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Scientific achievements and experimental development DEPARTMENT OF AGRICULTURAL MACHINES AND Systems Engineering named after PM Vasilenko

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The basic results of science, technology and innovation in the last decade of functioning of the department.

Science, technology, research, innovation, Chair.

In the world, right after the establishment of satellite navigation systems (SNS) GPS NAVSTAR and GLONASS SNS and transfer them into service opportunities civilian users began searching the effective application of SNA in various fields of human activity. In developed countries (USA, Germany, England, etc.) in the early 90s of the last century began work to create components of modern precision farming system (TRS) - monitoring of Life and Management of Technological mechanized crop operations. On the basis of the existing element base developed effective information systems, remote and field measurement techniques that improve crop yields, and most importantly - save process inputs (TM) 20-30% by taking into account factors uneven natural variation of soil fertility on the area of the field. Provision of plant nutrients, timely necessary measures to protect plants, optimization of existing farming systems, reducing the load on soil chemical grass-- all aspects of today highly precision farming system.

Back in 1997 in the city. Hannover (Germany) at the International Exhibition of agricultural machinery were presented a wide range of machines and tools for use in precision farming technology (TC). It was at that time relevant for Ukraine faced the problem of the global experience, adaptation and development of the theory and practice of technology STZ, as a country that has the most available

potential crop production in Europe. In 1998 the National Agrarian University, the Department of farm machinery them. Academician P.M.Vasylenka the initiative of Professor D.H.Voytyuka was the problem laboratory "Precision Agriculture", which subsequently became an important scientific school division "Agricultural Engineering", which is headed by prof. DG Voytyuk. Gone scientific school and take an active

part in the ideological and theoretical improvement STZ such scientists as prof. Aniskevych LV, prof. Myronenko VG, prof. Kravchuk VI, Deputy. Director of the Academy of Navigation and Traffic Management prof. Baranov GL, associate Zakharin FM, Wolanska MS, pit AV, AV Tsulaya, Sivak IM, Brovarets OO and many others.

First, it was necessary to determine whether the characteristic climatic conditions of Ukraine considerable variation agrobiological soil properties and plant communities in the area of the field. The urgency of solving these problems has been confirmed by extensive research monitoring yield ahrohospodarstvah Cherkasy, Chernihiv regions and so on gathering crops, as well as research on the level of nutrients in the soil in the area of the field. It was found a significant disparity in the distribution agrobiological and physical and mechanical properties of soil and biomes within the area of the field that showed a need for a vehicle technologies. Problems and tasks that they need to be addressed when introducing technology TC, stood one by one. For example, we know that for complex problem solving agrobiological variation of soil properties in the area of field used cartridge or sensor technology, each with its own advantages and disadvantages. To address the shortcomings of each of these, developed and tested for the first time in Ukraine compensation technology introduction TM (prof. Voytyuk DG, prof. Aniskevych LV). This technology has the advantages of the previous reading of cartograms mistsevyznachenyh data while using the information from sensors mistsevyznachenyh parmetriv working in real time. Moreover, the information from the sensors mistsevyznachenoyi real time pushing a certain level of "trust" that can compensate for the fact of aging information from electronic data card technology and use all the advantages of the latter.

The main innovation as a result of a number of studies in technology development vehicle can be considered scientific basis of a field of unmanned vehicles in crop information with the development of the theory of building navigation and control complex machines and methods of cultivation complex navigational information (prof. Voytyuk DG, prof. Aniskevych LV).

For the first time in the world offered (prof. Voytyuk DG, prof. Aniskevych LV) a new method of obtaining information about mistsevyznachenu yield for construction of high yield cartograms using Duhamel integral model based on pulsed transient characteristics harvesters in function of time. The technique involves a combination of specially developed algorithms restore intensity of the input flow sensor according to grain weight grain harvester. At the initial and final sections of yield mapping (input and output of each rut combine) and in areas with a sharp change in the intensity of the flow of grain into the hopper a

combination of so-called "belt" algorithm and the algorithm extrapolation of the velocity of weights that are improving. In other areas of the harvester uses proposed differential algorithm.

