Bulletin of the *Transilvania* University of Braşov • Vol. 2(51) – 2009
Series I: Engineering Sciences

THE DESIGN OF NEW TYPES OF AEROIONS GENERATORS REPRESSION WITH OZONE AND ELECTROGAS-DYNAMIC ENVIRONMENTAL PROCESS

C. BÎRSAN[1] T. SAJIN[1]

Abstract: *The paper presented and analyzed the main types of generators and ozone aeroions and proposed construction of two new generators, which combine the functions of cooling and the electrodes and pressing process gas containing oxygen, eg air. The first generator has no mobile parts and consists of a system of electrodes for dielectric barrier discharge with a compressor and electrogasdyinamic main function that combines the generation of ozone or aeroions with its complementary repression of gas and cooling the electrodes with barrier discharge. The second generator has electrodes with barrier discharge in the form of a barrier screw is repressing the gas processed and is involved in rotational motion of a jet engine electrogasdyinamic which replaces the generation of ozone and aeroions, too .*

Key words: *aeroions generator, ozone generator, with barrier discharge, electrogasdynamic repression*

1. Introduction

Sterilization in food containers, ozone is a viable alternative heat sterilization, which essentially reduces energy consumption in this process. Generate aeroions is appropriate for installations of air conditioning and various techniques for thermal processing of foods and in combination with ozone and to combat pathogens and micro-keeping fruit and vegetables.

Aeroionization and ozone generation, achieved by application of various technologies, may be used to extend the storage of horticultural products [1] and in strengthening health in general. Basically aeroions some are oxygen molecules that are constantly in the atmosphere and take in the rise of ionized factors.

By aeroionization application have achieved improvements in the treatment of diseases such as chronic bronchitis, asthma, ulcer, arterial hypertension, neurosis, insomnia, etc..

Currently there is a wide range of facilities to generate ozone and aeroions of which mention [2], generating, using electrical (corona), these being the most widespread. Depending on the geometry of electrode, emission generators are wired radiant, radiant with pseudofir, with counter electrode plan extraflat, generator with variable flow, generating aeroions piezoelectric.

[1] Dept. of "Power Engineering, Mecatronics and Computers Science", University of Bacau.

Another range of generation technologies aeroions would hydrogenerators the Lenard effect aeroions using electrostatic or dispersion of water. Using the Lenard have built many variations hydro-generators of aeroions of which mention Luke-Bejan hydrogenerator.

There are known generators using emission thermoelectroionic, generating aeroions with radioactive substances, photoelectric generators (photoelectric effect), generating aeroions flame.

Ozone gas is unstable and highly reactive, oxygen-derived, which is formed when oxygen molecules are broken after exposure to ultraviolet rays or electrical. Being an extremely powerful oxidant, is able to oxide most organic and inorganic components, transforming them into compounds inertia.

Ozone is used in water purification and disinfection in medicine to treat skin diseases, because maintain and enhance the healing process, inactiving viruses, bacteria etc..

Industrial ozone generators, depending on the geometry of electrodes, are classified in generating ozone plan with electrodes parallel to the central collector or longitudinal movement and ozone generators with tubular electrodes place vertically or horizontally. The widest use have a tubular ozone generators with horizontal placement of electrodes.

The disadvantage of ozone generators are known to reduce the intensity of production caused by ozone scratchy flow rate of gas processed by external tubular electrodes. Generators construction is complicated and large size. Adjusting the intensity of production of ozone is difficult.

Another major disadvantage is the center shows the errors of discharge electrodes, which are manufactured in cylindrical form with certain tolerances and operational center of the error increases directly proportional to the arrow to bend under their weight of water cooling, resulting in a discharge an uneven and irregular flow of gas processed.

However the final result of reduced efficiency of ozone production. In addition to those mentioned construction of ozone generators known systems require relatively complicated repression of cooling fluid and the repression of gas processed. Adjusting the intensity of production of ozone can be achieved only through changes in a not too high a voltage supply of the discharge electrodes, limited range on one side of voltage threshold from which the production of ozone, and on the other hand puncture voltage of the gas.

As will be shown two new types of aeroions and ozone generators, which removes the disadvantages mentioned above.

2. Ozone generator with compressor electrogasdynamic the pressing environmental process

Ozone Generator [3] (fig. 1 and 2) is composed of a cylindrical body (1) input flanges (2) and exit (3) of gas processed, which is fluid and coolant, cold outside body (1) (the cooling gas is not shown in the figures shown). The body (1) are located discharge elements, which contain some pairs of coaxial tubular electrodes (4) and (5), connecting to a transformer (6) removal of high voltage and separated by dielectric barriers (7). Between electrodes (4) and (5) are formed some johnny ring (8) for electric discharge in gas processing.

