6.EFRC Düsseldorf, Germany

Using reciprocating compressors to liquefy NG in a small scale LNG Plant

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Director

RWE
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ENGINEERING GMBH

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1. Introduction – RWE Energy and gas storage facilities
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RWE Energy

gas sales	**258 bill**	**kWh**
electricity sales	168 bill	kWh
gas-storage (underground)	**3.3 bill**	**Nm³**
gas-storage (above-ground)	**21,500** **14 mio.** **140 mio.**	**m³ LNG** **Nm³ gas** **kWh**

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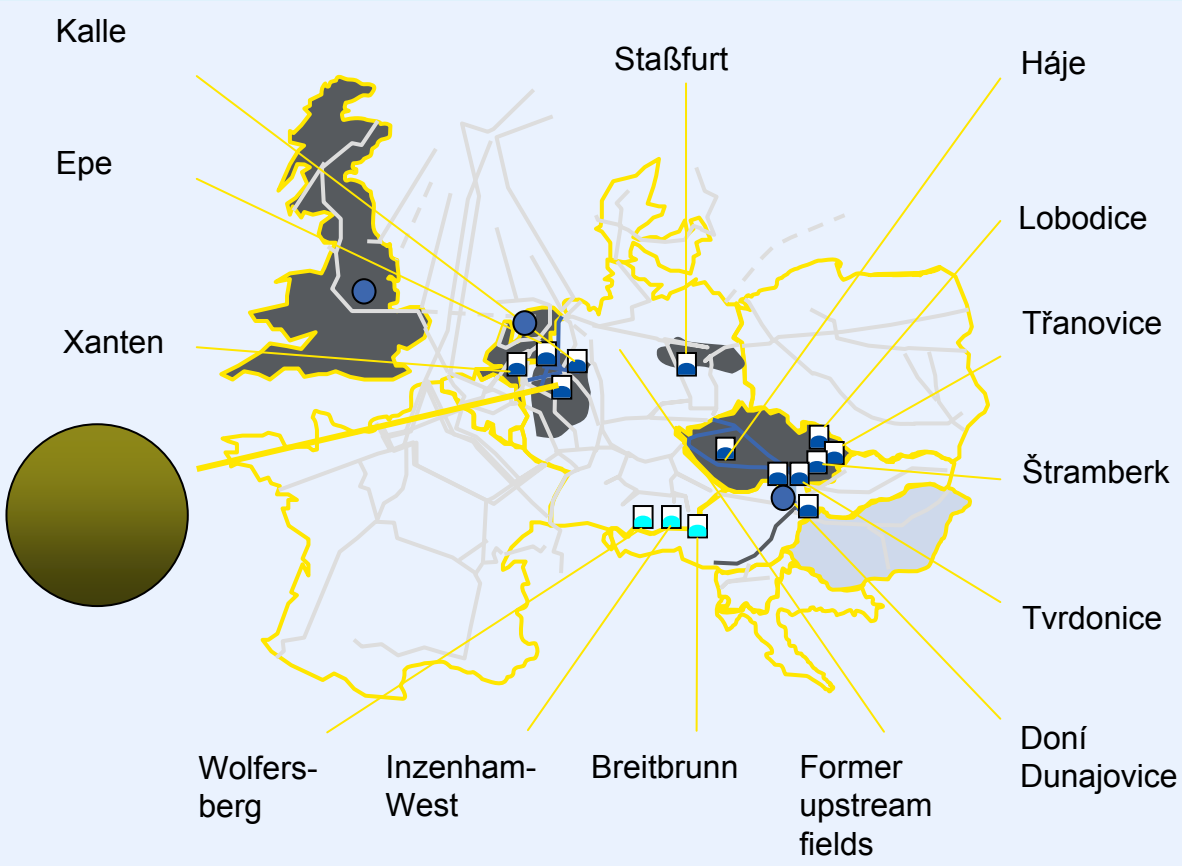
RWE Energy storage facilities



- in CZ: 75% storage capacity
- in GE: 17% storage capacity (RWE Energy 11%, RWE DEA 6%)

RWE Energy storage facility
RWE Dea storage facility
Supra-regional gas trading points (HUBs)

