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Social Economy Enterprise, Source of Innovation in the Local Community

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Abstract

Economic crises oblige the social actors to be involved in identifying new technological solutions, favourable of economic and social development. In such moments, Romanian social economy enterprises, for which priority is the interest of the community, make their presence felt in society as vectors of knowledge, sustainable development, social innovation, protection and also, restoration of the environment.
The paper aims to answer the question: what is the limit involvement of social economy enterprises in solving specific problems of the communities, referring of air pollution. To answer this question we will present the methodology for standardizing new equipment, for restoring air quality while eliminating the microbial load, designed in a Romanian social economy enterprise. Standardization was performed in compliance with European and American regulations, the result is a multifunction device used to restore air quality, while disinfection of the inhabited rooms. Data records were interpreted with IBM SPSS Statistics application.

Keywords: *local community; social economy enterprise; sustainable development; environment*

JEL Classification: *I310; O130; O140; Q530*

Introduction

This paper is part of a wider research on "Improved management of social economy enterprises, essential factor in the development of local communities".

Social economy is distinguished as an economic sector in its own right, with deep roots in history, which was developed from the need to solve specific problems of local communities, social, economic or environmental.

Social economy enterprises, representative entities of this sector, encourage and empower members of the community, to join in solving local problems that are ignored or uncovered by public or private sector. Technological and human capital accumulated in this process, transforms these enterprises into vectors of knowledge in the field of technical, technological, social, managerial, medical, environmental protection etc. The results obtained recommend social economy enterprises as models of good practice in areas where it operates. Such a model of social involvement we intend to present below, by exposing the results of an independent

research that we conducted to identify the most relevant solutions for keeping pollution under control within inhabited areas.

Starting from the observation that the daily activities compels us to spend most of our time in indoors: at home, at work, in waiting rooms, in underground etc., recent studies have shown that pollution from enclosed spaces is often higher than the in outdoor. Attention paid to this particular case of pollution has led to development, in recent decades, of some comprehensive and independent studies that have shown adverse effects of indoor and outdoor pollution on health, concomitant with testing in-situ solutions to restore air quality. Ozone, the miracle created by nature, thanks to its biocides properties, proved to be the optimal solution to eliminate pollution at source on condition to be used responsibly.

Health, human capital, innovation capital, technological progress etc., are vectors of development meant to restore the balance of the components of social, economic and environmental. Long-term development requires taking responsibility in every field, so that our present activities not to endanger the life of future generations.

Life is the core element of concept of sustainability. Addressing the challenges of lifestyle means concomitant approach of the potential risks due to exposure to pollutants and the effect they have on health. According to Pănculescu (2012, pp. 304), „pollution is not a simple unconscious or irresponsible action, it is and will soon become a real paradigm, equivalent to murder, and detailed presentation of its aimed to highlight the consequences of technological irrational and lack of morality of scientific creation in the last two centuries".

In recent decades, air pollution has captured our attention by its multitude of sources and specific forms of manifestation. However, increasingly more studies point out that, spending most of our time indoors (World Health Organization, 2015), in areas with levels of exposure to chemicals, dust, moisture, mildew, biological agents etc., with 2 to 5 times - and occasionally more than 100 times - higher than the outdoor (European Environment Agency, 2016), we are constantly exposed to a particular type of pollution; the risk of disease greatly increases for vulnerable persons (children, the elderly, people with cardiovascular and chronic diseases). Casuistry registered confirms that exposure to indoor air pollution has become more visible (European Environment Agency, 2016). Combustion sources, building materials and furnishings, moisture, furniture, cleaning and maintenance products, humidifier, heating etc., are all sources of air pollution inside the living spaces. International Agency for Research on Cancer (IARC) has classified the pollution caused by burning coal, as carcinogenic to humans, as Seow et al. (2014) highlights. Poor ventilation or worse, absence of natural ventilation, contributes to higher levels of indoor pollutants. According to the Green Guard Certification organisation, (2015), constant exposure to such substances leads to increase of respiratory symptoms, allergies and asthma, as well as disruption of the immune system.

European Union Programme for Environmental Action (PAM 6) aims to achieve levels of air quality that will not cause unacceptable impacts and risks to human health and the environment. The program also encourages research to identify optimal solutions for maintaining air quality level. Moreover, European Environment Agency (2016), make specific recommendations on air quality.

Literature Review

The impact of pollution (of air, water and soil) on human health has increased with economic development, reaching in some areas alarming rates and for their reducing, were imposed extreme measures, reaching to prohibit certain activities (e.g.: the closure of power plants on coal). Simultaneously, they have developed medical research to identify optimal solutions for environmental remediation.

