



Application of Electrostatics

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Grade 10th D

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This presentation is about the [Applications of Electrostatics](#) ,which will be presented by our group.

In this presentation we will try to explain about the applications of Electrostatics based on Physics perspective.We will try to provide different images for every application we define

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Table of Contents

1 Introduction

► Introduction

► Applications

► Summary



Acknowledgement

1 Introduction

I would like to express my special thanks of gratitude to my teacher who gave me this golden opportunity to do this wonderful project on Applications of Electrostatics which also helped me in doing a lot of Research and understand more about Electrostatics. Secondly I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.



Objective

1 Introduction

- What is Electrostatics?
- Knowing the history of different Physics based inventions
- Knowing where electrostatics is used in our daily life.
- Understanding how different materials apply electrostatics laws



What is Electrostatics?

1 Introduction

The electrostatic force is the force that exists between electrically charged particles or objects at rest. Examples of electrostatic forces: When we run a piece of paper with the oil in our head with the help of a comb produces electrostatic force. In addition to research using equipment such as a Van de Graaff generator, many practical applications of electrostatics exist, including photocopiers, laser printers, ink jet printers, and electrostatic air filters. This module covers just a few of the many applications of electrostatics.

- The Van de Graaff Generator
- Xerography
- Laser Printers
- Smoke Precipitators and more



Table of Contents

2 Applications

► Introduction

► Applications

► Summary





Applications of Electrostatics

2 Applications

Applications of electrostatics means the use of electrostatics in different ways to get a product or outcome. There are many ways we can use electrostatics, but in this beamer presentation we will try to observe some of them.



The Van de Graaff Generator

2 Applications

Van de Graaff generators (or Van de Graaffs) are not only spectacular devices used to demonstrate high voltage due to static electricity—they are also used for serious research. The first was built by Robert Van de Graaff in 1931 (based on original suggestions by Lord Kelvin) for use in nuclear physics research. Van de Graaffs use both smooth and pointed surfaces, and conductors and insulators to generate large static charges and, hence, large voltages.

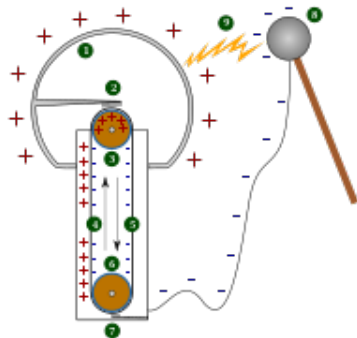
A very large excess charge can be deposited on the sphere because it moves quickly to the outer surface. Practical limits arise because the large electric fields polarize and eventually ionize surrounding materials, creating free charges that neutralize excess charge or allow it to escape. Nevertheless, voltages of 15 million volts are well within practical limits



Van De Graaf Generator Image

2 Applications

Van de Graaff Generator



1. hollow metal sphere

2. upper roller (rubber)

3. upper roller (for example an acrylic glass)

4. side of the belt with positive charges

5. opposite side of belt, with negative charges

6. lower roller (metal)

7. lower roller (rubber)

8. spherical device with negative charges

9. spark produced by the difference of potentials



Xerography

2 Applications

- Most copy machines use an electrostatic process called xerography—a word coined from the Greek words xeros for dry and graphos for writing. Xerography is a dry copying process based on electrostatics. The major steps in the process are the charging of the photoconducting drum, transfer of an image, creating a positive charge duplicate, attraction of toner to the charged parts of the drum, and transfer of toner to the paper. Not shown are heat treatment of the paper and cleansing of the drum for the next copy.
- A selenium-coated aluminum drum is sprayed with positive charge from points on a device called a corotron. Selenium is a substance with an interesting property—it is a photoconductor. That is, selenium is an insulator when in the dark and a conductor when exposed to light.



Xerography Stages

2 Applications

- In the first stage of the xerography process, the conducting aluminum drum is grounded so that a negative charge is induced under the thin layer of uniformly positively charged selenium.
- In the second stage, the surface of the drum is exposed to the whatever is to be copied. In locations where the image is light, the selenium becomes conducting, and the positive charge is neutralized. In dark areas, the positive charge remains, so the image has been transferred to the drum.
- The third stage takes a dry black powder, called toner, and sprays it with a negative charge so that it is attracted to the positive regions of the drum. Next, a blank piece of paper is given a greater positive charge than on the drum so that it will pull the toner from the drum. Finally, the paper and electrostatically held toner are passed through heated pressure rollers, which melt and permanently adhere the toner to the fibers of the paper.



Xerography Images

2 Applications





Laser Printers

2 Applications

Laser printers use the xerographic process to make high-quality images on paper. In its most common application, the laser printer receives output from a computer, and it can achieve high-quality output because of the precision with which laser light can be controlled. Many laser printers do significant information processing, such as making sophisticated letters or fonts, and in the past may have contained a computer more powerful than the one giving them the raw data to be printed.



