

**L.R.Manjunatha**

*-Marketing,JSW Cement limited, PhD Research Scholar, Bharatiyar University India*

**Dr. Sandhya**

*Professor, VTU, Bangalore, India.*

**R. Anvekar**

*Professor, VTU, Bangalore, India.*

### ABSTRACT:

*RMC is a readily available product any time and every time now a days in major metros and towns across India and it is replacing traditional site mixed concreting at construction sites across India due to its various advantages. The RMC industry is witnessing a sweeping changes in the customer mindset that large number of concrete users are migrating the Ready-mixed concrete from the traditional site-mixed concrete across the country and not much importance is being given to the cost factor due to the product advantages and easy availability in all the important cities across India.*

*Today ready-mixed concrete as a product is continuously evolving and moving forward by not only replacing traditional SMC but also giving a lot of value addition to the construction industry by offering new generation special green concrete products through continuous innovation, research and product development by the RMC Companies in India and green marketing is gaining more significance day by day*

*This pilot market study concept research paper aims to bring out the growth of RMC Industry in India and customer preference on smc vs rmc and recent developments and availability of new RMC special green products in the market using greener industrial by products like Flyash and GGBS as partial replacements to OPC Cement which is not so eco friendly . The benefits and the value additions of these products to the end*

*consumers is also highlighted with focus on the green marketing initiatives for growth for these products in future.*

**Key Words:** *SMC,RMC, High Strength Concrete, Flyash, GGBS, High performance Concrete, Self compacting Concrete, Fiber Reinforced Concrete, Site Mixed Concrete.*

### INTRODUCTION

Concrete is one of the main raw materials used for civil engineering construction works in India and as well as all over the world and one of the best material invented by man kind in the human history which has found its place as the second most consumed material after water .Ready-mixed concrete is used in most of the major building construction and projects in India to save time in construction and achieve better quality and durability.

Concrete is a very versatile building material, and can be designed and placed to the most exacting structural demands or the most discerning aesthetic requirements. It also ranks as one of the more sustainable building material through the use of secondary supplementary materials like GGBS and Fly ash.

India being second largest producer of cement in the world, the use of Ready-Mixed Concrete(RMC) as a product vis-à-vis traditional and manually made Site mixed concrete (SMC) in the construction sector and infrastructure projects has come a long way ever since the first commercial

ready-mixed concrete plant was established in Pune in the year 1992. Since then the industry is on a continual growth path. The entry of major commercial ready-mix concrete companies from India and abroad in 1993 has made the industry grow leaps and bounds and as we see today the industry is growing very fast and geographically spreading to all the corners covering metros, tier 2 and tier 3 cities and even major district head quarters of the country.

RMC has been very popular in developed countries for the last seven to eight decades with the establishment of first commercial RMC plant in United Kingdom in the year 1936 and it is the most popular method of production of concrete there.

### 1.1 GREEN MARKETING

Green marketing is the marketing of products that are presumed to be environmentally preferable to the consumers. Thus green marketing incorporates a broad range of activities, including product modification, changes to the production process, sustainable packaging, as well as modifying advertising. Thus the sole aim of green marketing is promotion or advertising of products with environmental characteristics, Recyclable, Refillable, cost effective and eco friendly.

Green marketing involves developing and promoting products and services that satisfy customers want and need for Quality, Performance, Affordable Pricing and Convenience without having a detrimental input on the environment

### 1.2 EVOLUTION OF GREEN MARKETING

The term Green Marketing came into prominence in the late 1980s and early 1990. The green marketing has evolved over a period of time. According to Peattie (2001), the evolution of green marketing has three phases. First phase was termed as “Ecological” green marketing, and during this period all marketing activities were concerned to help environment problems and

provide remedies for environmental problems. Second phase was “Environmental” green marketing and the focus shifted on clean technology that involved designing of innovative new products, which take care of pollution and waste issues. Third phase was “Sustainable” green marketing. It came into prominence in the late 1990s and early 2000.

