Green Printing: Inevitability for Printing Industry Sustainability

Mr. A. Arunkumar[1], Dr. (Mrs.) C. Muthulakshmi[2]
[1]*Ph.D. Research Scholar (Full Time), G. Venkataswamy Naidu College (Autonomous), Kovilpatti, Affiliated to Manonmaniam Sundaranar University, Tirunelveli*
[2]*Head and Assistant Professor, Department of B.Com. Business Analytics, G. Venkataswamy Naidu College (Autonomous), Kovilpatti*

Abstract **- Freedom for the human being to control and rule the environment is arguably the most valuable gift that the Almighty God has ever flourished on Mother Earth. But by his bodily acts day by day the same human person continually worsens this advantage inadvertently. The outcome of such destructive actions in nature surrounding us is unbalanced. Green printing is only the solution for all the cruxes of our eco system for the printer and packaging industries in particular. During various print operations, green printing helps reduce harmful substances such as Volatile Organic Compounds (VOCs) and gas emissions. This study aims mainly to clarify the environmental importance of green printing and, by efficiently decreasing dangerous chemicals and synthesis in this contemporary age, how green printing helps to limit the balance between humans and Nature.**

Index Terms **- Environment, Eco friendly, Printing, Packaging, Green Printing.**

I.INTRODUCTION

Green printing introduces a new strategy for the printing industry that prioritises environmental impacts. Emission of Volatile Organic Compounds (VOCs) and gases from chemicals used in printing has a number of negative consequences. Among these are common environmental concerns. Green printing techniques have permitted new effective and economical solutions to alleviate these arose concerns during printing. Green printing projects are better for the environment since they safeguard it from toxic chemicals and synthesis. Green printing solutions are designed to provide immediate environmental advantages by utilising green printing substrates and inks while reducing gas and VOC emissions.

II GREEN PRINTING METHODS

Green printing methods are used for minimizing the impact of hazardous chemicals and synthesis on our environment. Various aspects taken into account are:

1. GREEN PRINTING PRINCIPLE/STRATEGY
2. GREEN PRINTING SUBSTRATES
3. GREEN PRINTING INKS
4. USAGE OF VOLATILE ORGANIC COMPOUNDS (VOCS)
5. TIPS FOR ECO-FRIENDLY PRINTING INDUSTRY.

2.1.GREEN PRINTING PRINCIPLE/ STRATEWGY:

There are a variety of ‘green printing principles/strategies' from which to select. There are no hard and fast rules for establishing a green printing plan, but the main objective is to be environmentally friendly. These varied techniques offer a few actions to take in order to switch to green printing. Here are a few strategies to consider. They are

2.1.1 STRATEGY 1:

Any strategy is a set of particular norms to follow for efficient outcomes. Various points to be considered are explicated as below:

a. Cost Reduction:

Printing companies should concentrate on being energy and consumables efficient, as this will result in significant cost savings. Such "green" initiatives improve efficiency and increase profitability for the company.

b. Wastage Reduction:

Wastage generation occurs when natural resources are used inefficiently, resulting in higher production costs and lower profits. Careful assessment and selection of appropriate techniques can aid in the ‘go green' and waste reduction efforts.

c. Employee Health and Safety:
More effective operational methodologies not only allow for smoother organisation workflows, but they also create a safer working environment for employees, reducing the risk of incident. Another element of green printing that is taken into consideration is this.

d. Customer Loyalty:
It is the moral responsibility of organization to be loyal for the customers.

e. Competitive Advantages:
Opting mention strategies for efficient working will help not only cost cutting but also improved quality work. Quality work and cost cutting of production will help better sustainability to compete.

