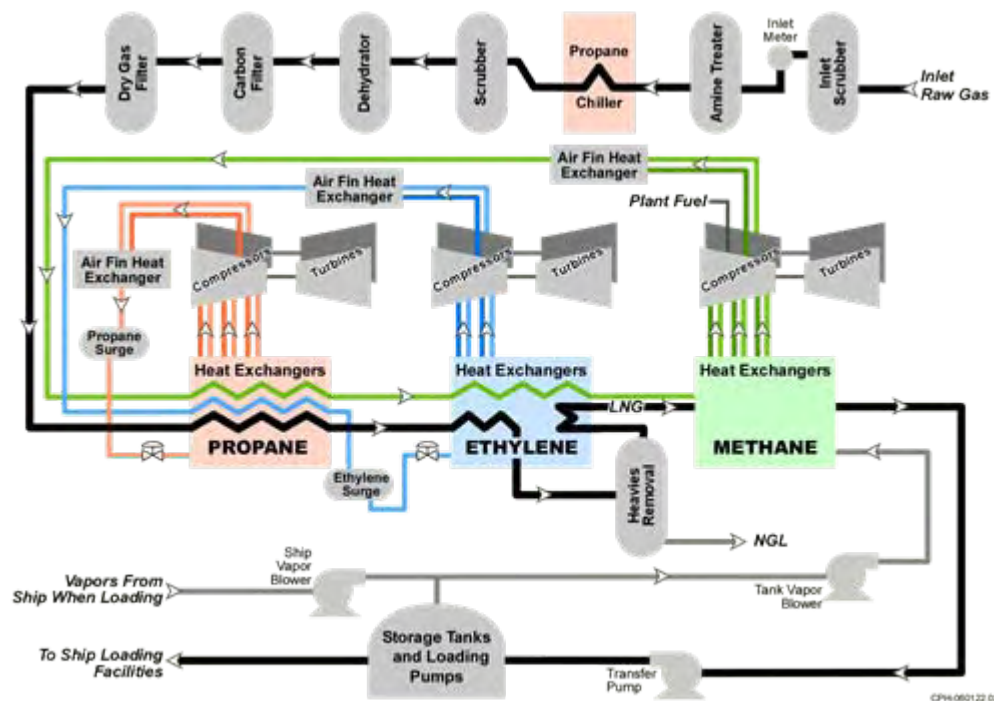


Cryogenic Heat Exchangers for LNG Plants

Liquefaction technology
 ➔ *by Conoco-Phillips*

PC: Plate-fin heat exchangers

LF/SC: Plate-fin heat exchangers



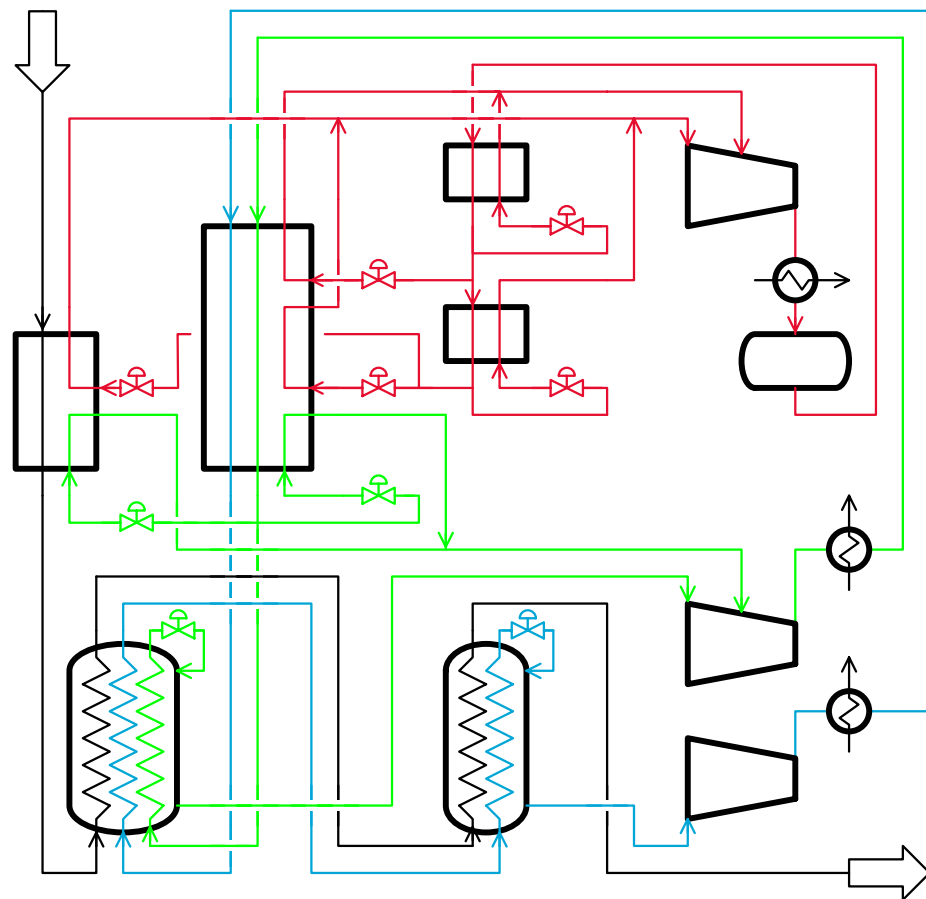
Cryogenic Heat Exchangers for LNG Plants

