

PART I.

ABSTRACT OF SELECTED PAPERS

THE INTERACTION BETWEEN SOIL AND
DIFFERENT RUNNING GEARS

Dr. J. Kowalski, Dr. S. Bialas
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CONNECTIONS OF GRAIN DRYING PROCESSES

Dr. J. Kowalski, Dr. M. Kowalski
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The paper describes the results of the investigation of the interaction between soil and different running gears. The authors have carried out a series of experiments in the laboratory and in the field. The results show that the interaction between soil and different running gears is very complex and depends on many factors. The authors have found that the interaction between soil and different running gears is very complex and depends on many factors. The authors have found that the interaction between soil and different running gears is very complex and depends on many factors.

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THERMODYNAMICS OF RHEOLOGICAL MODELS

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Out of the thermodynamic process, the theory of non-equilibrium thermodynamics render also the exact description of mechanical occurrence and interaction among forms of motion, so the knowledge of this process is essential for engineers dealing with transport processes. Each time, the thermodynamic method describes the form of mathematical relationships much shorter and more elegant for instance methods based on partial differential equations. It can be an additional advantage that it eliminates uncertainties came about unreliability assumptions concerning the structure of matter. In the last case the chopped green forage masses are a proper example.

RESULTS OF THE ENVIRONMENTALLY PROTECTIVE RECONSTRUCTION OF A PIG FARM

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Dr. I. Dombóvári - J. Deák
Cooperative of the Seregélyes pig Breeders

Large-scale pig farms of Hungary are more than 30 years old. Technical level of them is out of date. In accordance with the opinion of that age manure is removed from pig houses by adding water to it (hydraulic removal). For this reason slurry production is far too much as it would be required. Following the changes of the agricultural sector at the beginning of the 90's most of the pig farms have not sufficient arable land to dispose or utilize the large volume of slurry. There are only two ways for these pig farms. One is to develop their technical level and minimize the slurry production while the other one is to give up their activities.

The Cooperative of the Seregélyes Pig Breeders (Seregélyesi Sertésenyésztők Szövetkezete) has been running an Agrokomplex type pig farm with 800 sows near the settlement of Seregélyes, along the national road of No. 62. The enterprise started to run in 1972. The last decades made the modernization of the technology not to be delayed.

The Application, titled "Sustainable agricultural production technology" that was submitted under Reg. No. of 5916 was considered as worthy of financial assistance by the National Committee for Technological Development (OMFB).

Opposite of the well-known difficulties, of the pig farming sector, modernization has spread over the whole housing technology e.g. automatized feeding-drinking system, ventilation-climatization, slurry handling by separation and composting of the solid phase etc.

Aims of the technological development were to minimize the slurry production and handling the slurry expediently to gain saleable by-product.

CONNECTIONS OF GRAIN DRYING PROCESSES

Prof. Dr. J. Csermely - Dr. M. Herdovics
Hungarian Institute of Agricultural Engineering

During operation tests heat and material transport processes were determined and fairly accurate mathematical relationships were elaborated to describe the drying characteristics of corn as well as the changes of seed temperature and density. Examinations comprised the determination of the measure of dust and gas fume in the case of different driers and drying technologies.

CONNECTIONS OF COMPACTNESS OF SILAGE BALES

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In the course of preservation of coarse fodder and other plants aim is to produce sufficient organic acid, mainly lactic one, by means of lactic acid producing bacteria that makes possible to adjust the pH value and the bacteriostatic function on the required level. Fermentative ability of fodders are basically determined by the fermentable carbohydrate and protein content as well as buffer capacity. Effectiveness of the preservation is influenced by the chemical compound, the technical-technological level of the process and the technological strictness.

The Hungarian Institute of Agricultural Engineering (FVMMI) has dealt with the preservation of alfalfa and grass with lower dry matter content as silage for years.

Harvesting technologies, harvesters, balers and wrapping units serving the minimization of losses caused by weather on land are also testing continuously. We have stated that harvesting and preservation of fodder can be solved by up-to-date machines mainly Western European of origin. These machines are balers with constant bale chamber, balers with slicer unit, wrapping machines, etc. On the other hand preservation problems of the hardly preservation problems of the hardly preservable alfalfa have reminded us the necessity of application of additives that help fermentation in order to gain a silage of stable and good quality. Taking into consideration the above mentioned facts we have elaborated such kind of harvesting and preservation process that was based on large-scale method to apply additives to assist and control the fermentation process, prevented the multiplication of harmful microorganisms in order to have silage of good quality that could be stored stably and for long time.

