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LEVEL OF ELECTROMAGNETIC POLLUTANTS AND FROM THE EDDY CURRENTS IN THE ENVIRONMENT OF THE DURRES PORT

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ABSTRACT

The issues raised in this article are related to electromagnetic and electrical pollution in the marine port of Durres, as one of the most important ports of Albania and with the highest growth in development for the future. Considering the preservation and protection of the environment as a factor of vital importance for the protection and preservation of human life, flora and fauna, as well as the whole ecosystem. Using the time instances, after a theoretical study of the sources of pollution, the factors that determine their level, and the condition of the machinery and equipment installed in the Durrës marine facilities, we have made the real and concrete real level determination of these pollutions. According to the results, it is clear that the value of these pollutants, especially the electrical ones, is considerable and relatively high, as such and the devastating consequences and damage caused by them are enormous and with social and economic problems. In our study, we are in the moment of identifying the state of these pollutants with the aim of determining our recommendations on the elimination or minimization opportunities.

KEY WORDS: pollution, electromagnetic field, installed power, currents, metrology factors.

1. INTRODUCTION

Earth, water and air have their own electromagnetic field, so humanity has always been surrounded by the electromagnetic field and in particular the currents that induce these areas in these environments. [3].

But with industrialization, the use of electromagnetic fields has spread widely. Machinery, equipment, manufacturers of electromagnetic fields as well as television, radio, mobile telephony, electrical equipment etc. have grown the presence of these electromagnetic waves, environmental pollution from these waves and their negative consequences. Surface currents are electrical currents that derive from electric circuits [1], [4] or induced by electromagnetic fields [2] that are created, or any other type of currents that are born on earth, water and air from external sources.

Usually, these currents when they are in low value and operate for short intervals do not cause major damage, but when they operate for long intervals and have high current frequencies as sources, they pose a serious risk [4]. Electric winding currents can be either continuous or alternating current that exists for partial time intervals or at continuous intervals.

Surface flow sources in protracted environments are: electromagnetic fields of machinery and equipment installed, corrosion protection installations, galvanic coating systems and installations, electrowelding systems and equipment, induced currents of piping systems lying in port facilities, Induction lines of electrical line cables, railway lines, pipelines, jumper bearings, in or near port facilities, and any breakdowns or defects that may arise in port energy systems. Or all other sources of electricity currents from other electricity consumers near or on the outskirts of the port facilities. (Houses, other industrial infrastructure) [1].

The level of electromagnetic fields and ignition currents depends on: the machinery and equipment installed and their power, by atmospheric factors (temperature, atmospheric pressure, wave, humidity), salinity content, presence of electrical defects, magnetic and electrical characteristics of environment (materials). Constant electric waves on the ground, water and air in portal environments cause damage to the normal operation of machinery and causes damages to human health injuries, biodiversity damages (flora and fauna), As well as affect the work of machinery and electrical equipment installed at the gateway. The high and significant values of their currents or their densities cause not only corrosion as the highest form of damages in the area of maritime transport that are damage to marine environments and damage to infrastructure, but also cause damage to fauna and flora, people and other damage to be assessed. Electric eddy current is the form of pollution that causes the greatest damages from corrosion. Thus, according to Xhon, corrosion damage caused by carbon steel contained in NaCl solutions with a concentration of 0.1 N, enclosed by 60 Hz fluorescence fluorescents and 300 density (A/m^2) are very high, while the intensity of bi damage when they are crippled, due to the hydrogen liberating reaction. Also, the risk of corrosion damage and the rate of corrosion of the currents, increases in cases where they are continuous, the value increase increases to 1%. [1]

Damage to corrosion of continuous currents is high especially in aluminum materials and its bonds, namely when their density is 15 (A/m^2), the rate of damage reaches 5% when the density increases to 100 (A/m^2) the injury rate goes to 31%. Despite the impact of the electromagnetic fields on the machinery and equipment and the pollution caused by the currents in ecosystems (fauna and flora), they also have negative consequences for human society. There is a group of people who report health problems from electromagnetic fields, headache, dizziness, memory problems, heart rhythm disorders and skin irritation. These are considered sensitive to these domains. [5], [6]. The study data of Carlsson et al. show that 1.9% of people have problems with monitors (not LCDs) and fluorescent lights (these emit electromagnetic waves besides light). 2.4% report inconvenience from electrical fields. In 1991, William J. Rea concluded that "there is strong evidence that sensitivity to electromagnetic fields exists". [5].

