



A Review on Causes & Effects of Electrical Pollution

Vishavdeep Jindal¹, Abhi Garg²

Assistant Professor, Dept. of EE, GZS Campus College of Engineering & Technology, Bathinda, Punjab, India¹

PG Student [PE], Dept. of EE, GZS Campus College of Engineering & Technology, Bathinda, Punjab, India²

ABSTRACT: Pollution makes an adversely effects to the human life in twentieth century. There are number of pollution exist in the environment like Air Pollution, Water Pollution, Noise Pollution, Soil Pollution, Thermal Pollution, Visual Pollution and so on. Though pollution plays a very important role to make down of human life but out of all Electrical Pollution is touted as one of the worst effect which is harming in all field at large scale. “Electrical Pollution or Dirty Electricity” can be used to describe as corrupted electric power that may be present Surrounding us, produced by the use of Electrical & Electronic appliances such as Tube lights, CFL bulbs, Mobile phone transmission or receiver, power supplies for computers, phone chargers, dimmer switches, variable speed fans and many other devices which are in running from a long period. In this paper, various cause and effects of Electrical pollution is shown with the help of various survey conducted.

KEYWORDS: Pollution, Dirty electricity, Floating Neutral Surge Voltage, Harmonics, Arc Flash Hazards, Electromagnetic Fields.

I.INTRODUCTION

Pollution can take the form of chemical substances such as heat, energy or light. Pollutants, the components of pollution, can be either foreign substances or naturally occurring contaminants. Electrical pollution is also known as dirty electricity. Dirty Electricity may be in the form of electro-magnetic fields (EMF) is invisible to the eye, but has a biological effect on the human body and has been associated with a wide variety of illnesses. Electric and magnetic fields, or EMF, are emitted from electrical devices or anything that uses electricity. Earth currents are low electrical currents found in soil. Natural activity deep within the earth causes some of these currents along with above ground electrical energy to produce low magnitude electrical currents. Transients and high frequency noise or signals come from the wiring of buildings, and from the use of common electrical devices found in homes and offices which is created when electrical current is transmitted and interrupted [1]. In these characterizations of electrical pollution, high frequency signals pollute regular electrical currents travelling in wires and currents through the earth.

To better understand the background for the causes of electrical pollution, first it is need to learn about the basics of electric current i.e. how it flows. Direct current is similar to battery power where current flows back and forth between energy terminals. Alternating current is a wave-like movement of energy that oscillates back and forth, and the energy flows in the direction of the load. The rate of oscillation is defined as frequency. At an electrical grid base, the current oscillates at 60 times per seconds, or 60 Hz. Regular “clean” Power enters homes, buildings, and offices at 60 Hz. The increased use of electrical power overloads electrical grid base, which distributes the power. Power is “dirty” or polluted when it contains the high frequency signals flowing through overloaded wires, and not just clean 60 Hz power. The pollution of electricity is often compared to how water is polluted [2].

Dirty electricity is a dangerous form of electrical pollution that is invading our homes. Until recently, this phenomenon has largely escaped the attention of the general public and medical communities. Mostly observed that the danger from electricity is confined to the electrical wires in homes, schools and workplaces, but in fact it's becoming increasingly contaminated with invisible micro surges of dangerous radio-frequency radiation, now referred to as "dirty electricity". Dirty electricity is a form of electromagnetic pollution or radiation. It is also called electromagnetic interference (EMI) or electrical “noise.” It refers to powerful, high frequency electrical energy travelling along the wiring in buildings where only standard 60-Hz AC supply. We have heard about EMFs and their potential to harm our health. We probably also know there are links between electrical frequencies from all our new devices, even the power grid itself and

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 6, June 2016

serious health problems. A leading epidemiologist even says it may be the number one cause of cancer and the least known as well. It is specifically due to something called Dirty Electricity [3].

