UDC 621.31: 631.6.03

THE INFLUENCE OF STRONG ELECTRIC FIELDS ON THE CHANGE IN ELECTRICAL PROPERTIES OF WATER

O.M. Bereka, doctor of technical science
D.Y. Iliukhin, graduate*

Considered the way of treating water in a strong electric field, submitted the results of studies of pH and ORP of distilled water for ten days after the treatment in the strong electric field.

A strong electric field, distilled water, electrophysical properties, flour, moisture.

Modern development of agricultural production requires the use of advanced technologies that can maximize efficiency, automate processes, high production and its environmental cleanliness.

As an important component of the composite water used in agricultural manufacturing and processing industry. Therefore, research and development of methods and means of electrophysical water treatment in order to further its use in agricultural areas production to improve performance is a key issue.

Wheat, like other cultural grain cereals, is affected by many diseases, resulting in reduced yield and its quality deteriorates. During the processing of grain mineral dust and germs are transferred to the finished product, resulting in its increased bakterialnosti. Flour, groats become unstable during transportation and storage. Moreover, the development of microflora is so intense that these products are unsuitable for transportation on a bacterial indicators, which prevents their use in food production. One of the most common bacteria for flour and bakery business is a potato stick.

In recent years, the grain before milling is not clean, but dampen. Therefore, the grinding of grain all bacteria and fungi get into the flour. Under favorable

* Supervisor - doctor of technical science, professor O.M. Bereka.

conditions, the bacteria multiply rapidly potato sticks. The optimal conditions for the development of spores is the temperature around 40 ° C, the presence of moisture, lowered acidity. Its cells can not withstand heating to 80 ° C, and the spores remain viable at 120 oC. Because bacteria are killed when baking bread, and spores remain viable. To prevent ingress of spores and bacteria in flour and bakery products proposed to be set in the mill chamber for disinfecting water treatment under a strong electric field.

The purpose of research – impact of treatment setting distilled water in a strong electric field on its pH and ORP within ten days after treatment.

Materials and methods research. One of the promising directions of Electrotechnology, is the use of strong electric fields interact with the dispersed materials that carry electrical charge.

The paper presents the method of water treatment in strong electric fields [2, 3]. In the developed method the electrical treatment fluids were obtained patent of Ukraine № 80722 [6]. With this type of water treatment is influenced by the electric field of high voltage and physical processes that accompany these phenomena (formation of ozone).

The interaction between atoms and the strength of connection between them depending on energy levels, which are atoms that enter into the mix. In addition, many chemical reactions need for their early use with reserve energy in the reacting particles, called the activation energy of a chemical reaction. As a gas, under the influence of an electric field of high voltage, just observed a large number of particles with a large amount of energy: the excited atoms and molecules, ions, and a more or less rapid free electrons. In the electro treatment with gas generated active hydrogen, nitrogen, oxygen, etc. or atomic gases, H, N and O (while in normal state, we are dealing with molecules H2, N2 and O2), free radicals, diatomic molecules and molecular compounds monatomic in nature and completely inert gases preliminary ideas: Ne2, Ne2, NeNg.

The problem of learning processes in the system, which consists of a flat metal electrodes and electrolyte interested researchers for a long time. But still

could not find enough studies the properties obtained after treatment of water, and certainly not considered possible to use the water in agricultural production.

For research was developed experimental setup to handle liquid and liquid products, the circuit is shown in Fig. 1.

The facility consists of a voltage regulator 1, which is connected to the primary winding of the high-voltage transformer 2, the secondary terminals of which are connected to the voltage multiplier cascade 3, the output of which is connected lamellar upper electrode 5, which is placed in the chamber for processing liquid 4 made of dielectric material. Plant Supply is AC 50 Hz.

In conducting research using Kilovoltmeters S96, to analyze discharge processes taking place in camera processing - electronic RIGOL DS1102E Oscilloscope with a bandwidth of 100 MHz, to identify the pH and ORP - "Yonomer unyversalnыy Ev-74" electric - DiST3.

