Large and High Power Cylindrical Batteries – Analysis of the Battery Packs Temperature Distributions Using COMSOL Multiphysics® and MATLAB® Simulation Softwares

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1. Introduction:

- A **good cooling** inside a battery pack is important to **avoid safety issues** and to avoid the development of **too large internal temperature gradients**.
- The **temperature distribution** inside two battery **packs** (in-line and staggered) made of **large cylindrical lithium iron phosphate cells** is analysed

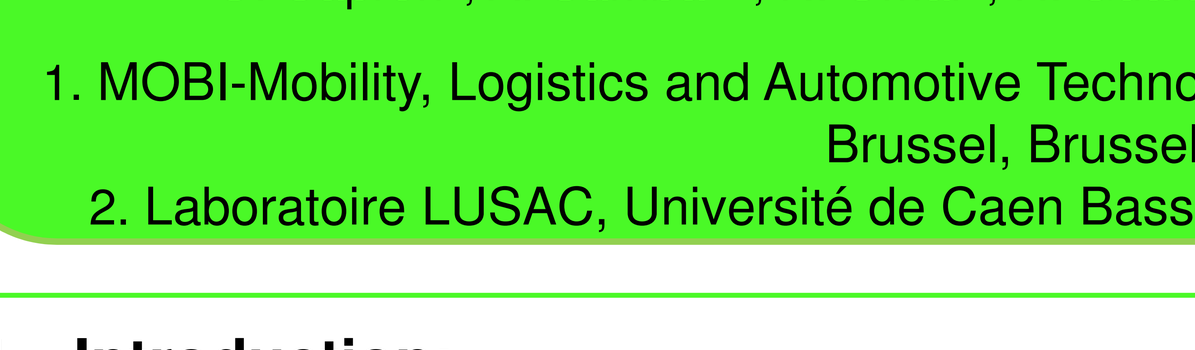
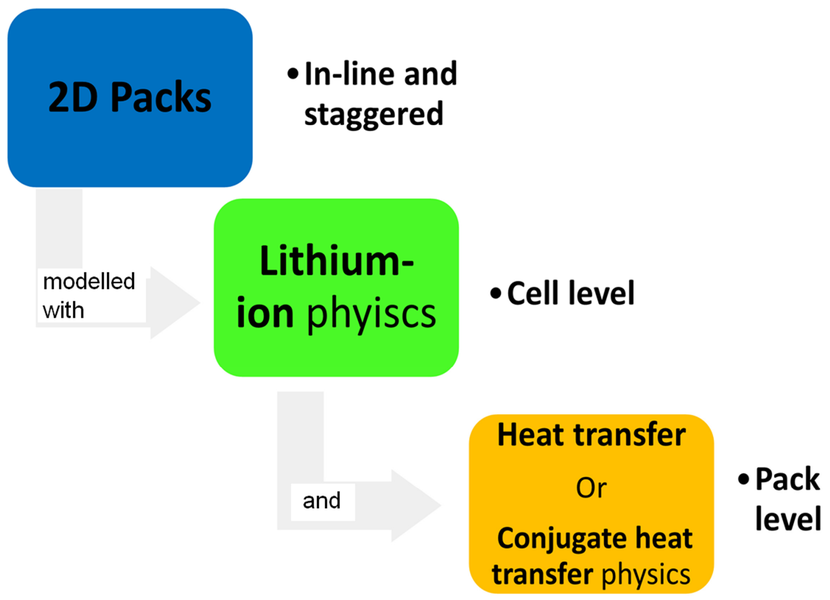
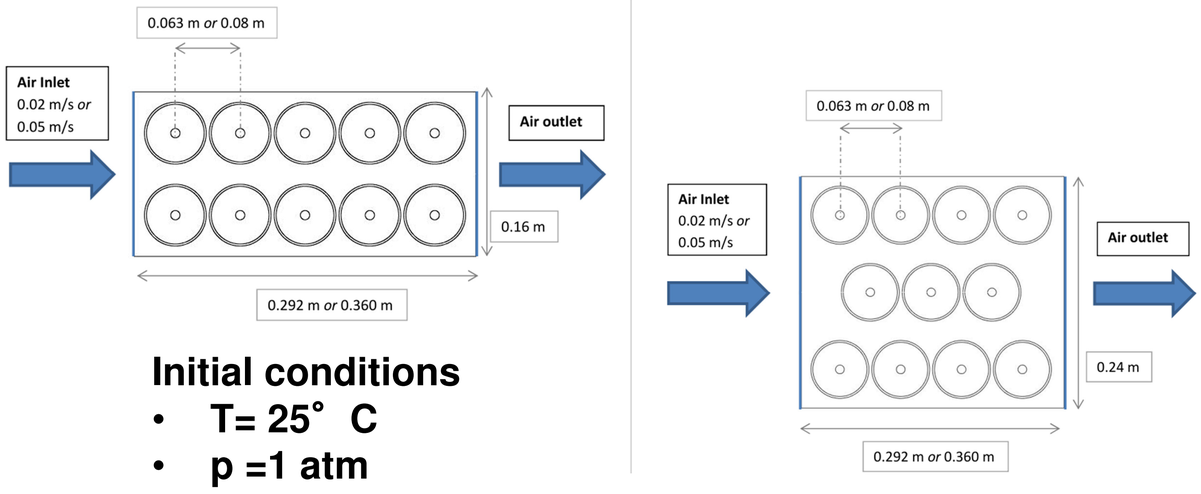