### 1.3 NECESSITY OF GREEN MARKETING

As our natural resources are limited and human wants and requirements are unlimited, it is important for the marketers and producers of products to utilize the resources efficiently without waste as well as to achieve the organization’s objective of profitability, sustainability and carbon footprint laid down by the govt. So green marketing is inevitable. There is growing interest among the consumers all over the world and in India regarding protection of environment. Worldwide evidence indicates people are concerned about the environment and are changing their behavior. As a result of this, green marketing has emerged which speaks for growing market for sustainable and socially responsible products and services for consumers.

### 1.4 NEED FOR GREEN MARKETING IN THE CONSTRUCTION INDUSTRY

Concrete is the most widely used construction material. It is said that per capita consumption of concrete is next only to Water because it is resistance to environment elements easy to produce and can be formed in to any shape easily.

Concrete is widely considered as the backbone of the construction industry, with a current consumption of 1 cubic meter per person per year (Gartner E, 2009). Ordinary Portland cement (OPC) has been used for around 200 years now as a binder material. However OPC has high embodied energy of 4.2MJ/kg (Peng J et al, 2014; Huang Li C et al, 2011; Huntzinger DN et al, 2009). The contribution of OPC is approximately 5–7% of global man made CO<sub>2</sub> emissions (Huntzinger DN et al, 2009; Meyer C et al, 2009).

High CO<sub>2</sub> emissions arising from OPC manufacturing are from calcination of limestone, and high energy consumption during manufacturing (Gartner E et al, 2009).

During the recent past many alternatives to OPC concrete have been proposed to reduce green house gas emissions which are **Blended Cement Concretes**, comprising OPC that has been partly substituted by supplementary cementitious materials, as binders for concrete. Commonly used substitutes include fly ash, a fine waste residue that is collected from the emissions liberated by coal burning power stations, and ground granulated blast furnace slag(GGBS), a waste by-product from steelmaking. According to Flower and Sanjayan use of blended cements results in reduction of CO<sub>2</sub> emissions by 13–22%. These estimates vary according to the local conditions at the source of raw materials, binder quantity and amount of OPC replacement, type of manufacturing facilities, climate, energy sources, and transportation distances.

**2. LITERATURE REVIEW**

**2.1 Concretes and types of Concretes**

It is a mixture of portland cement / cement and secondary cementitious materials (PFA.GGBS, Microsilica,etc), water, aggregates, and admixtures.The cement and water form a paste that hardens and bonds the aggregates together.Concrete is often looked upon as “man made rock”.

**Site Mixed Concrete (SMC):**

Site mixed concrete is the concrete prepared manually at site using the raw materials like cement, water, sand and aggregates.

**Ready Mixed Concrete (RMC)**

- Ready mixed Concrete is the type of concrete that is manufactured in a factory or batching plant, according to a set recipe, and delivered to a work site by truck mounted transit mixers.

**Concrete consumption pattern in India**

Even today the concrete consumption in India is predominantly through site mixed route except in the major metros and tier 1 and tier 2 cities where ready mix plants are established and major projects have captive RMC plants where in concrete is mechanically produced with advance methods. the current concrete consumption pattern in India is mentioned below

Indian Concrete production as on Feb 2015	Statistics
Concrete Consumption	450 – 475 m m <sup>3</sup>
Ready Mixed Concrete	90 m m <sup>3</sup>
Site Mixed concrete	350 m m <sup>3</sup>
Pre-cast Concrete	15 m m <sup>3</sup>

Data Source: Mr.Jose Kurian ,ICI –KBC Concrete panorama and Deminar 2015,Seminar document

**2.2. Ready Mix Concrete Industry in India**

The Ready mix concrete business in India is in its infancy but it is having a steady growth in the last two decades. For example, 70% of cement produced in a developed country like Japan is used by Ready Mix concrete business there. In Europe and USA it is about 60%. Here in India, Ready Mix Concrete business used around just 2-3 % in the beginning of the 90’s and presently the commercial RMC is at 9-10 % of total cement production with another 10% estimated to come from project based captive RMC plants totally taking the mechanized RMC Production to 20 % of the cement production in India and there is still a lot to catch up in terms of growth and convection of Site mix Concrete to Ready mixed concrete.(Manjunatha L.R. ,etc 2013,)

As per the earliest efforts to count the number of RMC Plants in India by Mr. A. K. Jain and as per the publications in the Concrete journal of India ,November, 2000,the of the number of RMC plants in India is listed as per table 1 below.