Category of studies that drew our attention, regarding on proposed solutions to the problem of air remediation in inhabited areas, refers to the determination of bactericidal effects of ozone and hydrogen peroxide, compared to that of free chlorine, on Legionella pneumophila serogroup 1. The study concludes that ozone was the most powerful of the three biocides tested, with a drainage capacity of bacteria higher than 99%, which occurs during an exposure of 5 minutes from 0.10 to 0.30 micrograms of ozone per millilitre (Domingue, et al., 1988). A similar effect was obtained in the case of ozonation of water that supply an unoccupied hospital, which have been reported positive cultures for Legionella pneumophila, located in the hospital plumbing fixtures. Mean residual of ozone concentration who eradicated the bacteria in the water system was 0.79 mg/litter (Edelstein, et al. 1982).

We also identified some studies that highlight the effectiveness of ozone in the case of Staph aureus eradication - maximum effective use was recorded in the first two hours of exposure of samples at a concentration of 0-9 ppm ozone; after this time frame, the eradication rate has slowed (Dyas, et al. 1983).

Another category of studies assesses bactericidal effect of ozone on bacteria Escherichia coli, Bacillus subtilis PC1219, and Penicillium species (Masaoka, et al. 1982). This latest study also notes, the ozone disadvantages (strong oxidant, accelerates degradation of the material), but recognize that this disadvantages can be easily controlled, suggesting that ozone is a promising method for decontamination, recommended to replace formaldehyde, which vaporize harder, increasing the risk of inhalation by hospital staff.

Research Objectives and Methodology

Our curiosity to find out the limits of efficiency for this method of air treatment became the *main objective* of the study that we present in this paper.

Individual studies on air remediation by burning in cold plasma and controlled emission of ozone, conducted by researchers of Pancuantic Foundation - with whom we have collaborated for standardization of equipment for air remediation - confirmed efficiency of ozone use, in order to remediate the air quality within inhabited areas.

The secondary objective of the study is the standardization of a specialised equipment for the remediation of the atmosphere (Figure 1), recommended for use especially in enclosed spaces, which restores the natural parameters of air, having a natural consequence the recovery of the waste resulted by combustion, in the form of raw materials needed for other economic activities (Figure 2).

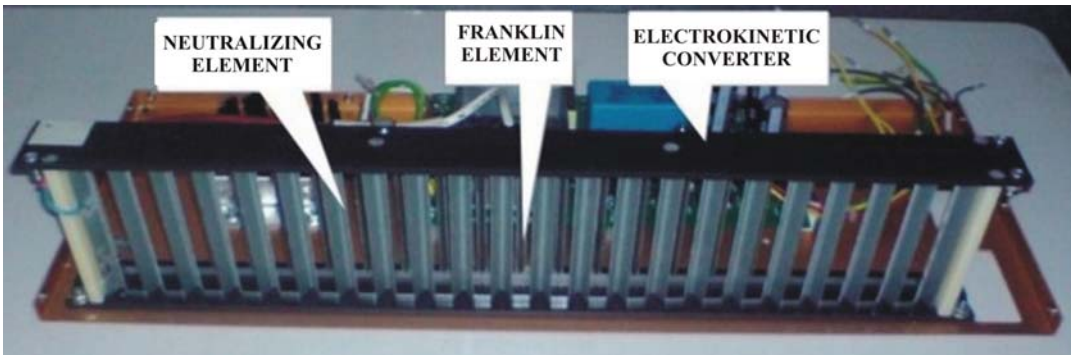

Fig. 1. The base plate of the air purifier designed to Pancuantic; Gold medallist, US and Romania patent. Source: Panculescu (2012, pp. 346)

The research methodology. Due to its specificity, which includes access to dangerous biological materials, research was conducted in two distinct phases:

1. to achieve the main objective, with reference to the limits of efficiency of air treatment with ozone, we conducted a *documentary research*, which aimed to identify the latest medical studies in the field;

