

MODEL BASED ESTIMATION OF BIOLOGICAL HEAT GENERATION DURING COLD-CHAIN TRANSPORT AND PROCESSING

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ABSTRACT

Biological processes continue after harvest in most of the fresh fruits. The generated heat, created by such climacteric fruits, must be removed by a cooling unit, but the amount of heat is also a valuable indicator for the current state of the product. In this paper we will present an approach, how the generated heat can be estimated from the measured temperature over time curve as additional – time varying – process state by the recursive and computational efficient algorithm of the Kalman filter. The application of the Kalman filter required a special adaptation. The parameter for heat removal has to be estimated by system identification techniques in the first step. The resulting time-continuous model has to be translated to a discrete state-space description of the process. Noise covariance matrices had to be defined. The required algorithm was implemented as JAVA code on a processing unit mounted directly in our prototype ‘Intelligent Container’. In an application example we showed how the ripening process of bananas can be supervised by the suggested system.