

PART I.

ABSTRACT OF SELECTED PAPERS

COMPLEX COMPARISON OF TRACTOR TRANSMISSION SYSTEMS BETWEEN CONTINUOUSLY VARIABLE TRANSMISSION AND POWERSHIFT TRANSMISSION

Zs. Kassai – M. Szente

Non-profit Co. of the MGI for Quality Testing, Gödöllő

The main exercises are to ensure maximum power (i.e. cultivated area, transporting power) and agro technical and optimal working speed at tractor-implement aggregate operation.

Significant points are minimizing of costs and specific fuel consumption. This needs to ensure harmonized connection between the tractor engine and characteristics of transmission system at working points on field.

Application of gear ratio of continuous variable transmission and their centralized control together gives several advantages for the agriculture. For that reason we measured more tractor transmission systems for operating advantage in last years.

The result of quick and accurate computer programming is perfect corresponding between engine and Continuously Variable Transmission system. It is absolute conform together the engine speed and gear ratio to situation, travel speed and load. In this way achievable the followings: optimal fuel consumption, minimal exhaust, economical and designable operation.

NEW METHODS OF FRUIT TREE SPRAYING

Gy. Dimitrievits¹ – Z. Gulyás¹ – L. Kovács¹ – P. Sallai²

¹ Hungarian Institute of Agricultural Engineering, Gödöllő

² Pomological Research and Consulting Non-Profit Company, Újfehértó

During the examinations, besides the spraying machines equipped with axial ventilators, the standard KERTITOX BORA 2000 and the KERTITOX BORA 1000 for intensive plantations, we studied the KERTITOX 600 spraying machine, as well, which is equipped with a linear spraying structure and a axial ventilator. We also examined the KERTITOX BORA 2000 plant detector spraying machine with infra red and ultra sound systems. The range of the coverage on both sides of the leaves was the lowest in the case of the standard KERTITOX BORA 2000, where the achieved values of 1,1-1,9, compared to other examined machines, are quite good results. In the case of the linear KERTITOX BORA 1000 machine the range 1,4-2,6 can also be considered good. The low air capacity KERTITOX 600 machine's result 1,6-2,8 can also be acceptable considering the fact that the spraying in the next row significantly decreases the ratio of coverage on both sides of the leaves. By applying the infra red plant detector device we had a spray solution saving of 28,1-55,3%. By applying the ultra sound plant detector device, the spray solution saving altered between 49,8 and 68,4%.

EFFECT OF THE DRYING PROCESS ON THE CHARACTERISTICS OF THE CORN BATCHES

J. Csermely – M. Herdovics – A. Csátár

Hungarian Institute of Agricultural Engineering, Gödöllő

Object of the OTKA (T 037-214) assisted researches are to determine the aggregation characteristics of the corn in the course of drying. Examinations are carrying on with three selected varieties of corn under laboratory and operative circumstances. Examinations contain among others the analysis of the bulk mass and density depending on the moisture content and the shrinkage of grain by the effect of moisture abstraction. The examinations covered the determination of the compressive stress connecting with the humidity, specific compression strain, elastic modulus and pressure work.

DEVELOPMENT OF LEAKAGE CONTROLLED FLOW DIVERSION SAFETY VALVE

E. Forgács – J. Csanádi – C. Hodúr – G. Szabó

Faculty of Food Engineering, University of Szeged

The strict instructions for heat-treating of raw milk are contained in Codex Alimentarius Hungaricus, 92/46, 92/380 EU Directives and 1/2003 (I.08) FVM-ESzCsM decree. Most of the applied equipments for heat-treating of raw milk have no flow direction valve, which should guarantee the heat-treating of milk by directives in all cases.

The goal of the project: to develop a safety flow-diversion valve for small and medium dairy firms in order these firms will be able to satisfy the EU directions, in this way, their products can take part in the Eu dairy market as well

Developed flow-diversion valve fitted small pipe diameter has double valve seat and leakage system.

The main advantage of developed valve is the follows: the raw milk or failure heat-treated milk doesn't able to flow into the regenerative sections of equipment in the case of the failure of gaskets, even more it shows the gasket failure with leakage.

