Utilization of Plastic & Construction by Manufacturing of Paver and Solid Blocks

Submitted in partial fulfilment of the requirements

For the degree of

Bachelor of Engineering

By

TAJUDDIN NIZAMUDDIN ANSARI (15CES11)

RAHUL KUMAR CHAURASIA (15CES14)

KHAN HASAN KAYYUM (15CES19)

ABHISHEK LAVKUSH PANDEY (15CES32)

Under the guidance of

Dr.Shabiimam M. A.

Department of Civil Engineering

School of Engineering and Technology

Anjuman-I-Islam's Kalsekar Technical Campus

New Panvel, Navi Mumbai-410206

2018-19

A Project Report on

Utilization of Plastic & Construction by Manufacturing of Paver and Solid Blocks

Submitted in partial fulfilment of the requirements

for the degree of

Bachelor of Engineering

by

TAJUDDIN NIZAMUDDIN ANSARI (15CES11)

RAHUL KUMAR CHAURASIA (15CES14)

KHAN HASAN KAYYUM (15CES19)

ABHISHEK LAVKUSH PANDEY (15CES32)

Under the guidance of

Dr.Shabiimam M. A.

Department of Civil Engineering

School of Engineering and Technology

Anjuman-I-Islam's Kalsekar Technical Campus

New Panvel, Navi Mumbai-410206

2018-19

CERTIFICATE

This is to certify that the project entitled **"Utilization of Plastic & Construction by Manufacturing of Paver and Solid Blocks**" is a bonafide work of **Tajuddin Nizamuddin Ansari (15CES11) Rahul Kumar Chaurasia (15CES14) Khan Hasan Kayyum (15CES19) Abhishek Lavkush Pandey (15CES32)** submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of "Undergraduate" in "Civil Engineering".

Dr.Shabiimam M. A
(Supervisor)

Dr. Rajendra B. Magar
Head of Department

Dr. Abdul Razzak Honnutagi
Director

APPROVAL SHEET

This dissertation report entitled **"Utilization of Plastic & Construction by Manufacturing of Paver and Solid Blocks"** by **Tajuddin Nizamuddin Ansari (15CES11) Rahul Kumar Chaurasia (15CES14) Khan Hasan Kayyum (15CES19) Abhishek Lavkush Pandey (15CES32)** is approved for the degree of "Civil Engineering"

Examiners

……

……

Supervisors

1. ……

2. ……

Chairman (Director)

……

Date:

Place: Panvel

DECLARATION

We declare that this written submission represents my ideas in our own words and where others ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that, we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

TAJUDDIN NIZAMUDDIN ANSARI (15CES11)

RAHUL KUMAR CHAURASIA (15CES14)

KHAN HASAN KAYYUM (15CES19)

ABHISHEK LAVKUSH PANDEY (15CES32

ABSTRACT

Plastic waste is increasing everyday due urbanisation and population growth. In developing countries like India it is very difficult to handling and dispose of plastic waste and 70% of the plastic is discarded as waste. Due to improper solid waste management enormous amount of plastic is dumped into the landfill which is severe thread to environment and ground water. In other way large amount of plastic dumped into the ocean illegally. 13 million tonnes of plastic thrown into the ocean each year according to United Nation Environment Development Program (UNEDP) in 2050 there will be the more plastic in ocean then the Fish. Due to plastic pollution human health is affected like through disruption of various hormones mechanism and cancer. In India around 5.6 million tonnes per annum of plastic waste is generated which about 15,400 tonnes per day.In this review study discussing about utilization of plastic waste (polyethylene, High density polymer, polyethylene terephthalate) for making paver blocks and bricks.

Keywords: *plastic waste, paver blocks, ceramic waste, construction waste.* .