Liquefaction technology

➔ **by Statoil / Linde**

PC: Plate-fin heat exchangers

LF/SC: Coil-wound heat exchangers



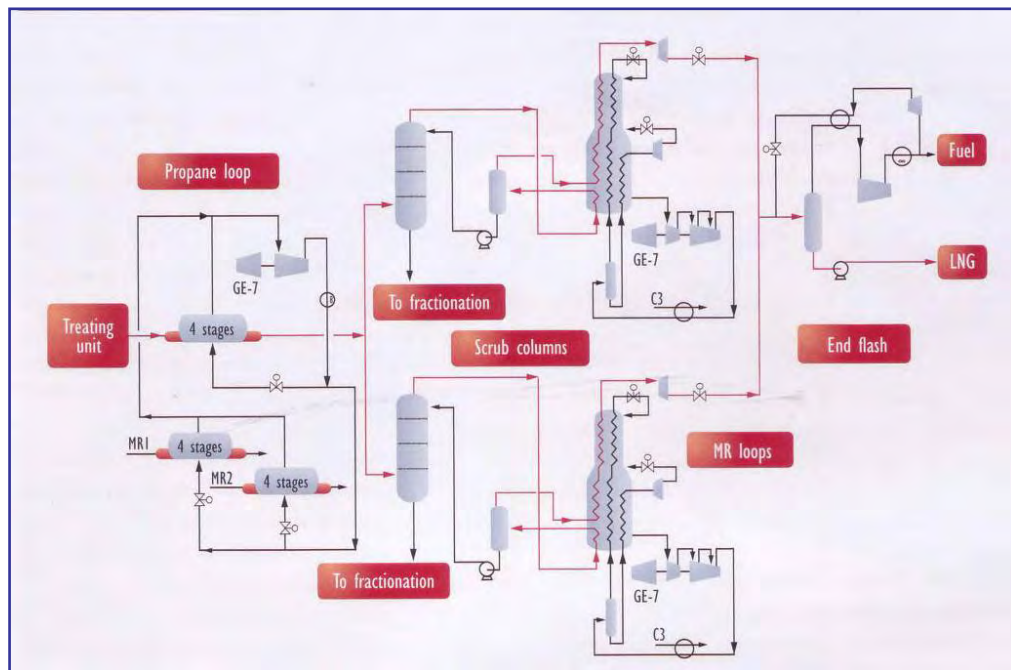
Cryogenic Heat Exchangers for LNG Plants

Liquefaction technology

→ by Shell

PC: Coil-wound heat exchangers

LF/SC: Coil-wound heat exchangers



Cryogenic Heat Exchangers for LNG Plants

THE LINDE GROUP

Linde

*NG liquefaction technology
always based on ...*



Plate-Fin Heat Exchangers



Coil-Wound Heat Exchangers

and / or

Cryogenic Heat Exchangers for LNG Plants

THE LINDE GROUP

Linde

(A) Focus on ...