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LNG Plant Nievenheim - basic data

start of construction:	**1974**
start of operation:	**1976**
reinvestment:	**2003/07**

LNG-Tank:

height:	**ca. 32 m**
diameter:	**ca. 37 m**
volume:	**21,500 m³**

capacity (L-gas form):	**14 Mio.Nm³**
liquefaction	**2,400 Nm³/h**
regasification	**100,000 Nm³/h**

5 Compressors **(3 reciprocating, 2 turbo)**

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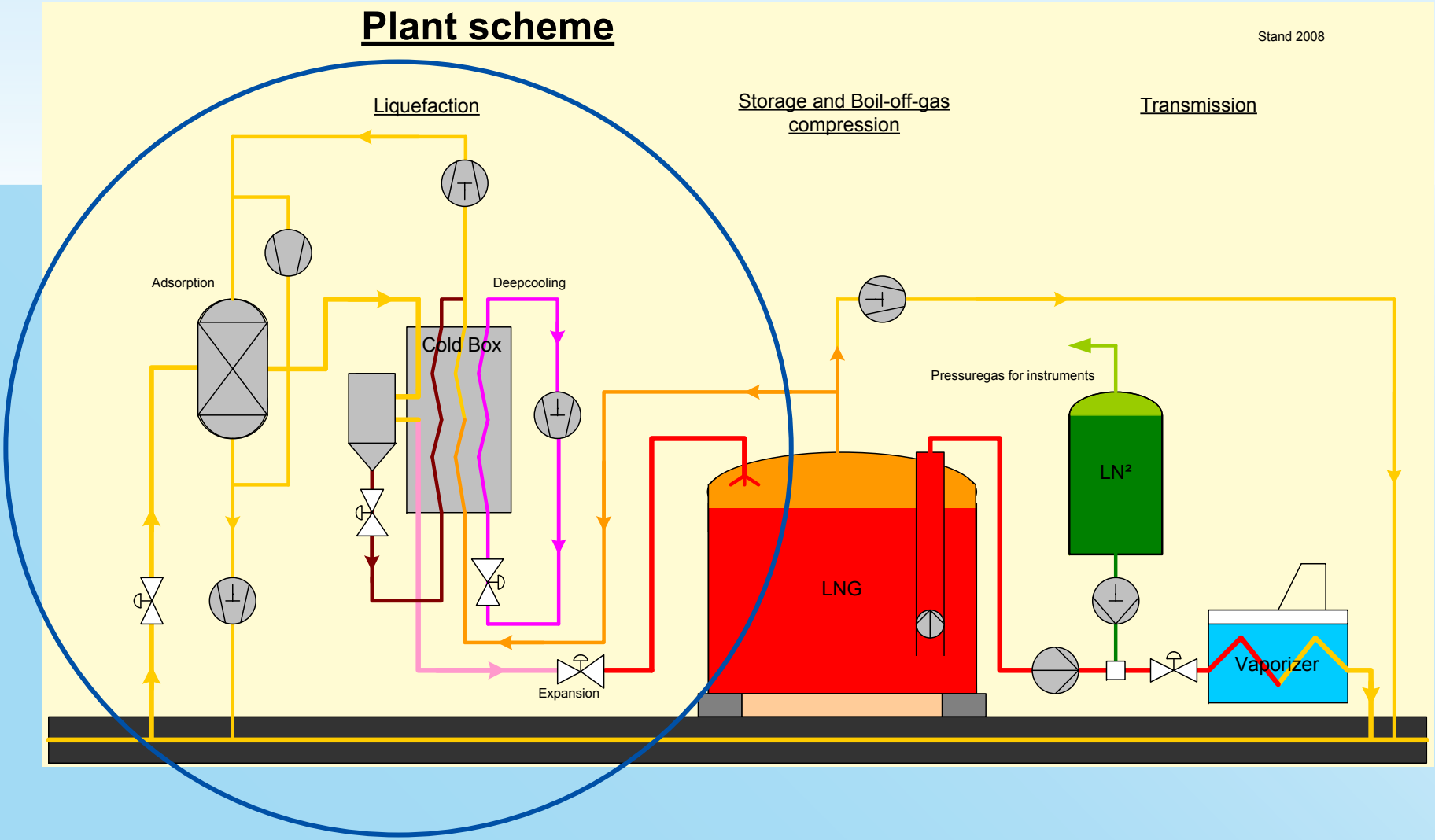
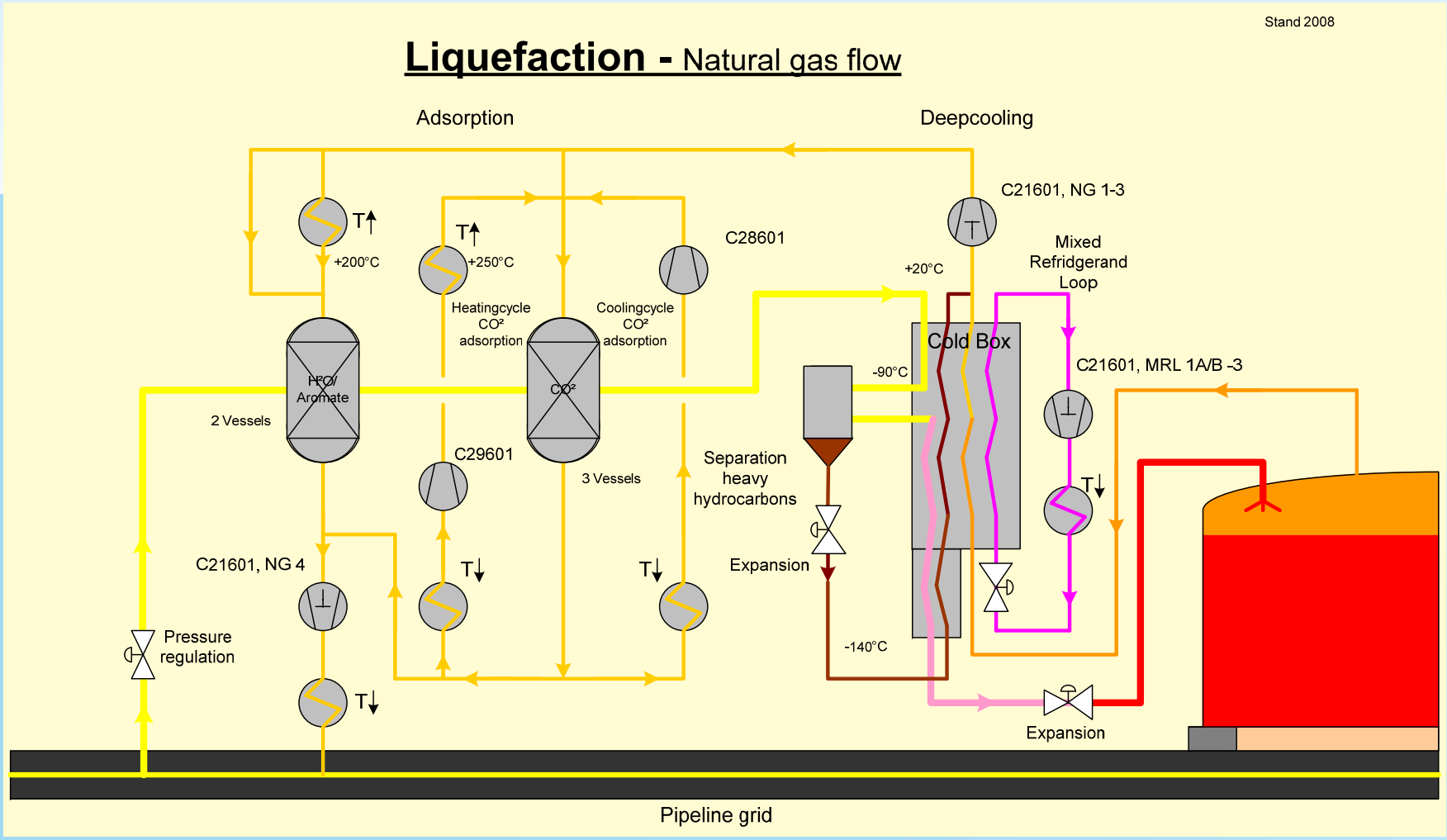
Peak Shaving Plant Nievenheim



