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Current Practices of Solid Waste Management in MITS Campus, Gwalior: A Case Study

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Abstract : Aim of the study was to access the present condition of the solid waste management in the MITS, Gwalior by taking key informants as field visits, personal interviews with different stakeholders and questionnaire to know the views of the students. Everyday around 150 kilograms of waste is generated from the campus. Predominantly the waste consists of plastics, paper, glass, metals, food waste, garden waste, textile, electronic/electrical, hazardous wastes etc. It was also found that annually an amount of one lakh sixty seven thousand rupees can be recovered by selling the recyclables if segregated from the waste. It was found that there is no proper waste management plan in the campus. All of the waste is collected and thrown at different dumpsites within the campus and is set to burn. Hence recommendations for developing a sustainable waste management plan in the campus are proposed.
Keywords: Waste, disposal, recycling, handling, pollution.

I. INTRODUCTION

For the sustainable development of the society it is very important to judiciously handle the environmental issues like the solid waste management. In order to manage the solid waste effectively we need to understand its composition and all the activities that follow once the waste is generated. Basically composition and characteristics of the waste depend on a whole lot of factors and also vary periodically.

Different approaches can be employed for the management of the solid waste, depending upon the factors such as varying composition and quantity. The management of solid waste becomes further more necessary with increasing pollution and other hazardous consequences due to the generation of waste. Waste is growing at an exponential rate in India due to the rapid urbanization and the industrialization.

The solid waste generated at the university campuses constitute large amount of recyclables which can be recovered if proper solid waste management system is used. Gwalior has developed into a significant centre of education. It hosts many prominent universities and institutions which includes 6 government and 2 private universities and over a hundred colleges. Gwalior has several Engineering and Technological Institutes and more than 30 affiliated Engineering colleges. This means a lot of institutional waste is generated in the city. This waste can be managed to reduce the burden on the municipality which is mainly responsible for proper handling and disposal of this waste.

Gwalior has been selected as one of the hundred Indian cities to be developed as a Smart city under PM Narendra Modi's flagship Smart Cities Mission .Smart Cities Mission is an urban renewal and retrofitting program by the Government of India with a mission to develop 100 cities all over the country making them citizen friendly and sustainable. Smart cities are projected to be equipped with basic infrastructure. And will offer a good quality of life through smart solutions. Solid waste management is a key attribute of these smart cities.

Comprehensive and efficient waste management plan can be buildup so as to effectively manage this waste and explore the potential of resource recovery from this waste. Taking MITS campus as an example it is being tried to check the feasibility of the institute level waste management plan under the local conditions.

II. STUDY AREA

Madhav Institute of Technology and Science commonly referred to as "MITS Gwalior", is a Government-Aided Autonomous Institute founded in 1957 and located in Gwalior in the state of Madhya Pradesh, India. The institute is operated by the Scindia Engineering College Society.

The institute is located on Race Course Road, Gwalior. The campus is spread in 47 acres (190,000 m^2). The campus has been divided into two zones, Residential zone with five hostels (three for male and two for females) and an Academic zone comprising of different departments, cafeteria, lawns, and medicine dispensary, Guest house and workshop. Each of these zones is further sub-

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divided into different collection points.

III. QUANTITY AND COMPOSITION OF THE WASTE

Waste auditing was conducted to quantify the waste generated. The waste audit constituted of measuring the waste generation rate and finding the composition of the waste. The total quantity of waste generated from the campus is around 150 kg/day or 1.5 quintal/day.



Fig.1 Sampling points in MITS campus.