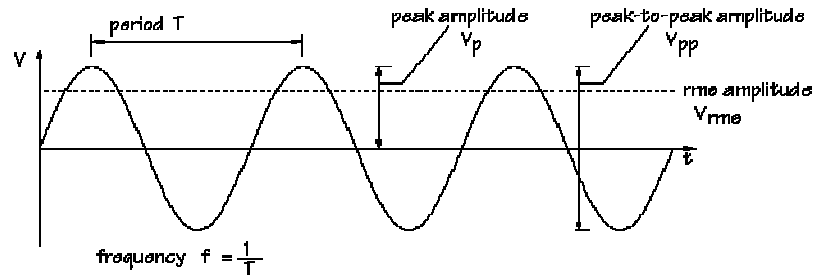


Figure: 1 Wave-form of clean electricity

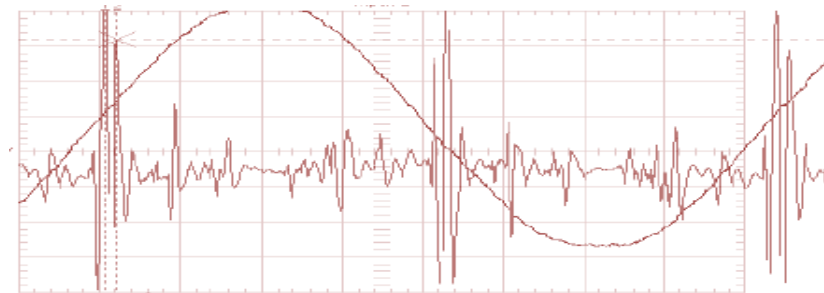


Figure: 2 Distortion produced in clean electricity due to electrical pollution

II. CAUSES OF DIRTY ELECTRICITY

(1.) Transients and High Frequency Noise

A transient is high amplitude, short-duration sound at the beginning of a waveform that occurs in phenomena such as musical sounds, noises or speech. It can sometimes contain a high degree of non-periodic components and a higher magnitude of high frequencies than the harmonic content of that sound. Transients do not necessarily directly depend on the frequency of the tone they initiate. Maintaining the Integrity of the Specifications. Electrical pollution is electromagnetic-field energy emanating from electrical wiring. In most places, the majority of this energy exists at 60 Hz, resulting from the AC (alternating current) that constantly flows in the utility wiring outdoors, indoors, and inside common appliances.

(2.) Electro Magnetic Field

Each source produces its own electro-magnetic field or EMF – a wave of energy radiating outwards, getting weaker with increasing distance. Electromagnetic fields or EMFs are invisible lines of force created whenever electricity is generated or used. EMFs are produced by power lines, electric wiring, and electric equipment and appliances. The frequency of EMFs is measured in hertz (Hz, or cycles per second).

Here are some other major contributors to EMF pollution:

- Cell or Mobile Phones- Cell or Mobile phones communicate by transmitting radio waves through a network of fixed antennas. Radiofrequency waves are emf, and unlike ionizing radiation such as X-rays or gamma rays.
- Digital Phones and Base Stations- The weak Radio Frequency signals from the base stations and wireless networks cause adverse health effects on human life. A concern about base station and local wireless network antennas relates to the possible long-term health effects that whole-body exposure to the RF signals may have.
- Computers and Related Equipment- Today we work with computers use wireless mouse, wireless mice and mobiles phones are also wireless. All this wireless signalling is done with the help of radio frequency (RF) electromagnetic waves. This involves frequency in the megahertz range and the transmission occurs with different output power depending upon how signal for travel.
- Wireless gaming consoles and Base stations- There are many other sources of EMF's in our homes and school. Wireless gaming console, base stations, wifi routers all emits EMF's as shown in the figure 3.