Peak Shaving Plant Nievenheim



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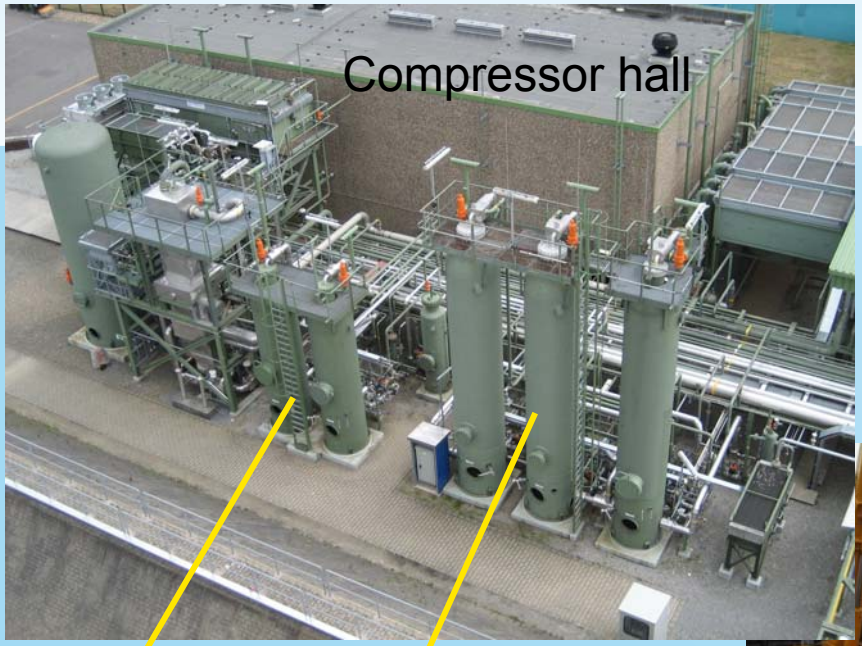

moisture and aromatics -

carbon dioxide - adsorbers

Heat-exchanger W31601

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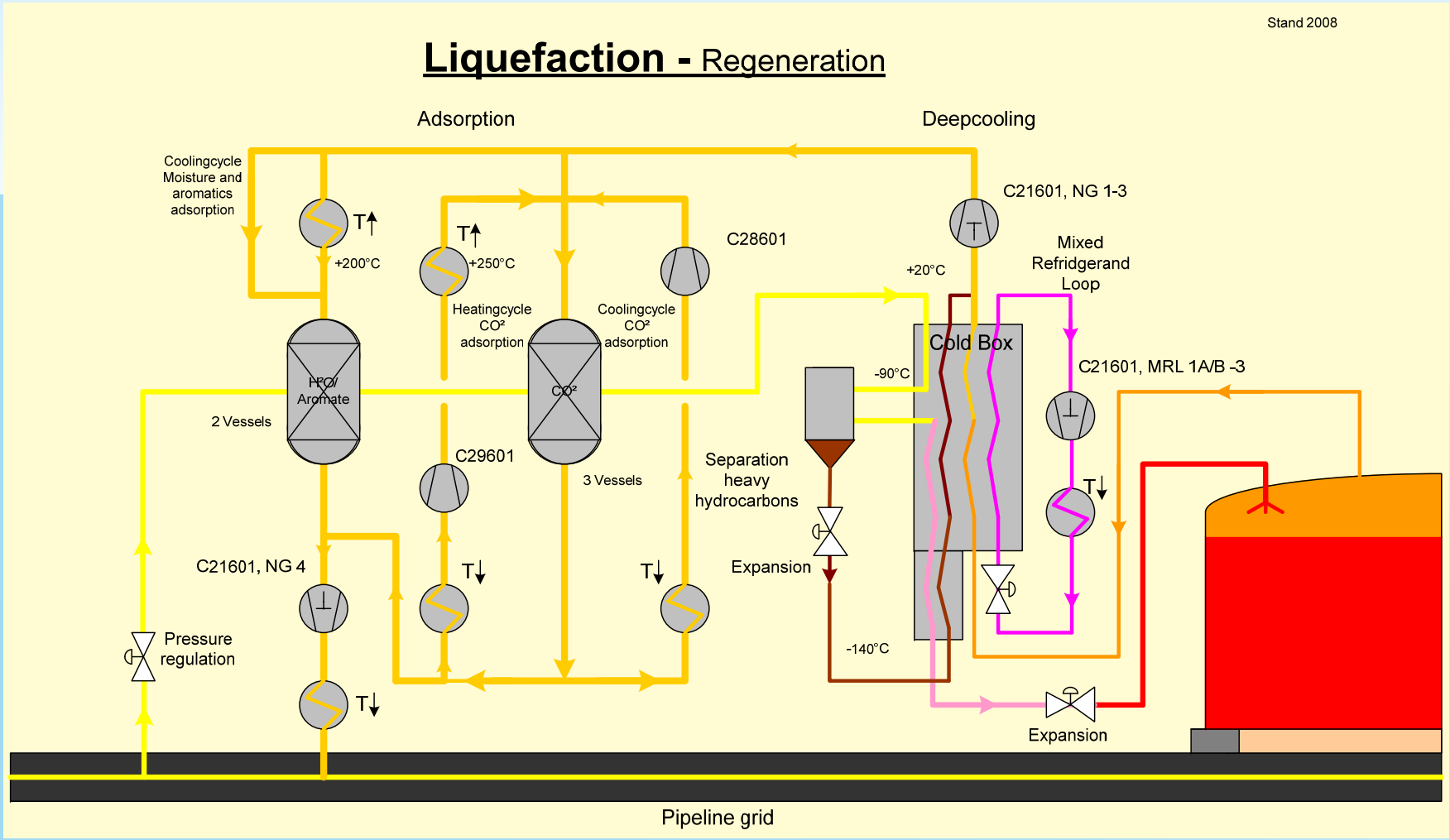

