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## **PREVENTION OF ECOLOGICAL SAFETY BY WASTE NEUTRALIZATION**

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*Проанализирована ситуация, сложившаяся в мире вследствие активного действия вируса H5N1. Определен дополнительный источник заражения птичьим гриппом – технологические отстойники птицефабрик. Даны технические и технологические предложения по переработке материала отстойников, позволяющие снизить риск возникновения эпидемии и получить биотопливо.*

*Проаналізована ситуація, що склалася у світі в наслідок активної дії вірусу H5N1. Визначено додаткове джерело зараження пташиним грипом – технологічні відстійники птахофабрик. Надані технічні та технологічні пропозиції переробки матеріалу відстійників, що дозволяють знищити різні появи епідемії та отримати біопаливо.*

At present the closeness of population on planet increases and simultaneously increases intensity of animal raising and special poultry raising. Only in Ukraine on the state on 1 February 2007, from data of «APK - Inform» total number of livestock of poultry counted a 160,4 million. Wastes of poultry raising count about 35 million ton to the present time. Technological settlers of poultry factories are the opened erections, disposed in the distance about 2-10 km from poultry factories. Because of the features of it chemical composition wastes of poultry raising are not used as fertilizers. They are not claimed and not utilized. At the same time settlers are a favourable environment,

reservoir of many viruses, for example, such as tuberculosis, all viruses of flu and especially bird flu.

The first outbreaks of bird flu associated with illness and death in humans have occurred in Southeast Asia, H5N1 strain of avian influenza has made its first known jump to humans in 1997 in Hong Kong. Since the beginning of bird flu epidemic in 2003 in this region 140 million of poultry have died or have been slaughtered and disposed of to limit the spread of H5N1. Only in PRC since the beginning of 2004 quarantine was announced in 33 areas of the country. In the course of localization of the consequences of epidemic 20 million head of poultry have been destroyed. China authorities officially confirmed 10 cases of bird flu H5N1 human infection. According to the reports of the World Health Organization the H5N1 strain has killed about 80 people in Asia since 2003. Losses of the national produce on the whole in Asia was approximately \$10-15 million. Outbreaks of bird flu were recorded in Japan and in Europe. In the Netherlands 17 million of chickens have been destroyed (or 60 % of farm livestock). Epizootic of the H5N1 among poultry population in Russia has captured 6 administrative districts. 1 million 311 thousand domestic birds infected with avian influenza died or have been destroyed. The number of poultry in Ukraine has decreased by 5.3 %.

At present mortality of poultry population caused by the H5N1 strain of avian influenza is registered in 47 countries worldwide. Yet there are no reported cases of human-to-human transmission of the current strain of avian flu. The virus does not pose a risk to humans but scientists fear the H5N1 could mutate into a form that could be passed between humans, causing a global pandemic influenza. In this case mankind faces the prospect of global epidemic. The World Bank says the global bird flu pandemic within a year can cause a damage to world economics as much as \$800 milliard.

A threat of human pandemic avian influenza has set a problem before sanitary-epidemiologic officials. In short term they are to develop and apply efficient measures to help contain the spread of avian influenza infection. The main efforts should be undertaken in two directions:

1. Killing livestock population of infected domestic and wild birds by incineration and burial.

2. The mass vaccination of the whole poultry stock.

It is considered that vaccinating birds does stop the spread of the H5N1 virus. However, despite the fact that by now about 1 milliard of poultry livestock and wild birds have been destructed, in spite of mass vaccination of the poultry stock, and measures taken to prevent close contact of poultry with wild birds epidemic has not been averted. It is the authors' opinion that one of the reasons is neglecting existence of additional source of infection, namely waste treatment lagoons of commercial poultry farms. Floss, dyed out tissue cover particles, manure of already infected birds but not for a while yet having symptoms of illness are removed from the farm buildings and home yards and moved to lagoons. Every day an average poultry farm produces 30-40 tons of waste and moves it to lagoons.

