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INSTALLATION FOR PREPARATION LIQUID FORAGES

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Preparation of high quality feeds that have undergone cavitational decontamination, increased digestibility for fattening pigs, young cattle, as well as feed additives for adult animals is an urgent task. Acoustic liquid-phase processing of materials has been used in agricultural machinery and agroproduction. The cavitational preparation of liquid feed has been developed, which allows the production of complete, disinfected feeds that are easy to assimilate in the livestock farms, bypassing the phase of cooking of fodder from fodder grain, grain-processing waste, by-products of grain-processing enterprises, food waste, etc., from plant raw materials , rough and succulent feeds. The technology, and the design of the dispersant, can be applied both in livestock complexes with a large number of animals, and on small farms with a small number of animals. In large pig farms, prepared and decontaminated feed can be supplied on dead-end feed lines without washing the latter, because the food does not spoil for three days, which distinguishes the claimed technology favorably from the technology "Hüdpoimik - cinspoon" Germany, in which the feed lines are washed after each filing (before 10 times a day).

Key words: hydrodynamical radiator, the amalgamator, forage, hydrolysis.

Introduction. Acoustic liquid-phase processing of materials has been used in agricultural machinery and agroproduction. Hydrodynamic emitters - devices that convert part of the energy of a moving fluid into the energy of acoustic waves. Preparation of high quality feeds that have undergone cavitation disinfection, increased digestibility for fattening pigs, young animals of cattle, as well as feed additives for adult animals is an urgent task [1].

Problem. A well-known compound feed product and pet food, according to which the combined feed product of reduced moisture is derived from the ability to convert into a jelly mixture of source of protein and starch source. The choice of sources of protein and starch in a known fodder product is determined in general by fodder needs, peculiarities of taste and type of produced feed. Intermediate sources of vegetable protein are: gluten, wheat protein, soy protein, rice protein, corn protein, etc. Intermediate sources of animal proteins are: muscle and skeletal mammals, birds and fish, as well as crushed raw materials such as meat flour, bone meal, fish meal, and others. The source of starch is grain such as corn, rice, wheat, barley, oats or soy and their mixture. Other compounds, such as salt, spices, condiments, vitamins, mineral additives, flavoring agents, lipids, and the like can be included in the mixture capable of converting the thermal process to the jelly. The mixture is capable of being converted into jelly during heating, obtained from gluten of wheat, skimmed soy flour, sugars, fermented bacon and water [2]. The disadvantages of this method are: - higher energy consumption for crushing and

heating up to 1150C in a colloid mill; - the need for dehydration of the mixture; - the need to feed the feed for domestic animals (dogs, cats) in a fryer, in beef fat, at a temperature of 170°C. A well-known method for utilizing high-quality food waste, which includes the addition of a high-volatile alcohol bard in a humidity of 85 to 95% pre-crushed grain waste with a moisture content of 10 to 20%. Due to the conductive mass transfer, the moisture content of the mixture is technological. The resulting mixture is extruded. Then the extrudate is dried by the air flow in the room until the humidity reaches 10 ÷ 12% [3]. The disadvantages of this method are: - the use as a main component of pre-crushed grain waste; - higher extrusion cost of the product, as friction is used as the sole source of heating; - the need for additional drying of the extrudate by a stream of heated air. A known method and installation of feed preparation [4], which includes the mixing of products with water, hydrodynamic, cavitational and thermal effects, in which the mixture is passed through a system of moving channels with variables in the course of its movement, intersections to ensure the release of energy of bursting cavitation bubbles directed on the processed mixture, which moves repeatedly on a closed circuit, to bring it to a homogeneous state at a temperature of 50-70 ° C. In this method and installation, the initial agricultural raw materials containing trace elements, protein, vitamin and mineral components, in a certain proportion diluted with water. The resulting mixture is fed into a special chamber in which, due to the geometric profile of the channels, the dynamics of their crushing, as well as the rotational height, hydrodynamic conditions are created for the formation of cavitation bubbles. The mixture is pushed through the channels having a variable intersection, which, due to changes in the flow rate, is a change in the pressure of the mixture, which leads to the formation of gas vapors, vapors. When moving the flow through the channels of the chamber into a zone with reduced pressure, the cavitational bubbles begin to burst. The disadvantages of this method are: - zones of stable occurrence of cavitational vesicles can be only channels of variable cross section of the rotor and stator; - insufficiently clear understanding of the conditions for the emergence and bursting of cavitation bubbles, namely: in areas with reduced pressure cavitational vesicles arise and only when the mixture moves into the zone of high pressure, cavitational bubbles burst. The well-known technology line for the preparation of forages «Tikx-Apgyc» [5], which includes a serially connected and technologically connected preloading device, a conveyor, a magnetic column, a working capacity, a chopper for cyclic processing of raw materials. Raw material for feed preparation, for example, in the form of feed grain, falls into a boiler, from which the conveyor is sent to the purifier of raw materials. Cleansing from mechanical impurities, the raw material enters the dispenser, which simultaneously adds various additives that improve the nutrition of the feed. In the capacity of the dispersant, pour water, start the pump - and the feedstock is fed into the capacity of the container. The dispersant is provided, under the influence of cavitation forces of high-frequency resonance, mechanical grinding, emulsification and heat-warming in the destruction of intercellular and inter-molecular bonds, the formation of a paste-like feed for animals occurs. The disadvantages of the technological line for cooking are: - the low density of