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATION NOTATION AND NOMENCLATURE

PET	Polyethylene terephthalate
HDPE	high density polyethylene
PVC	Polyvinyl chloride
LDPE	Low- Density polyethylene PP Polypropylene
PS	polystyrene
F.A	Fine Aggregate
C.A	Coarse Aggregate
CTM	Compressive Testing Machine
UNEDP	United Nations Environment Development Programme
C&D	Construction and Demolition waste

Chapter 1

Introduction

1.1 General

Plastic is a synthetic material which is also called as polymer and made up of so many monomers such as PVC,polyethylene,nylon, etc.that can be moulded into shape while soft, and then set into a rigid or slightly elastic form. In India a huge number of plastic has been used for various purposes such as household appliances, Industrial use is large and increase with time. Peoples has been used for various purpose for their easily benefits like using plastic bag for various purpose such as marketing easily buying goods they use to carry plastic bag. For that a large no of population is used for their easily benefits. In India about 70% of plastic has been used.

In every year 13 million tonnes of plastic leak into the ocean. According to UNEDP in 2050 there will be more plastic than fish in our ocean. What simply they do contain plastic waste simply leak into the ocean. And facing problems by generally fish they consume and after caught by human being by micro plastic they consume it human also face problem due to these because plastic waste is never decomposed causes pollution. It may cause harmful to the environment. People try to burn they may cause air pollution. Currently about 56 lakh tonnes

of plastic waste dumped in India in a year. They ultimately affect badly directly or indirectly human as well as animal. Hence it is necessary to decomposed properly as per government regulations. As we know plastic waste is never decomposed so it is essential to recycle it in proper way.

Recycling of plastic is essential. To reuse or recycle for making various good product such as paver block, bricks etc. such product having good properties of insulation of heat, cold and acoustic. Main benefits of these using plastic waste as materials because it is cheap and easily available nearby place and reduced the manufacturing cost. To achieve economy and also conserve our environment.

As we can see that 70% to 80% of earth surface have concrete work. Due to this its create difficulty after expiring the structure. After demolishing the structure it's difficult to manage that construction waste (Debris) it will harm public heals well as environment.....

According Ministry of Environment, Forest and Climate Change the most annual report estimate of C waste in India Cities is generated 165-175 million tonnes during the period 2005-13 and in 2017 25-30 MT has been generated its increasing day by day.

To avoid that problem in this project we are utilising both the waste (Construction and Plastic) with different design mix ratio and plastic waste is using as a Binder by burning and as a aggregate by Crushing 10mm down.

In this project we are utilization of plastic waste (polyethylene, High density polymer, polyethylene terephthalate) and Construction waste (Concrete) for making paver and Solid block.

1.2 Aim

To do the proper management and utilisation of Plastic and Construction Waste.

1.3 Objective

1. Selection and collection of the plastic and construction waste convert to reusable materials

2. To know the construction property of the Both Waste
3. Dings mix the both waste with different ratios
4. To make paver and solid block
5. Testing on paver and solid block
6. Practical usage of proposed innovation/Research

Chapter 2

Literature Review

2.1 General

Author name: S.vanitha , N.Natrajan and M.Praba

Title- utilization of waste plastics as a partial replacement of coarse concrete block.

Due to rapid growth of industries and urban areas, we need more infrastructure development. This processed crate lots of problem like shortage of construction waste and generating the waste (plastic,e-waste,etc), to overcome this waste this research has been conducted to reuse that waste in concrete as Fine Aggregate. Adding 0%, 10%, 20%, 30%, 40% by weight of the Course aggregate in a M20 concrete block having the size 200x150x60mm. All the necessary test has been conducted to know the property of the block. (Vinutha et al).

Table 2.1 Property of Plastic

SR.No.	Property	Types of plastic waste used		
		PE	PP	PVC
1	Density	910 -225	946	1380
2	Specific gravity	0.92	0.9	1.2
3	Melting point	105-115	85-195	100-260

Author name: Eric Ababiohemeng

Title: utilization of waste low density polyethylene in high strength concrete pavement blocks production.