Part of the "allergic" people to electromagnetic fields have serious health problems, they receive medical reports, or disability retire for that reason. Sensitivity to electromagnetic fields is

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especially popular in Sweden. [6] It is thought that electromagnetic fields increase the risk of leukemia. [7] [8].

2. OBJECT OF STUDY

The object of our study is the seaport of Durrës, located on a small peninsula on the Adriatic Sea coastline, one of the most ancient cities of Albania, the main port of the country, the second largest industrial center after Tirana. It represents Albania's most important gateway to the West. This advantage is the result of the combination of these factors: geographic location in the middle position along the coast; close to the capital, Tirana; only 40km inland in the direction of the east.

The territory in which the Durrës port is located is characterized by a natural bay positioned in the southern part of the Adriatic Sea, south of the city, in the northern part of the Durrës bay. The bay of Durres is about 18 km long from north to south, with a coast line of about 7 km to the east. [5].


Figure 1. View from the activity offered by the seaport of Durres.

The Durrës Sea Port is located in the northern part of the Gulf of Durres along the coastline with a stretch of 1400 (m) with a surface area of 670000 (m2), an area of 650000 (m2), with an entry channel of 6755 (ml), width 120 M), depth 9.5 (m), limited to light bulbs from its beginning to the waves, while the depth on the port territory is 7.3 (m) to 11.5 (m). The Navy Port of Durres is the largest port in Albania that offers all port services. Its port facility consists of 12 marshes with a total length of 2275 (ml) and is capable of processing about 78% of Albania's international maritime traffic, has a processing capacity of 5000000 (ton / year). Port facilities welcome ships with natures and sizes of goods. This is accomplished through 4 terminals operating in the port. Durrës port loads and discharges all types of goods: minerals, fuels, cement and items of various categories. The container terminal is equipped with all the mechanisms for their processing.

3. STUDY METHODS AND MEASURING INSTRUMENTS

Method of study

In the study, we have focused directly on the real and concrete measurements of the characteristics of the electromagnetic fields created on the portions of the Durrës sea port, focusing on parts that have more machinery and equipment or have the largest installed electric power. The obtained results have been elaborated to give a complete overview of electromagnetic pollution in these environments. We conducted our study for a two-year period 2015 and 2016 divided into four time periods in each quarter to clearly see the role of environmental and metrology characteristics.

Measuring Instruments

Electro-smog measuring instrument TES-92

For the determination of the characteristic parameters of the electromagnetic field and the electric currents in the marine port facilities of Durres we used the electro-smog instrument TES-92.

The electro-smog measuring instrument TES-92 is with three-dimensional spherical 3.5-degree projection and serves to indicate the average value in three directions. It is a frame that shaves and gives 99 values of the front measurements. For the values that we seek to receive this device requires to preset the boundary values which it ascertains when it is notified through the LCD alarm system.

Figure 2 View of electro-smog measuring instrument TES-92.