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 6, June 2016

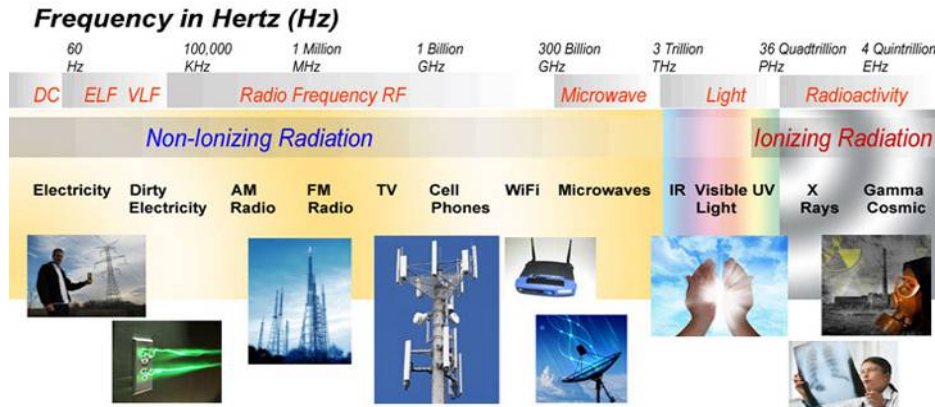


Figure 3: Electro-magnetic spectrum in frequency

- Wireless baby monitors and Base stations-All wireless baby monitors are a problem; the high frequency digital models are the absolute worst. The fact is that the long term effect of microwave radiations on children’s brain.
- Electrical appliances (including TV’s)-There are also external sources: TV, radio and mobile phone masts. These have all been linked to increase the risk of cancer level
- Electronic equipment-Today we all use of electronics equipments in our offices and homes, our daily exposure to EMF has become increasingly day by day. Now a day’s wireless communication has been common in our offices. These devices are used radio frequency waves to communicate and that produces the electromagnetic field.
- Cell phone masts or Bluetooth- This technology is used for fast data transfer over short distance. It is used for communication between cell phone and cell phone, computers and their peripherals (Wireless hand free device). They often work at 2445 MHz
- Radio and TV transmitters- Devices which generate electromagnetic field include radio or TV station transmitter, microwave oven, power transmission lines and electrical appliances.
- House-wiring- There is connection somewhere in the house between neutral and earth, so that some of neutral current can flow through the cable into the earth. Then the current are no longer balanced and there is net current and a magnetic field is produced.
- High and low-voltage power lines- Electricity is carried round on overhead lines at various voltages. All overhead lines produce electric and magnetic fields. The field is highest directly under the line as shown in the figure 4.

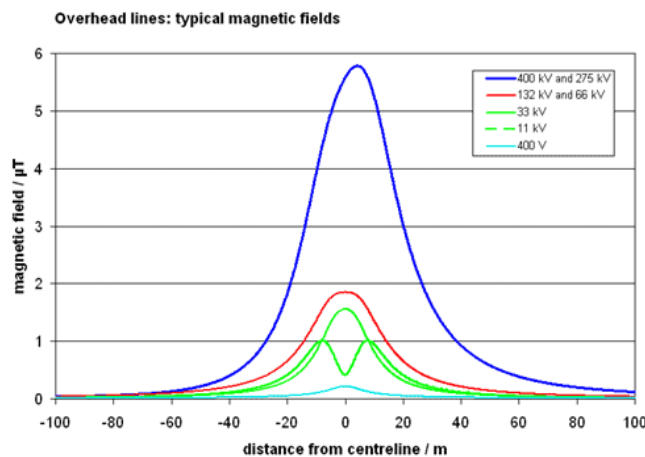


Figure 4: Variation of magnetic field produce with respect to line distance



International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 6, June 2016

III.EFFECTS OF DIRTY ELECTRICITY

Most modern electronic devices now use Direct Current (DC) power. These devices are equipped with switch-mode power supply (SMPS) converters that convert the alternating electrical current (AC) from the wall outlets into DC current. These SMPS converters can create dirty electricity – which is then added to our electrical wires. These converters can often be found in rectangular boxes in surge protector strips or on larger electronic devices. And, they may be built into the equipment. Public exposure to electromagnetic (EMF) radiation has increased dramatically over the past 25 years. Every day, people are exposed to a variety of electromagnetic fields (EMFs) from power lines and wiring; electronics and other electrical items; and wireless devices/technology. Dirty electricity is a type of EMF radiation. A growing body of scientific and anecdotal evidence points to possible connections between dirty electricity and a wide variety of health problems, including these potential dirty electricity health risks.

Many Authors/Scientist/Researcher are doing research on the environmental pollution to measure the effects on the human being. Many have been completed there survey. Some of them are listed below:-

(a) M Havas in 2004 D. Clements-Croome have shown results dependent on the Biological effects of low frequency with electromagnetic field. Author started his research to find out electric and magnetic field effects on living beings and in his research he conclude that these effects vary with living beings sensitivity, with geography as influenced by seasonal cycles, and the earth magnetization; these can be created at low frequencies and low intensities. Accordingly, to reduce the risk of Electro Magnetic Field, the author tells us to understand the characteristics which are biologically important and to identify biological necessities. Further research is also possible to introduce cost-effective, advance technical measures to limit EMF exposure [4].