The disposing of waste plastic is biggest problem in the globe. the usage of plastics is increasing day by day and it takes to decompose the plastic waste in thousands of years. Hence we need to find the solution to proper disposal of these plastic waste. In this research paper they replaced the sand with PET for the production of concrete pavement. In this study they have used different material with different ratio such as 1:5:3(cement, aggregate, coarse aggregate). The plastics waste was used to replace the sand volume at 0%, 10%, 20%, 30%, 40%, 50%, 60%. After that they have conducted all the necessary test they found that the flexural, split tensile compressive strength is decreases when the cement plastic ration was increases.

Figure 2.1 Plastic Waste and Moulding

Figure 2.2 Mould

Table 2.2 Compressive strength of concrete

Plastic Aggregate in%	14 Days Compressive Strength	Avg. Strength	28 Days Compressive Strength	Avg. Strength
0.00	28.80	28.87	39.50	41.10
	27.80		42.00	
	30.00		41.80	
10.00	26.80	27.70	39.00	40.07
	29.00		40.30	
	27.30		40.90	
20.00	26.00	26.90	38.70	
	27.90		39.60	38.97
	26.80		38.60	
30.00	25.00	25.43	37.60	37.77
	26.50		38.60	
	24.80		37.10	

Author Name: Vikram lathe, Alghary Gangurde, Abhijit Pawar

Title: green concrete using plastic waste or utilization of waste plastic in green concrete.

More then75% of the surface of the earth is covered by the concrete. Aggregate are the most important component of the concrete. In this research paper they had reduced sand content in concrete.

There are different types of industries and urban plastic waste material which they are producing, such waste material are used in concrete to make it cost effective and aslo helps in Managing the

waste and disposing the plastic waste. In this research paper they used the plastic waste such as (PVC), (PP), (PE) as replacement of fine aggregates in concrete. They test were carried out for replacing sand by 10%, 20%,30%,40%,50% in concrete.

These shredded particles have used as a replacement of sand in concrete.

Author Name: Dinesh.S , Dinesh.A, Kirubakaran.K

Title: Utilization of waste plastic in manufacturing of brick and paver block.

Due to industrialization and urbanization the production plastic is increases day by day, due to this waste plastic is generated in huge amount, to dispose that waste is very difficult in order to dispose that plastic waste they utilize plastic waste in manufacturing Brick and Paver block by using River sand by the ratio of 1:1, 1:2, 1:3, 1:4, 1:5, 1:6. they have used **high density polyethylene, polyethylene, properties etc.** by melting within the range.

Figure 2.3 Brick

Figure 2.4 Compressive Testing Machine

Table 2.3 Compressive strength of block

MIX DESIGNATION	MIX DESIGNATION	COMPRESSIVE STRENGTH(N/mm2)
M1	**1:2**	**4.65**
M2	**1:3**	**4.78**
M3	**1:4**	**5.12**
M4	**1:5**	**4.92**
M5	**1:6**	**3.17**

Chapter 3

Materials and Methodology

3.1 General

3.2 Materials :

3.2.1 Aggregate:

As per IS 1526: 2006 the maximum size of aggregate is 12mm. TEST: the permissible limit for test are

I. Sp. gravity-2.6 to 2.7
II. Water absorption- IS :156582006 clauses 6.2.4- 7%
III. Aggregate impact value as per Is: 2386-1996 – 30%
IV. Crushing value – as per IS 2386-1969 -30%
V. Abrasion value as per IS: 2386- 1969- 30%

3.2.2 Cement

AS per IS: 269-1969

I. Sp. gravity – 3.15 g/cc
II. Initial setting time -30min
III. Final setting time – 600 miin
IV. Soundness- 0.8-10mm

3.2.3 Water:

IS: 456-2000 CL 2.20 – Maximum limit for chloride content as per IS 456:1978 is 100mg per lit.

3.2.4 Construction waste:

Figure 3.1 Construction waste(Concrete) having size is 10MM down.