Generator are used in pairs of tubular electrodes (4) and (5) and dielectric barrier (7) with diameters increasing in the diameter of body (1).

Tubular pairs of electrodes (4) and (5) are located coaxial with the body (1) of the ozone generator so that johnnys ring (8) are formed between pairs of electrodes.

Electrodes (4) pairs of the interior walls of the dielectric barriers (7) are in place against axial movement with electrodes (5) on the exterior walls of the barriers (7).

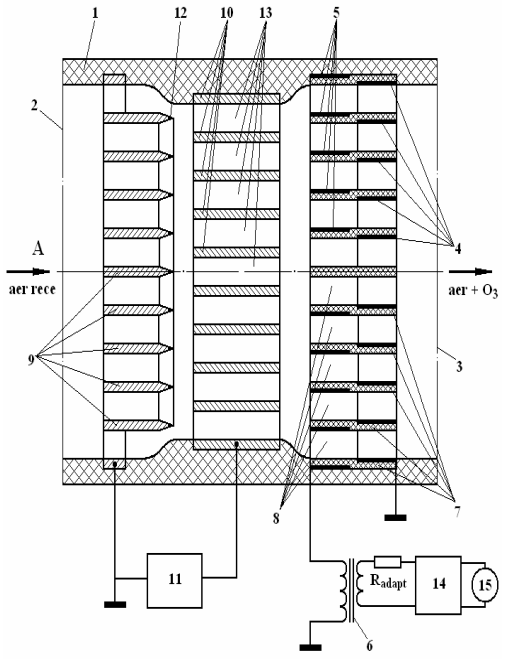

Fig. 1. *Construction of aeroions generator with compressor and ozone electrogas-dynamic the pressing environmental process (notation in the text)*

On the flange (2) entry of gas into the body (1) ozone generator, coaxial with it, is positioned a additional electrodes tubular coaxial ionization (9) and the coaxial electrodes tubular deionization (10) of gas processed, connected to a source (11) high-voltage direct current, which make up a electrogasdynamic the pressing and processing of gas . Electrodes ionization (9) have sharp edges (12) oriented electrodes deionization (10). Ionization electrode diameters (9) are equal to the diameters pairs of electrodes (4) and (5) of dielectric barrier discharge with (7). Deionization electrodes (10) formed between them some johnny ring (13) passing gas to suppress electrodes (4) and (5) of dielectric barrier discharge with (7). Average diameters johnnys (13) are respectively equal diameters with sharp edges (12) of the ionization electrodes (9). The transformer primary coil (6) removal of high voltage is connected in series with resistance adjustment (Radapt) out of a linear amplifier (14) signal. On entering the amplifier (14) is connected to a frequency generator (15).

Centering electrode ionization (9) and their galvanic connection is made with metal bars (16). The analog is achieved centering and connection of electrodes of galvanic deionization (10), discharge electrodes (4) and (5) and the dielectric barriers (7).

Ozone generator shown above work as electrodes to feed (9) and (10) with DC high voltage source (11) in the space between these electrodes will determine a scratchy electric field intensity maximum sharp edges (12) the ionization electrodes (9). In the vicinity of these edges intensity electric field will exceed the intensity of

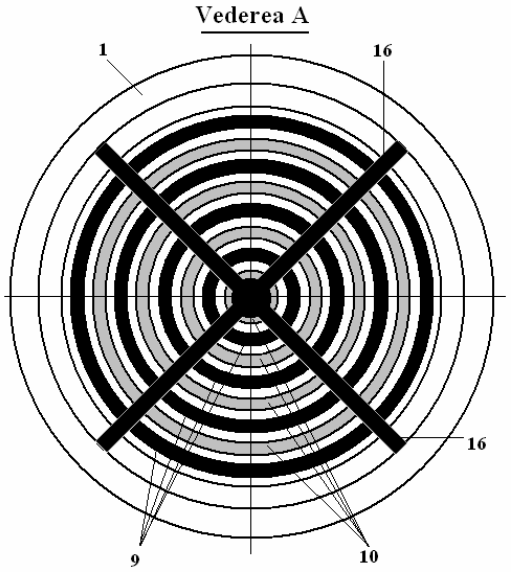

Fig. 2. *Construction of aeroions generator with compressor and ozone electrogasdynamic the pressing environmental process, a view of* Fig. 1

corona discharge initiation in these areas will be of shock ionization of gas processed molecules containing oxygen (cold air).