**TABLE-1**  
**RMC Plants in India (June 2000).**

No	City	Number of RMC Plants	Apprx production of RMC: Cum/month
1	Mumbai/Navi Mumbai	9	40000
2	Hyderabad	4	14000
3	Delhi/Gurgaon	2	6500
4	Calcutta/Haldia	2	5500
5	Bangalore	4	15000
6	Chennai	4	12000
7	Pune	1	1000
8	Indore	1	2000
	TOTAL	27	95000 CUM

**Source: CJI, Novmber 2000.**

Since the year 2000, there was not much efforts in studying the growth of RMC industry in India and the current research work and survey is in the direction for estimating the number of RMC plants operating in the Indian cities and the spread of the Industry though out the country through Authors data collection through open source and market survey

**2.3 Advantages of Ready Mixed Concrete (RMC) Vis –a-Vis Site mixed concrete (SMC).**

In India, concrete has traditionally been produced on site with the primitive equipments and use of large labour force. Ready mixed concrete is an advanced technology, involving a high degree of mechanization and automation. A typical RMC plant consists of silos and bins for the storage of cement and aggregates respectively, weigh batchers for proportioning different ingredients of concrete, high efficiency mixer for thorough mixing of ingredients, and a computerized system controlling the entire production process. The quality of the resulting concrete is much superior to site-mixed concrete

Technologically speaking, ready mixed concrete (RMC), which is a building material of paramount importance, is certainly advancement over the age-old site mixed concrete. The benefits of RMC in terms of quality, speed, life-cycle cost and

environmental friendliness are overwhelmingly superior to those of site mixed concrete (Suresh Rao, etc 2013).

An added advantage of RMC is quantity of cement can be reduced in Ready Mixed Concrete by replacing a portion of cement by supplementary cementitious materials like ground granulated blast furnace slag(GGBS), Fly ash, Silica fume with are Industrial by products which otherwise would have been solid waste products and cause environmental Issues.

Ready Mixed Concrete has higher durability as there is better process control and monitoring of raw materials. Addition of supplementary green cementitious materials such as fly ash, silica fumes, GGBS reduces permeability in concrete making it more durable, sustainable and a green product. Some of the secondary cementing materials which are either waste or by products of manufacturing industries which find application in the concrete industry to enhance the properties of concrete are as follows.

- Fly ash
- Silica Fume
- Finely Ground Slag
- Ground Granulated Blast Furnace Slag (GGBS)

- Rice Husk Ash
- Metakaoline
- Lime Stone Powder



Fig.1 Traditional site mixed concrete under usage in India- the most primitive methods of concreting



Fig.2 A modern eco friendly RMC plant with advanced manufacturing process and technology for producing quality ready-mixed concretes

## 2.4 MARKETING MIX FOR GREEN MARKETING IN CONCRETE INDUSTRY.

When companies come up with new innovations like eco friendly green products, they can access new markets, enhance their market shares, and increase profits. Marketing mix of green marketing consists of 4ps. They are buttressed by three additional Ps, namely people, planet and profits. (Heena Dua, 2013)

### PRODUCT:

The concrete products have to be developed depending on the needs of the concrete customers who prefer environment friendly building products. Products can be made from recycled or industrial materials. (Heena Dua, October, 2013) Efficient concrete products not only save resources, energy and money, but also reduce harmful effects on the environment like  $\text{CO}_2$  emissions. The concrete marketer's role in product management includes providing concrete manufacturing companies and technical managers and concrete technologists with market-driven trends and customer requests for greener concrete product attributes such as energy saving, lesser emissions of  $\text{CO}_2$ , local sourcing of raw materials, etc., For example, the

concrete products have to have the right features like good quality in terms of workability in the fresh state (Slump, cohesiveness and pumpability) during the delivery stages and give good 7 days and 28 days compressive strengths as per requirement of Indian standard (IS 456 -2000) after the placement. Apart from the above the Concrete has to have desirable durability, impermeability properties which are generally difficult to achieve by using manually made Site mixed concrete (SMC). RMC Concrete emphasize that it has reduced wastage and used environment-friendly materials like Fly ash , GGBS, Silica fume, M-Sand etc.

