

# 26<sup>th</sup> World Gas Conference

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Innovations in Small to Mid-Scale LNG Plants

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TECHNIP

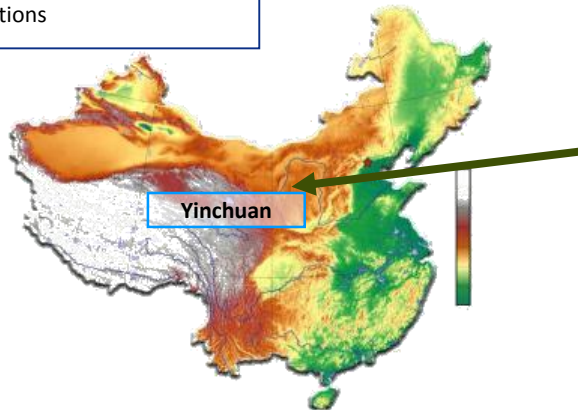


# Innovations in Small to Mid-Scale LNG Plants

## ■ Project presentation

### HANAS LNG

- 2 trains x 0.4 mtpa
- Air Products SMR liquefaction process
- 1 x 50 000m<sup>3</sup> FC tank
- Many innovations



# Innovations in Small to Mid-Scale LNG Plants

## ■ Acknowledgement

- Fei Chen and Christopher Ott, Air Products and Chemicals, Inc.
- Tania Simonetti, Manikandan Narayanan, Technip

**Co-authors of this paper**

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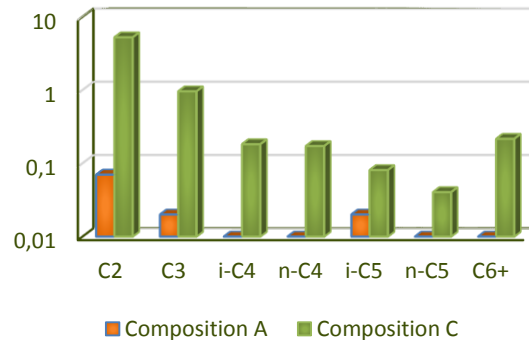
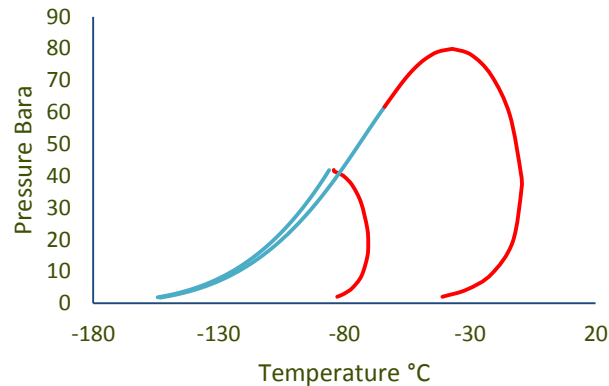
## ■ Project challenges

- Lean feed gas with fluctuating composition
- Highly variable throughput and large turndown
- Electrically driven compressors
- Inland location
- Challenging schedule

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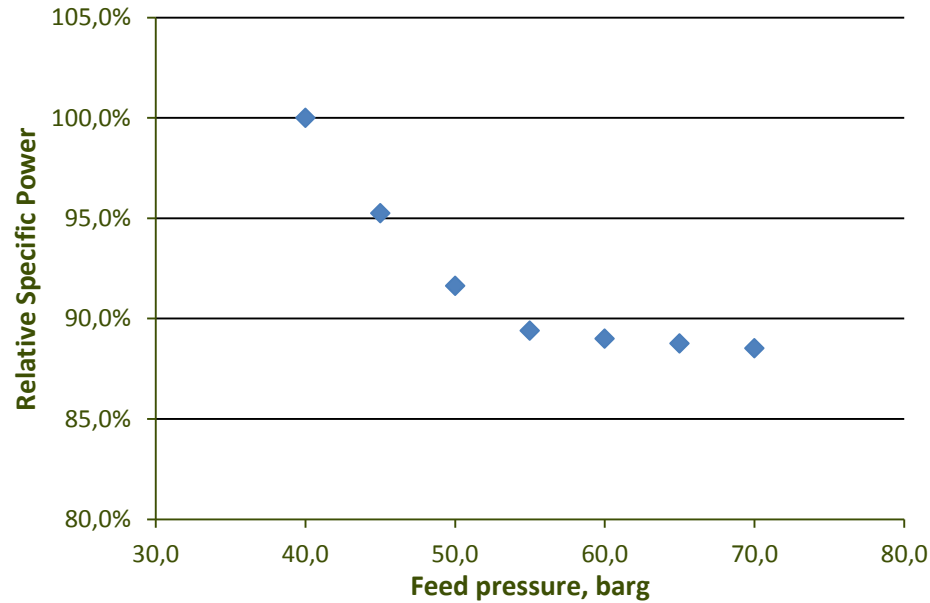
## ■ Feedstock and envelope