The electro-smog measuring instrument TES-92 is field intensity meter through electromagnetic radiation measurement. It is also used to measure wireless LAN, GSM or microwave radiation determination. With a frequency up to 3.5 GHz, it is possible to use the device. Measuring with the three-dimensional probe saves the calculation of individual axes. Small electro-smog meter with appropriate special properties is used in every area and industry, as well as in simple, fast and accurate labs. The characteristics of the electro-smog TES-92 measuring instrument are: the frequency range that defines 50 MHz to 3.5 GHz, has a Field Electrical Intensity Sensor (E), for three dimensional isotropic measurements, with values ranging from 38 mV / m to 11 V / m, the measurement of the measurements is automatic. Measurement units are displayed on its screen in: mV / m, V / m, µgA / m, mA / m, µgW / m², mW / m². Resolution: 0.1 mV / m; 0.1 µg A / m; 0.01 µgW / m², while absolute error in measurement (1V / m and 50MHz) ± 1.0 Db and accuracy (depending on frequency) ± 1.0 dB (50 MHz ... 1.9 GHz) ± 2.4 dB (1.9 GHz ... 35 GHz).

While other parameters can be mentioned: Isotropic Deviation of ± 1.0 dB (in Frequency> 50 MHz), maximum detection area 4.2 W / m² (40 V / m), temperature deviation of ± 1.5 dB and other. The average value obtained is with up to 4-digit LCD resolution, can be repeated for every measured value every 400 ms The device has a voice alarm signaling system when it exceeds the boundary values, has a calibration factor disruption, and measurements of measured values Maximum, average and minimum.

Thermo-hygrometer and barometer (atmosphere) PCE-THB 40

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Metrological Factor Data Meter is the Thermo-Hygrometer and Barometer (Atmosphere) PCE-THB 40

Temperature, relative humidity and atmospheric pressure from an SD memory card. PCE-THB 40 thermohygrometer and barometer-atmosphere can measure ambient temperature, relative humidity, and atmospheric pressure while keeping these results to an SD memory card. PCE-THB 40 thermohygrometer and barometer-atmosphere is a compact data recorder with a large memory capacity (up to 16 GB of SD card).

Figure 3 Overview of Instrument Thermo- Hygrometer and Barometer (Atmosphere) PCE-THB 40

This device is an ideal tool for prolonged use in the industrial (transport) sector, but also for other measurements in the industrial sector (heating and cooling processes, temperature on cars and warehouses, etc.). The actual value will be displayed directly on a large LCD PCE-THB LCD 40 Hygrometer and Barometer-Atmosphere. Optional software is the possible and graphical analysis of measured values.

The data is stored directly on the SD card, so it is possible to use analysis using the MS Excel program (eg checking whether a value of a column exceeds the allowed limit). PCE-THB 40 thermohygrometer and barometer-atmosphere has an internal clock to provide people the most accurate results. The metering quota can be adjusted.

Thermocouple and Barometer Instruments The PCE-THB 40 serves for measuring relative humidity, temperature and atmospheric pressure, having a real-time recording memory and a memory card (1 to 16GB), data that are stored directly in the Excel format on the SD card, as the HPA, mmHg and inHg pressure gauges have a large LCD display, it has a simple 2-card hard drive and a software for transferring and analyzing data in computer.

Thermo-hygrometer and barometer-atmosphere PCE-THB 40, 1 x 2GB SD memory card, 1 x card reader. Optionally available: software, ISO-certified, adapter.

4. RESULTS OF THE STUDY

The measurements were carried out for each quarter in 2015 and 2016, on the basis of which we have made a value averaging for two places at the entrance of the port and the one in the most loaded with work, machinery and services. The outputs and results were coupled even with the values of metrology factors in these spaces.