Peak Shaving Plant Nievenheim

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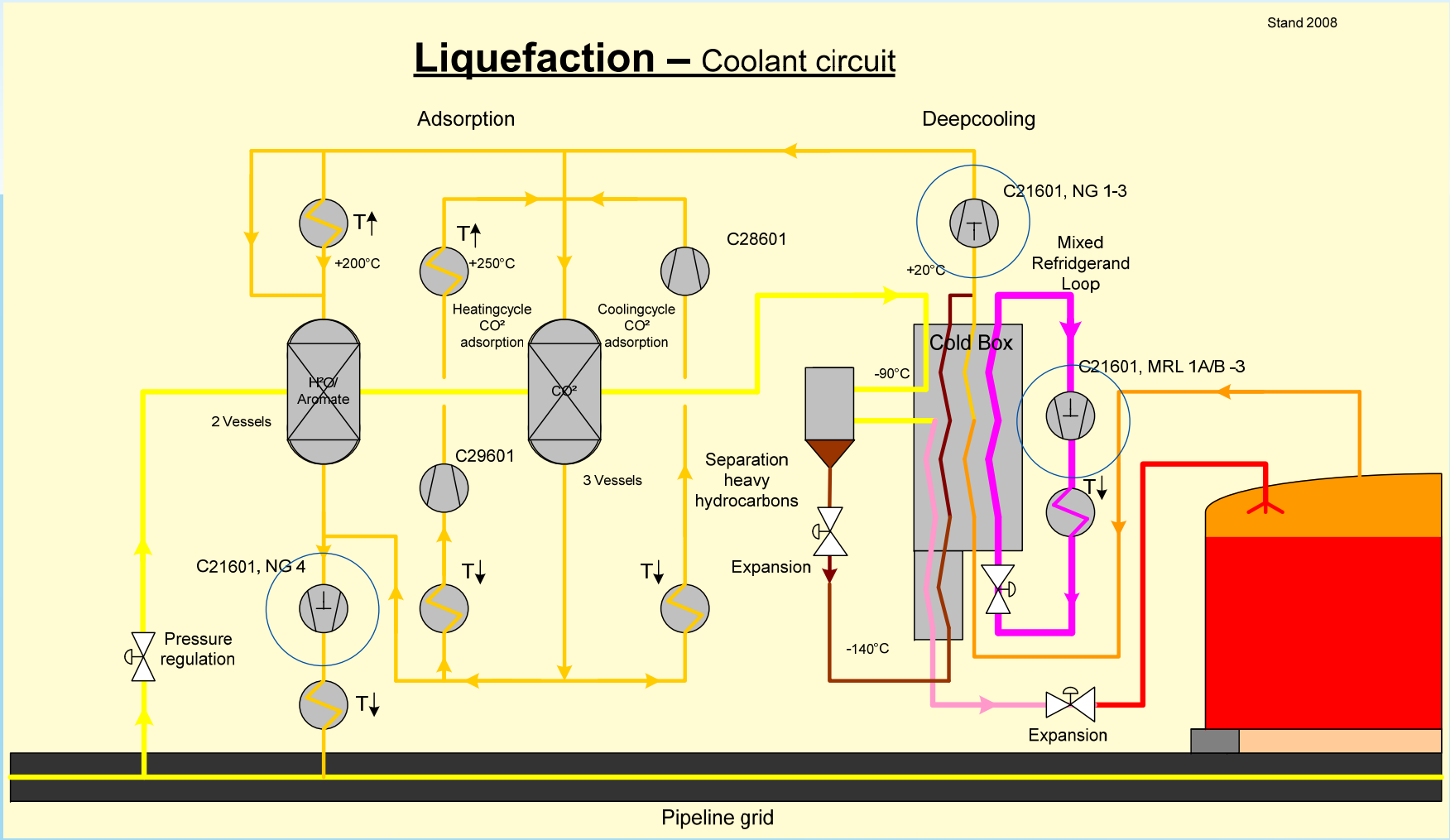