A. *Quantity of Waste Produced at various Locations in the College Campus*

Collection points	Weight (kg/day)
1.Academic zone	
1.1 Academic area (A1)	21.5
1.2 Academic area (A2)	5.72
1.3 Canteen (C)	9.42
1.4 Workshop (W)	12.96
2.Residential zone	
2.1 Hostel (H1)	16.12
2.2 Hostel (H2)	13.77
2.3 Hostel (H3)	10.44
2.4 Hostel (H4)	15.90
2.5 Hostel (H6)	35.74
Total=	141.25

The generated waste was separately collected at predetermined sampling points including Canteen (C) , Hostels (H1, H2, H3, H5 &H6) , Workshop (W) and Academic area (A1 & A2). The compositional analysis of waste included segregating waste in following categories:

1) *Plastic :* bottles, bags, styroform
2) *Paper :* cardboard, paper, newspaper
3) Glass
4) Metals

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5) Food waste
6) garden waste
7) Leather
8) Rubber
9) Textile
10) Household hazardous waste: batteries, medicines
11) Electronics and electrical waste
12) Others

B. *Composition of Waste Produced in the Academic Zone:*

Type of Waste	Weight in kgs	Percentage
Plastic	5.305	10.82%
Paper	10.21	20.83%
Glass	0.596	1.215%
Metal	0.646	1.317%
Food waste	8.891	18.18%
Garden waste	17.8	36.31%
Leather	-	-
Rubber	-	-
Textile	0.22	0.45%
Hazardous/biomedical	0.397	0.81%
Electronic/Electrical	0.137	0.28%
Others	5.035	10.27%
Total	50	100

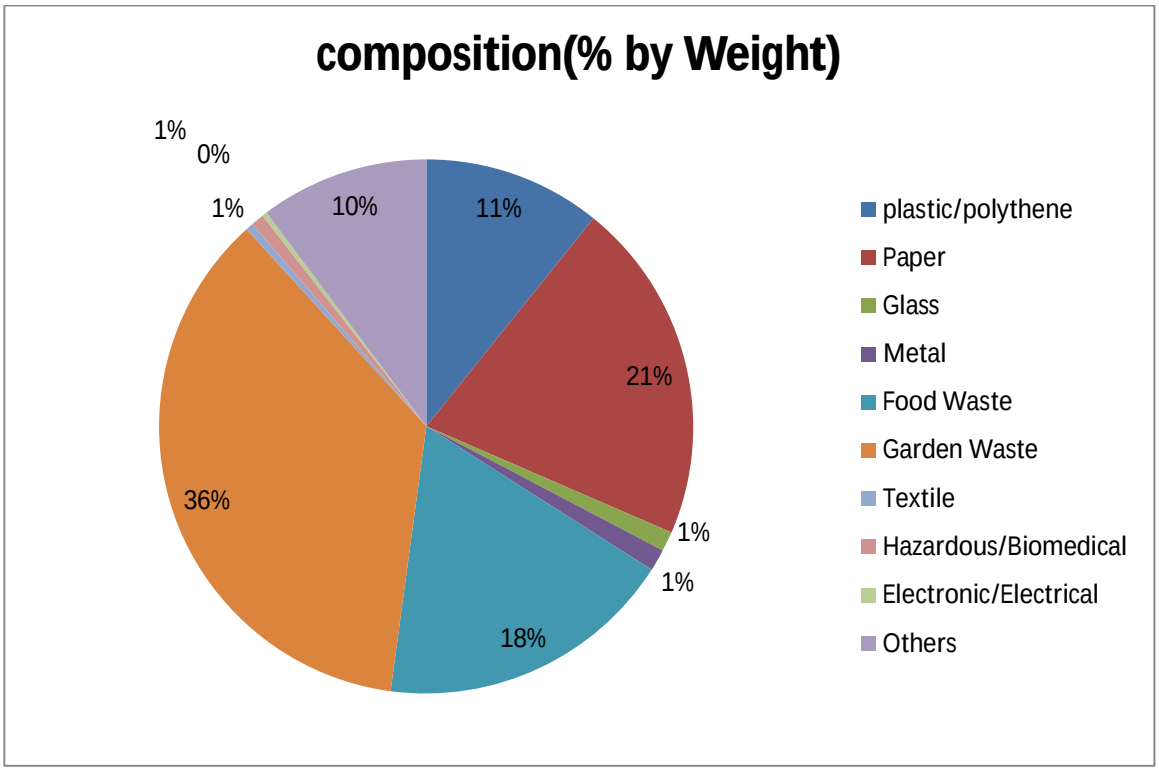


Fig.2 Graphical representation of composition of waste produced in the Academic Zone