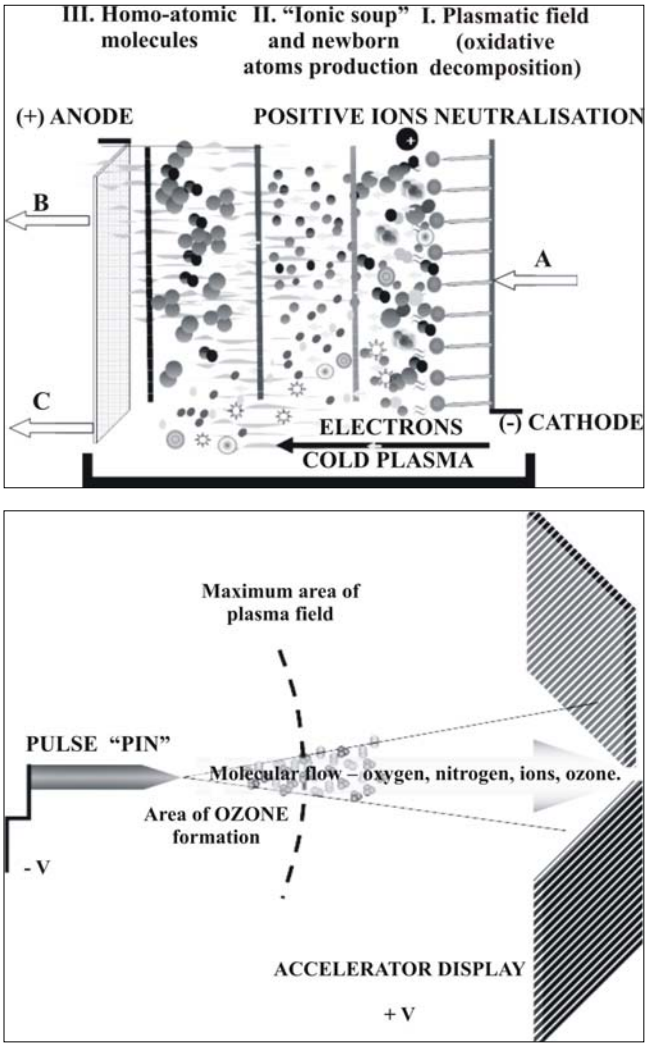

Fig. 2. Schematic diagram of EHD converter. The mechanism of atmospheric remediation, by decompose and restructure the atmospheric substrate

Note: A. Polluted air (CO2, SO2, NO, NO2, CO, CH4, C6H6, pathogen agents, dust and radioactive powders), is transformed in B. Clean air (O2, O3, N2, H2Ovap) and C. Solid deposits (carbon, sulphur, heavy and radioactive metals).

Source: Foundation Pancuantic.

2. to achieve the secondary objective - standardising a multifunctional equipment for air purification and sterilization, designed for the inhabited areas - we proceeded to identify international standards applicable in the field of restoring air quality, which we have used as reference in making a product according with regulations.

Documentary research led us to identify the most recent medical studies, published in international medical journals (indexed ISI), which include:

- The study „*Effect of low-dose gaseous ozone on pathogenic*" (Bio Med Central, 2012); The authors use eight bacterial strains, which have been pathogens of nosocomial infections with known antibiotic resistance. The results of the study showed that a dose of 20 µg O_3 / ml in a mixture of O_3 / O_2 gas (1% O_3 / 99% O_2) in a single spraying for 5 minutes, at atmospheric pressure, effectively inhibits the growth of the pathogenic potential (in vitro) of bacterial strains with known antimicrobial resistance.
- The study „*Activity of ozonated water and ozone against Staphylococcus aureus and Pseudomonas aeruginosa biofilms*" (Slide Share, 2016) demonstrates that fresh ozonated water can be an effective solution for destroying bacterial strains developed on biofilms. There was observed almost complete eradication of S. aureus biofilm after 30 seconds of exposure to ozonated water, to the ozone concentration of less than 1.2-3.6 µg / mL; the bactericidal effect of ozonated water on P. aeruginosa was somewhat less pronounced.
- the study „*Nosocomial infections - a new approach towards preventive medicine using plasmas*", published in 2009 in New Journal of Physics journal, underlines the importance of cold plasma generators in terms of fungicidal efficiency and bactericidal effects and the role it may have in the future in the fight against nosocomial bacterial infections.
- The study „*Ozone therapy in traumatology and burns treatment*", published in 2013 in Revista Espanola de ozonoterapia, describe the indications and contraindications of ozone, specific care protocols while applying this treatment, based on Russian clinical experience.