THE INTERACTION BETWEEN SOIL AND DIFFERENT RUNNING GEARS

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The aim of the research made in 1998-1999 was to do a comparison between the soil compaction by rubber track and wheeled tractor (four wheel driven and mechanical front wheel driven). There was examined the traction capability too. For this reason we have done field tests with RABA-250 and 4WD, New Holland FIAT G-240 2MFWD and Claas Challenger-45 rubber track tractors. The test results with different running gears show the tractor with rubber track has higher traction capacity as compared to wheeled one (at the same weights). The experiences and the test results show there are no significant difference between the same powered wheeled tractors.

On the other hand the soil compaction and the environment impact of rubber track is better than the conventional running gears. The advantages of the rubber track system can be used in that case if we have well-matched implement line (tillage machines, fertilizer spreader, plant protection machines, drilling and seeding machines etc.) for the tractor and not only the tractor equipped rubber track but all heavy agricultural machines like tractors, forage and combine harvesters.

DETERMINING KERNEL HARDNESS THROUGH THE GRANULOMETRIC PARAMETERS OF GRINDING

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The authors have been working for years on the development of a method of determining the hardness of wheat kernel through measuring the so called 'grinding resistance'. By 'grinding resistance' they mean the specific surface grinding energy (kWh/cm^2) of milling with a hammermill at a constant e_d (kWh/t) specific grinding energy consumption. (Böloni - Véha - Gyimes, 1997. Véha - Gyimes - Böloni, 1998 and Véha - Gyimes, 1999).

FODDER PRESERVATION BY FERMENTATION IN PLASTIC BAGS

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Dr. J. Schmidt - Dr. J. Sipőcz
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In the frame of the R & D project, subsidized by the MoARD, working examinations in three agricultural enterprises and working observations in nine ones were carried out in 1999. Working examinations were done by AG-BAG equipment and TAUROS machines. More than 40,000 tons of fodder was preserved by means of this technology on twelve farms. Selection of fodder was enlarged by production of cob corn crushings and corn-cob mixture. Examinations were included the determination of biological characteristics of fermentation as well as digestible characteristics of the nutritives.

RUNNING COST OF POWER MACHINE FLEETS ACCORDING TO DIFFERENT FARM SIZES

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We have developed a measuring system to analyze the dynamic loads of machines connected to electric motors that can make possible to samples determined by different trigger signs as zero point of power voltage or power current or ordered to different phase situation during one rotation. In our measuring the getting of samples were synchronized by the current cross points. The generated data were set in a txt. file type to the data processing in a high level software (e.g. Excel). We have analyzed in our paper concretely the contact of a three-phase electric motor of $P = 5.5 \text{ kW}$ and a hammer mill grinding different materials, i.e. barley, maize, wheat and changing the screens of different size. We have measured the effects of sudden increasing in feeding (loading) upon the slip and $\cos\varphi$ and the electric current and calculated the momentary power and torque. (See in diagrams.). Besides one can get a quick balance about use of electric energy.

RELATION OF QUALITY REQUIREMENTS TO TECHNICAL DEVELOPMENT PROCESS IN THE AGRICULTURE

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The **technical development** – as a part of **innovation** – has been playing *determining role* in the agricultural development. This activity system is fundamentally predestined to harmonise, integrate and transform the essential elements of technical development to agricultural producers. Technical development

is not independent from space and time. At all times, development is realised according to the existing demands and possibilities. Hereupon, in the course of setting the development targets, the actual challenges of agriculture have to be considered.

Among the challenges of the Hungarian agriculture, this paper will lay emphasis on the **quality requirements**.

In the interest of our agricultural future, it would be important that the requirements of quality production conduct the technical development activities of agricultural producers already in the planning phase of the developments. Furthermore, the demands of end-users ought to enjoy the priority in this process.

STUDY OF INTERMITTENT AND CONTINUOUS-MODE MICROWAVE DRYING

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For the automatization of the drying process the inner qualities of the material to be dried must be measured. The microwave dissipation field (i.e. the electromagnetic cavity) does not allow the application of traditional sensors.