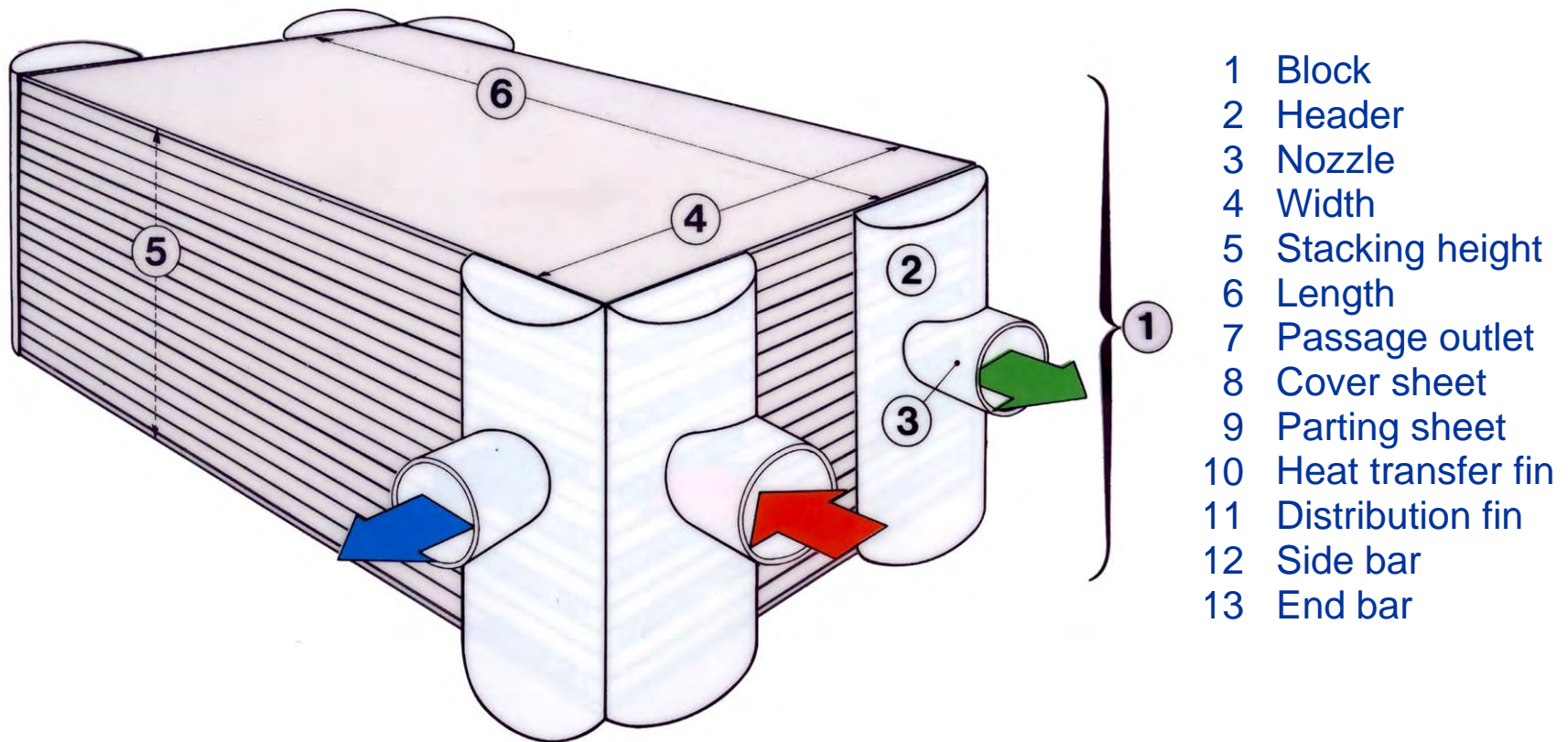


Plate-Fin Heat Exchangers

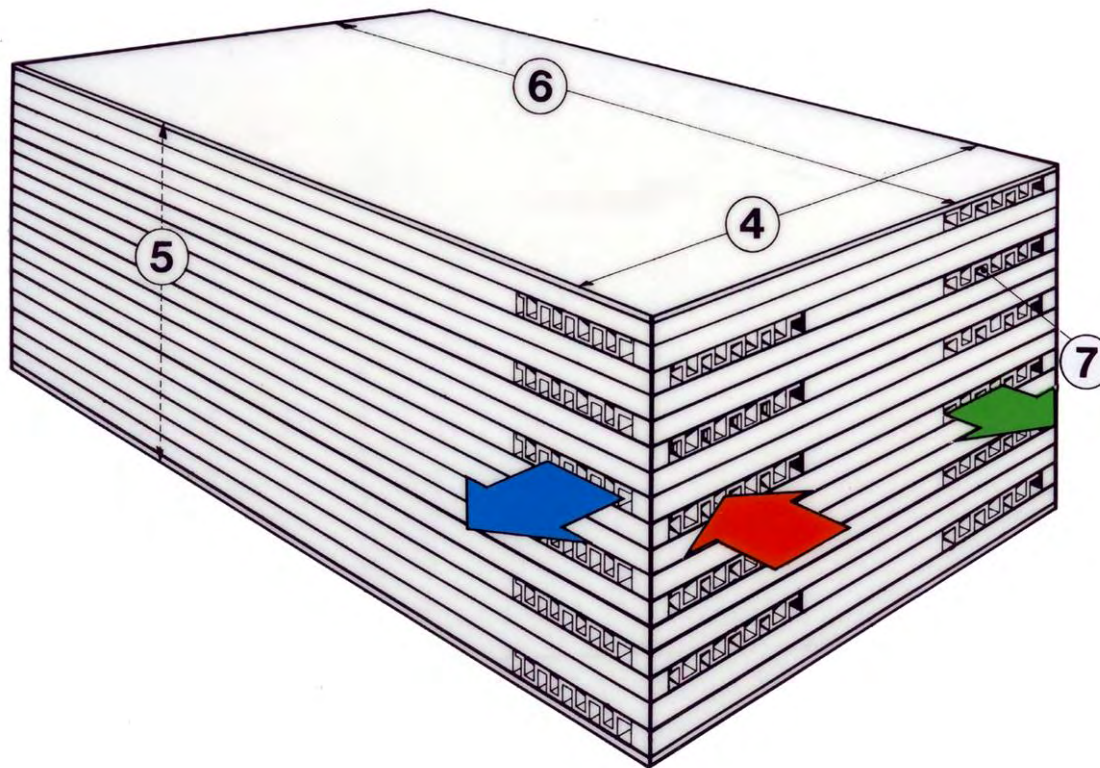


Coil-Wound Heat Exchangers

Cryogenic Heat Exchangers for LNG Plants

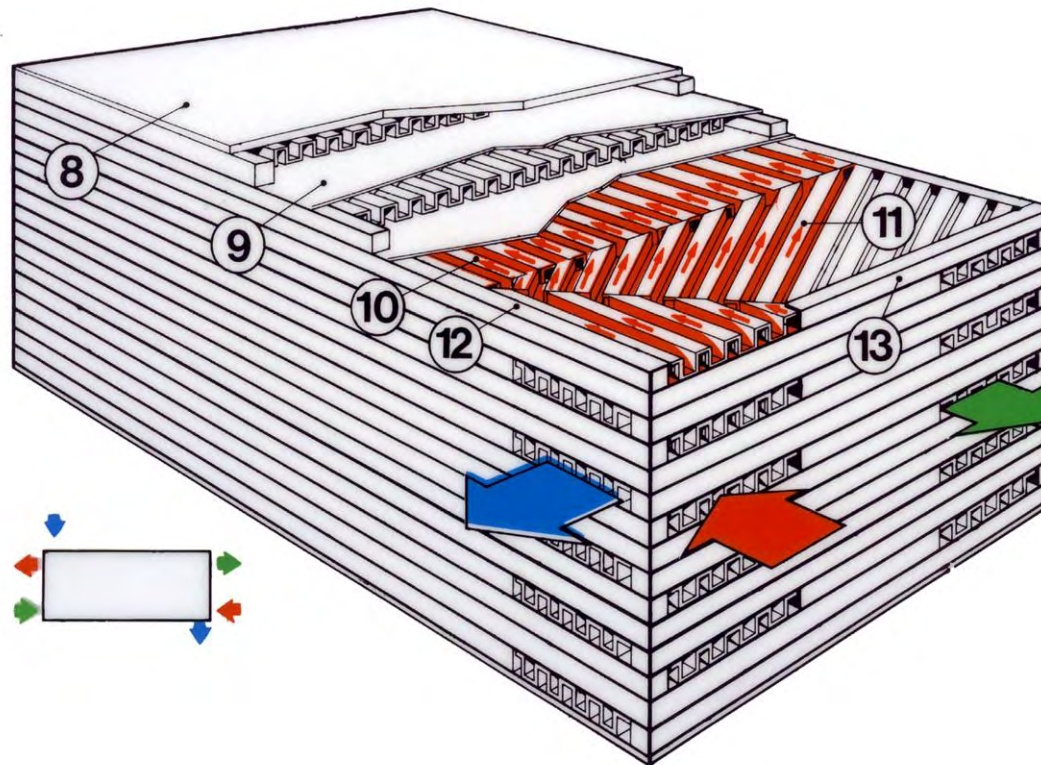


Cryogenic Heat Exchangers for LNG Plants



- 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

THE LINDE GROUP

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Ready to go ...