### PRICE:

Green pricing in concrete industry takes into consideration the people, planet and profit in a way that takes care of the health of employees and communities and ensures efficient productivity. Value can be added to it by changing its performance, functionality and through customized special concrete products. The price must be right for the customer when RMC is being sold in place of SMC. Customers will need to buy in large quantity of RMC to construct their buildings or projects.



RMC Prices are a little over 15-20% costlier than SMC due to the Local VAT Taxes, and newly imposed excise duty and transportation and pumping costs, but the good product features and advantages of RMC vis-à-vis SMC should make the target customers to choose RMC instead of SMC and also it is good to use RMC for eco friendliness and to earn green points.

**PLACE:**

Green place is about managing logistics to cut down on transportation emissions in the concrete and construction industry, thereby in effect aiming at reducing the carbon footprint.

The RMC Products must be in the right place at the right time. Making sure that the Ready Mixed Concrete arrives when and where it is wanted by the customer.

To operate a Ready-Mixed Concrete plant/business in a particular area, the following parameters have to be satisfied. This is done with a proper market survey.

1. There should be sufficient construction activity happening in that particular city/region to support the minimum business and price realization
2. Availability of good source of raw materials, road net work and sufficient industrial land or area to set up the manufacturing plant.

Hence RMC as a product is generally available in cities and not in rural part of India in comparison with SMC which can be produced anywhere and everywhere manually with the availability of raw materials.

**PROMOTION:**

Green promotion in construction industry involves configuring the tools of promotion, such as advertising, marketing materials, signage, white papers, web sites, videos and presentations by keeping people, planet and profits in mind.

The target customer group needs to be made aware of the existence and availability of the RMC

products which are green and sustainable through promotion and advertising once they start their operation in a city/region. Successful promotion helps an RMC manufacturing company to spread costs over a larger output.

Promotional activities in RMC business include, Product Launch programs, Technical awareness programs to Architects, Engineers, Contactors and customers on the advantages of using RMC vis-à-vis SMC through Demos and presentations.

Plant visits to customers are organized by the RMC Companies to show the customers that the RMC concrete they get is superior quality, durability and sustainability in comparison with SMC by the use of mineral additives like GGBS and Fly ash which are industrial by products and sustainable materials like M-Sand.

**3. SCOPE FOR RESEARCH**

**3.1. RESEARCH GAP**

The Indian ready-mixed concrete industry is totally an unorganized sector . There has been the use of green products like Fly ash GGBS and M-Sand for making the RMC products more durable , sustainable and Eco friendly and many consumers of RMC are not aware of the new developments in concretes like special eco friendly concretes and concepts.

- *Since the year 2000 there is not much work has been done to estimate the approximate number of RMC plants in India being operated and how much approximate volumes are being produced in India and what is the scope for green marketing of green building raw materials like Fly ash , GGBS and M-Sand and customer awareness about these green products etc*
- *What are the innovations and newer green concrete products available in the RMC markets and their scope.*
- *The availability and usage of secondary cementitious materials (SCMS) like Fly ash,*

GGBS ,etc to make the RMC Concrete products more sustainable and durable and the scope for green marketing.

- What are the preferences and expectations of RMC Consumers from the RMC Suppliers
- This research work will analyze the above GAPS and brings out the possible solutions.

The research design is the plan or model for the conduct of formal investigation. It is the overall operational pattern on framework of the project that stipulates what information to be collected, from which source and by what procedure.

### 3.2 STATEMENT OF THE PROBLEM

Traditionally concrete is always made at construction sites (SMC) using manual methods and now a days RMC is being used predominantly in many cities throughout India as many Ready-mix Concrete plants have come up. Apart from the above the captive batching plants are set up at major project sites to cater to the huge requirements for mega projects which demand timely completion and there is usage of industrial by products like Flyash and GGBS in the production of concrete at RMC plants and there is not much awareness about the benefits of using RMC as well as the sustainable green products like flyash and GGBS among the construction industry fraternity in Bangalore and hence this research work has been taken up for study the importance of **Green marketing in construction industry “ A comparative study of Site mixed concrete and Ready mixed concrete” in the city of Bengaluru, India, with reference to the use of green building materials like Fly ash and GGBS.**

### 3.3 .OBJECTIVE OF THE STUDY

1. To study the construction industry customers preferences on the products RMC vis-à-vis SMC.
2. To study the consumers perceptions on quality, service ,brand and cost of the RMC they are getting from the RMC Companies.