Using equipments with developed valve cancel a main critical point from the Quality Management System. Innovated valve is quickly installable with standard binder items.

The flow-diversion safety valve, which was developed by Zootechnika Ltd. and University of Szeged, sponsored by EU and Hungarian National Program GVOP 3.1.1-2004-05-0275/3.0. has a Qualification from Bundesanstalt für Milchwissenschaften Institut Kiel n:KI-S 5/04.

MICROWAVE TREATMENTS OF LIQUID FOOD

J. Kiss – P. Sembery

Szent István University, Gödöllő

The accession of Hungary to the European Union launched a lot of important development in the food industry. The growing market did not only result in the expansion of supply and the appearance of new products but it also created intense competition. Food quality and safety have become more significant in primary food processing. Meeting the requirements of both quality and safety is a very important step to the success in the EU. The application of microwave energy in preservation processes – for example in the pasteurization of liquid food products – may provide a great tool to meet those requirements. Significant improvement may be achieved by the innovation of traditional methods and by making use of the advantages (internal heat production, quickness) that microwave technology may provide.

This paper focuses on introducing the possible use of microwave energy in pasteurization processes (implementation, etc.). It also concentrates on looking for the opportunities to reduce costs of operation and to improve the quality and the safety of food.

Keywords: microwave, pasteurization, temperature, food quality

DETERMINATION OF THERMAL PARAMETERS UNDER INDUSTRIAL CONDITIONS

F. Eszes – R. Rajkó – G. Szabó

Faculty of Food Engineering, University of Szeged

The measurement and evaluation of industrial heat penetration curves can help at CAD design of heat transfer because the thermal parameters (e.g. thermal diffusivity) can be determined from it. We investigated the heat treatment of meat products with the Ball method, finite series solution of Fourier differential equation, calculation of thermal parameters from chemical composition and using robust regression. The obtained results were compared with calculation of finite difference

method taking into account the temperature dependence of thermal diffusivity. In the course of our investigation we experienced that using robust regression reduced the standard deviation of determination. So the overestimation can be avoided. Although the Ball method using more simplification presumptions is more robust than the infinite series solution, the role of the measurement errors can be hardly cleared out. The initial and boundary conditions and the placement error of temperature sensor influence the value of thermal diffusivity. Its fluctuation caused rather by the temperature development than by the convection and denaturation. The assumption of the infinite large surface heat transfer coefficient resulted often unrealistic large thermal diffusivity values. The thermal diffusivity values deriving from methods dealing with the thermal diffusivities as constant and from chemical composition taking into account the average temperature of the process were close together. The temperature curves calculated with finite difference method taking into account the temperature dependence of thermal diffusivity proved the acceptability of the obtained results.

GEOMETRIC AND AGRO-PHYSICAL CHARACTERISTICS OF WINTER WHEAT VARIETIES

E. Gyimes – A. Véha
Faculty of Food Engineering, University of Szeged

This study presents the results of the authors' investigations into winter wheat varieties in the years 2000 - 2002. They tested the values of kernel size, kernel and mass density, porosity and also how kernel hardness changes in kernel hardness. Kernel size is noticeably influenced by the year the crop is harvested in, the main contributor being precipitation, first of all. Kernel hardness values reveal a similar tendency.

It was established that kernel hardness is related to several agro-physical characteristics. Investigations suggest that the inverse proportion between hectolitre weight and porosity is greatly influenced by the quality of endosperm texture, i.e. kernel hardness.

EFFECT OF SAMPLE SHAPE AND SIZE ON MEASURED IMPEDANCE SPECTRUM

E. Vozáry – P. Mészáros
Budapest Corvinus University, Faculty of Food Science,
Department of Physics and Control

Magnitude and phase angle of electrical impedance of apple and potato samples with different shape and size were measured with an HP 4284A precision RLC meter in frequency range of 30 Hz – 1 MHz. The length of gold plated copper electrode pins was 5 mm. The measurements were performed with different electrode distances. A correction for the electrode polarization was calculated and the impedance of biological tissues was evaluated. The value of phase angle was practical independent from the size and shape of sample and the magnitude of impedance increased as the size of sample decreased.