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REG Gas handling >>> compressor C 28/29 – 601

Turbo compressors for
Heating up /cooling within
the REG Gas cycle

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BOG handling >>> compressor C 22601

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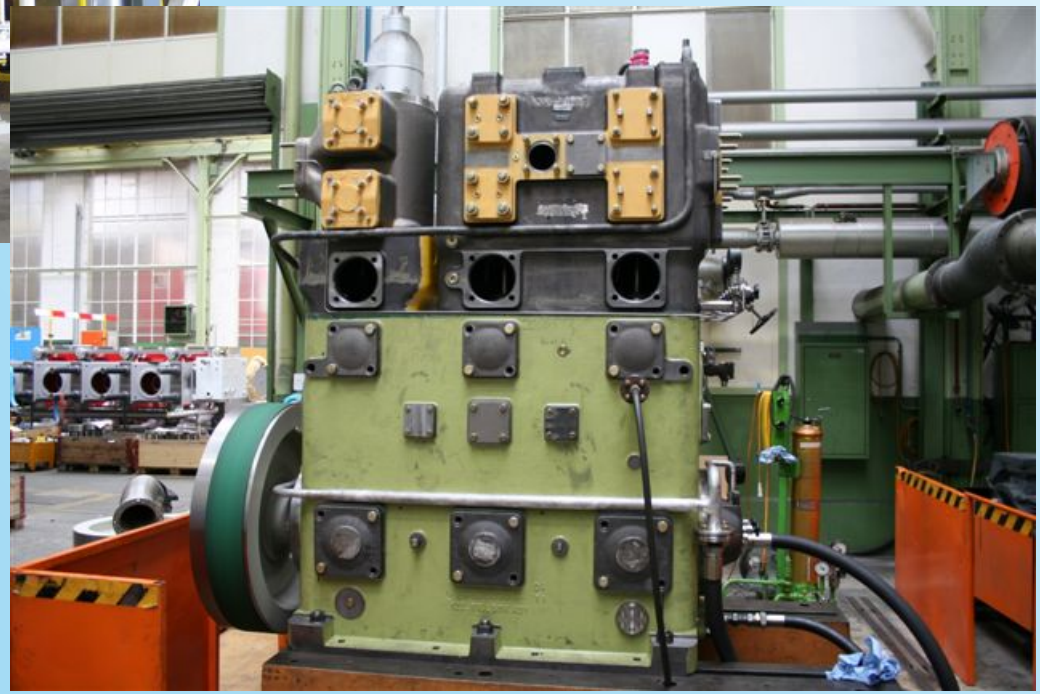
BOG handling >>> compressor C 22601

Mechanical Test run



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Typical compressor in Cavern storage plants