3.2.5 Plastic waste:

Table 3.1 Properties of Plastic

SrNo.	Property	Types of plastic waste used		
		PE	PP	PVC
1	Density	910 -225	946	1380
2	Specific gravity	0.92	0.9	1.2
3	Melting point	105-115	85-195	100-260

3.3 Methodology(Design)

3.3.1 Mixed design: Casting & Curing: M7.5

Usually for constructional work the mostly M20 Grade of concrete is used. In this project M7.5 concrete is used and waste plastic is replaced by CourseAggregate.Aggregates such as 10% were added in percentage and it replaced by waste plastics. Concrete block and of size 150*150*150 cube. Were casted in 7-day curing.

Figure 3.2 Design Mix

Table 3.2 Compressive strength of concrete (Casting & Curing:)

%Plastic Aggregate by C.A	%Construction waste by F.A	Mix Ratio for M 7.5 N/mm2 (Nominal mix)	7 days curing strength(N/mm2)	14 days curing strength(N/mm2)	28 days curing strength (N/mm2)
10%	60%	1:4:8	3.2	6.99	7.98

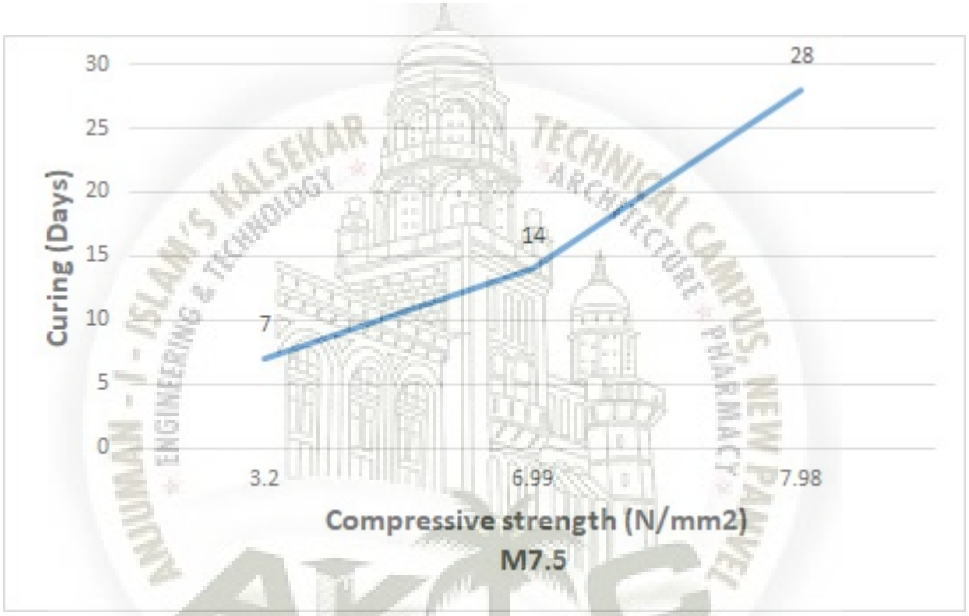

Figure 3.3 Compressive Strength M7.5

3.3.2 Melting and Casting:

In these project melting the plastic (Low density Polymer) within the range at the melting point of105-135*C and after that mixing crushed**Concrete Waste**. After properly mix of plastic and crushed Concrete Waste, usually cast in cube of size 100*100*100 and after 2 hours cooling simply we taste by using CTM (Compressive Testing Machine) in these method no need of curing of block is required. It gives fast production.

Figure 3.4 Melting of Plastic using Pan

Table 3.3 Compressive Strength

Plastic Waste	Construction waste	Mix Ratio	Compressive strength(N/mm2)
Low Density Polymer (Bisleri Water Bottle)	Only Concrete Waste	1:3	17

Mixed design:

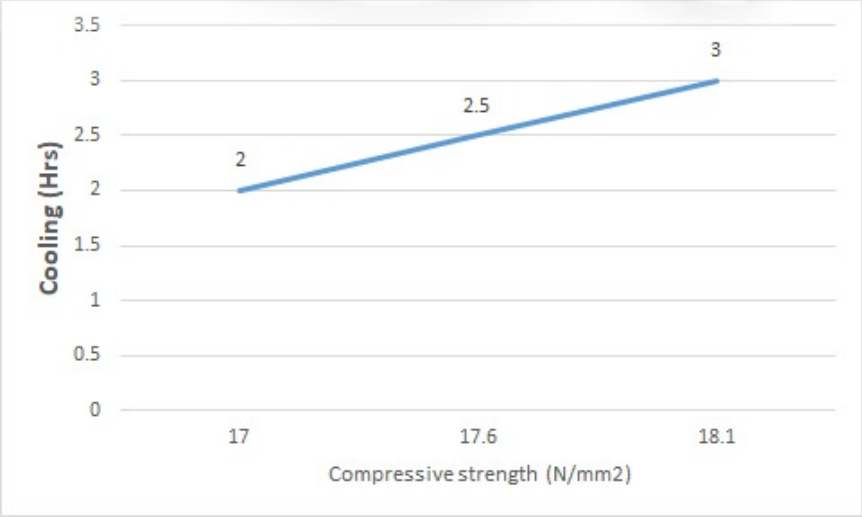

Figure 3.5 Compressive Strength

Casting & Curing: M20

Usually for construction work the mostly M20 grade of concrete is used.In this project we used M20 grade of concrete having Nominal mix 1:1.5:3.In these project generally using the waste which are, Construction waste having 10mm down and plastic waste i.e. crushed plastic having 15mm down. In which cement is used 3.834Kg and Replacing Fine aggregate with 60% of construction waste and Replacing coarse aggregate 10% of plastic waste after that we can concluded 3.8196Kg of construction waste and 1.29Kg of plastic waste is used for manufacturing of block.After the proper mixing of all the material in one tray and sample put it on mould of size 150*150*150 mm3.And proper compaction is done with tamping rod, and places it on mould for 24 hr. After 24 hr removing the mould and place the block in curing tank for 7, 14, and 28 curing.

Table 3.4 Compressive Strength

%Plastic Aggregate by C.A	%Construction waste by F.A	Mix Ratio for M20 N/mm2 (Nominal mix)	7 days curing strength(N/mm2)	14 days curing strength(N/mm2)	28 days curing strength(N/mm2)
10%	60%	1:1.5:3	12	24.2	27.3

Melting and Casting:

In this project plastic (Low density Polymer) is melting within the range at the melting point of 105-135*C and after that crushed Concrete Waste is mixed. After properly mixing plastic and crushed Concrete Waste, cast in size of 100x100x100 mm and after 2 hours cooling

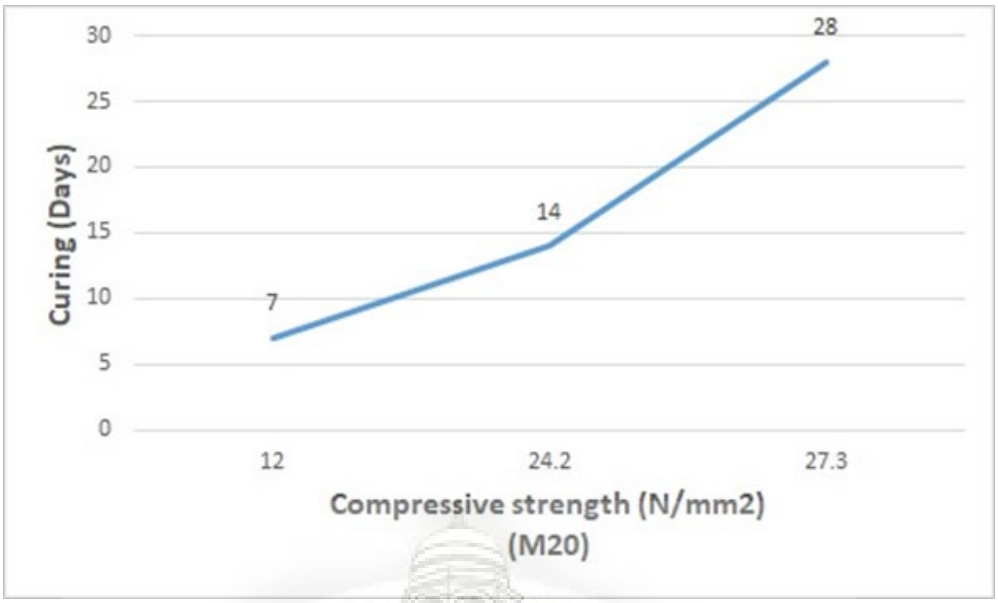

Figure 3.6 Compressive Strength M20

simply we tasted it by using CTM (Compressive Testing Machine) in this method no need of curing isrequired. It gives fast production.