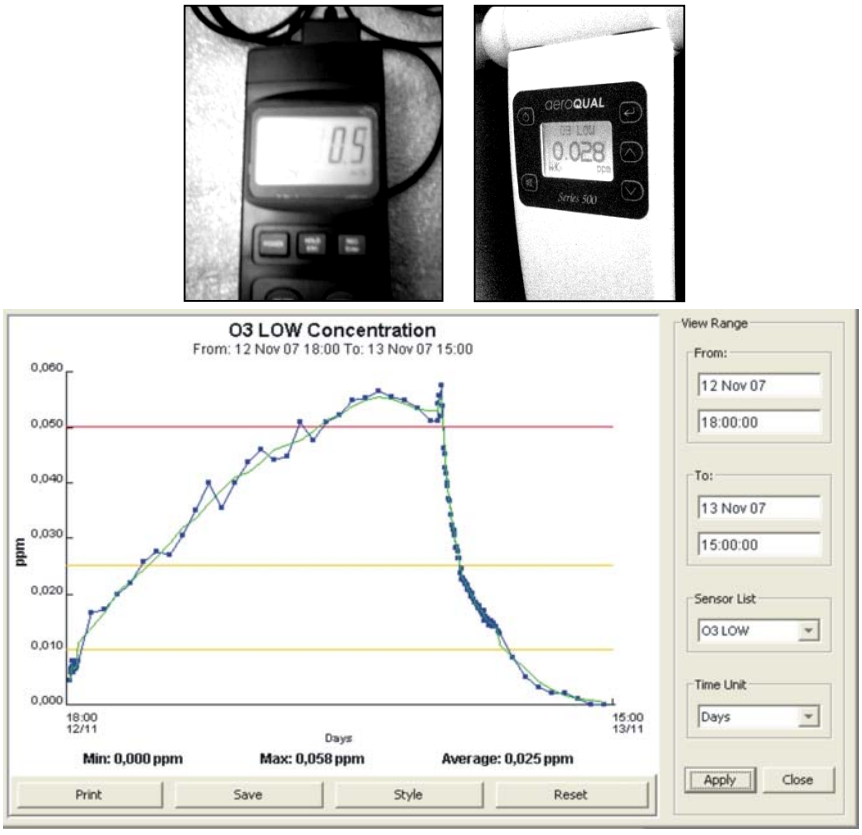

Fig. 3. Measuring tools and Ozone law representation: electronic anemometer and ozone meter. Equipment calibration tests were performed according to European and American standards (AHAM).

Source: Pancuantic Foundation.

The standardization of ozone emissions - involving the use of equipment in order to maintain air quality or for sterilization of inhabited areas (eliminate pollution at source) - has followed the methodology described by the standards SR EN 60335-2-65 CEI 60335-2-65, Safety of electrical devices for household and similar purposes Part 2: Particular requirements for air scrubbers and equivalent regulations equivalent to the American standard, AHAM. According to the mentioned regulations, the maximum concentration of ozone, allowed in the air, is 0.05 ppm. For higher concentrations of ozone, the device turns into a biocides product which can be used for sterilization in the absence of personnel.

The tests were conducted in a blind room, of the size 2,5 m x 3,5 m x 3 m, with the volume of 26.25 m^3, whose walls were covered with polyethylene film to achieve a perfect electrostatic isolation. Equipment under calibration was placed on a table in the centre of the room at a height of about 750 mm. To record the air velocity we used an electronic anemometer, and for recording, in real time, the ozone concentration was used a firmware ozone-meter, connected to the computer (Figure 3). The temperature in the test chamber was maintained throughout the course of the study, of the values between 19^0 C – 25^0 C. Relative humidity was maintained in the range of 50%.

The Research Results

The study was conducted a period of over 18 months, and was intended to record ozone concentration obtained in different stages of standardization. Ozone concentrations recorded allowed us to set-up several working levels, according on the volume and level of pollution of the inhabited space, wherein will be used the equipments. The recorded data were later interpreted in the IBM SPSS Statistics (Figure 4).

Analysis of scores distribution for ozone was made for 3923 records without missing records.

The amplitude of scores was 0.977 points, placed between the minimum 0.000 and maximum 0.977; the mean is 0.11248, with a standard deviation of the mean of 0.002612. The standard deviation of the scores is 0.163575; the median is located at 0.043000 score level.

Category with maximum frequency is the score 0.000, which was recorded in two distinct situations: a) at the beginning of the testing program, before putting ozone generator into service, testing room is naturally ventilated; b) at introduction of the pollutants agents into the testing room, that quickly neutralize ozone (was found that the smoke, whatever it generates, is the polluting agent fastest neutralized by ozone, in the test chamber).

Category with the minimum frequency is represented of 0.977 ppm ozone concentration. This concentration is much higher than the standard threshold (of 0.05 ppm) and highlights the biocides character of the equipment.

The standardization of equipment was performed by *trial and error method*. Simultaneously with the study of the microbiological effectiveness of the ozone, was tested ability of equipment to neutralize the smoke, in a controlled experiment of fire simulation (Figure 5).