At the level of global innovation proposed (prof. Voytyuk DG, prof. Aniskevych LV) method predictive mode adjustment modes of operation harvesters working to address the problem of uneven loading of material bodies combine technological change as a result of mistsevyznachenoyi yield and harvesting conditions move in the direction of the car.

Theoretical studies on optimizing the use of differential rates of application of TM and search for this rational kinematic parameters of motion MTA on the field. Developed (prof. Aniskevych L.) cultivation technique integrated navigation information filtering procedure kalmanovskoyi "split" type of cyclic processing component vector of observations gives increased stability of the process and relatively simple sequence of implementation. This method allows to determine the necessary staff and technical and technological requirements for navigation equipment to achieve high accuracy and reliability performance of field operations for mechanized technologies TSW.

Theoretical studies (prof. Aniskevych LV) with analytical construction of optimal dosing process materials of agricultural machinery. Specifically developed theoretical basis for computation of the control law actions of regulators TM application rate directly setting the optimal tracking the prediction based on data that contain the specified standards cartograms sowing on current estimates coordinates ITA in the field and the course of its movement. Based on this set (Voytyuk DG, LV Aniskevych, Wolanska MS, pit AV) software and hardware for the family "TC Diamond" that allow you to record mistsevyznacheni data and control signals to form a functioning operating modes of agricultural machines.

In order to achieve high-performance hardware-level management and technical systems for agricultural machinery technology solved the problem of vehicle (prof. Aniskevych LV) application to the dosing of the principles of adaptation. Developed variant of adaptive automatic control system (ACS) metering systems for agricultural machinery operation variable application rate TM bezposhukovoyi using adaptive ACS with parametric identification object management during normal operation. The peculiarity of this was the use of ACS unit identification dynamic system parameters while calculating the smoothed estimates of kinematic parameters and coefficients of local approximation given application rate TM.

Tasks vehicle are related to a number of global man-made problems, including the problem of the "greenhouse effect", known since the XIX century French physicist Joseph Fourier, who believed that the

atmosphere of our planet is like glass in a greenhouse, letting the sun that is converted into heat Do not let it warm to go outside. Certain crop production operations are a source of greenhouse gases, including carbon dioxide (such as plowing recorded increase of carbon dioxide in the air pryґruntovomu almost 2 times). Scientists department developed a method and equipment made registration of CO2 in soil air that is required to justify the use of such systems tillage as "No Till", "minimum", "restricted" and so on. The essence of the method is to register mistsevyznachenyh data of carbon dioxide in the air in the soil layers of soil by sucking air from the bundle set depth, its filtration and supply analysis on the gas chromatograph with simultaneous detection coordinate sampling and the formation of an array of numerical data.

Posed and solved the problem (Popovych OM) forming the grain flow drills under the influence of the two components of motion: a portable component with agricultural machines and relative - when traveling seed on working organs of agricultural machines. Developed software and hardware module implementation plans set sowing grain considering effects of systematic measurement errors and noise intensity sensor seed flow sensors and kinematic modes of the ITA.

For wide-seeding machines and machines for fertilization theoretical foundations (doc. Siwak IM) administration density distribution of TM as the length of the rut, and the width of the capture. On the basis of studies designed machine with variable standards of mineral fertilizers on working width and the direction of movement of the AIT.

The current state of agriculture needs to provide the information base of fertile agricultural land and property status plant communities to optimize processes aimed at obtaining sustainable and high yields of crops. Information base on the status of agricultural fields is a source of sustainable management processes making process materials, care as plant communities, harvesting plant products and so on. The team of Prof. TK scientific school. Voytyuk DG developed ideology application for monitoring of agricultural land small automated systems for collecting field data. Specifically designed (doc. Brovarets AA) mathematical model of the machine to collect information from mistsevyznachenoyi vision systems in accordance with the course route-speed method. This machine can operate continuously, offline, which provides low cost mistsevyznachenoyi information, and there is no soil compaction, due to the low specific pressure of the running surface field (curb weight system - to80 kg).