DRYING CHARACTERISTICS OF DIFFERENT VEGETABLES

K. Kacz K. – A.J. Kovács – Zs. Stépán Zs. – M. Neményi
University of West Hungary, Faculty of Agricultural and Food Sciences, Institute for Biosystems Engineering, Mosonmagyaróvár

Drying characteristics of different vegetables have been examined at the Institute for Biosystems Engineering for four years. Thin layer drying experiments were conducted based on a National R&D Program. Our aim was to model the drying

inside belt driers in practice. Drying curves were determined in order to describe the heat and mass transport processes. The moisture gradients as driving force can be calculated from these equations. Our aim is to use water potential gradients instead of moisture gradients in modeling of mass transfer. In order to do this, sorption measurements were carried out in carrots. From the sorption curves water potential and pF values can be determined. Based on these examinations the heat and mass transport modeling was established.

DYNAMIC AND STATIC METHODS OF KERNEL HARDNESS MEASUREMENT

A. Véha – E. Gyimes – B. Szabó P.
Faculty of Food Engineering, University of Szeged

In the last few decades the interest in the commercial classification of wheat varieties has increased significantly making the need for dividing kernels into hard and soft ones based on their kernel texture even greater. In our investigation we used two dynamic methods (Perten SKCS 4100 measuring device and Perten 3303 disk-type mill) and a quasi static method (LLOYD 1000 R testing machine) to measure kernel hardness. Our objective is to compare and critically analyse these three methods.

Our results suggest that all three methods are suitable for determining wheat kernel hardness. The static measuring method is a far more precise way of determining the kernel hardness of the same varieties harvested in different years. Besides, the results we received are far more informative. Dynamic methods, on the other hand, are quicker and show more resemblance to the milling processes.

OPTIMAL FREQUENCIES OF INERTIA TYPE FRUIT TREE SHAKERS

(Sponsored by the Hungarian Scientific Research Fund)
Láng Z.

Technical Department, Corvinus University, Budapest

Optimal shaking frequency can be defined in many ways. In this paper optimal shaking frequency means shaking the tree at one of its natural frequencies, whereby the efficiency of the power input is the highest.

ENERGY ASPECTS OF WIND MEASUREMENTS IN HUNGARY

N. Schrempf – G. Tóth – L. Tóth
Szent István University, Gödöllő

The Hungarian wind atlas has not been ready yet, so we can choose a place to install just randomize or lean on the meteorological measuring, and after the necessary local wind measurements can we decide where rewarding the installation. The main objectives are:

- to analyse the data of long-term measuring at several places, to show our experiences, and find out the trends and the criterions
- to analyse the Hungarian wind characteristic (wind speed, wind direction, the Hellmann's coefficient, the expectable energy production etc.), after the interpretation to show the Hungarian specialities, to give recommendation to selection the installation place, the mode of the measuring, and the recommended tasks during the analysis
- to define the correct parameters for the investors and the manufacturers, which help them to choose the best solution and best efficient wind generator
- by means of the analysing the Hellmann's coefficient to give an input data's to the Hungarian wind atlas, and a control data's locally or all around the country

IMPROVED THEORY OF HYDRAULICAL ATOMIZATION

István Sztachó-Pekáry
College of Kecskemét, Kecskemét

In this study our previous two – against surface tension and against viscous shear force based – theories were improved. In the new, complex equation we consider force balance for a droplet separating radially from a liquid sheet. We consider that a small mass Δm with a radial velocity is separating into a droplet. The analysis of the equations revealed that the calculated effect of drag force for $\Delta r=0d-25d$ on drop velocities was negligible for a water spray in still air; furthermore the assumptions that a droplet separates only laterally did not prove to be right; and erroneous estimation of dynamical pressure p ; and inappropriate incorporation of spray angle α were also revealed.

NEW METHODS FOR THE EVALUATION OF HYDRO MOTORS

S. Török – Z. Bárfai
Szent István University, Gödöllő

The scope of hydraulics is growing permanently year by year. Nowadays it is inconceivable that a modern agricultural machine has no hydraulic system.

During the operation all the structural elements of a hydro motor abrades. Because of this the leakage loss increases which has an effect on the operational parameters. The result is: the volume flow, the pressure, the effective power and the power uptake, and the sum-efficiency. Several kind of diagnostic tests have to be taken in order to make decision of how long is worth to continue the operation [1]. Tests can be carried out by special hydraulic testers, or by a hydrostatic measuring bench.