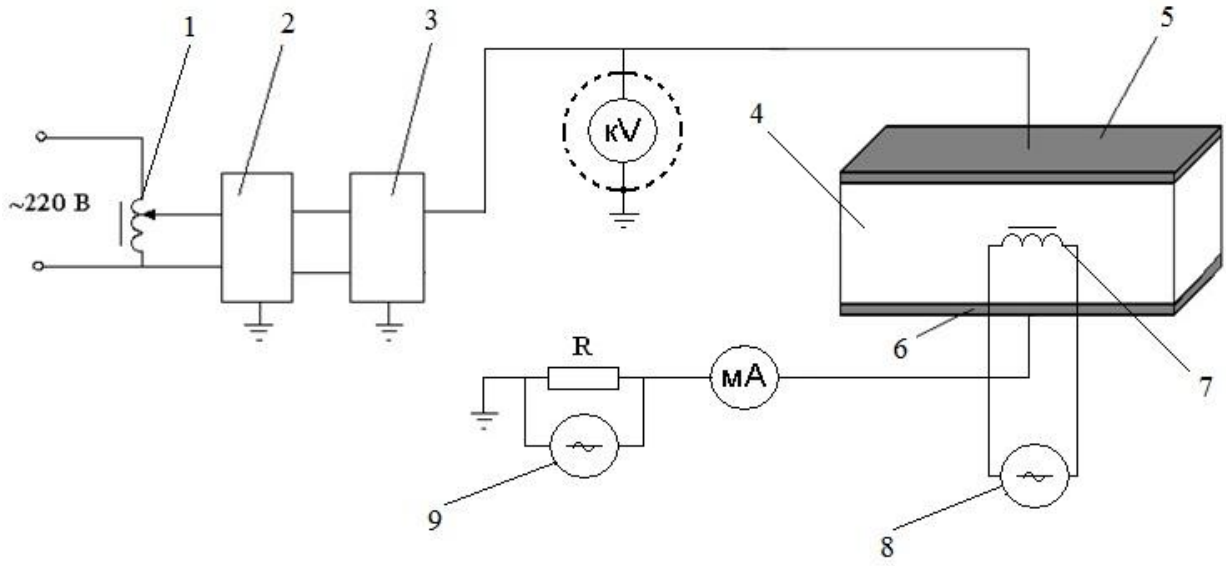

Figure. 1. Experimental setup for handling liquids and liquid products:

1 - Voltage Regulator 2 - High-voltage transformer, 3 - tube, 4 - chamber treatment, 5 and 6 - respectively the upper and lower plate electrodes treatment chamber, 7 - Sensor Inductor, 8 - oscilloscope (2 channel), 9 - Oscilloscope (1 channel).

Installation works. Turn on the voltage regulator 1 is automatically switched high-voltage transformer and two cascaded voltage multiplier 3, then the voltage applied to the electrode plate 5. The fluid that is processed, typed the corresponding amount, and after treatment is given, between the upper electrode and the fluid must be air layer of appropriate thickness. In chamber 4 fluid will constantly be under the power influence of high voltage electrostatic field, in addition, at the appropriate intensity electric field pulses occur in a layer of liquid. Pulse frequency adjustable elevated voltage between the electrodes and the thickness of the liquid layer and the air gap between the liquid and the top electrode. Also, the frequency of pulses is adjustable input capacitance, which is connected in parallel between the upper and lower electrodes.

The results of research. Figures 2 and 3 shows the experimentally captured waveform discharge processes that occur in the processing chamber at a voltage on the electrodes chamber 9 kV and 12 kV, respectively. The first channel of the oscilloscope shows a curve, taken from the resistor impedance 30 ohms, which is on the circle neutral conductor and the second channel - with an inductive sensor.

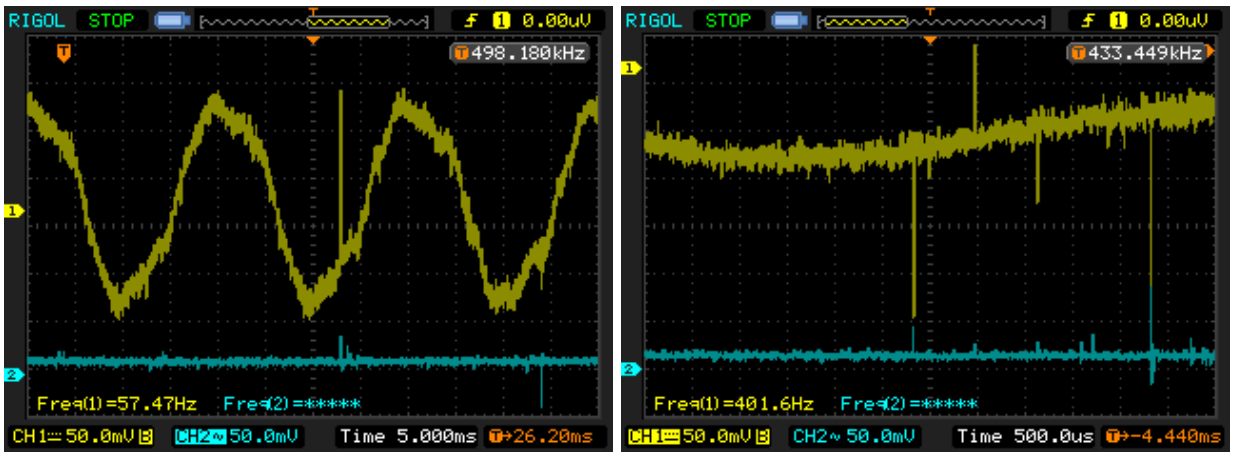

Fig. 2. Oscillograms of the discharge processes at a voltage of 9 kV on the electrodes treatment chamber.