The result is multifunction equipment that can be used both, as a biocides product for disinfection - in the absence of the staff - and for domestic usage, according to the ozone concentration level (Figure 6).

Subsequently, the study was expanded out of the test chamber, in a living space of about 72 m^3, to study the effectiveness of air remediation equipment in the eradication of the various mould culture.

Table 1. Ozone Concentration

N Valid 3923	Missing	0
Mean	0.11248	
Std. Error of Mean		0.002612
Median		0.04300
Std. Deviation		0.163575
Range		0.977
Minimum		0.000
Maximum		0.977

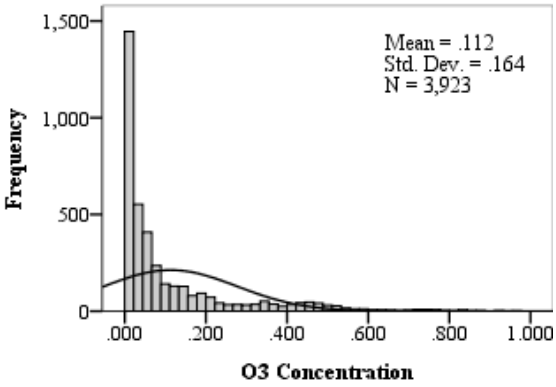

Fig. 4. Data processing, by author, in the IBM SPSS Statistics

Source: Pancuantic Foundation

Adapting the equipment to the new operating conditions (higher ventilation air volume, temperature and humidity different from those of the test chamber) was carried out by adjustment of the settings of the purification equipment.

Fig. 5. The neutralization capacity of the smoke. We conducted the experiment over 3 hours in a closed chamber. Source Pancuantic Foundation.

Ozone concentrations recorded during operation of the equipment, reach higher values than those used by European and American researchers in their medical studies regarding effectiveness of ozone in eliminating microbiological pollution.

Conclusions

The study results allow us to answer yes to the question we put it at the beginning of the work: social economy enterprises are able to take, punctual, responsible and address the specific problems of local communities.

A model of good practice is the research program that we have presented, initiated by Pancuantic foundation, which was completed by providing equipment for air regeneration and eliminate the microbial load, specific of inhabited areas, according with international standards applicable in the field.

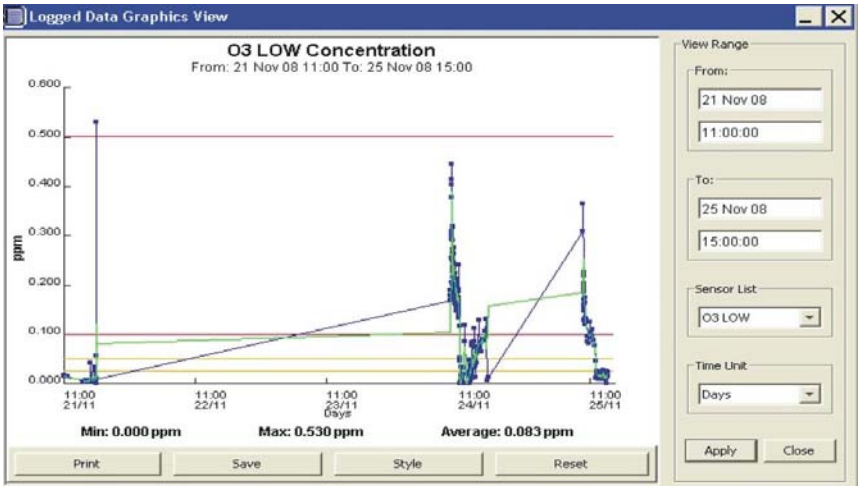

Fig. 6. Biocides character of the equipment. Ozone concentrations used to eliminate pollution

Source: data recorded, by author, in different stages of the calibration, archived at Pancuantic Foundation.

The device has proven the efficiency both, in the testing room in standard working conditions and also in inhabited areas, by neutralizing smoke, eradicate mould and insects carrying pathogens, that increase the risk of disease.

Simultaneously with the standardization of air regeneration equipment, we have achieved a solid database on research findings about the effectiveness of ozone in stopping pollution, with positive consequences on the health of the population, conducted worldwide.

It was observed that the neutralization degree of ozone is strongly influenced by pollutants agents, temperature and ambient humidity level. Thus, in the temperature range between 19-22^0 C and relative humidity between 40 – 60 %, the characteristic of ozone neutralization is normal. Outside of these intervals, ozone decomposes slower.

Last but not least, the study that we presented opens new perspectives of research in the field of health and atmosphere remediation.

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