cavitation in the operating organs of crushing «Apryc» because the holes in the channels in the rings of the rotor and stator are made in the form of subsonic nozzles, profile of which is designed for gases, and not for liquids - the manufacture of channels in the stator in the form of openings with the output of the processed suspension through the end surfaces - also do not contribute to an increase in the density of cavitation, and thus to increase the efficiency of the technological line.

The purpose of research: Development of the cavitate preparation of liquid feed, which will allow the livestock farms to prepare complete, disinfected feeds that are easy to digest, bypassing the cooking phase of fodder from fodder grain, grain-processing waste, by-products of grain-processing enterprises, food waste, etc., from plant raw materials , rough and succulent feeds.

Research results. The technical result of the researches is the installation of cavitational preparation of liquid feed. The composition of feed is complex, because it is, depending on the destination, feed, plant compound and feed additives (micro and macro additives). The task is achieved by the fact that in the cavitation method a feed additive is obtained on the basis of humic acids and humates (humate of sodium or potassium), from peat or brown coal, which includes cavitation, dispersion of peat or brown coal in aqueous solution of alkalis until the complete release of humic acids from followed by the receipt of humates by adding sodium hydroxide and sodium carbonate and potassium, cavitation dispersion until the temperature of the mixture of 80-90 ° C reaches the "thickening" of the suspension. Gummies, getting along with food in the stomach of animals, increase the permeability of cell membranes and thus contribute to the filling of potassium in the intracellular fluid, which accelerates cell division. At the same time, due to the additional energy reserve, the physiological processes are intensified in the cells. The trace elements contained in brown coal (magnesium, manganese, copper, molybdenum, selenium, iodine, etc.) satisfy the needs of animal organisms and contribute to filling the required energy for bone formation and total activation of the organism (for example: manganese is involved in oxidation-reducing processes and is an integral part of enzymes, copper is involved in the processes of oxidation, increases the intensity of respiratory processes, without it the difficulty in protein synthesis, iodine can be included in the free amino acids and, accordingly, the proteins). Humates made of peat are particularly effective in aqueous solutions, because water is the most important part of the diet that provides the flow of exchange reactions, digestion, excretion of urine from metabolic products, especially in this product, an absorbent in the form of not a large amount of activated carbon in combination with humic acids [6]. The content of the main components in the feed additive is determined by the initial composition of the used peat, brown coal, the content of which naturally-hydrated humic acids should be at least 20% and ash content not to exceed 30%. In the case of a deficiency of certain trace elements in the initial stores it is necessary to replenish them from other sources. At the proper stage in the practice of animal husbandry in order to increase the nonspecific natural resistance of the organism and the productive properties of animals and poultry, a number of biologically