Testers are used for registering the following physical parameters: volume flow, pressure, temperature, and seldom r.p.m.

The hydrostatic test benches are usually used where manufacturing, fixing, maintenance, and testing of hydraulic elements is in progress. Hydrostatic test benches are able to measure several kinds of physical parameters – as volume flow, pressure, temperature, torque, r.p.m.-needed for recording curves.

RELATIONSHIP BETWEEN FARM SIZE AND MECHANIZATION

J. Hajdú – L. Gockler
Hungarian Institute of Agricultural Engineering, Gödöllő

The Hungarian farm and property structure has been changing continually recently. The rapid devolution is followed by a slow concentration. The size of applicable machines, the utilization of machines and the costs of machine work basically depend on the size of property to be tended and the size of cultivated fields at the same time.

Practical and model calculations show that power- and working machine demand as well as engine power demand can be reduced by 50-66 % specifically between 10 and 1000 ha. Increasing the engine power and capacity of power machines results in a sharp reduction of the cost of machine work at performance categories between 40 and 100 KW. The reduction is moderated afterwards but is still significant. Machine demand, performance provision, the volume and cost of machine work can substantially be reduced – by 75-66 % - on 1 to 10 ha fields, on a field size exceeding 20 hectares the decrease is not so significant.

Key words: agricultural mechanisation, property size, machine utilisation, machine investment and utilisation cost, power machine demand

ECONOMIC ANALYSIS OF MECHANIZATION TECHNOLOGY OF FIELD VEGETABLE PRODUCTION

L. Magó – F. Jakovác
Hungarian Institute of Agricultural Engineering, Gödöllő

In this paper the economic investigation of field vegetable production is introduced by using the production technology of the most important vegetables, onion and tomato as examples.

Onion is a very important vegetable that plays a very significant role in human nutrition. Practically onion is produced in every part of Hungary on large, as well as on medium and small farms, on 5-8 thousand hectares altogether.

Seed-grown vegetable onion is gradually gaining ground on the traditional onion set production method. In our present days there are good seed-grown species available for farmers. These species can provide good quality products and can be stored well.

Tomato is one of the most popular vegetables in the world, produced on very large lands. Canning tomato is a very significant vegetable in Hungary as well, traditionally produced on a very large land – 3700-4000 hectares – by transplanting or direct seeding methods.

This paper focuses on introducing the mechanized production technology of seed-grown onion and direct-seeded canning tomato.

The paper also aims to promote the popularization of the modern technology of field vegetable production by reviewing production technology and providing useful pieces of information on the operational and economic figures of the machines necessary for production.

Key words: field vegetable production, machine technology, machine investment and utilisation cost

EFFECT OF NUTRIENT SUPPLY ON THE VALUE OF FIELDS IN HUNGARY

Z. Peszeki – Zs. Szentpétery – I. Kovács
Szent István University, Gödöllő

Analyzing Hungary's capabilities we can agree, that our arable stock, which is available in limited amount and cannot be enlarged much more, plays more and more important role of our resources.

From the whole area of the country (9 303 400 hectare) the agricultural land was 5 million 865 thousand hectare in the 31st May 2003. The size of the arable lands -which contains the area of the forests, reeds, fish ponds too apart from the agricultural lands- is 7 million 734 thousand hectare. The size of the ploughland, which determines the agricultural production, is almost 4516 thousand hectare, but the forests' (1775 thousand hectare) and green's (1062 thousand hectare) ratio is considerable too.

There are two things which change basically in the Hungarian land market by reason of the EU membership. The first well-known change is the entering of land based support. The second indirect change will be the interest of the capital of EU, because the capital of EU wants to achieve the domestic market contribution in the connected country's market too, and looks for the promising opportunities.

The EU's land cultivating enterprises and private persons (not the owners) owing agricultural land based support is an income complement support, which encourages the economic activities. The amount of it is 70.000 HUF/ha/year now in the EU. From this we get 25% (17.500 HUF) in 2004, and it increases annually. The Government may expand this part additionally with 30% (21.000 HUF). In 2004 the initial amount of the support was 38.500 HUF/ha/year. To compare with 2003: in that year the land based support was 7.000 HUF/ha/year in Hungary, and nowadays 30-40 thousand HUF means a good profit in a year per hectare. So the income can double.