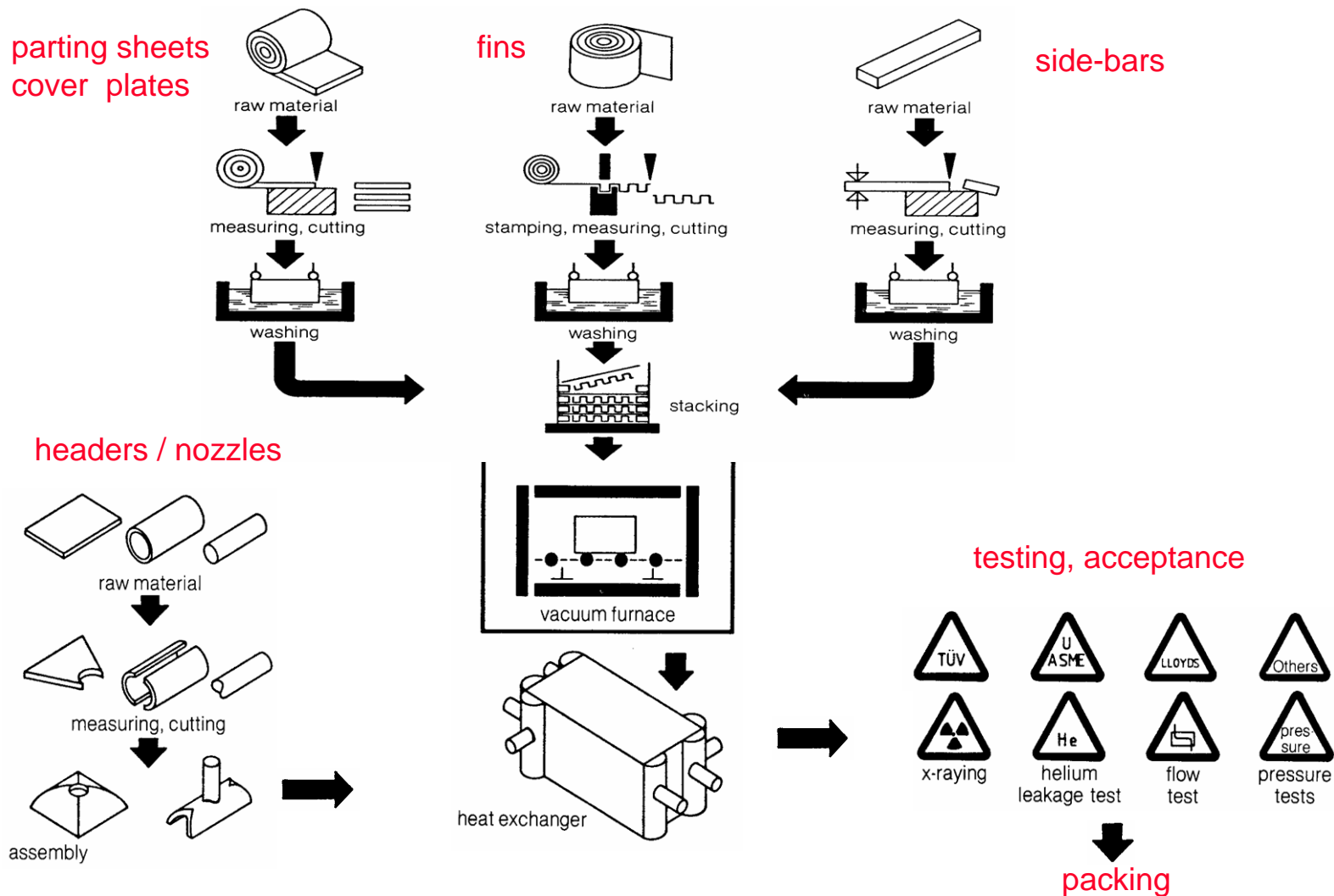
single
PFHE block



Cryogenic Heat Exchangers for LNG Plants

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Cryogenic