active substances, and especially of natural origin, which include the drug received from peat - humate sodium (HELAFIT), is used. Production of the preparation according to the technical specifications (TU 26.8-23690792-002: 2006) developed by the small enterprise "MIZ" (Odessa). This drug can be used on small farms and large livestock complexes without significant increase in labor costs and investments. By its efficacy, the preparation-HELAFIT, successfully competes with synthetic drugs, and on some indicators has an advantage due to its natural origin and multilateral effects on the organism of the animal. The content of the cavitation effect is as follows: When passing a mixture of peat or coal with water through the cavitation dispersant, in constructively conceived areas there are zones of reduced and high pressure, the mixture is subjected to a sharp shift load. The work of a hydrodynamic dispersant is based on the generation of perturbations in a liquid medium, in the form of some field of velocity and pressure, in the interaction of a moving fluid with a fixed or moving obstacle of a certain shape and size. When the mixture of pressurized water vapor decreases (depending on the pressure and temperature) in the mixture of intensively boiled water, a lot of cavitation vials are formed [6,7]. In the intense sound wave during the half-life of the rarefaction there are bubbles of cavitation, which are sharply closed after the transition to the region of high pressure, causing strong hydrodynamic perturbations in the liquid, intense radiation of acoustic waves. Bubbles of cavitation are formed in those places where the pressure P in the fluid becomes lower than some critical value of P at the corresponding threshold of cavitation. For a perfect homogeneous pure liquid, the probability of spontaneous formation of bubbles becomes noticeable only with sufficiently large tensile stresses, for example, for the water, the theoretical value of Pk is close to -Pa = 1500 kgf /; real liquids are less strong. The maximum stretching of thoroughly cleaned water, achieved at 10 ° C, is - Pa = -280 kgf /. Under normal conditions, continuous fluid ruptures occur at a pressure of only a little less than the saturated vapor pressure at this temperature. The low strength of real liquids is due to the presence of cavitation germs - microscopic gas bubbles. Cavitation occurs as a result of loss of resistance of the embryos entering the region of reduced pressure in the sound waves, and their rapid growth. The process of expanding the bubbles-germs is due to a number of effects: pressure of gas and vapor in the bubble, which exceeds the pressure in the surrounding fluid; diffusion of gas into a liquid bubble; evaporation of fluid and increase in the mass of vapor in the bubble; coagulation of the embryos. The first of these mechanisms plays a major role in the formation of cavities with a sharp decrease in pressure in a liquid with a low gas content in the temperature range far from the boiling point. The microscopic bubble, getting into the region of rarefaction, is greatly expanded as a result of the fact that the pressure Q contained in it, the vapor and gas, are manifested as exceeding the total effect of the surface tension and the pressure P in the liquid. The velocity of the expansion of the bubble in this case is determined by the momentum that is obtained by the surrounding layers of the liquid under the action of the pressure Q of the vapor and gas in the bubble, and is approximately expressed by the formula:, where Q P, p is the density of the liquid. For Q = Pa cm / s, that is, with a sufficiently sharp drop in

pressure, the bubble rapidly expands. The diffusion mechanism is usually found at relatively slow pressure changes (i.e., at low frequencies) in a liquid with a large gas content. In expanding the bubble, the concentration of gas in it falls, and the gas diffuses from the liquid into the bubble. The velocity of diffusion expansion of the bubble, where rg is the density of gas in the bubble, C is the mass concentration of the dissolved gas, D is the diffusion coefficient of the gas in the liquid (for air in water D), t is the time. The installation is based on a hydrodynamic dispersant, which converts the energy of a turbulent flooded jet into heat energy by heating the liquid. The most expedient is the mechanism of hydrodynamic radiation due to the pulsation of the cavitation region, which is formed between the nozzle and the obstacle. Reflecting surfaces can be convex, flat and curved. The best in energy terms is an inverted reflector in the form of a hole. Hydrodynamic dispersant works under the pressure of the fluid created by the pump station. With the help of the adjustment mechanism, the size of the gap between the nozzle and the reflector of the disperser can be changed. The radiator is tuned by setting a certain gap between the nozzle and the reflector. The optimum clearance is 2.9 mm. The control of the operating mode of the emitter is carried out using a special acoustic sensor (hydrophone). In most cases, you can adjust the emitter by listening for maximum sounding acoustic mode. When the mixture is displaced to the zone of high pressure, the vials disappear and burst, at which points disappear, as is known, there are local zones with high temperatures and pressures. If the bubbles have preserved a spherical shape at the time, then all collisions occur in the center of the former bubble, and if the shape of the bubble was deformed by hydrodynamic effects, then when the disappearance occurs, the formation of high-energy cumulative jets. The shock waves generated by them have an energy that exceeds not only the van der Waals communications but also the CC bond in organic compounds, which provides the disintegration and destruction of the components of peat and coal, initiates and intensifies the physico-chemical processes of processing raw materials . In the cavitation method for the preparation of liquid fodder from fodder grain (grains of cereals and legumes) and grain-processing waste (crushed grain, seeds of weed plants, etc.), which includes cavitational treatment of feed grain, which is carried out by cavitation dispersion in aqueous solution fodder grain, which is a grain of cereals and legumes, and grain-processing waste until the temperature of the mixture reaches 60-80C, at which the transition of starches into easily digestible substances occurs and the pasteurization of the resulting suspension. Such substances are most often monosaccharides, disaccharides, trisaccharides (glucose, fructose, sorbosa, maltose, galactose, etc.) [6,7]. In the cavitation method, the preparation of components of liquid feed from plant raw materials, coarse and sewage forage, which includes cavitation treatment of plant raw materials, coarse and succulent feed, in the aqueous medium and warming the mixture with the described dispersant. It is known that in the complex stomach of ruminants, cellulose is partially digested and cultivated by large colonies of microorganisms inhabiting the scar. An animal with such a stomach, in order to preserve the motility of the gastrointestinal tract, part of the feed should be stored in the primordial or partially treated species, and a smaller part is desirable