Figure 1. **In-line (left)** and **staggered (right)** packs temperature distribution **without cooling after 610s**

2. Computational Methods:



3. Geometries:



Initial conditions

- **T= 25° C**
- **p =1 atm**

4. Results:

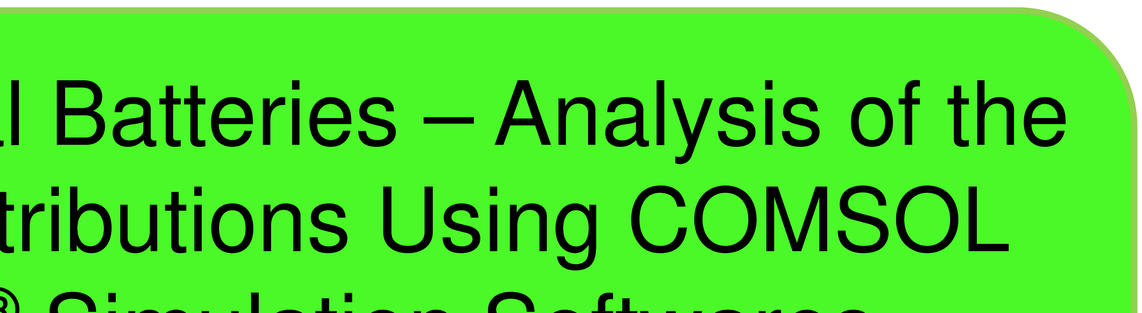


Figure 2. Velocity Fields *v =0.02 m/s ; d= 0.063 m*

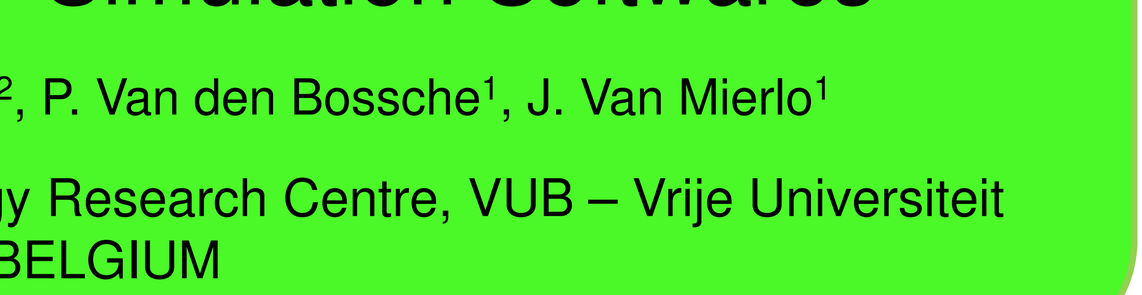


Figure 3. Temperature distribution *v= 0.02 m/s; d= 0.063 m*