Chapter 4

Results and Discussions

4.1 General

This chapter discuss about the plastic paver blocks compressive strength.

4.2 Test on materials

4.1 - Determination of Gradation of aggregate
4.2 - Determination Bulk density
4.3 - Determination of water absorption
4.4 - Determination of specific gravity

4.3 Determination of Gradation of coarse aggregate (4.1)

Coarse aggregate means the aggregate which having size more than 4.75mm. To find size of aggregate has passes through 20mm IS sieve.

Table 4.1 Gradation Of Coarse Aggregate

Sieve size	Weight retained (gms)	Percentage weight retain	Cumulative percentage weight retains	Percentage passing
4.75	143.76	14.376	**14.376**	**85.624**
2.36	216.65	**21.665**	**36.041**	**63.959**
1.18	250.88	**25.088**	**61.129**	**83.959**
600 Mic	811.98	8.498	69.627	11.277
300 Mic	110.96	11.098	86.7263	30.377
150 Mic	101.23	16.193	19.627	19.277
Span	31.44	3.144	96.650	0

4.4 Determination of Gradation of fine aggregate (Waste Concrete) (4.2)

Fineness modules of sand is an index number which represent the mean size of particles in sand. It is calculated by performing sieve analysis with standard sieves

Fine aggregate.

It means the aggregate which passes through 4.75mm sieve. To find FM of fine aggregate we need sieve size of 4.75mm, 2.36mm, 1.18mm, 60 Micron, 30 Micron 15 micron.

Table 4.2 gradation of aggregate (Sieve Analysis)

Sieve size	Weighted (gms)	Percentage weight retain	Cumulative Percentage weight retain	Percentage Passing
4.75	**143.76**	**14**	**14**	**89.5**
2.36	216.65	15.32	**36.89**	**25.89**
1.18	**250.88**	10.5	**25.52**	**25.55**
600 Mic	**811.98**	25.6	24.62	55.26
300 Mic	**110.96**	32.89	63.12	82.33
150 Mic	**101.23**	45.28	25.56	6012
Span	**31.44**	23	63.25	22.36

4.5 Determination Bulk density (IS 2386-3:1963) (4.3)

Density

It is defined as a ratio of mass per unit volume it is denoted by gama.it is essentially measurement of how tightly matter is trapped together the density of the aggregate how much air is entrapped the cement concentration and the maximum size of aggregate used.

Table 4.3 Bulk density of materials

Sr No.	Ingredient	Mass Kg	Density Kg/M3
1	Cement	7.67	1446.89
2	Concrete waste	8.88	1675.15
3	Coarse ggregate	7.55	14.24
4	Water	…….	1000

4.6 Determination of water absorption of waste concrete (IS 2386-3: 1963) (4.4)

Water absorption by concrete is dangerous for any structure water absorption of material should be standard (Not more than 6%) as per IS code, in this casethe waster absorption of waste concrete is very high due to its dust particle

Table 4.4Water absorbtion of Concrete waste

Sr. No.	Weight of saturated sample (Kg)	Weight of Owen dried sample (Kg)	Water absorption
1	1.120	299.69	24.44%

4.7 Determination of specific gravity of waste concrete (IS 2386-3 : 1963) (4.5)

Specific gravity is the ratio of the density of a substance to the density of standard substance as per the standard the specific gravity of sand should not be greater than 2.6

After experiment the specific gravity of concrete waste we found that 3.91 which is not suitable for concrete

Chapter 5

Summary and Conclusions

5.1 Summary & Conclusion

As per the report of UNEDP, in 2050 there will be more plastic as compare to fish in the ocean and 13million tonnes of plastic thoroughpin in the ocean. To dispose the plastic and construction waste is become very difficult day by day In the project Utilization of Plastic Waste by Manufacturing of Paver and Solid Block we are disposing/Recycling the both waste as a raw material in concrete, mixing with the different design mix ration so we can get successful result.