to cavitationally crush, disintegrate and transfer part of fiber (cellulose) into starch and sugars. In animals with single-chamber stomachs (horses, pigs), rough feeds are digested worse, because digestion and absorption of the main amount of nutrients in the diet occurs in the intestine. For such animals, preliminary cavitation treatment of roughage, in order to transfer nutrients into easily digestible forms, yields a significant increase in productivity. The essence of cavitation influence on plant raw materials, rough and juicy food is as follows: cellulose (cellulose), as well as starch, is a natural polymer. It turned out that these substances have the same structural components and, consequently, the same molecular formula (CbHy5)n. Cellulose and starch molecules differ in structure. Starch molecules have a linear, and often branched structure, molecules of the same cellulose - only a linear structure. This explains that cellulose, which has a significantly higher value of n, forms fibrous materials such as cotton, flax, yarn, and the like. In the process of cavitational dispersion of plant material in aqueous solution, part of the cellulose is converted into starch, and under the action of high temperatures, in the region of the breakdown of cavitation bubbles, there is partial hydrolysis of starch in sugars. The technological line for cavitational preparation of liquid feed has been developed, which includes: - the line of cavitation preparation of a feed additive on the basis of humates (humate of sodium or potassium - HELAFIT); - a line of cavitate preparation of liquid fodder from fodder grain (grains of cereals and legumes); - a line of cavitate preparation of liquid feed from plant material, coarse and juicy feed. The technological line for implementing this method of liquid feed preparation works in the following way: pre-dried to 25-30% moisture content of peat or brown coal, most of which have high natural humidity, making them sticky and making their crushing becomes difficult due to sticking bins and tines, clogging crushers and grinders, are delivered to the feed additive feed line. The weight dispenser of peat and brown coal are sent to a mixer, which feeds water and meadow. The resulting mixture is sent to a cavitation dispersant, which pumping it from the mixer after treatment again returns it to the mixer. In the process of cavitation dispersion, the physical and chemical decomposition of peat and brown coal at the molecular level occurs simultaneously. The resulting cavitational processes, which occur, the peat or hydrocarbon paste paste is intensively warmed up and stirred. Cavitational treatment of peat and brown coal is carried out until the complete release of humic acids. If there is a need for the production of humic acids as a commodity product that will continue to be used outside the process line, the resulting suspension is sent to a storage vessel for humic acids. In the case of the use of humic acids and humates for the preparation of the feed additive, the resulting suspension is added hydroxides, carbonates and bicarbonates of potassium, sodium or potassium up to the full transfer of humic acids in the removal of potassium or sodium. To carry out the complete transfer of humic acids into the gum, the suspension is passed through a cavitation dispersant until its temperature reaches 80-900 ° C. The resulting product of dark brown or black color has a high sorption, ion exchange, complexing, gelling, flocculating, and biological activity. In the future, humates are fed into a mixing mixer for mixing with other components of liquid feed. Forage grain (cereals and legumes or