As a rule, a lagoon is the most common open treatment facility located in the low-lying part of specially allotted lands. Underestimation of the role of geocological conditions often shown results in that waste liquid phase through soil layers drains into low-lying water layers with possible brining in them of incubated H5N1 virus. The sun and the wind dry up the upper level of a lagoon. Solid component saturated with the virus is sublimated, becomes loose in stricture and spreads by the wind in the neighbourhood. In contact with a living organism in appropriate favorable conditions (temperature, humidity etc.) the virus becomes actively evolve, with all following consequences, i.e. necessary prerequisites are created for the new outbreak of epidemic.

In no way denying the fact of the primary infection of poultry with the H5N1 strain from wild birds, we do consider necessary to take into account the existence of the potential source of the secondary infection with the virus. Also special measures must be taken for neutralization of accumulated chicken farming waste.

As one of the measures we propose our method developed in the course of investigations. The method includes waste briquetting adding sorbent and neutralizing components [1] and further use of it as fuel for industry. A composite proposed consists of:

– poultry manure: 5-80 %;

- lime: 2-10 %;
- lignin: 10-20 %;
- coal fines: the rest.

Poultry manure in combination with lime is a binding agent. Besides, lime is a neutralizer of the ammonia it contains and shall reduce H5N1 strain activity. Lignine (pulp and paper industry waste) shall function as a sorbent and plasticizing agent. Addition of coal fines shall increase heat engineering properties of briquette as a fuel to the level of power-generating coals (table 1).

Table 1

Properties of briquettes

Item	Main parameters	Symbols	Unit measure	Value
1	<i>Analytic moisture</i>	$W^a$	%	7.0
2	Ash level	$A^d$	%	30.8
3	Volatile content	$V^d$	%	41.4
4	Total sulfur	$S_t^d$	%	1.14
5	High heat value	$Q^{daf}$	kcal/kg	5857

Briquetting of poultry farming waste is made as follows. A portion of manure is removed from a lagoon following necessary personal protective measures and charged into a mixer whereto lime is added, and then the whole mixture is mixed thoroughly. Further lignin and coal fines by turns are loaded into this mixture being constantly mixed. Prepared mixture is charged into a special expeller [2] where it is shaped in the form of cylinder-type briquettes of  $\varnothing 20-22$  mm and of the length 25-30 mm and the briquettes are subject to hydrophobization. Briquettes obtained are dried in a drying chamber for 10-15 minutes at temperature 150-200 °C and dispatched to customers for combustion. Strength of such fuel briquettes is 3.0 MPa that meets requirements made to coal briquettes. The shape and size of a briquette are taken starting from optimum conditions of combustion process in boiling bed burners.

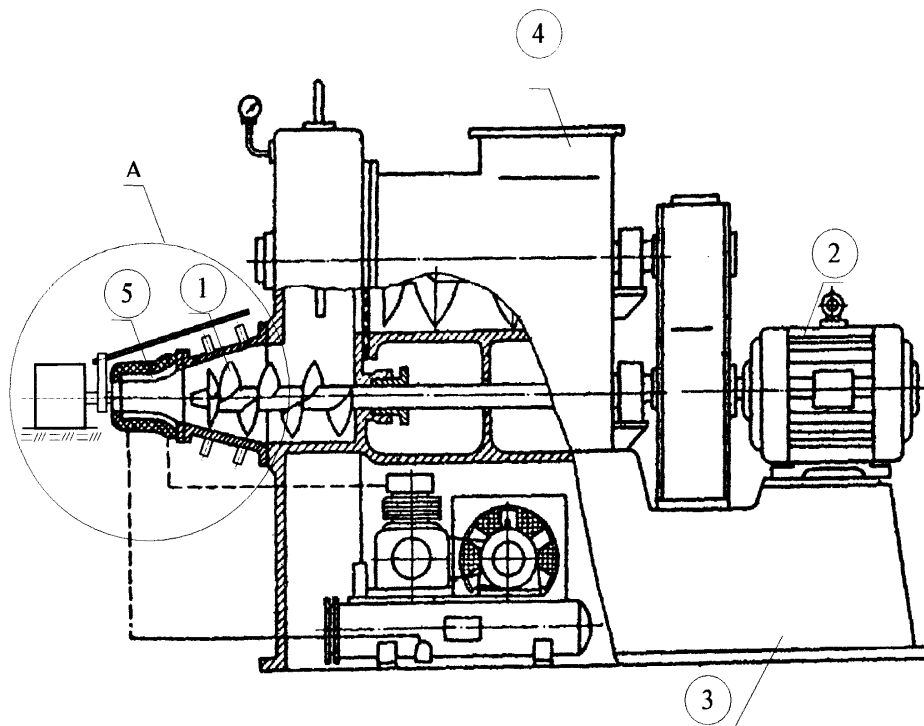
A complex of equipment to neutralize commercial poultry farming waste must be mobile, placed directly near a lagoon and consist of:

1. Generator.
2. Mixer with dispensing apparatus.
3. Shaping expeller.
4. Drying chamber.
5. Charging equipment.

The primary element of this complex is a shaping expeller (Fig. 1). Press design includes a worm 1 with a driving actuator 2 located in a housing 3, a charging hopper 4 installed at the housing 3 and adjoining to the end of the housing 3 nozzle 5 with channel-orifices 6 provided with shaping tubes 7. There is also a cutting element 8 made such as to slide along the line of coming out of briquettes from the shaping tubes 7. Each of the tubes 7 has an internal circular groove 9 with an orifice 10 for discharging hydrophobizing solution.

Prepared briquette mass is charged into the housing 3 through a charging hopper 4 wherefrom by means of rotated by a driving actuator 2 extrusion worm 1 it is fed in the nozzle 5. There it is compacted by an worm 1, pressed out in a channel-orifice 6 and is moved in the shaping tubes 7 where the mass is shaped in the form of a solid full-strength dense cylinder. A cylinder is subject to hydrophobization by a special solution discharged through an orifice 10 in circular grooves 9 of tubes 7. At the outlet from the shaping tubes 7 the mass is cut by briquettes of selected length with a cutting element 8 sliding along the line of their coming out.

Taking into account forecasts of scientists with respect to mutation of H5N1 virus (there are favorable conditions for this in multi-component medium of a lagoon), it is necessary, without delay, to bend every effort to the complete neutralization (treatment) of accumulated poultry farming waste by suggested technique. This will ensure prevention of global bird flu epidemic among people, environmental improvement and obtaining of additional fuel.



Assembly unit A

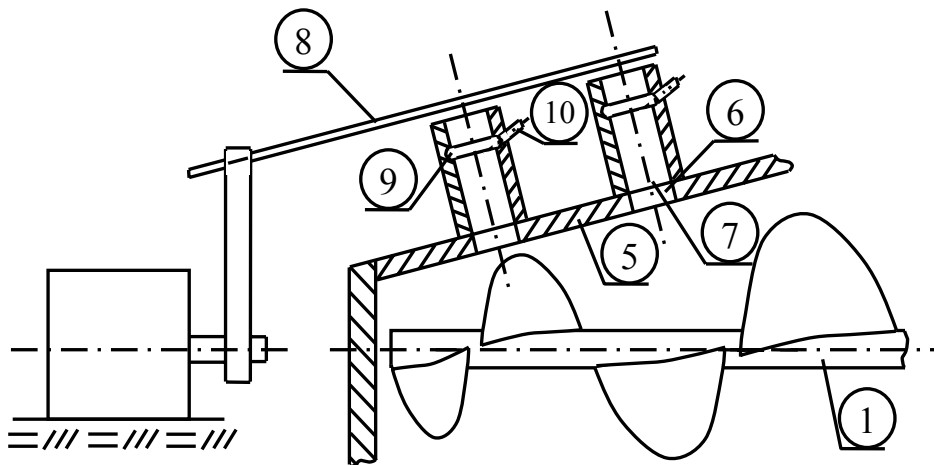


Fig. 1: 1 - extrusion worm; 2 - driving actuator ; 3 - housing; 4 - charging hope; 5 - nozzle; 6 - channel-orifice; 7 - shaping tube; 8 - cutting element; 9 - circular groove; 10 – orifice for discharging hydrophobizing solution

## REFERENCES

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