When conducting research in the chamber for treatment of liquid poured distilled water. Thickness of water equal to 5 mm and 15 mm layer of air.

The results of pH and ORP within ten days after treatment are shown in Table. 1.

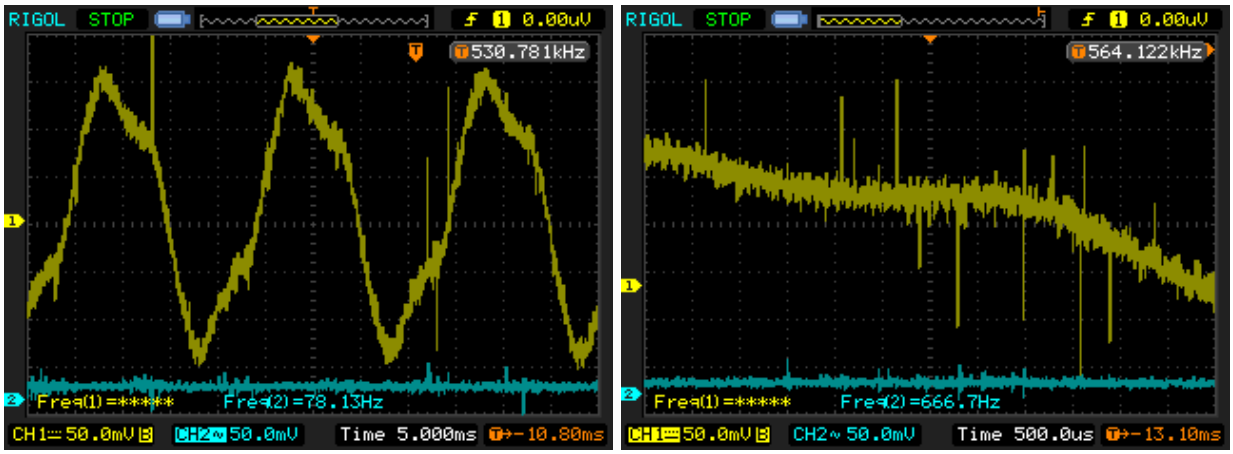

Fig. 3. Oscillograms of the discharge processes at a voltage of 12 kV on the electrodes treatment chamber.

The value of ORP and pH were measured at t = 20 ° C with the aid of "Yonomer unyversalnыy Ev - 74". To measure used glass electrodes ЭVP - 1ta ЭSL - 43 - 07 with an auxiliary electrode ЭVL - 1M1. The object of the study was used distilled water. Initial ORP (no treatment) amounted to - 165 mV, pH - 6.45.

The pH and ORP distilled water one hour after treatment are shown in Fig. 4.

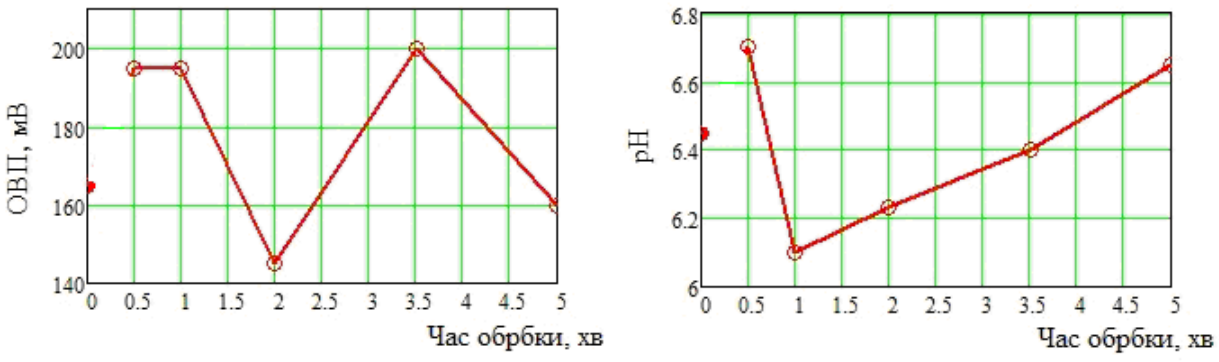

Fig. 4. Effect of processing time in the electric field at the ORP and pH of distilled water.