In this study we are used M20 grade of concrete using plastic and construction waste, the compressive strength of 7 , 14 and 28 days are as follows 12N/mm^2,24.2N/mm^2,27.2N/mm^2 ,which is greater than the commercially available blocks, This study reveals that plastic and construction waste could be used for paver blocks and solid blocks.

REFERENCES

Style of listing references of some standards are as below;
ASME standard
Book,
[1] Merritt, H. E., 1971, *Gear Engineering*, Pitman, New York, pp. 82–83.

Journal Paper,
[2] Arakere, N. K., and Nataraj, C., 1998, "Vibration of High-Speed Spur Gear Webs," ASME Journal of Vibration Acoustics, 120(3), pp. 791–800.

Proceeding Paper,
[3] Stewart, R. M., 1977, "Some Useful Data Analysis Techniques for Gearbox Diagnostics," Proceedings of the Meeting on the Application of Time Series Analysis, ISVR, University of Southampton, Southampton, UK.

Thesis,
[4] Kong, D. W., 2008, "Research on the Dynamics and Fault Diagnosis of the Large Gear Transmission Systems," Ph.D., thesis, JiLin University, Changchun, China.

IEEE standard
Book,
[1] J. F. Curtis, (Ed.), *Processes and Disorders of Human Comm-unication.* New York: Harper and Row, 1978.

Journal Paper,
[2] J. Schroeterand M. M. Sondhi, "Techniques for estimating vocal-tract shapes from the speech signal,"*IEEE Trans. Speech Audio Process.*, vol. 2, no. 1, pp. 133–150, 1994.

Proceeding paper,
[3] J. M. Pardo, "Vocal tract shape analysis for children," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Process.*, 1982, pp. 763–766.

LIST OF PUBLICATIONS

International Conferences Presented

Shabiimam M. A, TehsinKazi, Abhishek Pandey, TajjudinAnsari , Rahul Churasia (2018), Review Study on Reuse of Plastic Waste from Manufacturing the Paver and Solid Blocks, 3rd International Conference on Construction, Real Estate, Infrastructure and Project, Nov 23-25 2018

National Journals

1.Rahul Churasia, Abhishek panday (2019) ,5th National level project presentation cum exhibition competition at universal college of Engineering (Vasai)

2. Rahul Churasia, Abhishek panday (2019) 3rd National level Project competition Lokmaniya Tilak of Engineering (Kopar Khairne)

.

ACKNOWLEDGEMENT

It is our privilege to express our sincerest regards to our project Guide**, Dr.Shabiimam M.A.**, for their valuable inputs, able guidance, encouragement, whole-hearted cooperation and constructive criticism throughout the duration of our project.

We deeply express our sincere thanks to our Head of Department Dr.R.B.Magar and our Director Dr. Abdul Razzak Honnutagi for encouraging and allowing us to present the project on the topic "**Utilization of Plastic & Construction by Manufacturing of Paver and Solid Blocks"** in partial fulfillment of the requirements leading to award of Bachelor of Engineering degree.

We take this opportunity to thank all our Professors and non-teaching staff who have directly or indirectly helped our project, we pay our respects and love to our parents and all other family members for their love and encouragement throughout our career. Last but not the least we express our thanks to our friends for their cooperation and support.

Tajuddin Nizamuddin Ansari (15CES11)
Rahul Kumar Chaurasia (15CES14)
Khan Hasan Kayyum (15CES19)
Abhishek Lavkush Pandey (15CES32)

AIKTC – New Panvel,

Navi Mumbai.