Universitatea *Transilvania* din Braşov

HABILITATION THESIS

SUMMARY

Contributions to industrial processing optimisation of food products

Domain: Engineering and Management

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ABSTRACT

Habilitation thesis summarizes the research and results of the candidate after obtaining the PhD title from Transilvania University of Brasov, confirmed by the PhD diploma no. 1062 from 12 September 2001.

Habilitation thesis, divided into 4 chapters, presents briefly the main results obtained by the author after sequel research undertaken in the PhD thesis in the field of industrial processing of agricultural and food products.

The first chapter presents contributions to optimization of dryers for grains and technical plants.

Drying is one of the most important industrial operations from food industry, with important energy consumptions. Over 40% of the consumed energy in food processing, from the agri-food area is caused, in one way or another by water removal operations from products. The complexity of simultaneous mass and heat transfer phenomena is very important, and has the purpose, in the agri-food area, to reduce the moisture content to a level where microbiological activity becomes negligible.

The opportunity of this aproach is also given by the very high variability of raw materals characteristics (variety, region of origin, climatic conditions, etc.) as well as the environmental disturbance (humidity, temperature). These elements have considerable influence on the final quality of the product and, as a case study it is presented the preservation of grain seeds germination capacity.

Special tehnical control solutions and different control strategies of drying processes are presented further in chapter 3.

The second chapter presents a few contributions about modelling of processing and production system in agrifood area. Are used specific software aplications for drying simulation of granular products with dimensions between 3...6mm (typical for grain dryers or other technical plants) or powdery type having dimensions of micron order. Underlying these simulations, are conclusions established during PhD work, in which were used other modeling techniques such as finite element analysis of heat transfer and fluid mechanics phenomena.

Another issue addressed in this area is modeling of environment - economy systems in terms of eco-emergy. The model developed in LabVIEW environment provides important information’s related to the sustainability of a medium size system, livestock farm type from Brasov area.

The third chapter approaches the conservation problems of physical and biochemical characteristics of products during processing. Thus, are presented some modern control methods and techniques of food products quality by using video camera with visible and infrared spectrum.

There are defined new control quality indicators of products during drying, by real time image analyses with dedicated software applications. A special application, jointly developed with HTWG Konstanz Germany, enable different drying approaches, having as reference either the drying agent temperature, either surface product temperature, all measured by usig infrared techniques. The second strategie reduces drying time with 40-50 %, and was applied to different agricultural products like apple, banana, carrots. The final goal of this researches is the design of reliable and cheep equipment, in order to controll the quality of industrial processes from agri-food area.

At the end of the third chapter are presented results of researches regarding the content of C vitamin after subcritical extraction at temperatures between 200...300 K and presure between 400... 600 Mpa.

The last chapter, the fourth, presents results of research activity and specific skills and future directions of professional development. All the original contributions are presented in the context of the current state of scientific research in the field.

The research-development activity of the candidate evolves throughout his professional career (1996-2015) is impresive, matherialised by: 11 speciality books (single author at 3 of them, first author at 2); - 156 scientific articles presented at national and international conferences and/or published in speciality journals, from which: - 5 articles published in ISI Thomson Reuters journals; - 5 articles published in journal and conference volumes indexed ISI Thomson Reuters; 65 – articles published in journals and volumes of scientific events indexed in other scientific international data bases; - 57 articles published in B+ journals and/or presented at prestigious international conferences; - 1 international grant as project Director; - 3 national grants as project Director; 2 – international grants as member in research team; - 9 national projects as member in research team;

Also the candidate has coordinated over 100 BSC projects and over 30 MSC thesis. From 1996 until present, in the frame of Department for Mashinery for Agriculture and Food Industry and after in the frame of Department of Engineering and Management in Food and Tourism, the candidate was responsable of the following disciplines: Advanced Informatic Systems in Eco-Biotechnology; Computer aided design – Modelling and Simulation; Instalations and Equipments for Preservation of Vegetal Origin Products.

An important moment of University career of candidate was obtaining of the Associated Professor title in 2007. This confirmed the achievment of necessary level of experience for the next step, that of to coordinate a research team and PhD thesis. In the next period, until present the candidate has conducted an intense research activity, together with younger colleagues and PhD students from Department of Engineering and Management in Food and Tourism.

University career development also focuses on two main areas of research and teaching, ways that complement and reinforce each other.

Developing an educational activity is based on a constant concern for improving teaching methods, student involvement in educational activities, update information of courses using resources from both national and international sources.

Development of research activity is following 3 fundamental objectives:

a. Research enhancement in the frame of international team and development of new conexion, both with West and East Universitys;

b. Participation to international and national scientific events, for publication and dissemination of research result;

c. Involving a higher number of graduated young students in research activities as PhD's and postdoctoral, from Romania and abroad.

A more detailed description of each topic can be found in section (b-ii): Scientific, professional and academic development plans.