In convective drying technologies the information bearing (i.e. the energy-transmitting) medium is the drying air. In the microwave drying chamber the main parameters of drying are ensured by the electrical parameters of the electromagnetic field, and not by the changes of state of the air.

The parameters of drying are not easy to measure due to the inhomogeneity of the microwave field, the geometry-depending resonance frequencies and the irregularity of energy distribution. This problem is specially important in the case of large-size, intermittent microwave chambers. Thus investigations have been made using continuous-type, smaller-size dissipation fields as well. An important point was to test the response of the humid material to microwave radiation by measuring such an electric parameter that is of microwave character, can be measured easily and provides suitable data for analyses.

ANALYSIS OF THE TRAJECTORY OF THE KNIFE CONTROL MECHANISM IN THE CUTTERHEAD „VIBRO CUT”

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(Made in the framework of the project K+F no. FKFP 1171)

The edgewise displacement of the knives of the cutterhead has a favourable effect on the energy requirement of the cut. We have patented many different kinds of structural solutions, each being able to perform the edgewise displacement. As a result of our developing work in the near past (and with the support of the project mentioned above), a new cutterhead mechanism has been implemented. This vibration cutterhead, which has already been patented as well, performs the edge displacement with a control of forced trajectory. The motion came about this way, raises several technical questions. The solutions of these questions are decisive regarding the devices which run smoothly and properly, and which are easily carried out. This includes for eg. the increased noise load, the problems with mass balancing and the adequate endurance/machine life of the control disc and the percussive roll pairs- both being exposed to high accelerations, thus to mass forces. This is why the topic of our study – the dynamic analysis of the trajectory of the control mechanism – is of great significance.

EFFECTS OF ADDITIVES ON THE QUALITY OF SILAGE BALES

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In the frame of the project entitled "Effects of additives on the quality of silage bales" we have made roll bales of sliced and traditional length of coarse by means of two technologies at Erdőhát and Lászlópusztai of the MARTONSEED Rt. Latest bales were handled by additive. Bales, made by NEW HOLLAND 544 CROPCUTTER and by PÖTTINGER ROLLPROFI 3500 type balers, were wrapped by an universal, automotive bale wrapper machine that was suitable to use on middle and large-scale farms. Using up of the examination results of the SZIE-MKK Takarmányozási Tanszék and the OMMI we have stated the followings. Owing to the required compound of the volatile fatty acid and the general composition as well as the favourable microbiological state, feeding value can be preserved still in case of longer storage.

PREVENTION OF THE DAMAGES IN SOIL TILLAGE BY THE QUALITY ASSURANCE METHODS

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The importance of soil and environment conservation and their maintenance will be required improving the quality assurance and spreading the view of quality management connected with soil and environment conservation policy in EC. Soil conservation and energy save tillage are the most important factors of the tillage systems in a sustainable agriculture. The quality assurance gives for both factors an appropriate background, qualifying and controlling aspects and make possibilities surveying the probable risks, preventing tillage damages, recognizing the faults in time and decreasing the costs of the faults.

Quality management in soil tillage can be become a continuous activity, aiming a higher process effectiveness and efficiency. The quality assurance system of soil tillage can be divided into 8 stages, such as: 1. Principles and strategy. 2. Technology variants listing. 3. Decision in suitability of technologies. 4. Specification and quality planning. 5. Quality control of processes. 6. Fault diagnosis and corrections. 7. Evaluation of results and quality costs. 8. Documentation and perfection.

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EVALUATION OF FRUIT FIRMNESS

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The objective of the paper reported herein was to determine correlation of the relationship found between the coefficient of elasticity and the rupture stress and between the acoustic stiffness coefficient and the rupture stress for apples, pears, peaches and apricots of different ripeness. Furthermore the purpose was to develop a system for fruit firmness evaluation from firmness characteristics measured by nondestructive methods.

Relationship was determined between the coefficient of elasticity and the rupture stress and a system was developed for the evaluation of the firmness. This system provides with the ranges of the rupture stress and the coefficient of elasticity for two different ripeness ranges of the tested fruits.

The firmness ranges were determined for the ripeness "suitable for picking/harvesting" and for the ripeness "suitable for eating" for different cultivars of apples, pears, peaches and apricots. The firmness was expressed by the rupture stress and by the coefficient of elasticity.

The system can be used for the practical evaluation of fruits and the system can be developed for further fruits and vegetables as well.