In the corona discharge, with unipolar ionization gas will form ozone and other chemical species and, under the action of Coulomb forces, trained ions will migrate towards the electrodes deionization (10), the electrical load of the particles will be offset loaded. In moving towards the ions due to molecular viscosity, will be trained and neutral gas particles forming so-called "ionic wind". In this way the mixture of cold air with ozone generated in the electrogasdynamic of repression will be circulating to the electrodes (4) and (5) of dielectric barrier discharge with (7).

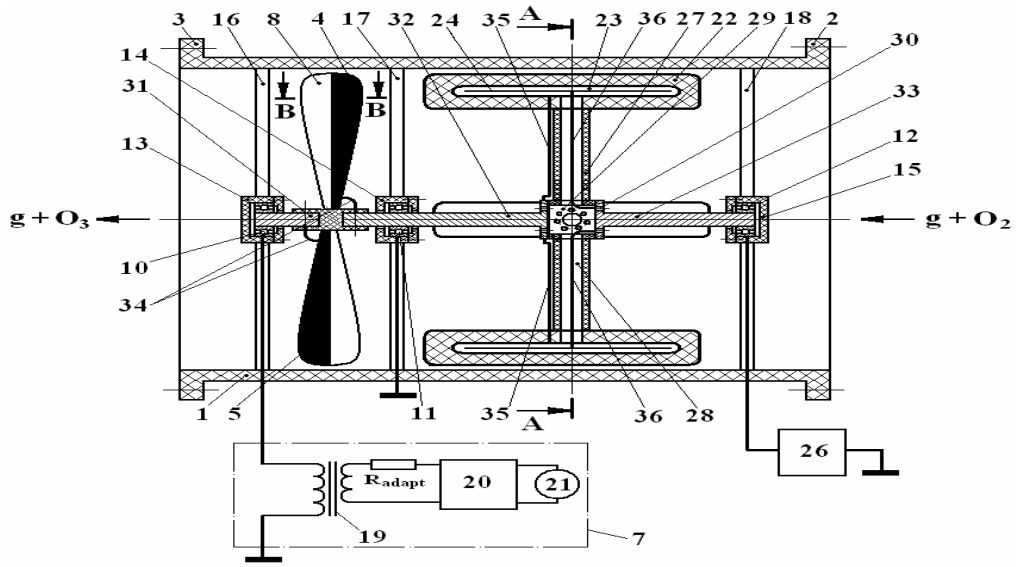

Fig. 3. *Construction of generator aeroions with ozone and electrode in the form of actionable propeller with an engine electrogasdynamic turboreactor (notation in the text)*

Voltage and frequency alternating current supply of the electrodes (4) and (5) are adjusted depending on the electrode geometry and gas electro-physical properties, processed in the preventive electrogasdynamic of repression. Thus, by generating the generator (15) signal with adjustable amplitude and frequency, amplified by linear amplifier (14) and the high voltage transformer with lifting (6) choose the optimal frequency and voltage supply of the electrodes download (4) and (5) with dielectric barriers (7), which establishes a regime of maximum intensity discharge with possible generation of ozone.

Dielectric surfaces of the interior and exterior barriers (7) between the edges of electrodes (4) and (5) are localized areas of extended plasma discharge with barrier, where the final generation of ozone. Flow of gas to suppress the cold electrogas-dynamic (9) and (10) cooled electrodes (4) and (5) and take the ozone formed in the space of the discharge. Thus, entry via flange (2) cold air is absorbed, cool on the outside of the generator and the
output flange (3) suppress air mixture with high ozone.

Ozone generator shown above contains elements that aggregates complementary functions of electrode cooling and

vehicular gas processed by the primary generation of ozone and, thus, has a simple construction with high intensity to generate ozone in relation to unit volume of the body (with greater than 30-50% if generators known).

3. Ozone generator with electrode in the form of actionable propeller with an engine electrogasdynamic turbo-reactor

Ozone Generator [4] (fig.3, 4 and 5) consists of a cylindrical body (1) Input flanges (2) and exit (3) gas processed (g + O3).