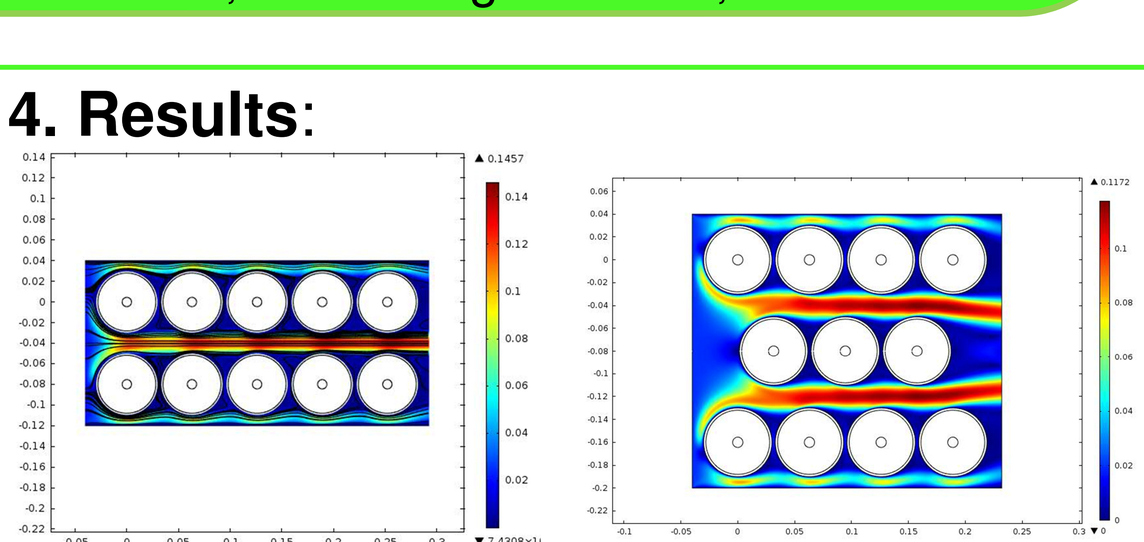


Figure 4. Temperature distribution *v= 0.05 m/s; d= 0.063 m*

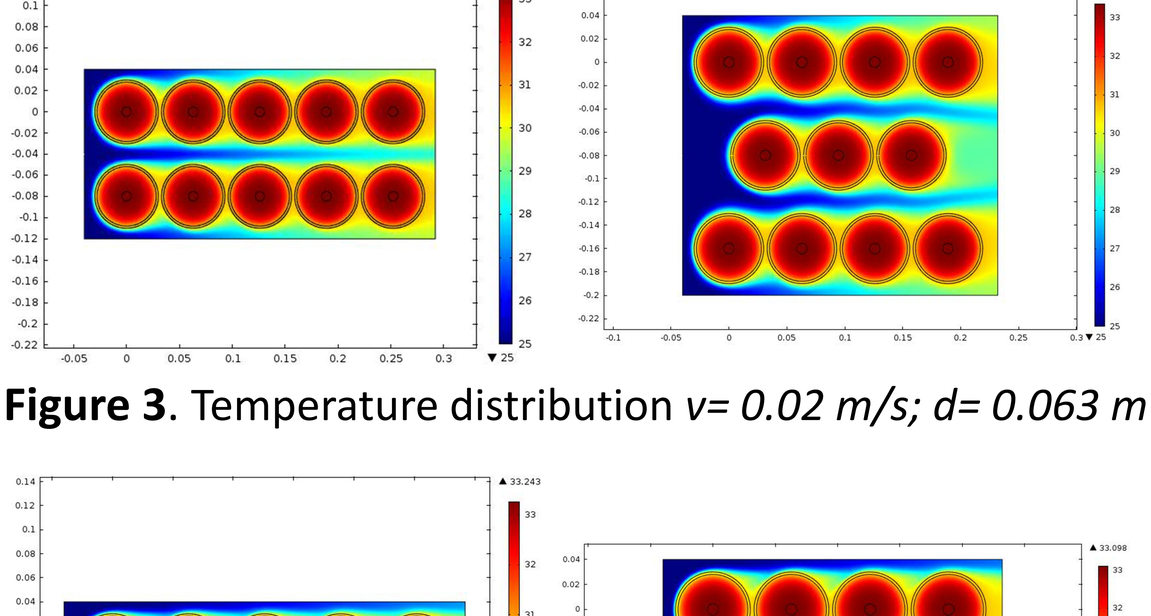


Figure 5. Temperature distribution *v= 0.05 m/s; d= 0.063 m*

5. Conclusions:

- *Improved cooling* of the cells at the rear of the pack for *high inlet air velocity* values
- The *cells internal regions* show the *highest temperature* values inside both packs

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