grain-processing waste), delivered by car, are fed by weight dispensers, and then by a conveyor belt in the mixer. The mixer is filled with water, mineral additives and trace elements are needed. The lobed turbine of the cereal is brought to a weighed state in the mixer, then the grain mixture is fed into the cavitation dispersant, and from it back to the mixer. In the process of cavitation dispersion, when heated, destruction of cellular structures is performed, starch or gluten is released into solution. Cooking of fodder from fodder grain and waste of grain-processing is carried out by cavitation dispersion with heating in a water solution of fodder grain, which is a grain of cereals and legumes, and waste of grain processing until the temperature of the mixture of 60-80C, at which the transfer of starches in the light-carrying substances and pasteurization of the resulting suspension. Substances obtained as a result of hydrolysis of starch, often occur (glucose, fructose, sorbosa, maltose, galactose, etc.). After the cavitation treatment, the mixture enters the prefabricated mixer. Vegetable raw materials, rough and juicy food delivered by a car, weight dispensers, and then a belt conveyor, on which the magnetic removal of iron parts is made, is fed into a crush feeder and then into the mixer. The mixer is supplied with water mixed with a vegetable raw material mixer, rough and succulent feeds, wetting and impregnating them, and after reaching a mixture of mobility, it is directed to the cavitation dispersant and back into the mixer. As a result of the cavitation effect on the resulting mixture, it is crushed, disintegrated, the formation of starch from cellulose (cellulose) and its partial hydrolysis, with the release of sugars. In the process of cavitational dispersion of plant raw materials and succulent feeds, there is the destruction of weed seeds, the destruction of rotting and pathogenic microorganisms. Subsequently, the prepared feed mixture is fed into a mixing mixer. The components that came into the mixing mix in the required proportions, liquid feed and passed cavitation treatment on their lines, disinfected, gelatinous, etc., are mixed, and then screw conveyor are sent to a container for storage and delivery of ready-made liquid feeds for their intended purpose. The unit for liquid feed preparation (Figure 1.) works in the following way.

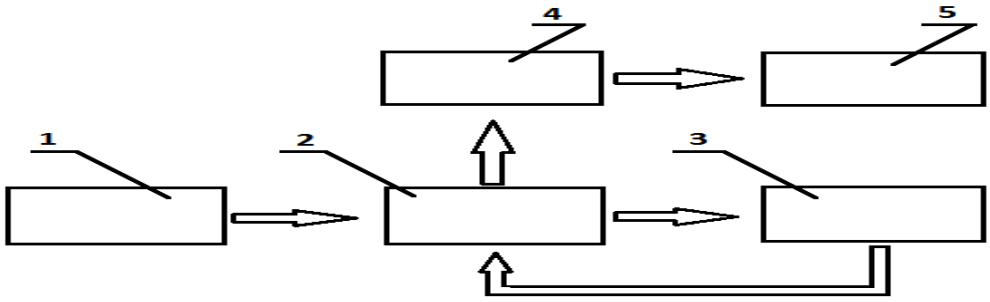

Fig. 1. Technological scheme of the method of preparation of liquid feed.

Peat or brown coal imported with cauliflower, after crushing to a size of 0-10 mm, weight doping 1, are fed to the belt conveyor, and then into the mixer 2. In the same mixer water and alkali are fed in the appropriate proportion. Coming from the mixer in dipper 3 (described construction), the mixture is subjected to intensive dispersion, heating, etc., after all physical and chemical processes and the heating of the resulting suspension to 80-90C, commodity humic acids are added to the