THE ROLE OF EXTENSION IN THE TECHNICAL IMPROVEMENT OF AGRICULTURAL ENTERPRISES

K. Tóth – J. Bárczi – Cs. Fogarassy
Szent István University, Gödöllő

International statistical figures prove that in the last decade, those countries have been the winners for the global economic competitiveness, where higher level of activity in extension, agronomic research and teaching has been running, and on the contrary, there is a developed institutional network (P. Horn 2002). In these countries, extension is the one that provides information on farmers to produce efficiently (J. Kozári 2003). In Hungary, advisory system relying upon the basis of entrepreneurs supported by the state ought to be reformed. In its present structure, it does not improve agricultural entrepreneurs' informational level and knowledge efficiently. Beyond improving the level of extension, advisory system ought to take upon itself the role of development and innovation (Dimény I.-Hajós L. –Szűcs I. 2003). In order to improve agricultural entrepreneurs' economic competitiveness, they have to put more and more emphasis on improving technical innovation. Adopting technologies within agricultural enterprises is such a complex area that farmers tend to put experts and advisers in charge of these kind of services. In the course of research, we have analysed the demands of agricultural enterprises raised on extension services in connection with technical support.

EXPERIMENTAL DEFINITION OF THE PRIMARY FORCE OF STUMP

E. Horváth-Szováti – I. Czupy
University of West Hungary, Sopron

Removing tree trunks in Hungary has been going on according to the principle of stump extraction, which means stumps are removed by grabbing technology. Experiments have been carried out to reduce primary input. In the Great Hungarian Lowland, where there are really enormous areas where forest machinery is required to implement that kind of particular operation, stump extraction is done by special, hydraulic driven caterpillars equipped with sophisticated grabbing devices. During operation of the equipment, different measurements are carried out so as to verify the suitable power supply. The experiments are designed to carry out the measurements with different soils and different tree species. Meanwhile the time requirement is also taken into serious consideration. In the course of the evaluation procedure of our findings, a widely applicable method of parameter estimation - supported by regression-estimation - is shown.

Keywords to support the mathematical background of the procedure: linearization into Taylor-line, principle of the smallest squares, matrix-equation, and iteration.

MEASUREMENT OF FOREST ROAD BY GPS

J. Péterfalvi – G. Markó
University of West Hungary, Sopron

The network of forest roads defines basically the approach of opened up area. After planning and construction this network needs of maintenance. The established opening up network needs continuously rethought dynamic developing because of the changing of influencing factors. This tasks can be solved with a GIS with exact digital map and proper descriptive data basis. The development and maintenance of forest road network demands exact tracing of roads on the digital map, to have reliable and exact connected data. This claim can be contented with the widely applied GPS technology. This paper introduces the experiments and results in this fields at the Institute of Geomatics and Civil Engineering at the University of West-Hungary.

EFFECT OF MOISTURE CONTENT CHANGE ON COLOUR CHARACTERISTICS OF PAPRIKA POWDER

Zs. H. Horváth – A. Véha
Faculty of Food Engineering, University of Szeged

The use of natural food colours is preferred to that of artificial dyestuffs for by modern alimentary purposes. Paprika is a spice plant grown and consumed in considerable quantities worldwide, and also used as a natural food colour. Hungarian paprika powder is still regarded as a "Hungaricum" today. Paprika is cultivated in areas of the world such as Spain, South Africa and South America, where the weather is favourable for the growth of this plant and for the development of its red colouring agents. The large number of hours of sunshine allows the paprika to ripen on its stock, so that the basic material reaching the processing mills has a high dyestuff content. Hungarian paprika has a unique aroma and a specific smell, but the production of powder with a good red colour is a considerable problem.