Laser Printers Image

2 Applications





Ink Jet Printers and Electrostatic Painting

2 Applications

The ink jet printer, commonly used to print computer-generated text and graphics, also employs electrostatics. A nozzle makes a fine spray of tiny ink droplets, which are then given an electrostatic charge. Once charged, the droplets can be directed, using pairs of charged plates, with great precision to form letters and images on paper. Ink jet printers can produce color images by using a black jet and three other jets with primary colors, usually cyan, magenta, and yellow, much as a color television produces color. (This is more difficult with xerography, requiring multiple drums and toners.) Electrostatic painting employs electrostatic charge to spray paint onto oddly shaped surfaces. Mutual repulsion of like charges causes the paint to fly away from its source. Surface tension forms drops, which are then attracted by unlike charges to the surface to be painted. Electrostatic painting can reach hard-to-get-to places, applying an even coat in a controlled manner. If the object is a conductor, the electric field is perpendicular to the surface, tending to bring the drops in perpendicularly. Corners and points on conductors will receive extra paint. Felt can similarly be applied.



Ink Jet Printer Image

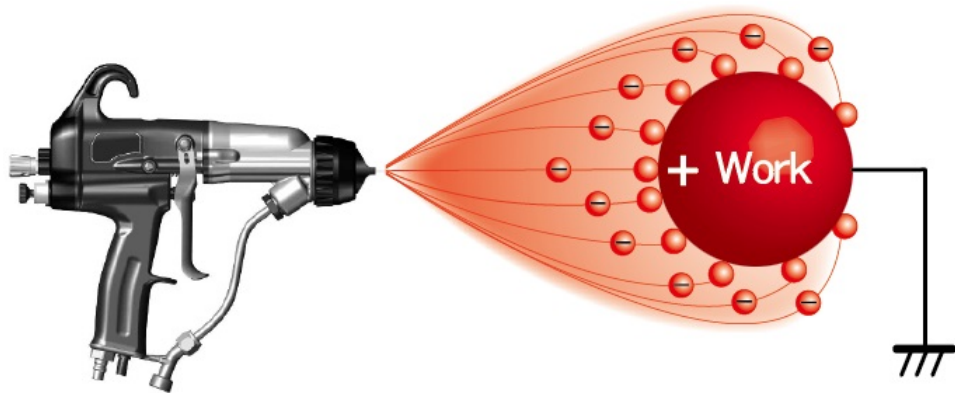
2 Applications





Electrostatic Painting Image

2 Applications





Smoke Precipitators and Electrostatic Air Cleaning

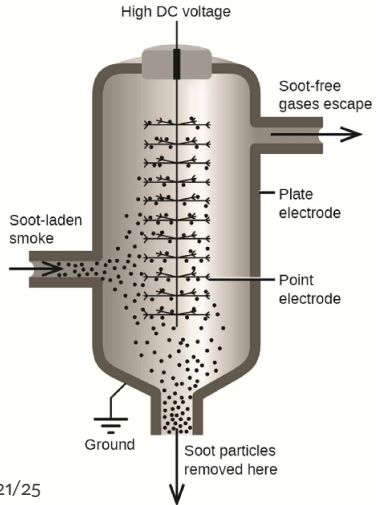
2 Applications

Another important application of electrostatics is found in air cleaners, both large and small. The electrostatic part of the process places excess (usually positive) charge on smoke, dust, pollen, and other particles in the air and then passes the air through an oppositely charged grid that attracts and retains the charged particles. Large electrostatic precipitators are used industrially to remove over 99 of the particles from stack gas emissions associated with the burning of coal and oil. Home precipitators, often in conjunction with the home heating and air conditioning system, are very effective in removing polluting particles, irritants, and allergens.



Smoke Precipitators Image

2 Applications





Electrostatic Painting Image

2 Applications





Table of Contents

3 Summary

► Introduction

► Applications

► Summary



Conclusion

3 Summary

Electrostatics: -

- The study of the phenomena and characteristics of electric charges that are stationary or moving slowly is known as electrostatics
- Coulomb's law, which explains electrostatic phenomena, describes the forces that electric charges put on one another, despite the fact that electrostatically produced forces appear to be weak.

There are many different applications of electrostatics but here we will be discussing some of the most critical applications: -

- Static electricity is used by inkjet printers and photocopiers to direct a tiny jet of ink to a specific spot on the page.
- Xerographic-processing laser printers and photocopiers
- Nuclear physics research makes use of the Van de Graaff electrostatic generator.



Reference

3 Summary

- [Openpress](#)
- [Lumen Learning](#)
- [Labxchange](#)