(b) 2- M Havas and D Stetzer wrote a report on Electrical Hypersensitivity [3-7]. The results from the case studies are so dramatic and they concluded that:

- (i) Poor power quality may be contributing to electrical hypersensitivity.
- (ii) A much larger population than originally assumed may be electrically hypersensitive (50% vs. 2%).
- (iii) Children may be more sensitive than adults; Dirty electricity in schools maybe interfering with education.
- (iv) Possibly contributing to disruptive behaviour associated with attention deficit disorder (ADD).
- (v) Dirty electricity may elevate plasma glucose levels

Dirty electricity is adversely affecting the lives of millions of people. Different kind of problems influenced by dirty electricity on the human beings is exiting in the present days [8-10]. Some of them are listed below:

Table1: Problems formulated due to Dirty Electricity:-

S. No	Type of Problem	S. No	Type of Problem
1	Cancer	14	EMFs may damage sperm
2	Diabetes	15	Reduce melatonin levels in the body
3	Heart Problems (pain/pressure, palpitations)	16	Sleep Disturbances
4	Asthma	17	Headache
5	ADD/ADHD	18	Skin Problems (itching, burning, facial flushing)
6	Behavior/Learning Problems	19	Muscle/Joint Pain
7	Concentration Issues	20	Leg/Foot Pain
8	Memory Problems	21	Fatigue and Weakness
9	Produce stress proteins	22	Numbness and Tingling Sensations
10	Damage the DNA in cells	23	Tremors and Muscle Spasms
11	Cause oxidative stress	24	Reduce melatonin levels in the body
12	Raise Cortical level in the body	25	Cause calcium ion efflux
13	EMFs may damage sperm	26	EMFs can elevate blood sugar levels



ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 6, June 2016

IV. ACKNOWLEDGEMENT

The authors are very thankful to IKGPTU, Jalandhar & MRSSTU, Bathinda provide the support and fruitful environment for the research work.

V. CONCLUSION

This paper shows the presence & existence of electrical pollution as a conclusion. Also various cause and effects of electrical pollution are represented in this paper. Different case studies related to bad effects of electrical pollution also reviewed in this paper.

REFERENCES

- [1] M. Havas, "Health concerned associated with energy efficient lightning and there electromagnetic emission" presented in Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) & Light Sensitivity, 2008.
- [2] Mercola's, "Total health program the proven plan to prevent disease and premature aging, optimize weight and live longer" *New York Times* pp.23-30, 2004.
- [3] M. Havas, "Electromagnetic hypersensitivity: biological effects of dirty electricity with emphasis on diabetes and multiple sclerosis", *Electromagnetic Biology and Medicine*, 25: 259-268, 2006.
- [4] Milham and Morgan, "A new electromagnetic exposure metric: High frequency voltage transients associated with increased cancer incidence in Teachers in a California School", *American Journal of Industrial Medicine* 2008.
- [5] M. Havas, M. Illiatovitch, and C. Proctor, "Teacher and student response to the removal of dirty electricity by the Graham/Stetzer filter at Willow Wood School in Toronto, Canada. Biological Effects of EMFs, 3rd International Workshop, Kos, Greece, pp. 311-317, 2004
- [6]. M. Havas, and D. Stetzer. "Dirty electricity and electrical hypersensitivity", *World Health Organization Workshop on Electricity Hypersensitivity*, 25-26 October, 2004
- [7] M. Havas, "Analysis of health and environmental effects of proposed San Francisco EarthLink Wi-Fi Network, Commissioned by SNAFU (San Francisco Neighborhood Antenna Free Union) and presented to Board of Supervisors, City and Country of San Francisco 2007.
- [8] Mizon & Bob, "Adverse impacts of inefficient artificial lighting" Chapter 3 in *Light Pollution*. New York, NY: Springer Science Business, pp. 53-75, 2012.
- [9] Pendoley, Kellie, Arwini Kahlon, Robert Ryan and Jeremy Savage. "A novel technique for monitoring light pollution." *International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production*, Society of Petroleum Engineers, September 2012, Perth, Australia.
- [10] Hölker, Franz, C. Wolter, E. K. Perkin, and K. Tockner. "Light pollution as a biodiversity threat." *Trends in Ecology and Evolution*. 25: pp. 681-682. Accessed May 28, 2013.