Implementation of the ideology of small automated information systems in production is impossible without the use of unmanned field of information systems. The development of unmanned machine units for work in plant becomes the world's increasing attention. Thus there is a

need to address the problems associated with the definition of the parameters of the objects, the requirements on the accuracy and reliability of obtaining information about the position, velocity and spatial orientation of moving objects. Terms of use and operation of unmanned vehicles in crop requiring high accuracy and high frequency navigation parcels at all stages of their life. In this regard, developed a combined procedure compliance given route, which has two modes - Mode angle off of the course and treatment of lateral stability. A new (prof. Voytyuk DG, prof. Aniskevych LV) invariant compensation method of processing complex navigational information that allows you to use simple (and therefore cheap) sensors courses-speed navigation subsystem with low measurements and high accuracy functioning of the entire complex as a whole. In general, studies constitute the theoretical basis of navigation and motion control field of unmanned vehicles on the task of monitoring the state of the soil environment and plant communities.

On the basis of acquired knowledge and experience of the research, a new (for conditions Ukraine) training course "Precision Agriculture". Issued typical program on discipline; prepared teaching materials. For example NUBiP Ukraine discipline "Precision agriculture" is read to students about 8 universities in Ukraine (for example, Kharkiv, Kirovograd, Lugansk, Nizhin etc.).

Department researchers (dinner OM), together with specialists NSC "IMESH" designed and manufactured fixed universal dressers continuous action inertial friction-type CGP-4 and CGP-10. These machines are realizing process of applying liquid preparations for seed crops due to inertial forces and use the side of the caryopsides as working. Dressers engaged in dispensing, distribution and processing of its seeds nerozpylenym liquid drug with a single working body. During the seed dressers from the bunker on your body goes through gravity exhaust neck on passive distributor, who also served under viddozovanyy flow of the drug. Centrifugally seeds with drug film moves along the surface of the conical working body rotates around its axis and drug taking away its surface. The processing of seed preparation continues after its transition from your body Transition Guides and surface etching chamber until the seeds out through the exhaust neck of a container. As a result of comparative evaluation of the main technical, technological and operational characteristics of different types of dressers can be concluded distinct advantage developed rotor-stator dressers and inertia-friction type.

Deep Research (Assoc. Of pit OV) made towards improving beet harvesters by hychkozbyralnyh study parameters and digging out bodies working to reduce the energy intensity of their workflows. Investigated

circuit layout beet units and improve the accuracy achieved directly copying rows of roots, which reduces losses in recent gathering.

Commissioned by the Ministry of Agrarian Policy of Ukraine defined and justified (doc. Wolanska MS) design parameters calculated technological modes, power and traction and grip ultralight mobile power product, Dynamics of motion, reasonable design parameters of process modules to it using statistical dynamics.

Department researchers (supervisor - Assoc. Onishchenko VB) was developed by spraying of crops with adjustable dispersion of droplets and air deposition system drops fluid, and spraying of crops with automatic control of application rate, which took place in UkrNDIPVT them. L. Pogorelogo state testing. Spraying allow selection of spray nozzles for a given quality implementation process for the various process conditions.

Paid a lot of attention to research the history of agricultural machinery, agricultural machinery, construction, engineering philosophy as science and scientific heritage of Ukrainian scientists and engineers. Thus, under the direction of Professor DG Voytyuk analyzed the history of design plow investigated the activities of prominent scientists in the fields of agricultural mechanics, agricultural mechanization, agricultural machinery.

Pryvedeny Main Results and scientific-technical activities for ynnovatsyonnoy LAST desyatyletye funktsyonyrovanyya the department.

Science, Technology, Studies, Innovation, Chair.

The basic results of scientific, technical and innovative activity for the last decade of functioning of department are resulted.

Science, technique, researches, innovations, department.