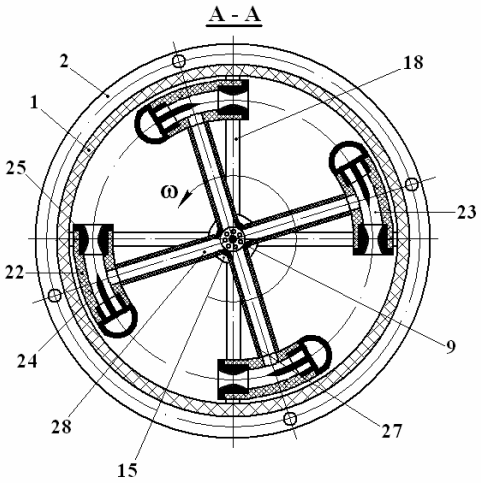

Fig. 4. *Construction of generator aeroions with ozone and electrode in the form of actionable propeller with an engine electrogasdynamic turboreactor, section A-A of* Fig.3

Pairs of electrodes (4) and (5), separated by dielectric barriers (6) and connected in parallel to high voltage source (7), respectively are located along opposite virginity of each propeller pale (8) with a transverse displacement in relation to the other. Propeller (8) is located inside the generator (1) and installed with the possibility of rotation on a spindle (9) fixed in bearings (10), (11) and (12). Camps (13), (14) and (15) of rolling bearings are rigidly fixed to the body (1) of the generator with spoks (16), (17) and (18). Propeller blade (8) are made of dielectric material and are used as dielectric barriers (6).

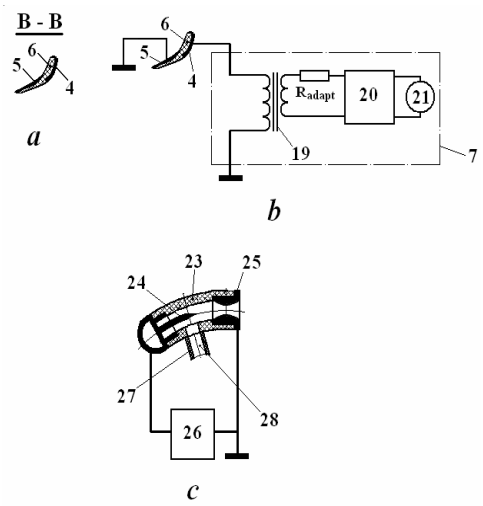

Fig. 5. *Construction of generator aeroions with ozone and electrode in the form of actionable propeller with an engine electrogasdynamic turboreactor:*
a - *section BB through the propeller paddle of fig.3;* b - *electrical connection diagram of a pair of electrodes on a paddle to source high-voltage;* c - *electrical diagram for connecting a pair of electrodes and ionization deionization from carcasses dielectric to the source of high voltage DC.*

Source of high voltage (7) is performed as a transformer (19) lifting high voltage primary coil which is connected in series with resistance adjustment (Radapt) out of a linear amplifier (20) signal, and entry in amplifier (20) is connected to a frequency generator (21).

On the axle (9) of rotation of the propeller (8) is further mounted a drive electrogasdynamic turboreactor, made of some dielectric housing (22) channel (23), which are positioned in pairs of electrodes

(24) in the form of blades with edges sharp gas ionization process (g + O2) and the electrodes deionization (25) gas processed (g + O2), run as a nozzle.

Pairs of electrodes (24) and (25) are connected in parallel to the source (26) high-voltage DC. Heads channels (23) from the ionization electrode (24) and ends are obturate channels (23) from the electrodes deionization (25) are open to the generator from inside the body (1). Carcases dielectric (22) are mounted tangential to the circle of rotation of the drive power some radial tubes (27), inner channels (28) of the ends which communicate with the peripheral channels (23) of carcasses dielectric (22) and ends with interior the body of the generator (1) through the collector (29) and windows (30). Axis of rotation (9) is three sectional electroconductive axle (31), (32) and (33), galvanic isolated.

Pairs of electrodes (4) and (5) are connected to high voltage source (7) through rolling bearings (10) and (11), electroconductive axles (31) and (32) and conductors (34). Pairs of electrodes (24) and (25) are connected to high voltage source (26) through rolling bearings (11) and (12), electroconductive axles (32) and (33) and conductors (35) and (36).

Ozone generator shown above operates as follows: the power electrodes (24) and (25) with DC high voltage source (26) in the space between these electrodes will determine a scratchy electric field intensity maximum of the sharp edges ionization electrodes (24).

In the vicinity of these edges intensity electric field will exceed the intensity of corona discharge initiation in these areas will be of shock ionization of gas processed molecules containing oxygen (cold air). In the corona discharge, with unipolar ionization gas will form ozone and other chemical species and, under the action of Coulomb forces, trained ions will migrate towards the electrodes deionization (25), the electrical load of the particles will be offset loaded. In moving towards the ions due to molecular viscosity, will be trained and neutral gas particles forming so-called "ionic wind".

