Design and construction of a batch oven for investigation of industrial continuous baking processes - DTU Orbit (28/01/2019)

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A new batch oven has been constructed to mimic industrial convection tunnel ovens for research and development of continuous baking processes. The process parameters (air flow, air temperature, air humidity, height of baking area and the baking band velocity) are therefore highly controllable and adjustable over a wide range of settings. It is possible to monitor the product weight and temperature continuously during baking. The simultaneous measuring of mass and a window allowing for visual (e.g., by video recording) control is unique for this experimental batch oven. Two validation steps have been carried out. The uniformity of heating in the oven was assessed by measurements of local heat transfer coefficients and confirmed by baking tests. The methods showed that the oven is able to heat and bake uniformly across the baking area. Hereafter, the oven was validated against a commercial 10-m tunnel oven, with a butter cookie as the test product. The investigated quality parameters for the butter cookies were mass loss and surface browning, where the uniformity of browning was evaluated subjectively against a scale of standards and objectively by L* value measurements. Good reproducibility of the baking was documented over a range of temperatures (160°C to 190°C).

Practical Applications

The purpose of this paper is to describe a new specially designed pilot scale batch oven. The batch oven is designed and constructed to imitate the baking processes in continuous tunnel ovens with forced convection. Experimental work in the new batch oven will increase knowledge of how the environment and baking conditions influence the quality of bakery products in continuous tunnel ovens. © 2013 Wiley Periodicals, Inc.