container. To obtain humates in the mixer, add hydroxides and potassium or sodium carbonates and continue to process the suspension until the complete release of humates, which is completed when the slurry is set to a temperature of 80-90°C. Visually, the output of humates is expressed in a zagictnoy mixture. The resulting suspension of humates is either pumped into the product container 4 or dosed into a mixing mixer 5. To obtain a feed material component of liquid feed, fodder grain and grain processing waste delivered by avtomobili, weight doses and then condensed is sent to the mixer. The same mixer is supplied with water. The turbine mixer water, grain and waste of grain processing are brought to a weighted position, and then sent to the dipper and through the pipeline return to the back [6,7]. In the process of cavitation dispersion and the course of physico-chemical processes, the mixture intensively heats up, and when the temperature reaches 60-80C, its clay extraction occurs. The mixture becomes gelatinous and it begins with the hydrolysis of starch, which results in the release of sugars. The resulting gelatine suspension is dosed to the prefabricated mixer. To obtain the plant component of liquid fodder, vegetable raw materials, rough and juicy food, delivered avtomboilem, dispensers, and then the conveyor are sent to a shredder of rough kopmi. Along the way from the feed the magnetic separator removes iron components. Shredded feed is sent to the mixer in which they are wetted and leaked with water, which is sent to the mixer. After acquiring a mixture of mobility, it is sent to the dipper and then returns to the mixer. In the course of physico-chemical, thermal, cavitational influence, coarse fats are fused, the mixture is heated, and partly starch is released from the cellulose, some of which is hydrolyzed into sugars. Upon completion of the dispersion, the dosage mixture is sent to the prefabricated mixer. All components of liquid feed supplied to the mixing mixer are thoroughly mixed, and then screwed into the container for storage and delivery of feed. The resulting liquid feeds can be produced in any combination of components, are environmentally friendly, have increased digestibility, pleasant activities and attractive flavoring qualities..

Conclusions. The cavitational preparation of liquid feed has been developed, which allows the production of complete, disinfected feeds that are easy to assimilate in the livestock farms, bypassing the phase of cooking of fodder from fodder grain, grain-processing waste, by-products of grain-processing enterprises, food waste, etc., from plant raw materials , rough and succulent feeds. The technology, and the design of the dispersant, can be applied both in livestock complexes with a large number of animals, and on small farms with a small number of animals. In large pig farms, prepared and decontaminated feed can be supplied on dead-end feed lines without washing the latter, because the food does not spoil for three days, which distinguishes the claimed technology favorably from the technology "Hüdpoimik - cinspoon" Germany, in which the feed lines are washed after each filing (before 10 times a day).

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УСТАНОВКА ДЛЯ ПРИГОТОВЛЕНИЯ ЖИДКИХ КОРМОВ

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Ключевые слова: гидродинамический излучатель, кавитация, диспергатор, смеситель, корм, гумат, гидролиз.

Резюме

Приготовление кормов высокого качества, прошедшие кавитационное обеззараживания, повышенной усвояемости для откорма свиней, молодняка крупного рогатого скота, а также как кормовые добавки для взрослых животных является актуальной задачей. Акустическая жидкофазного обработка материалов получила применение в сельхозмашиностроении и агропроизводства. Разработана установка кавитационного приготовления жидких кормов, позволяет в условиях животноводческих ферм готовить полноценные, обезврежены корма, которые легко усваиваются, минуя фазу приготовления комбикормов с фуражного зерна, отходов зернопереработки, побочных продуктов зерноперерабатывающих предприятий, пищевых отходов и т.д., из растительного сырья , грубых и сочных кормов. Технология и конструкция диспергатора, может быть применена как на животноводческих комплексах с большим поголовьем животных, так и на мелких фермерских хозяйствах с небольшим числом животных. На крупных свиноводческих комплексах приготовленный и обеззараженной корм может подаваться по тупиковым кормопроводу без промывки последних, потому что корм не портится в течение трех суток, что выгодно отличает заявленную технологию, от технологии «Гидромикс - синхрон» Германия, по которой кормопроводы промываются после каждой подачи (до 10 раз в сутки).

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Key words: hydrodynamical radiator, the amalgamator, forage, hydrolysis.

Summary

Preparation of high quality feeds that have undergone cavitational decontamination, increased digestibility for fattening pigs, young cattle, as well as feed additives for adult animals is an urgent task. Acoustic liquid-phase processing

of materials has been used in agricultural machinery and agroproduction. The cavitational preparation of liquid feed has been developed, which allows the production of complete, disinfected feeds that are easy to assimilate in the livestock farms, bypassing the phase of cooking of fodder from fodder grain, grain-processing waste, by-products of grain-processing enterprises, food waste, etc., from plant raw materials , rough and succulent feeds. The technology, and the design of the dispersant, can be applied both in livestock complexes with a large number of animals, and on small farms with a small number of animals. In large pig farms, prepared and decontaminated feed can be supplied on dead-end feed lines without washing the latter, because the food does not spoil for three days, which distinguishes the claimed technology favorably from the technology "Hüdpoimik - cinspoon" Germany, in which the feed lines are washed after each filing (before 10 times a day).