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Compressor C21601

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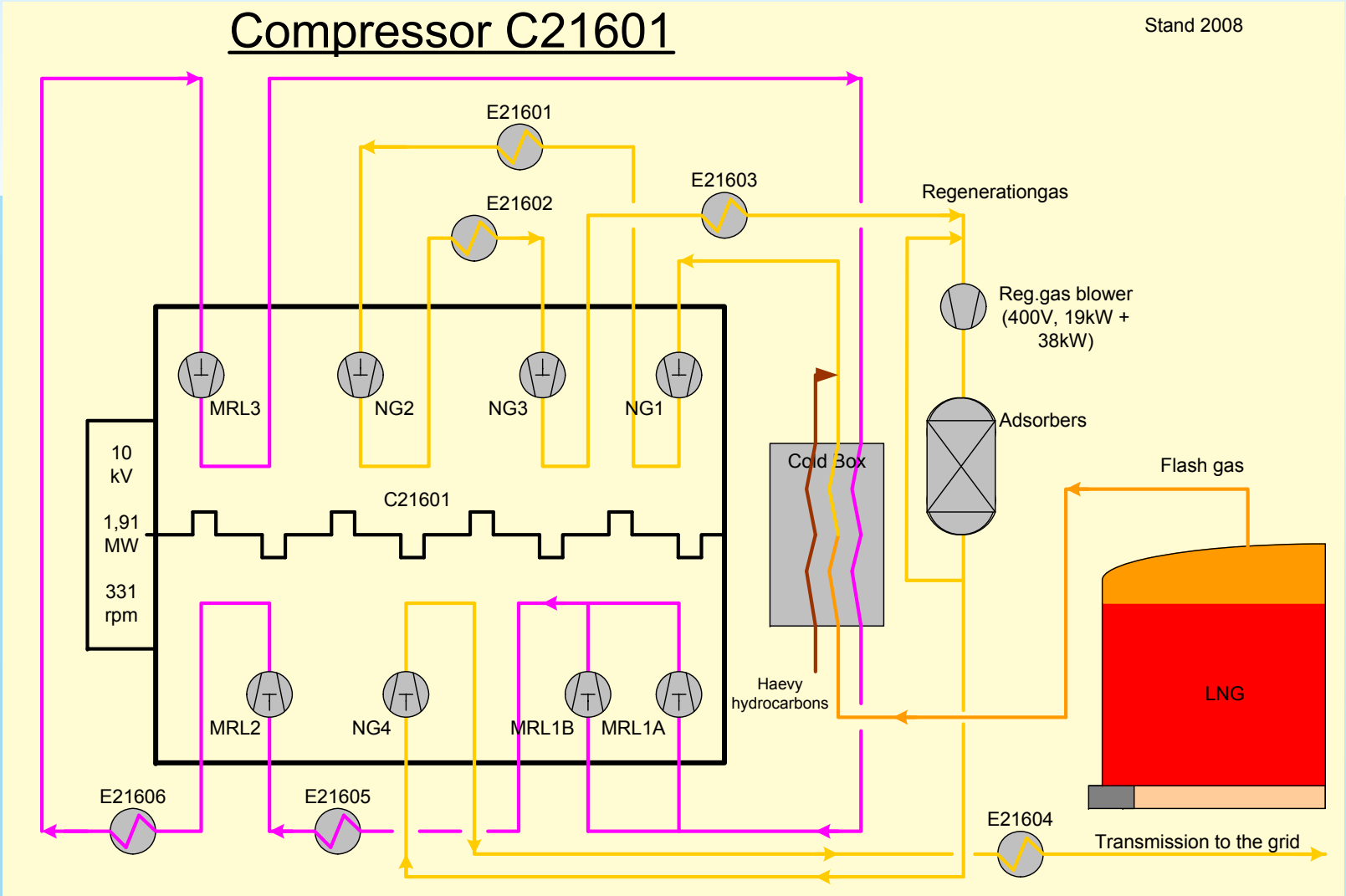

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Compressor C 21601

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Compressor C 21601

Some operation problems and limitations

- ► Control of process
- ► Startup conditions
- ► Trip function/ control of compressor safety features
- ► Control of process at partial load conditions
- ►High risk to damage the compressor

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Solutions/next steps

Solutions to be discussed

- New liquefaction process
- Optimized existing plant arrangement (modify MRL)
- New compressor arrangement