In this way the mixture of cold air with ozone generated in the channels (23) of carcasses dielectric (22) will suppress the nozzles electrode (25), placing the carcasses (22) reaction forces directed tangential circle rotation thereof. In this scheme, because the ends of channels (23) from the ionization electrode (24) and ends are obturate channel (23) from the electrodes deionization (25) are open to the generator from inside the body (1), gas processing (g + O2) will be absorbed by the ionized jet generator of the body (1) through the windows (30), collector (29) and inner channels (28) of the radial tubes (27) and returned back enriched with ozone formed in the corona discharge generator inside the body (1) in the form of reactive jets through the nozzles electrode deionization (25).

In this way power electrogasdynamic turboreactor will be circle with angular velocity ω (Fig.2), while generating ozone gas processing and printing of a moving vortex.

Electrogasdynamic turboreactor action will involve moving the rotating propeller (8), which will inspire the flow of gas processed in the first step. Movement of vortex gas will facilitate the efficiency of repression and improve its efficiency. Sub electrodes (4) and (5) of the propeller blade (8), and that the dielectric barrier (6) with high voltage alternating current from source (7) will start downloading the barrier, which is the second step of processing the gas. Downloading the barrier will hang gasdynamic boundary layer on the blade surfaces. Such gas is easier to detach pale

additional contributing to increased efficiency of repression by reducing losses in the local pale.

Voltage and frequency alternating current supply of the electrodes (4) and (5) are adjusted depending on the electrode geometry and gas electro-physical propreties, processed in preventive action electrogasdynamic turboreactor. Thus, by generating the generator (21) signal with adjustable amplitude and frequency, amplified by linear amplifier (20) and the high voltage transformer with lifting (19) choose the optimal frequency and voltage supply of the electrodes download (4) and (5) with dielectric barriers (6), which establishes a regime of maximum intensity discharge with possible generation of ozone.

Dielectric surfaces of the interior and exterior barriers (6) between the edges of electrodes (4) and (5) are localized areas of extended plasma discharge with barrier, where the final generation of ozone.

Stream of cold gas, the interaction with the blade propeller (8), cooled electrodes (4) and (5) and take the ozone formed in the space of the discharge. Thus, entry via flange (2) cold gas is absorbed (g + O2), cooled generator outside and exit through the flange (3) suppress the gas mixture with high ozone (O3 + g).

And in this case, the proposed ozone generator contains elements that aggregates complementary functions of electrode cooling and vehicular gas processed by the main function of generating ozone, and in this way provides a high intensity to generate ozone in relation to unit volume of the body (with greater than 40-60% if generators known). Constructions proposed schemes allow the discharge intensity is not too high or in any regime of separation but provided neutralization ozone generated or to be used to generate aeroions.

1. Conclusions

Most technologies for generating ozone and aeroions known to have disadvantages that the intensity reduced generation per unit volume of the body, caused by scratchy velocity flow of gas processed, gasodynamic high resistance, which leads to a high energy consumption, building complex gauge and higher.

Were designed for building two new generators aeroions and ozone, which are devoid of the above disadvantages: aeroions generator and compressor electrogasdynamic ozone with the pressing environmental and processed aeroions generator with ozone and carbon in the form of a propeller with actionable electrogasdynamic turboreactor engine.

Processes occurring in the types of generators are designed complex. Study that will follow will focus on the physical processes shaping the discharge phenomena and the formation of molecules of ozone and aeroions order to understand the basic phenomena and transient, occurring to this technology.

Acknowledgement

This paper was realised with the support of *BRAIN* project: "*Doctoral scholarships as an investment in intelligence*", financed by the European Social Found and Romanian Governmen.t

References

1. Ionică, Elena: *Cercetări privind influența tehnologiei electroionice asupra păstrării unor specii horticole*. Grant 33062, tema 40, cod CNCSIS 711.
2. Iurea, D., Alexa, M.E., Cadinoiu, L.: *Generatoare de aeroioni*, Bucuresti. Editura Tehnică, 1991, 127 p.

3. Bîrsan, C., Sajin, T., Mărian, M., Nedelcu, I., Ostahie, N.,Vernica, S., Aniţei, F.: *Generator de ozon*, Cerere de brevet de invenţie nr. A/00021, 2009, depozit 16.01.2009.

4. Bîrsan, C., Sajin, T., Aniţei, F., Mărian, M., Nedelcu, I., Ostahie, N., Vernica, S.: *Generator de ozon*, Cerere de brevet de invenţie nr.A/00103, 2009, depozit 30.01.2009.