Heat Exchangers for LNG Plants

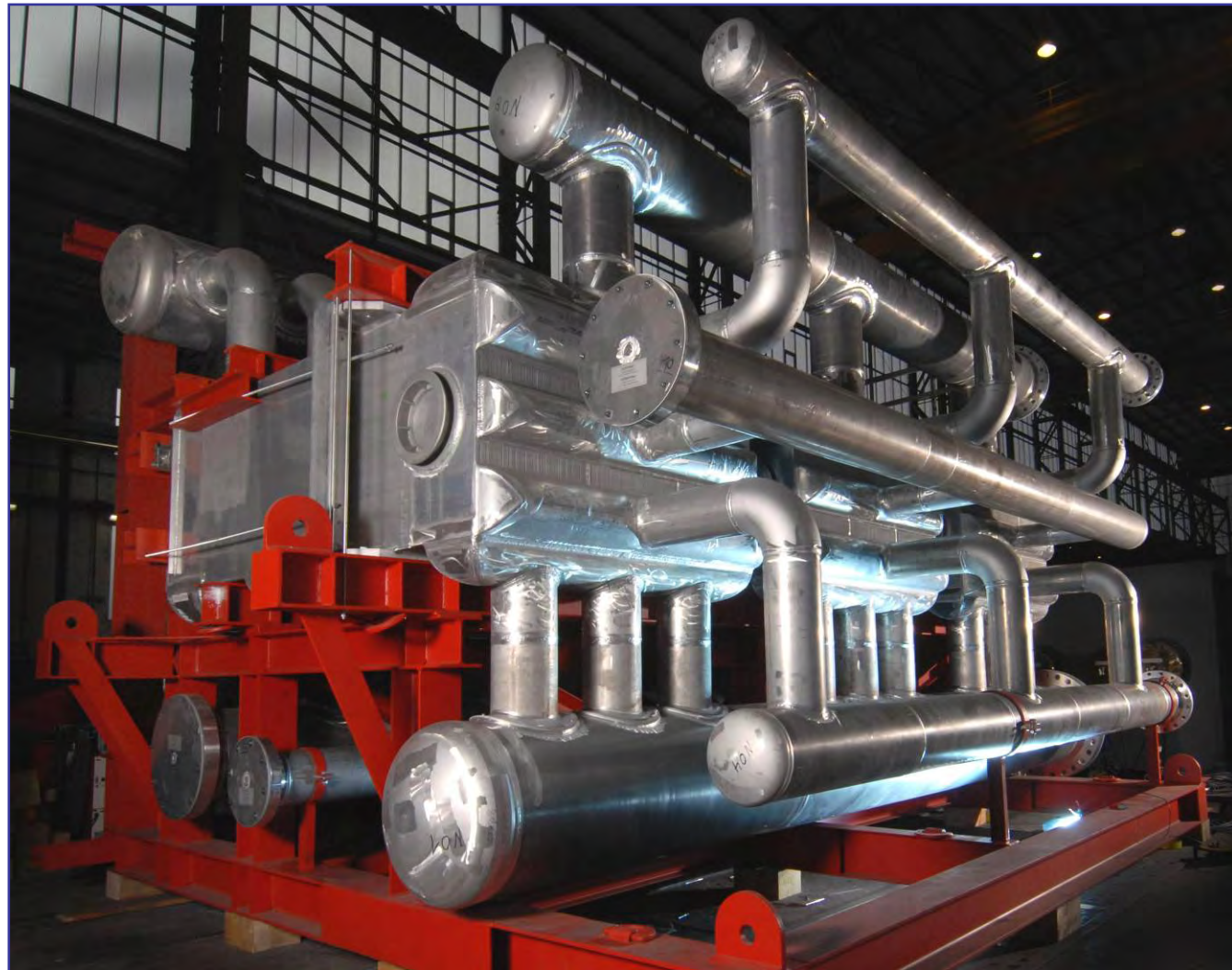
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Assembly ...