2.1.2. STRATEGY 2:
Green printing methods aren't just for industries; they can also be employed in everyday life. One of the most significant environmental consequences connected with day-to-day activities is printing. This is the simplest method for achieving immediate environmental advantages. This method is founded on the assumption that any printing process has three major environmental impacts: the substrate (paper) on which it is printed, the ink used to convey information, and the energy used to print (power). Here are some useful green printing tips that should be followed:-
i. Paper Reduction:
In general, most office work is printed single-sided, which should be avoided and double-sided printing should be done instead. One of the simplest methods to reduce paper usage is to use both sides of the paper. This technique immediately decreases paper use by 50%. Another way to cut down on paper usage is to "Think Before Inking" or "Print Only What Is Necessary." According to several studies, the majority of consumption is due to unwanted and waste publications. When purchasing paper, the recyclability factor should be considered, since recycled paper has a lesser environmental effect during production.

ii. Ink and Toner Reduction:
Another important factor that has a direct influence on the environment is the type of ink and toner used. Ink is the cornerstone for any printing process, and it is extremely dangerous. Avoiding unwanted and waste printing saves a lot of money on ink and is more environmentally friendly. Another factor to consider is that only vegetable-based ink and toner should be purchased. Most ink and toner are now made from vegetable-based materials, resulting in fewer emissions of Volatile Organic Compounds (VOCs) and a reduction in environmental risks. Ink should also be properly disposed of.

iii. Paper Reduction:
In general, most office work is printed single-sided, which should be avoided and double-sided printing should be done instead. One of the simplest strategies to reduce paper use is to use both sides of the paper. This approach immediately cuts paper use by 50%. Another way to cut down on paper usage is to "Think before Inking" or "Print Only What Is Necessary." According to many studies, the majority of consumption is due to underutilised and waste publications. When purchasing paper, the recyclability factor should be considered, as recycled paper has a lesser environmental impact during production.

iv. Ink and Toner Reduction:
Using ink and toner has a direct influence on the environment. As a result of its toxicity, ink is the cornerstone of any printing process. Avoiding unneeded and wasteful printing can also help you save money on ink and benefit the environment. Ink and toner should only be purchased with vegetable-based inks and toners. Most inks and toners are now made from vegetable-based materials, which reduces the amount of volatile organic compounds (VOCs) released into the environment, hence reducing environmental dangers. In addition, ink should be disposed away correctly.

v. Energy Consumption Reduction:
Each printing process or printer requires energy to operate. This can be done by printing efficiently and reducing superfluous prints. In addition to decreasing the carbon footprint, this will save electricity. Many printers have energy-saving settings that allow them to be put into'sleep mode', resulting in energy savings for

the user. Hence, energy efficiency must be prioritised in order to realise actual savings in terms of costs.

2.2. GREEN PRINTING SUBSTRATES:

As the basis of any printing process, materials and ink must be used. In order for this technique to be green, it is equally important to use environmentally friendly printing substrates. The use of green printing substrates adds to this environment to a certain degree. Among the many types of substrates used are:

2.2.1. Recycled paper:

In this case, the scraps, wasted papers, and waste paper materials are used to make this type of material. One of the commodities that may be recycled with ease is paper. As a result, using recycled paper has a little impact on the environment.

2.2.2. FSC Environmentally Paper:

A certified company that meets FSC (Forest Stewardship Council) forest management requirements is known as an FSC (Forest Stewardship Council). This accreditation is given not only to forest managers or lumber companies, but also to processing and distribution companies such as furniture and paper makers.

On the basis of recyclability, any recycle paper offers three alternatives varies from Good choice to Best choice. These are enlisted as below: -

1. Good Choice: Paper which is minimum 10% recycled.
2. Better Choice: Paper which is minimum 30% recycled and Enhanced Elemental Chlorine Free (EECF) Processed Chlorine Free (PCF) or Total Chlorine Free (TCF).
3. Best Choice: Paper which is minimum 50% recycled and Processed Chlorine Free (PCF) or Total Chlorine Free (TCF).

2.3. GREEN PRINTING INKS:

Another basic requirement of printing operations is green printing inks. Green printing inks emit fewer volatile organic compounds (VOCs) and gases, reducing environmental risks. The various varieties of green printing inks that have been utilised are listed here.

