

Ventilation System of a Microwave Assisted Drying Kiln

Adrian-Gabriel Ghiaus¹, Marian-Andrei Istrate¹, Andrei-Mugur Georgescu¹
1. Technical University of Civil Engineering Bucharest, bd. Pache Protopopescu nr.66
021414 Bucuresti, Sector 2, ROMANIA

Introduction: For most hardwood users, lumber drying is an essential manufacturing process which could increase the production costs, could degrade the material quality and wastes the energy by improper application of drying techniques. The improvement and optimization of air distribution systems in drying kilns contribute to the preservation of the wood quality.

Computational Methods: The drying unit consists of a two-meter side cube kiln chamber inside which there are four recirculation fans having 250mm diameter. The simulation is performed with Comsol Multiphysics using k- ϵ turbulent model and the Navier-Stokes equation in steady-state regime.

Results: The present study reports on the analysis and optimization of a four-pallet stack arrangement inside the drying lumber kiln working with two recirculation fans. The performance of the air flow field is examined in different situations and configurations, with stack in the middle or in the corners. Except from the first analyzed case, where the two fans are working in diagonal, in all the others, the two fans at the bottom part are working.

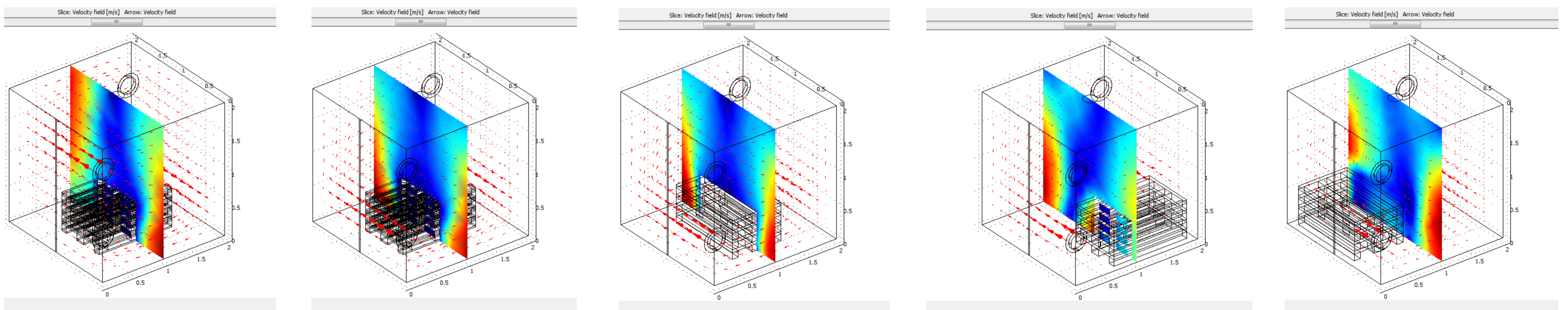


Figure 1. Vectors and contour of velocity distribution

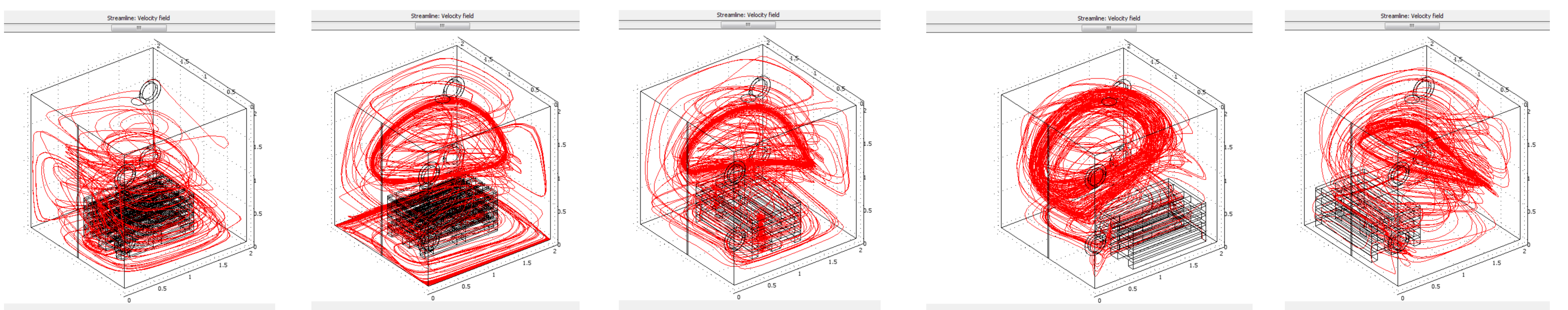


Figure 2. Path lines for the analyzed cases

Conclusions: The results highlight the presence of recirculation regions and the distribution of the air. More complex kiln geometries were simulated and the result analysis and interpretation indicated the best solutions for design purpose.

References:

1. Ghiaus A., Istrate M., Georgescu A., Air Flow Characteristics inside an Industrial Wood Pallet Drying Kiln, Comsol Conference, Paris (2010)
2. Margaris D., Ghiaus A. Dried products quality improvement by air flow manipulation in tray dryers, J. of Food Eng., 542-550 (2006)