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C. Composition of Waste Produced in the Residential Zone

Type of Waste	Weight in kg	Percentage
Plastic	11.18	12.29
Paper	16.49	18.13
Glass	1.374	1.51
Metal	0.923	1.014
Food waste	16.86	18.53
Garden waste	25.9	28.47
Leather	-	-
Rubber	1.10	1.21
Textile	1.43	1.58
Hazardous/biomedical	-	-
Electronic/Electrical	1.0374	1.14
Others	14.67	16.12
Total	92	100

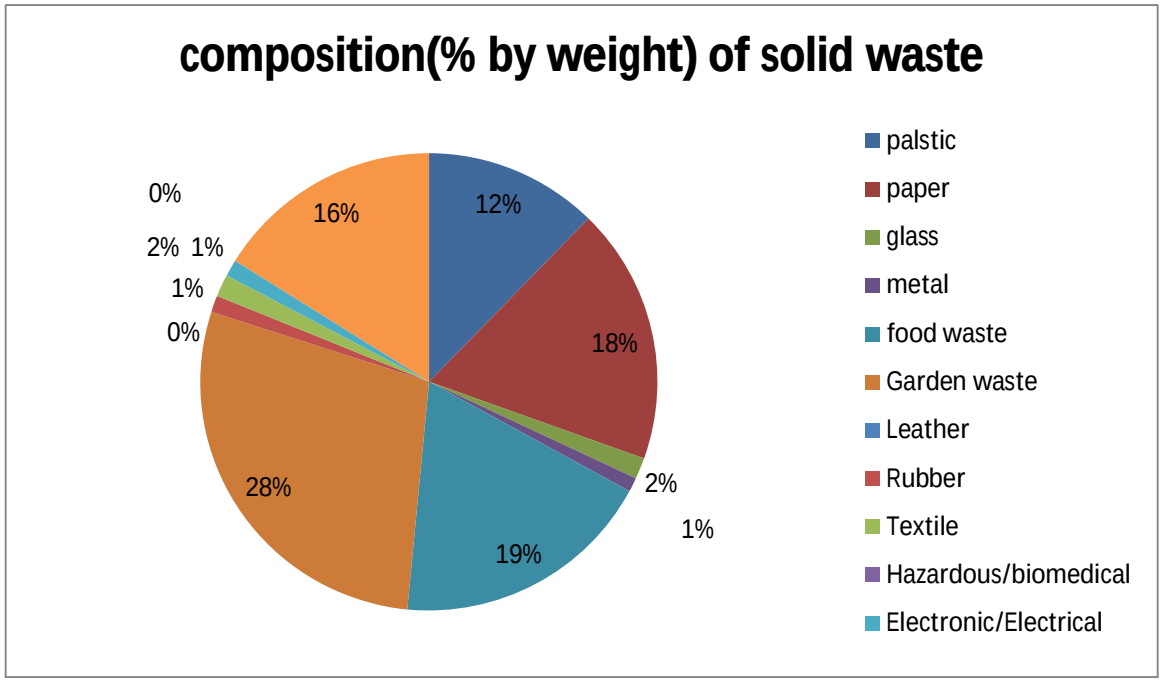


Fig. 3 Graphical representation of composition of waste produced in the Residential zone:

IV. CURRENT PRACTICES OF SOLID WASTE MANAGEMENT IN THE CAMPUS

Assessment was done on the basis of interviews with all the stake holders and field observations. Students were also involved by knowing their views about the state of waste management in the campus. The solid waste in the campus is generated from various potential sources, such as Academic Buildings, Hostels, Canteen, Garden, etc. All the waste is managed by sweepers which are allotted for different buildings in the campus. There are 11 sweepers for the Academic area and the hostels have their own sweepers for this purpose. In an around, there are 20 workers for the waste management in the campus. Dustbins are placed at different locations in the campus. Some of them are placed in the classes and laboratories. Dustbins are also placed in front of cafeteria and in the corridors at some places. But there is not enough availability of the Bins. These bins are emptied daily in the morning around 11 to 11:30 am. The waste is collected in hand carts and then it is transported to the disposal sites within the campus. There is no proper place for disposing the waste. It is dumped in heaps at different places and then set to burn to reduce the volume of the waste. Often

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these burning sites produce smoke which contains harmful gases such as dioxins which generate from the burning of plastics. These sometimes affect the health of the residents of the campus.

The waste generated from the hostels is also collected and burnt in the same manner, although some organic part from the waste generated from the mess which includes vegetable cuttings and food waste is collected in buckets and is taken out of the campus for the cattle feed. The garden waste which includes the plant cuttings, weeds and grass cutting is collected in heaps and then left over to dry and after some time is also burnt. The construction and demolition waste is produced whenever some construction and maintenance work is going on. All the waste generated from here is collected and thrown in some low-lying area within the campus. The amount of Construction Demolition waste is less and is also not produced regularly. It is thrown at different locations in the campus mostly near the work site. Scrap waste is sold every year to recover wealth from waste paper, iron, tin, plastic and mild steel rods.

A. Some Good Solid Waste Management Practices were also seen in the Campus such as

1) Cement concrete cubes which are used for testing compressive strength of concrete are produced as a waste from the concrete laboratory. These cubes are reused as pavers at some places in the campus.

2) Students of the Architecture department made use of the scrap waste to make decorative furniture near the cafeteria.

B. Response to Questionnaire

Students are not satisfied with the current situation of the solid waste management in campus. Most of them feel that there is not enough availability of the dustbins and also they are not suitably located where they need to be placed in places like in the corridors and the garden. They don't observe any waste segregation activities in the campus but look forward and appreciated the idea of using a set of three dustbins (Green- for the food waste, Blue- for the non-recyclables and yellow- for the recyclables). Hardly noticed any 3R (Reduced, Reuse and Recycle) strategies in the campus. Basically most of the students demanded to increase the number of dustbins in the campus. Students were also concerned about the open burning of the solid waste and complained about the air-pollution damaging the surrounding and also affecting their health. The best part is that all the students are interested in improving the current situation of solid waste management in the campus and are concerned about it.

V. RECOMMENDATIONS FOR DEVELOPING SUSTAINABLE WASTE MANAGEMENT SYSTEM IN THE CAMPUS

An integrated approach can be adopted for the disposal of the waste. The organic part of the waste can be turned into manure by using sustainable practices such as composting and vermicomposting. The Garden waste can be dried and used for making Charcoal briquettes and Biomass briquettes which are used as a substitute of coal and wood for burning in kilns.

Resource recovery from the waste may include both recovery of the useful materials by recycling, as well as the recovery of the wealth by selling the recyclables.

The Recyclables can be easily sold in the secondary market to recover wealth. It was evident from the study that approximately an amount of One lakh sixty seven thousand six hundred can be recovered annually from the waste.

*Paper recycling plant***:** As we know the recycling is a key attribute in waste management and it is very easily feasible in case of paper as it is a simple process and can be undertaken at the college level and do not need much infrastructure.

Paper recycling plant in MITS was functional under the mechanical Department. It was setup in 2014 and was designed by an M-tech Student. It recycled paper to make products like file covers, carton and egg trays. The paper recycling plant was an innovative approach to recycle paper in eco-friendly products. Presently the paper recycling plant is not functional. It can be repaired and can be again made functional so that the process of recycling of paper can be resumed and the potential of paper recycling can be exploited in the campus. This can be very useful in changing the attitude of people in looking towards waste as a resource rather than neglecting it.

Encouraging waste reduction can be very helpful. It would reduce the quantity of waste and ultimately fewer efforts would be required for the disposal of the waste.

