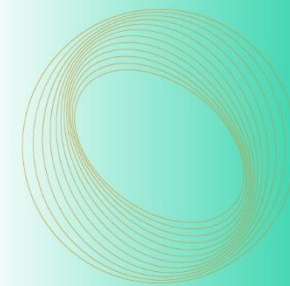




The Business Case Natural Refrigerants



BRUSSELS

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The road to natural refrigerants for a small train operator



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Introduction

- Small operator
- Limited resources, limited knowledge about the subject
- Overview of our road to the phase out of hydrofluorocarbons as refrigerants

History

- First fully airconditioned train into service in 1994
- Greenhouse gasses only considered briefly
- R134a used as refrigerant



First step

- Project for purchasing new intercity trains, 2014, ICNG
- F-gas regulation since 2006 and 2014 to come
- Introduction of requirement about refrigerant:
 - Refrigerant with GWP < 150 shall be offered as an option
- Result of the tender
 - CO₂, HFO mentioned as options
 - No usable offers for alternative refrigerants



Second step

- Next project for purchasing new double decker regional trains, 2020
- Update of the requirement about refrigerant:
 - Refrigerant shall be R744 or R729
- After consultation rounds:
 - Refrigerant shall be R744 or R729, R290 or R513a
 - Natural refrigerant as a rewarding criterium in the tender
- Result:
 - All suppliers offered R290



Second step, the results

- Cabin unit: cooling 6,5 kW
- Single deck unit: cooling 39,5 kW, heatpump 16,5 kW
- Double deck unit: cooling 29,5 kW, heatpump 22,5 kW



Third step

- Next project for purchasing new regional trains, 2024
- Update of requirement about refrigerant
 - Refrigerant shall be R290
- Result: no problem



Future

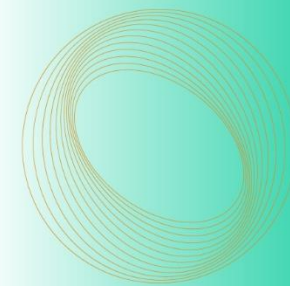
- Prepare the maintenance organization for working with propane
- Creation of an EN standard for flammable refrigerants, based on the DIN standard (CEN/TC 256/WG 8)

Conclusions

- F-gasses regulation helped us to start the transition towards natural refrigerants
- Introducing requirement about the refrigerant and a reward for the use of a natural refrigerant also helped
- Shift was pretty smooth, thanks to bigger players like DB who took the lead in the transition



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Thank you
for listening
Any questions?



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