2.3.1. VEGETABLE INKS:

Environmentally friendly inks made from vegetable oils are known as vegetable-based inks. Although vegetable-based inks take a long time to dry, they are considered better in terms of performance because they contain significantly less VOCs because they are made from vegetable oils. These inks emit roughly 2-4 percent VOCs, which is significantly less than solvent-based inks. Vegetable-based inks, on the other hand, can be cleaned with water-based cleaners rather than solvents.

2.3.2. Soy based Inks:

Soy inks are prepared with soybean oil as a carrier. In addition to being naturally low in volatile organic compounds (VOCs), soybean oil has a smaller impact on the environment. It is also a renewable resource that is easy to grow. Also, soy-based inks produce effects that are highly clear, brilliant, and vibrant, and contain no heavy metals. Today, newspaper firms have switched to soy inks because of these benefits. Paper printed using soy inks can also be recycled easily. Modern printers can use soy inks as well.

2.3.3. Water based Inks:

Water-based inks are gaining popularity around the world due to their characteristics and delicate print quality. Making water-based inks and nonhazardous inks for the environment does not require harsh chemicals, but rather water. Using water-based inks, pigments are dispersed in water and are therefore suspended. Inks with more brilliant and dazzling hues have been developed. The availability of water-based inks allows for a VOC-free printing environment. CFC and HCFC, which deplete the ozone layer, are not used in these inks either. pH stability, oil resistance, fast drying, and low viscosity are other features of water-based inks, as well.

For green printing, there are a variety of inks that have a lesser environmental impact. Considerations should be made based on guidance from the National Association of Printing Ink Manufacturers, including: As a minimum, inks should have the following characteristics:

2.4. VOLATILE ORGANIC COMPOUNDS (VOCs)

Green printing is the way to go if we want to deal with the many environmental concerns that come with our green planet. Green printing acquaints you with a variety of methods for making printing processes more environmentally friendly. Green printing is being investigated in this way on a multidimensional level.

The most significant emissions created during the printing process are volatile organic compounds (VOCs) and gases from various cleaning solutions and chemicals. VOC emissions are also caused by some adhesives used in post-press areas. VOCs are both odorous and poisonous when discharged into the atmosphere. Ketones, aliphatic, and alcohols are among the volatile organic compounds found in printing inks, fountain solutions, and cleaning chemicals. Cleaning chemicals based on petroleum, such as mineral spirits, methanol, and toluene, are used for roller washing and blanket cleaning, and they emit VOCs into the atmosphere.

Because of the nature of the printing process, solvent-based inks are commonly employed in gravure and flexography printing. These volatile solvents produce vapours during the printing process. VOCs are also emitted by the ink and solvent used in the heat-set lithographic printing process. VOCs are released by some adhesives and glues employed in post-press activities.

2.4.1 MINIMIZING VOCs IN PRINTING PROCESS:

Only alternative to save our environment is either elimination of hazardous chemicals or minimizing their usages up to lowest level as far as possible. Some considerations which are of prime significance are enlisted as below:

1. Opting printing methodology in where fewer chemical consumption is required
2. Replace hazardous chemicals to those which offers lower emission of VOCs
3. Proper maintenance of printing equipments
4. Cleaning of press immediately after printing
5. Technology upgrade which is eco-friendly.

Especially for the environment, green printing has a lot to offer. Savings on printing costs are also realised as a result of this. A green printing approach applied in a printing firm might reduce costs by up to 70 percent or more.

2.4.2. OVERALL BENEFITS OFFERED ARE ENLISTED AS BELOW:

1. Environmental concerned i.e. Conservation and preservation of environment
2. Wastage reduction of consumables used during oprinting like chemicals, paper, ink etc.
3. Overall cost reduction of the production
4. Time and energy saving
5. Offers enhanced quality of printing with improved standards
6. Safer workplace with improved employee health.