Intensive awareness programs should be undertaken, and students should be taught the best practices for the waste management.

Training should be given to the sanitary workers for the proper handling and disposal of the solid waste. Health issues of sanitary workers should also be looked after.

Segregation is the key for making a sustainable waste management system. Hence the waste should be segregated from the source

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itself so that it can be easily handled and disposed.

Increase the number of dustbins in the campus premises.

Safe disposal of Hazardous and biomedical waste should be undertaken.

VI. CONCLUSION

There is an immense possibility for adopting a sustainable waste management system in the college campus as the institute is under one authority, hence improved solid waste management can be easily adopted. If Good waste management practices will be institutionalized at the university level then they will definitely trickle down to the society.

The present situation of Solid Waste Management was not found satisfactory in the campus. And it was found that there was not proper disposal of the waste. It is being directly burnt at different dump sites. Burning of the waste can be very harmful for the environment and the health of the students in the campus. Hence proper disposal of waste is very crucial.

Waste management can be improved by following the recommended practices. Most importantly segregating the waste at the source and then applying the sustainable waste management practices. Which include composting, vermicomposting, biomass briquettes, Charcoal briquettes, RDF etc. Money can also be recovered from the waste by selling the recyclables. Hence it was found that it is feasible to dispose the waste properly.

REFERENCES

[1] Coker A.O., Achi C.G., Shridhar M.K.C., Donnett C.J. 'Solid waste management practices at a institution of higher learning in Nigeria.' Procedia Environment Sciences, Vol.35, pp 28-39, 2015.

[2] Rajamanikam R., Poyyamoli G.'Towards zero waste campus: Compositional analysis of solid waste at the staff quarters to frame inclusive sustainable campus waste management system'International Journal of Innovative Research in Science, Engineering and Technology Vol.3,Issue 4, pp. 11255-11264,2014.

[3] Taghizadeh S ,Ghassemzadeh H.R., Moghadamvahed Md. and Fellergari R.'solid waste characterization and management within university campuses casestudy: university of Tabriz' Elixir Vol.43 pp. 6650-6654,2012.

[4] Shreedevi S. 'solid waste generation and its management- a casestudy' International Research Journal of Environment Sciences Vol.4 (1), pp. 90-93,2015.

[5] C.M. Punongbayan, Sheena P. Leyesa A., MarrielDanise P. Arago 'Waste management practices of an educational institution' Asia Pacific Journal of Education , Arts and Sciences Vol.1, No.4, pp 15-20, 2014.

[6] Malakahmad A., Zaimzaki M., Nasir M. 'Solid Waste Characterization and Recycling Potential for University Technology PETRONAS Academic Buildings' American Journal of Environmental Sciences Vol.6 (5), pp 422-427, 2010.

[7] Danielle P. S., Arthur L.F., Annie L. B. 'Reducing Solid Waste in Higher education: The first step towards "greening" a university campus' International Journal of Sustainable Resource Management and Environmental Efficiency, Vol. 54, pp 1007-1016,2010.

[8] Boysan F., Ozer ,Has Md.,Murat M. 'Project on solid waste recycling plant in Sakarya University campus' Procedia Earth and Planetary Science , Vol.15, pp 590-595,2015.