1. Modes of processing distilled water and their impact on ORP and pH

№ of the sample		Control	1	2	3	4	5
Processing time, min		-	0,5	1	2	3,5	5
Voltage, kV		-	10,5	10,5	10,5	10,5	10,5
1 day	pH	6,75	8,1	7,85	7,1	7,25	7,4
	ORP	140	181	167	157	190	116
2 day	pH	7,3	7,8	7,85	7,2	7,3	7,39
	ORP	229	160	135	170	150	162
3 day	pH	5,95	7,45	6,45	6,6	5,95	6,44
	ORP	220	176	215	200	230	140
6 day	pH	7,35	7,92	7,2	7,15	6,3	7,6
	ORP	135	155	180	140	245	135
7 day	pH	7,4	8,05	7,8	7,35	7,52	7,75
	ORP	210	140	130	155	145	165
8 day	pH	7,2	7,9	7,35	7,05	7,31	7,55
	ORP	158	149	165	162	230	165
9 day	pH	7,35	7,97	7,82	7,25	7,37	7,7
	ORP	157	158	155	157	156	163
10 day	pH	7,27	8,05	7,85	7,25	7,53	7,65
	ORP	155	130	125	160	115	134

Profiles of water treatment and results of electrical conductivity of distilled water for 20 days are shown in Table. 2.

Specific conductivity was measured within twenty days after treatment. The test samples and controls were in separate opaque containers at laboratory temperature.

An analysis of research shows that on the twentieth day of the third and fifth samples are significantly different from the control (46% and 38%). Virtually indistinguishable from the first and second control samples that were treated for 15 and 30 s.

2. Modes of processing distilled water and their impact on the specific conductivity

Parameter		The reference sample	Test specimens				
			1	2	3	4	5
Voltage, kV		-	10	10	10	10	10
Current, mA		-	0,4	0,4	0,4	0,4	0,4
Processing time, min		-	0,25	0,5	1	3	5
The electrical conductivity, mS / cm	2 h. after treatment	25	28	28	29	27	38
	1 day after treatment	27	28	30	35	33	41
	3 days after treatment	25	26	29	37	30	37
	7 days after treatment	28	29	31	43	32	40
	9 days after treatment	29	30	32	45	34	41
	12 days after treatment	31	33	35	49	36	45
	15 days after treatment	31	32	34	47	36	44
	17 days after treatment	33	34	36	49	38	46
	20 days after treatment	39	40	42	57	45	54

Conclusions

The studies found that strong electric fields affect the electrical properties of distilled water, depending on the mode of treatment and exposure time.

When processing distilled water varies pH ORP and conductivity. The properties of the treated water is stored for 10 - 20 days.

References

1. Aleksandrov A.B. Yonyzatsyya water molecules in the magnetic field ravnomernom / AB Alexandria, VA Kharitonov / / Mehanyzatsyya Electrification and rural economy. - Moscow: Kolos, 2004. Number 11. - S. 10 - 11.

2. Bereka A.M. Effect of electrostatic field of high voltage and spark the optical transmittance of water / A.M. Bereka, L.S. Chervinsky, Y.M. Chykin, S.M. Usenko / / Electrification and Automation of Agriculture. - K. NAU, 2005. Number 3 (12). - S. 62 - 68.

3. Bereka A.M. The influence of the electrostatic field of high voltage and spark on the pH and ORP of water / A.M. Bereka, L.S. Chervinsky, M.P. Salata, S.M. Usenko / / Electrification and Automation of Agriculture. - K. NAU, 2005. Number 4 (13). - S. 61 - 66.

4. Hriaznova S.I. Magnetic Processing polyvochnoy water in ovoschevodstve / S.I. Hriaznova, V.N. Shmyhel, T.N. Steering, D.V. Selyverstov / / Mehanyzatsyya Electrification and rural economy. - Moscow: Kolos, 1999. Number 7. - P. 9 - 10.

5. Duradzhy V.N. Rev. elektricheski pulse razryade between a metal electrode and эlektrolytnыm / V.N. Duradzhy / / SUMMARY Processing materials. - Chisinau: IAP, 2001. Number 3. - S. 22 - 26.

6. Pat. for invention № 80722 A23S 3/00, A23L 3/32, C02F 1/48. A method of processing power liquids and liquid products and device for its implementation / / Bereka O.M,. Chervinsky L.S., M.P. Salata, Soup GM (Ukraine). Number a200503599, appl. 18.04.2005, publ. 25.10.2007. Bull. Number 17.

7. Rukshan L.V. Effect of acidity of water, yspolzuemoy in cold conditioning, on tehnolohycheskye properties of grain / L.V. Rukshan / / PROCESSING and storage of grain. - Dnepropetrovsk, 2006. Number 11 (89). - S. 31 - 32.

8. Hatsukov S.M. Exploration properties эlektroaktyvyrovannoy water / S.M. Hatsukov / / Mehanyzatsyya Electrification and rural economy. - Moscow: Kolos, 2003. Number 3. - S. 14 - 15.

9. Chervinsky L.S. optical technologies in livestock production. / L.S. Chervinsky - K. Science. view, 2003. - 229 p.