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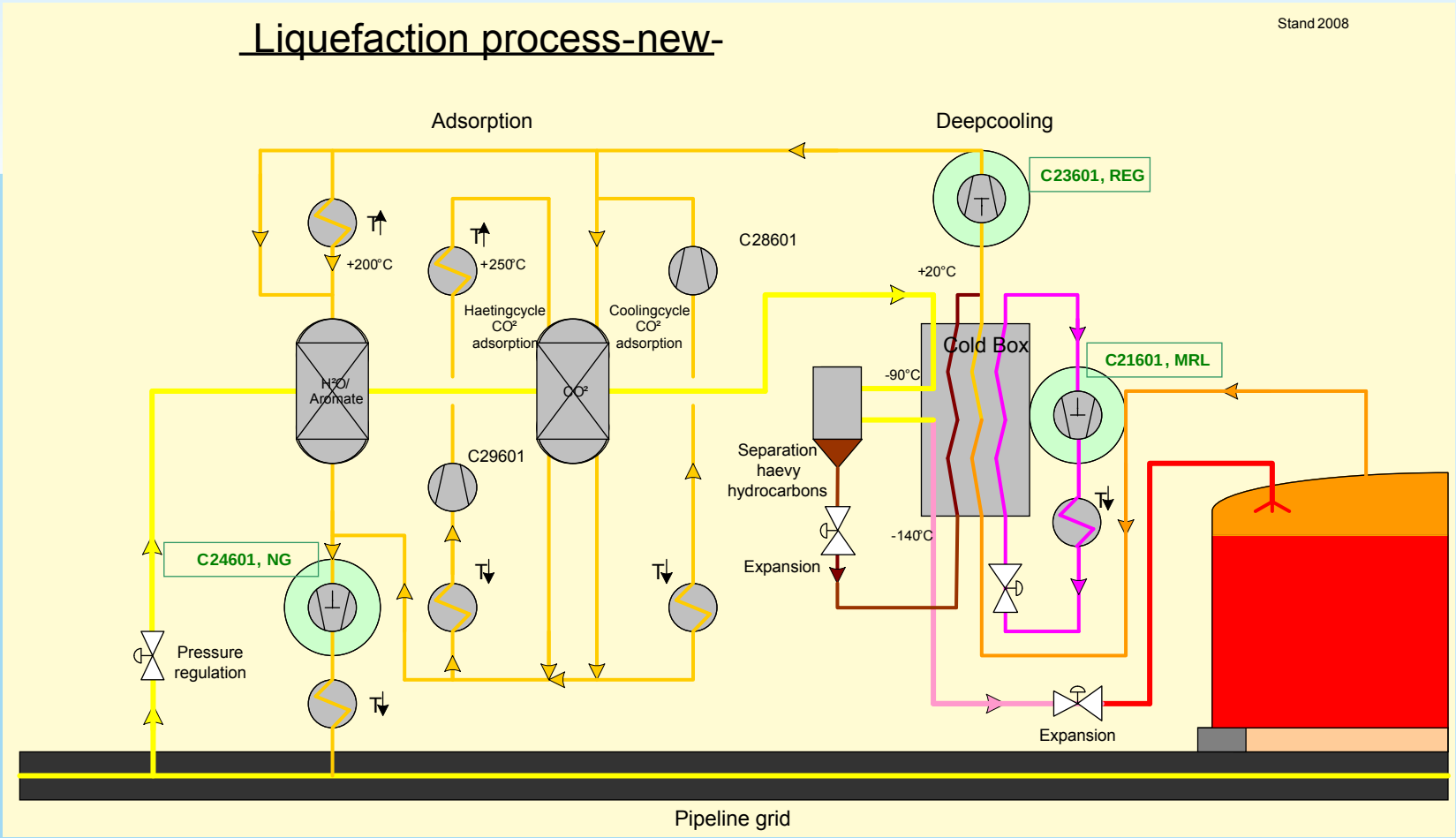

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Conclusions

- ► Existing compressor arrangement is complex but it works
- ► Still possibilities to optimized the existing process
- ► Discuss new compressor arrangements
- ►**Next Step:** Conduct feasibility study to compare CAPEX/OPEX of the alternatives

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Thank you

for your attention !

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