multiple blocks
with manifolds

(piped battery)



Cryogenic Heat Exchangers for LNG Plants

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Ready to go ...

“Coldbox”
with special
transport
device



(B) Focus on ...



Plate-Fin Heat Exchangers



Coil-Wound Heat Exchangers

Cryogenic Heat Exchangers for LNG Plants

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~ 1950 ...

CWHE fabrication



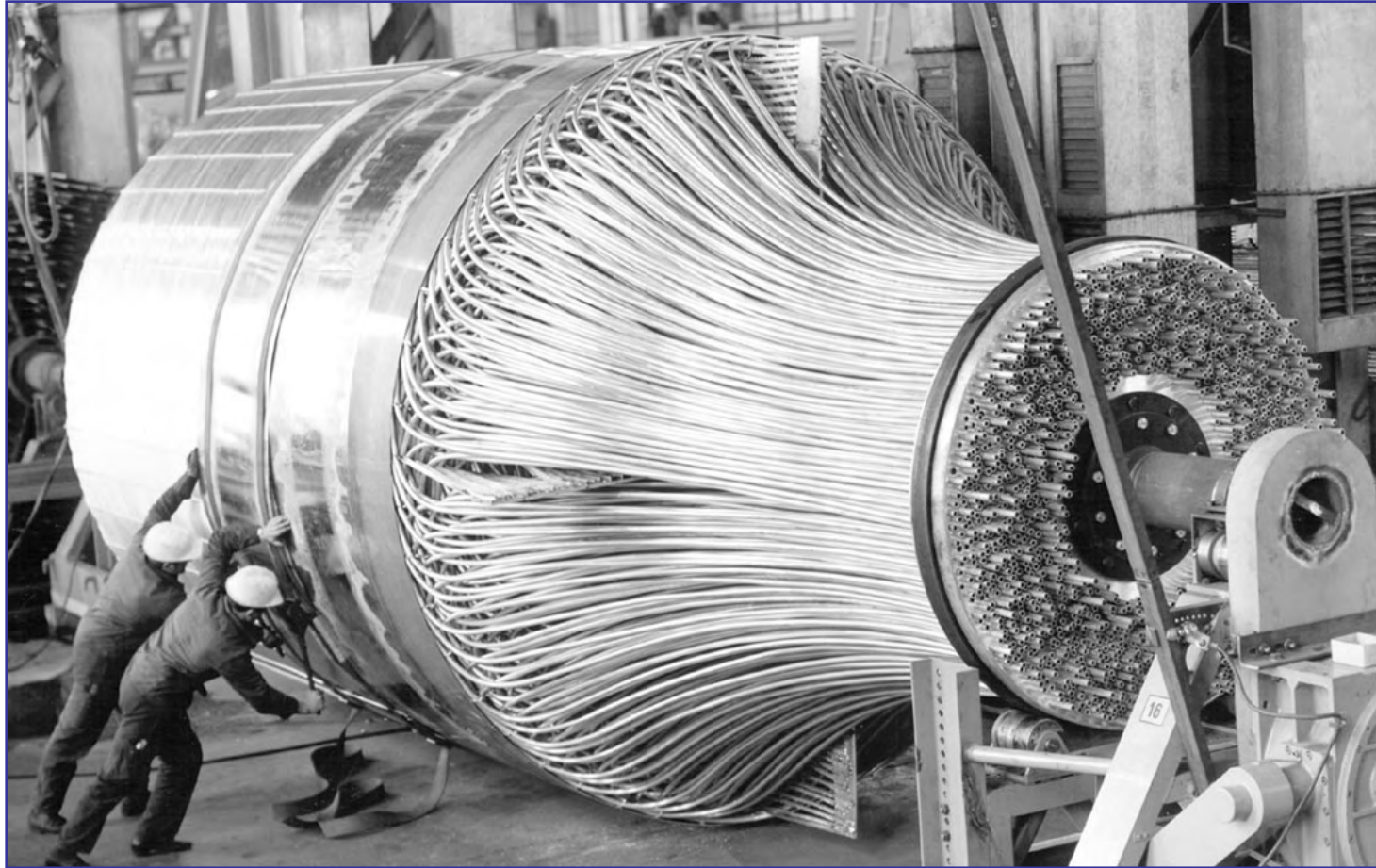
Cryogenic Heat Exchangers for LNG Plants