SOME QUESTIONS OF VIBRATIONAL TRANSPORT AND SEED CLEANING

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The most important part of the vibrational machines which are used for transport, ordering and cleaning of granular materials is a flat riddle plate or a feeder trough. This flat surface swings, hereby the grains move too on the surface. In this paper we have studied the motion of an only single grain. We determined the conditions of formation of the different motiontypes in function of the motion influencing parameters. We studied the motion of the grain particularly when it doesn't leave the swinging surface and it slides only in the direction of the transport.

FLOW PATTERN CALCULATION IN AN AXIAL FLOW FAN CASCADE

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We were dealing with the calculation of the flow pattern in an axial flow fan. A 2D mathematical model, $\Psi\omega$ method, was used. The blade passage and the tip clearance secondary flow were calculated. The effect on the secondary flow was investigated by the clearance dimension between the running blade and the standing casing. The effect of the viscosity was also carried out.

NEW METHODS IN TOWER DESIGN

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The main consideration in this wind turbine analysis was the possibility of FEM and CFD modelling. Flow around the tower was modelled with Computational Fluid Dynamics. An on site wind measurement data have been used as inlet boundary condition for a dynamic system analysis. There was an effort to find the most suitable height and cross section for tower design considering the possible vibrations and torque. The results were verified with wind tunnel and vibration measurements.

The first wind turbine installation was planned on the hilly region on the bank of Danube near Dunaujvaros. The wind speed measurements were carried out from the beginning of 1999. Topographical and wind speed measurement data was collected in the first step. These were the input for the pre-feasibility study.

DETERMINING FLOW PARAMETERS OF GRAIN MATERIALS

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The cast distance in air can only be determined by experiments as no exact formulae like that for cast in vacuum are available. The experimental determination of the parameters is rather costly because large laboratory, experimental spreader and collecting appliances are needed. The formulae of cast in vacuum are not valid for throwing in air. The difference is especially significant above 20-25 m/s air velocities and in the case of low density extraordinarily shaped seeds.

The experiments are necessary because in the education and in the research for developing artificial fertilizer spreading equipments a need for the cast distance computation of fertilizer grain and wheat seed arose several times.

In chapter *Motion of mass point under gravity and air resistance* of the book Kármán Tódor -Maurice A. Biot: *Methods of mathematics* (1967) the development of the equations of horizontal cast can be found in detail. There is no neglect there. The reader is correctly guided in the development of expressions but the final equations (for path, velocity, time of flying) contain complicated integrals and the book gives no exact solution. As we made several unsuccessful attempts to solve the integrals it seemed reasonable to use numerical method. We think that our experiments and the elaboration of relating theoretical relationships could serve the design of spinning disc spreaders.

ENERGETICAL EXAMINATION OF VIBRATIONAL RIDDLES EXCITED NEAR SELF-FREQUENCY

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Seed cleaning is a very important operation of harvesting in the agriculture. The basic machines of the cleaning are the riddles with different construction and drive. The condition of the unbroken riddling is the relative motion of the seed mass on the screen surface. As the cleaning of a very big mass happens in every year, therefore the energetical examination of the riddling is very important.

In this paper we have studied the possibilities of the reduction of the energy-requirements of the seed cleaning, especially in the event of the energetical examination of vibrational riddles excited near self-frequency.

APPLICATIONS OF ARTIFICIAL NEURAL NETWORK IN THE RESEARCH OF VISUAL PARAMETERS OF FRUITS AND VEGETABLES

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The visual quality parameters of fruits and vegetables are very important in trade, because these features can be influenced by the quality of fruits and vegetables. The visual quality parameters like shape and color features must to be determined by an objective and non-destructive method. Therefore these features were investigated using image processing. Image processing by computer vision was chosen, because this method is rapid, non-destructive and the results of this method give objective parameters. These features were analysed in order to apply these parameters in the classification of varieties.

DEVELOPMENT RESEARCH OF AC HYDRAULIC ENERGY TRANSFER

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Application of the method of AC hydraulic energy transfer results in several advantages. The objective of our research is to provide an ongoing operational experimental model of this transfer. In the course of the procedure an acceptable clarification of constructional and theoretical questions is to be also provided. Idle running tests and loading tests are to be designed to describe the basic static and dynamic transfer properties. We would like to create - as a result of some constructional variants - a very efficient energy transfer, which can be widely applied, and its operation is economical. Vibration stump lifting seems to be a perfect forest application. In case the stump is vibrated it accelerates and lightens the procedure of stump lifting. It also decreases the power and moment - stress needs. The significant task is to optimise the parameters of the vibration (frequency, amplitude). A diphasic AC system is suitable for stump lifting, where the motion of the hydraulic generator is rotary and the motion of the hydraulic engine is linear. The amplitude and the frequency of the vibration can be adjusted and controlled by the alteration of the liquid stream.

