

CO₂ cooling at Roskilde Festival

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INTRODUCTION

Cooling takes a lot of energy. It's particularly interesting at Roskilde Festival where all the cooling systems are spread across the festival site. It's one of Roskilde Festival's biggest energy consumers and therefore a huge CO₂ emitter. There lies a great potential in creating a sustainable, climate-friendly cooling system to events like Roskilde Festival. The idea of creating a sustainable cooling system will not only reduce the emission of CO₂ but hopefully also have a long-term effect on the new standards concerning sustainable and climate-friendly cooling at bigger and temporary events.

We want to set up a model of a cooling system with CO₂ as refrigerant and compare it with the existing cooling containers/refrigerators based on other refrigerants. We want to use data from Mærsk Container Industries A/S and compare the energy efficiency of a regular cooling container and a cooling container running on CO₂. With the research from Mærsk Container Industries A/S and our further studies, we want to analyse whether or not it would be a good idea, energetically speaking, to switch to cooling containers running on CO₂.

APPROACH

More precisely, we want to set up detailed thermodynamic models for cooling systems based on the refrigerant R134a.

These models include calculations of the energy consumption and waste heat. We want to estimate a detailed thermodynamic model when CO₂ is the refrigerant, based on the result from R134a as refrigerant. The results would then be compared to Mærsk Container Industries A/S's cooling containers that are based on CO₂. We want to use the collected data about variations in temperature, waste heat and energy consumption from Mærsk Container Industries A/S and DTU, to make an assumption, whether or not it would be economically and environmentally profitable for Roskilde Festival to invest in CO₂ cooling containers.

EXPECTATIONS

We expect that CO₂-cooling have an advantage compared to normal cooling systems, environmentally speaking. We have no idea to what extend this advantage would be though. It's proven to be both environmentally an economically sustainable to switch to CO₂-cooling at the Netto corporation in Denmark. We could imagine ourselves using some of their experience in our work analysis.