2.4.3. LOWER VOLATILE ORGANIC COMPOUNDS (VOCs):

Solvents used in the ink manufacturing process must be low in volatile organic compounds (VOC). The environment would benefit from using inks with a lower VOC concentration. On this front, ink manufacturers have made significant strides in recent years.

2.4.4. BIO-DERIVED or RENEWABLER MATERIALS:

Most people agree that using bio-derived renewable oils in the production of printing ink has a positive environmental impact. As a result of their lower VOC content, such as soy or vegetable-based inks, they are a better choice.

2.4.5. REDUCING USE OF HEAVY METALS:

The use of heavy metals in inks such as lead, arsenic, selenium, chrome, mercury, and cadmium is common in printing brilliant colours. As a result, they have a poisonous character. They are now made without the use of harmful chemicals.

2.4.6. REDUCED USE OF HAZARDOUS AIR POLLUTANTS:

It is also possible to lessen the environmental impact by reducing the usage of hazardous air pollutants (HAPs).

2.4.7. RECYCLABLE PRODUCTS:

The deinking technique removes the majority of ink from recycled paper. The recyclability of inks, however, is currently being worked on and is being considered.

2.4.8. REDUCED HAZARDOUS WASTE:

Due to their in flammability, solvent-based inks should be avoided as much as possible. These days, there are a number of other options available.

2.5. TIPS FOR ECO-FRIENDLY PRINTING INDUSTRY:

Green printing aims to reduce the use of harmful chemicals in printing processes. There are a number of efforts that need to be taken in order to transform the traditional printing sector into a green one.

2.5.1. 3R Principle:

It stands for Recycle, Reduce, and Reuse (or 3Rs). 3R is the basis upon which green printing may be implemented. Recycling old paper and non-chlorine bleached recycled paper are advised. The performance of recycled paper is comparable to that of virgin paper in terms of strength and durability. Waste must be minimised as much as possible. It is also important to consider reusability while making eco-friendly decisions.

2.5.2. Using Eco-friendly Ink:

Reduced levels of volatile organic compounds (VOCs) in inks can help to reduce health hazards to a significant degree. Therefore, soya or vegetable-based inks decrease environmental effect, according to suggestions from printing ink manufacturers. Inks of this type have a minimal influence on the ozone layer. Avoid using metallic inks as much as possible.

2.5.3. Think before Inking or Print only:

Eco-friendliness can also be achieved by avoiding unwanted and wasted publishing. As the name suggests, print-on-demand allows you to print information whenever you need it. It reduces waste, storage, and pollution. Such a technique should be used in order to reduce the amount of consumables thrown away.

2.5.4. Avoid printing with Polluting Inks:

Chemicals derived from petroleum that cause cancer must be avoided by industry. In addition, these inks emit chemicals into the air, which are harmful. These inks are inherently low in volatile organic compounds (VOCs) and are preferable alternatives. Other heavy metal-containing inks, including those that contain lead, mercury and cadmium, must be avoided.

2.5.5. Use online proofing and approvals:

Digital printing has reduced the need to print several times, which wastes paper, ink, chemicals, films, etc. As a result, such time-consuming and waste-producing operations should be minimized or eliminated.

2.5.6. Provide a web portal to Customers for Job order:

Clients should be able to purchase, request, and submit projects online using a printing company's website. In addition to reducing paper, it will make printing more efficient.

III CONCLUSION

To provide immediate environmental advantages, this article has provided an outline of green printing and its investigation within the printing sector. New advancements have improved quality and believability in different ways, but green printing is still of paramount importance. All-around excellence can only be achieved via effective application of green printing techniques. In the printing business, green printing attempts to reduce emissions of volatile organic compounds (VOCs) and gases, as well as chemical usage and carbon footprints. In the printing business, only green printing offers a complete approach to sustainability and environmental responsibility. Not only does it provide immediate environmental advantages, but it is also committed to the health and safety of its workers. Thus, green printing is a benefit to the printing industry in the current day.