APPLICATION OF COMPUTER AIDED MODELLING IN DEVELOPMENT RESEARCH OF FOREST MECHANIZATION

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Theoretical operational basis of the agricultural machinery has already been described. But on the other hand a similar description of the forest machinery does not exist. At the same time agricultural machines can not be adopted in forest utilisation since forest conditions are sometimes totally different from the agricultural ones.

Formerly certain mathematical calculations required plenty of time and energy since computer background was missing. Nowadays computer programmes - based on the finite-element method - are designed for this job. The advantages of the finite-element method-aided planning are as follows:

- fast and cost-effective, since being familiar with the model the most suitable machine is to be created without manufacturing several experimental machines for testing,
- operational testing under all conditions is not necessary,
- there is a very good possibility for strength and functional analysis of the projected machine.

Naturally the computer aided modelling is not enough. A running in test of the prototype is also necessary. This sort of testing is designed to satisfy the following needs: on one hand it should detect the possible unreliability of the modelling procedure, and to prove the theoretical calculations with the hands on experience on the other.

FOREST STEAM SEDIMENT TRANSPORT IN SOPRON MOUNTAIN

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Small catchments research is the best way of studying erosion processes and sediment transport in the upper, forest covered watersheds. This study runoff caused erosion and sedimentation

processes have been analyzed under conditions of forest exploitation in two neighbouring catchments, between the years 1996-99 (Farkas-valley (FÁ) and Vadkan-valley (VÁ)). Two sediment forms have been examined, bed load and suspended sediment. Not only the sediment yield, but also quality parameters of sediment have been analyzed and evaluated. Correlation system between sediment quantity, quality parameters and environmentally variables were determined, too.

DETERMINING THE TENSILE STRENGTH OF GLASS METALS USING A THEORETICAL METHOD

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A computer algorithm based on a topological model has been created to determine the tensile strength of glass metals in a theoretical way.

EXAMINATION OF PARAMETERS GENERATING LIGHT REDUCTION IN GREENHOUSES

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Light is one of the factors of efficiency in greenhouse production. Solar radiation coming through the cladding material is of prior importance in greenhouses partly in terms of growing (photosynthesis) partly in terms of energy using. The measure of incoming radiation into the greenhouse is influenced significantly by construction and cladding materials besides other effects. One of these effects is condensation. The research was focused on how greenhouse covering materials used in Hungary and condensation formed on them influence the intensity of light coming into the greenhouse. Light reducing effect of intentionally generated condensation was tested instrumentally time depending during laboratory examinations. It can be stated as a result of examinations that

the measure of light intensity reduction can reach 7-21,9 % (depending on the type of covering materials) due to condensation in our climate that can not be left out of consideration in greenhouse production. This research was made with the support of OTKA F 032582.

FINDING THE POSSIBLE MEANS OF THE FINANCIAL REGULATORY SYSTEM FOR THE AGRARIAN BRANCH OF HUNGARIAN ECONOMY WITH RESPECT TO ACCESS TO THE EUROPEAN UNION

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The future of the Agrarian branch of our economy could be more easily surveyed and predicted by the 1990-ies than earlier. Its financial regulatory system had become more simplified and the purpose of the measures taken with a view to its future functional vigour was to give reliable subsistence for the people engaged in agriculture for at least 4-5 years ahead and to increase the financial aid offered to the domestic producers.

Our Parliament showed a serious commitment to this issue when passed the decree contained in the 8 § of the law. "The farmers drawing on the financial aid provided from the state budget are obliged to supply data specified by the statutory rules." This decree reflects the endeavour to ensure that the state and the different state authorities should pay special attention to the fact that the budgetary subvention reach only the targeted sphere of people to the greatest possible extent. The structural build-up of the present subvention system of agriculture, its priorities and its main supportive arrangements will promote the following intentions included in the law on the development of the agrarian branch of economy as passed by the Parliament, and comprised in the government programme.