MEASUREMENT ASSEMBLY FOR ENERGETIC ANALYSIS OF COMMINUTERS

P. Korzenszky – E. Judak
Szent István University, Gödöllő

Taking the results gained up to now, in the course of the mechanical investigations on comminuting machines (first of all impact mills) as a basis, a new measurement system was constructed. The system is suitable for investigating the states in continuous regime ranges as well between the earlier set discrete parameters as against that in the former stepped measurements. Besides the infinitely variable rotary-speed adjustment, the measurement assembly is usable and indispensable to the work on understanding better the comminution process and grounding its comminution-kinetic description. On the basis of the analysis of the experiments carried out and the conclusions drawn, a mechanically and energetically well-founded control and regulation circuit, utilizable in the practice as well, can be elaborated. The system with its present form, through using the independent parameters revealed during the investigation, is already capable of operating as a feedback regulation circuit (it may be considered a pilot-scale control device as well).

APPLICATION OF ULTRASOUND TECHNIQUES IN WASHING PLASTIC BOXES AND CRATES

Gy. Mészáros¹ – Z. Csizmazia²
¹College of Food Engineering of the University of Szeged.
²Centre of Agricultural Science University of Debrecen

The food industry uses a large amount of plastic cases, boxes and containers for transportation within and outside of the company. These contain strong bounded dried, bloody and fatty contaminations. Their removing is difficult especially in case of complicated surfaces. The traditional washing machines equipped with high pressure nozzles are not able to remove the contaminations from places situated in shaded areas (ribs, holes, and corners). It can not be accepted in case of tools having direct contact with foods. Therefore we investigated the introduction of ultrasonic procedure for cleaning of objects having

STUDY ON TEMPERATURE AND MOISTURE DISTRIBUTION INSIDE THE BATCH OF CONVECTIVE CORNCOB DRYER

J. Beke – G. Bihercz – Z. Kurják
Szent István University, Gödöllő

Convective drying is one of the most favored drying methods of drying industry because of its simple build-up and relative low investment cost. However, the high improvement of the

convective drying technology (enrichment of quality and quantity of drying product) may cause difficulties of drying process, especially in the seed production. We aimed to measure the temperature and moisture distribution inside a batch type modern convective corn cob dryer. A unique measurement system has been prepared for this purpose and a huge level data acquisition has got a special chance to draw down some meaningful conclusions.

HOMOGENIOUS MICROWAVE FIELD CREATION

E. Lakatos¹ – A. J. Kovács¹ – M. Neményi²

¹University of West Hungary, Mosonmagyaróvár

²Research Group Process Engineering of Agricultural Products of the Hungarian Academy of Sciences, Mosonmagyaróvár

Microwave treatments are very common in various food processes such as drying, pasteurization, cooking and enzyme activation [1]. Almost all the time a problem occurs during microwave treatments, namely that the energy (and consequent temperature) distribution inside the radiated materials is significantly uneven [2]. The results of treatments are hardly reliable by this non-homogeneous temperature distribution. At the Institute of Biosystems Engineering preliminary studies were carried out using an own-built experimental microwave oven in connection to temperature distribution of treated liquids [3]. In this apparatus there was not possible to regulate the magnetic field for various reasons. Therefore, a domestic

microwave oven with fiber optic thermometer system was installed for microwave researches of liquid foodstuffs.

EFFECT OF ADDITIVES ON TRANSMISSIVITY AND TEARING STRENGTH OF THE GREENHOUSE COVERING PLASTIC FILMS

V. Madár – M. Szabó – E. Judák
Szent István University, Gödöllő

The double plastic film covered block greenhouses are the new products of the last 10 years and their speedy development is assured by the cheap plastic films. The main disadvantage is the lower light transparency than glass and because of the double using for the better insulation the light transparency is much more reduced. In most of the cases the type of the inner and outer layer is the same which is not the best solution for the spectral transmissivity from the plants point of view.

The basic material of agricultural covering plastic films for greenhouses is Polyethylene (PE). The basic additive is the UV-absorption additive for ensuring the UV stability and other additives for the stability which brake the degradation due to oxygen, improve a resistance of the plastic film against chemicals. It is important for the span of life of the plastic.

The aim of the research is to find out such an adequate coupling of film layer which provide an advantageous spectrum from energetic, physiological and forcing point of view and in such a way that the selected couple of film layer can fulfill the stress requirements coming from the different forming of greenhouse structure.