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1973 ...

**Aluminium
CWHE
for BASF**



Cryogenic Heat Exchangers for LNG Plants

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*Heading for
the far east
of Russia ...*

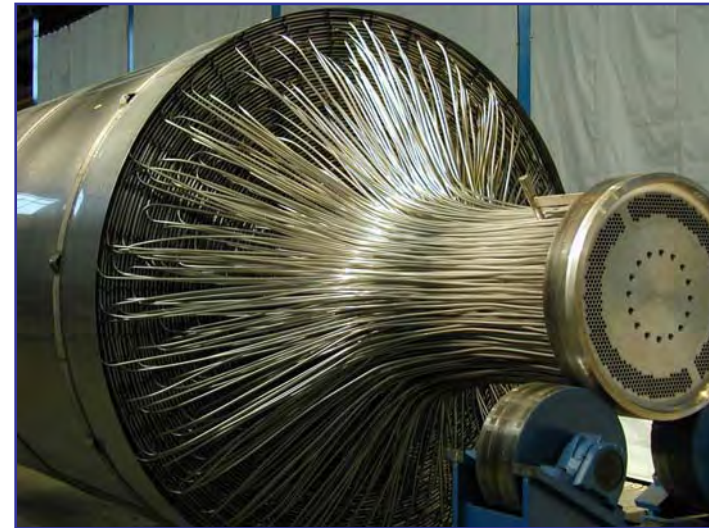
CWHE
loading



(C) Comparison ...



Plate-Fin Heat Exchangers



Coil-Wound Heat Exchangers

versus

*Designed for
the same performance ...*

“Coldbox” containing
Coil-wound Heat Exchangers

“Coldbox” containing
Plate-Fin Heat Exchangers



Cryogenic Heat Exchangers for LNG Plants

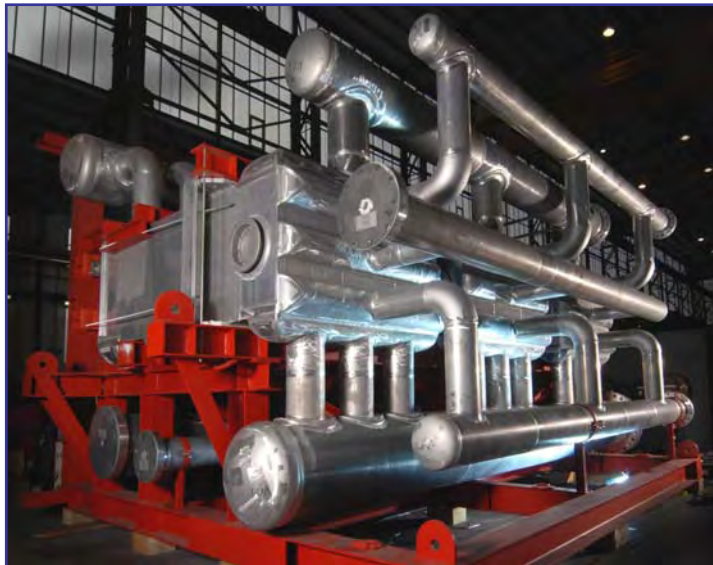
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(D) As of today ...

~ 7500 PFHEs

~ 1000 CWHEs



PFHE supply 2008



CWHE supply 2006

Cryogenic Heat Exchangers for LNG Plants

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Serving the industry with ...



Plate-Fin Heat Exchangers



Coil-wound Heat Exchangers

AND