%mol	Lean Comp	Rich Comp
N2	0.3	0
C1	99.57	93.1
C2	0.07	5.2
C3	0.02	1.0
i-C4	0	0.18
n-C4	0	0.17
i-C5	0.02	0.08
n-C5	0.01	0.04
C6+	0.01	0.2
Benzene	Trace	400ppm
Toluene	Trace	50ppm
Xylene	Trace	15ppm



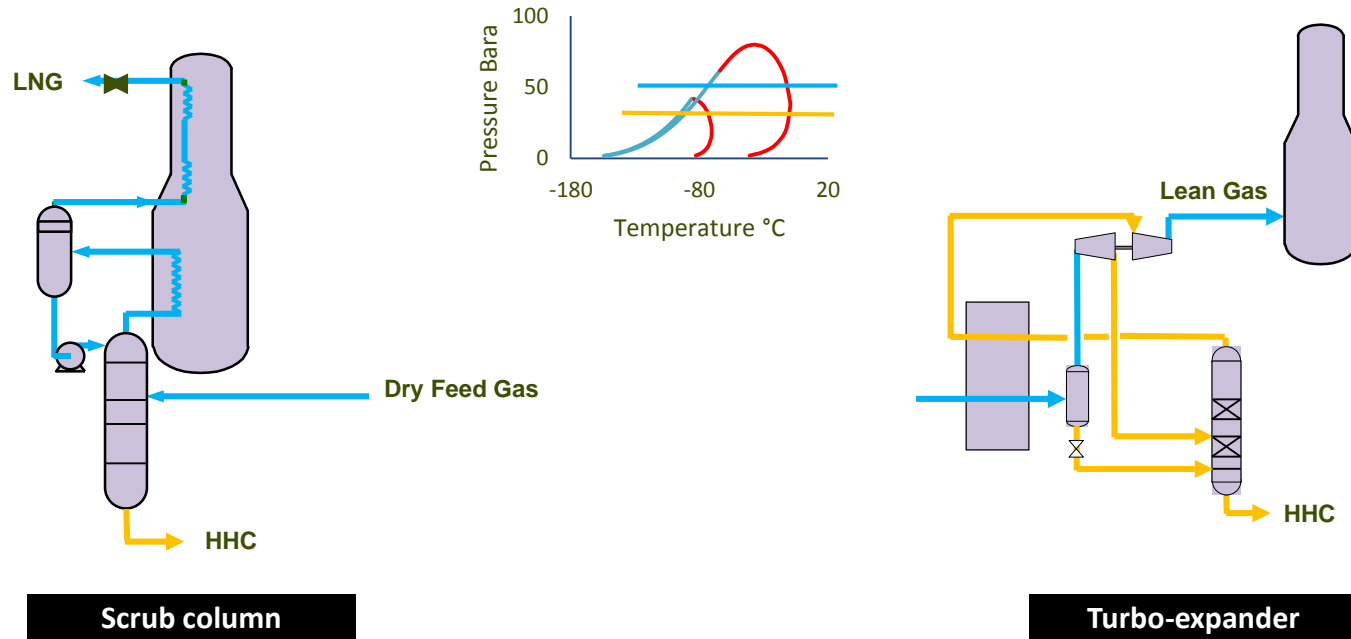
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## ■ Efficiency and pressure



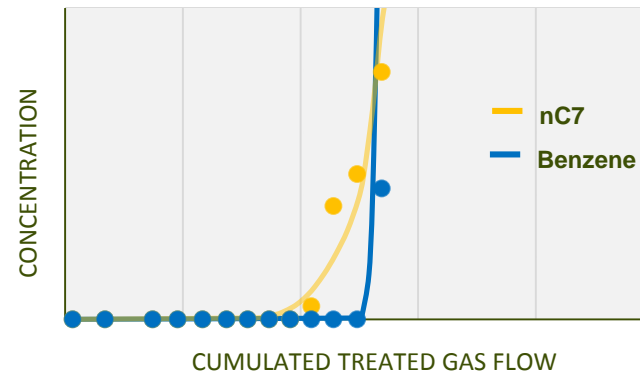
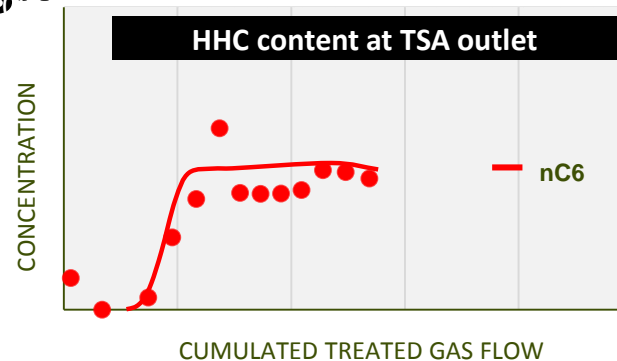
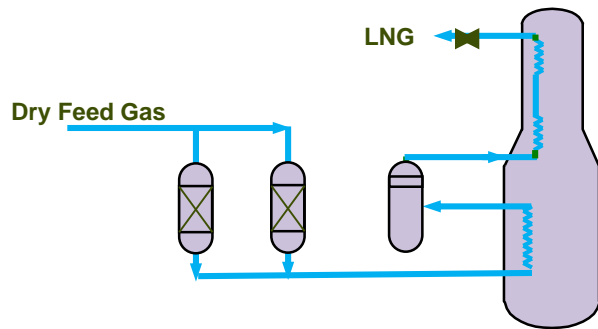
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## ■ Conventional HHC removal processes