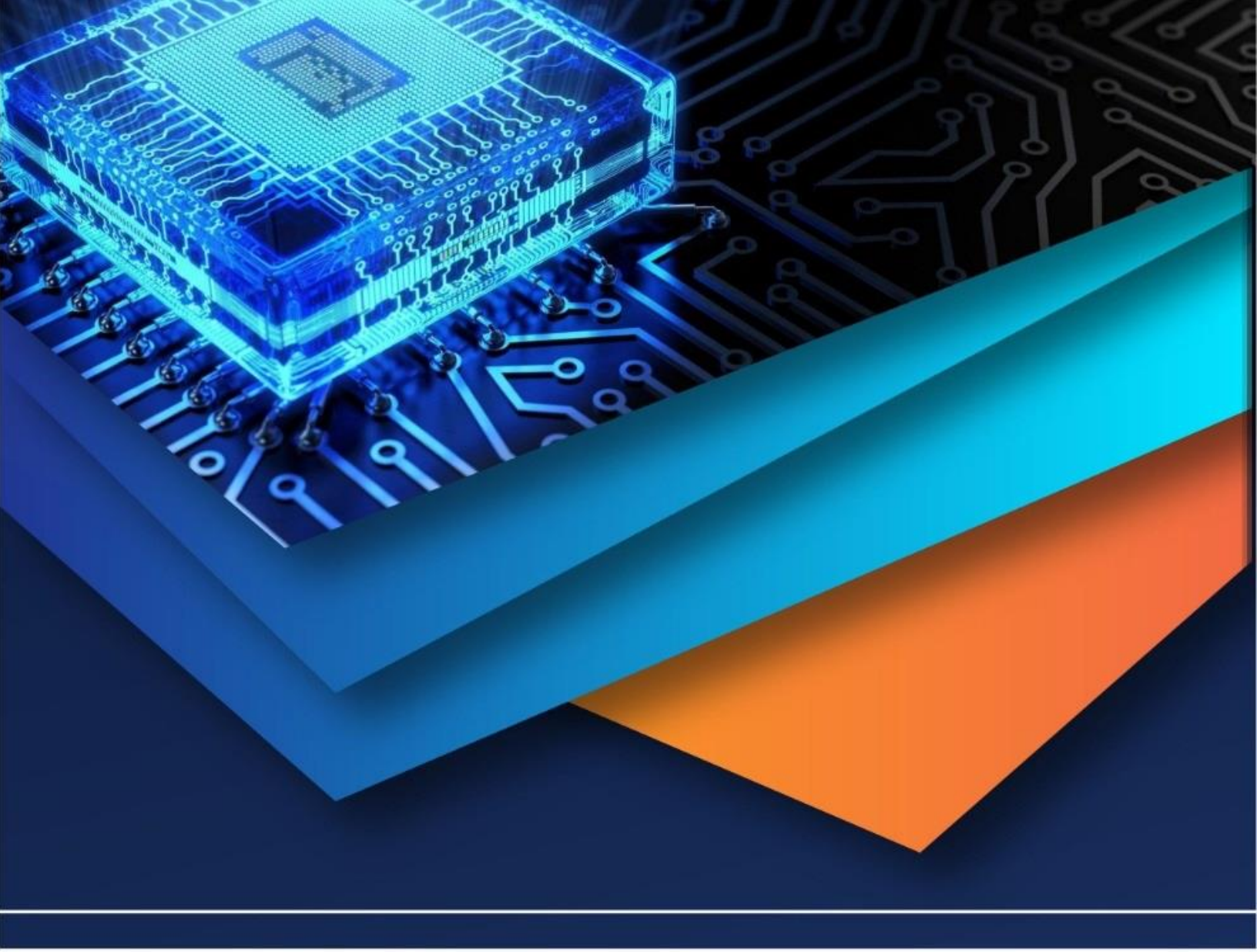
[9] Upadhyay V., Jethoo A.S. Poonia M.P. 'Solid waste collection and segregation: A case study of MNIT Campus, jaipur' International Journal of Engineering and Innovative Technology Vol.1, Issue 3, pp 144-149,2012.

[10] Elfithri R., Ghee T.K., Ahmad Basri N.E., Mdzain S.'Integrated Paper Recycling Management System in UKM Campus.' Procedia-Social and Behavioral Sciences Vol. 60, pp 556-561, 2011.

[11] Zohur-uz-Zakan Md., and Riyad A.S.M. 'Sustainable management scheme for academic institutional solid waste' International Journal of Computer Applications,Vol. 91 , pp 21-26,2014

[12] Dowie W.A., McCartney D.M. and tamm J.A. 'A case study of institutional solid waste environmental management system.' Journal of Environmental Management, Vol.53, pp 137-146, 1997.

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