Table 1 Value of parameters of the electromagnetic field and electric field at the entrance to the Durrës sea port (measurements are made at the entrance of the port)

MOMENTAL VALUE VALUE – RIGHT							
Nr.	Symbol	Name	Unit	x	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	0	57 46	62 90,1	303 241
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0,007 0,008	0,001 0,007	0,007 0,011	0,033
3	(E)	Electric field strength	$\frac{mV}{m}$	195	156 104	152 57	550 321
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	164	532 414	538 419	833 670

,, MAX ’’(Maximum measured value displayed)							
Nr.	Symbol	Name	Unit	x	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	193	74,4	103,7	252,4
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0,019	0,007	0,010	0,055
3	(E)	Electric field strength	$\frac{mV}{m}$	269,8	167,5	197,8	458,2
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	656,7	444,2	524,6	818,3

,,AVG ’’(Average measured value displayed)							
Nr.	Symbol	Name	Unit	x	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	66,3 57,8	8,8 19	7,1 2,1	51 12
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0,003	0,001	0	0,001
3	(E)	Electric field strength	$\frac{mV}{m}$	150 94,8	174 125	33,6	181 121
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	394 314	180 98	171 426	540 290

,, MAX AVG ’’(Maximum average value displayed)							
Nr.	Symbol	Name	Unit	x	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	67,4	75,6	15,3	142,7
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0	0,007	0,001	0,013
3	(E)	Electric field strength	$\frac{mV}{m}$	159,5	168,9	76	223,5
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	423	448	238,9	592,8

Table 2 Metrological characteristics and electrical resistance of the facilities at the Durrës port

Nr.	Symbol	Name	Unit	Measured value
1	RH	Relative humidity in air	%RH	43.1
2	T	Temperature	℃	28.1
3	P	Barometric pressure	hPa	1014.9
4	R	Electrical resistance	$K\Omega$	In water 12,2-5.6
			$M\Omega$	In earth 1,3-18,4

Table 3 Value of parameters of the electromagnetic field and electric field at the entrance to the Durrës sea port (measurements are made at the entrance of the port)

MOMENTAL VALUE VALUE – RIGHT							
Nr.	Symbol	Name	Unit	X	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	1,2 1,9	1,3 0,9	0,6	2,2 2,7
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0	0	0	0
3	(E)	Electric field strength	$\frac{mV}{m}$	22,8 21,5	18,8	12,1	28 36
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	62,4 49	53,3	32	841 83

,, MAX ''(Maximum measured value displayed)							
Nr.	Symbol	Name	Unit	X	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	1,3	1,4	2,6	1,587
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0	0	0	0,158
3	(E)	Electric field strength	$\frac{mV}{m}$	22,8	23,5	31,6	38,4
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	60,4	62,3	60,4	122,5

„AVG ''(Average measured value displayed)							
Nr.	Symbol	Name	Unit	x	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	0,6	0,8	0,7	2,3
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0	0	0	0
3	(E)	Electric field strength	$\frac{mV}{m}$	14,1	18,1	9,4 16,8	27,6 33
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	37,4	48	48 42,7	71,3 68,4

„ MAX AVG ''(Maximum average value displayed)							
Nr.	Symbol	Name	Unit	x	y	z	xyz
1	(B)	Density of magnetic flux	$\frac{\mu W}{m^2}$	4,6	1,4	0,5	10,1
2	(S)	Power density	$\frac{\mu W}{cm^2}$	0	0	0	0
3	(E)	Electric field strength	$\frac{mV}{m}$	41,7	18,8	14,1	37,5
4	(H)	Magnetic field strength	$\frac{\mu A}{m}$	110,6	53,3	37,4	104,5

5. INTERPRETATION AND DISCUSSION OF RISKS

Referring to the obtained and elaborated results, the changes are determined by the change of installed power, defects at different points, and the characteristics of the electro and electromagnetic constants. The results clearly show the influence of installed machinery and equipment and their power, atmospheric factors (temperature, atmospheric pressure, tumults, humidity), salinity content, presence of electrical defects, magnetic and electrical properties of the environment (materials).

6. CONCLUSIONS

The measurement results and their interpretation lead to the conclusion that:

Electrical pollution in all Durres marine port facilities depends on the installed power, the presence of defects in the machine of various piers, as well as the metrological and structural changes.

In terms of design and investment in Albanian seaports, the level of pollution from the currents and their sources should be assessed in order to meet the standards requirements.

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