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## ■ TSA performance and design





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## ■ Driver selection

- High power draw to start a large electrical motor
- Frequent swings in capacity
- High cost of refrigerants
- Restart from settle-out pressure

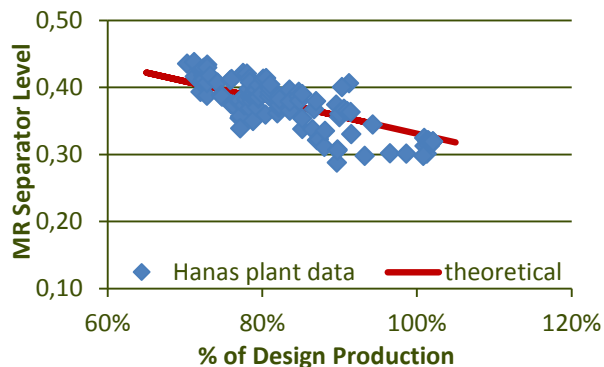
Electronic frequency variation (VFD)

Variable ratio hydraulically coupled gear with fixed speed motor

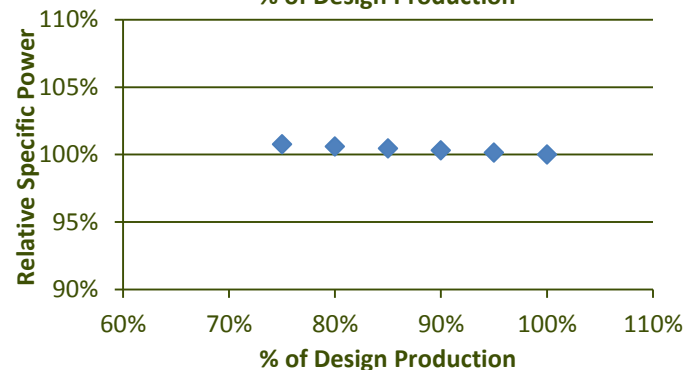
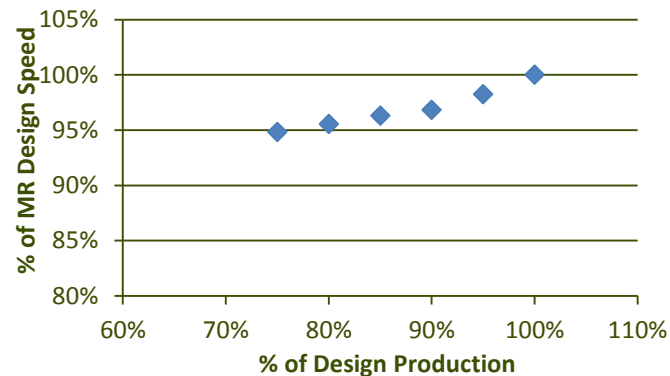


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## ■ Turndown

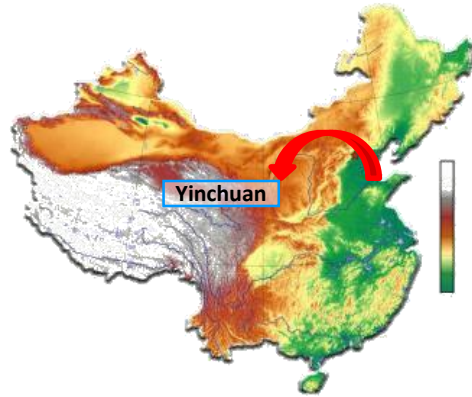


Actual operation from 10% to 100%  
30% turndown without recycling



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- MCHE in 3 bundles



# Innovations in Small to Mid-Scale LNG Plants

## ■ Summary – conclusion

- Mid-size LNG plants raise particular challenges
- Innovative design and solution have been implemented and proved through the HANAS LNG Plant
- Key factor for success was the close collaboration between all parties

Close collaboration and innovation allow Air Products and Technip to deliver a successful, innovative, efficient, and robust plant.

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