3. To study the consumers awareness and knowledge on the use of industrial by products like flyash/GGBS which are green and sustainable in Concrete productions as replacement of opc cement.
4. To study the different types of special concretes which are sustainable which are being marketed .
5. To study and estimate the green marketing potential for products like GGBS and Fly ash for use in concrete production .
6. To suggest appropriate marketing and advertising tools for RMC Companies and green products manufacturing companies in India to maximize the use of sustainable products like GGBS and Flyash for durability and sustainability in constructions.

The above research design called for decisions on data sources, research approaches, research instruments, questionnaire, sampling plan and contact methods.

### 4. RESEARCH DESIGN

The study of green marketing in the construction industry is fairly new topic with very little available literature. Hence the research design consisted of clearly two stages.

- An initial exploratory stage aimed at identification and crystallization of research questions and,
- A formal study involving statistical tools and procedures to test the hypothesis.

#### 4.1. Objectives of the Exploratory study:

The exploratory study was conducted with the following objectives in mind.

- Establish the research questions.
- To estimate the size of RMC Industry in India and number of RMC Plants and cities of establishment.
- Establish the hypothesis.

#### 4.2. Method of Exploratory study:

In this research work the exploratory study is qualitative in nature and was executed by:

- Secondary data analysis
- Experience survey and open source information.

Secondary data involved extensive literature review which includes articles and publications in the national and international journals related to the study topic. Additionally the Indian construction industry magazines and journals like, ICI Journal, ICJ Journal, Master builders Magazine, Built expressions ,EPC Magazine, Indian cement review, Civil Engineering and Construction review, news paper articles, Annual Reports of RMC and cement companies, reports of Cement manufacturer's Association, Ready mixed concrete manufacturers' Association(RMCMA),NRMCA-USA ,trade journals became source of information which helped to frame and crystallize the research questions.

Experience and open surveys which were designed to seek out important information on the presence of RMC plants, their current quality and service levels and their geographical locations. The participants in the exploratory survey were the top executives from RMC, Cement, Admixture, construction, architects and consultants companies .

The study helped to understand the various aspects of RMC Production and usage like quality, service and cost effectiveness and the usage of various green building materials like Portland puzzolana cement, Port land slag cement, Fly Ash, GGBS and M-Sand in the production of concrete both at RMC Plants as well as at construction sites while making Site-mixed concretes.

According to them the factors influencing the use of green products in concrete making was mainly to reduce the cost of concrete production coupled with making the concrete production in India more durable and eco friendly .

Clarity on the benefits and advantages of use of green products in concrete and constructions and specifications and approvals from consultants ,Govt and architects to use these products while making and production of concrete and construction at jobsites are some of the things which will influence the use of more and more green eco friendly raw materials in constructions.

#### 4.3 Descriptive study:

The primary objective of the descriptive or formal study here is to test the hypothesis and answer the posed research questions. The second objective is to establish a correlation among various variables that are responsible for need for thrust to promote green marketing in the construction industry especially in the RMC Industry.

#### 4.4 Primary Data:

Primary data was gathered through the use of sampling survey. For the above research data is collected through sample survey using the designed on line questionnaire.

### 5. SAMPLING

Stratified random sampling was adopted to conduct the pilot market survey by using well designed questionnaire on online format (Questionpro.com).

#### 5.1. Sample Size.

The questionnaire was administered on line and it is attempted by 59 people and completed by 58 people with the completion ratio of 98.31% and average time taken to complete the questionnaire was 14 minutes.

The Sample size is 58 and with different domains of concrete customers and B2 B customers, consultants and Govt agencies etc and the sample was drawn from the city of Bangalore.

#### 5.2. Sample Frame:

The sample frame for the proposed research work was taken from the builders/contractors/architects/



engineers, Individual house builders and end users across different parts of Bangalore.

**5.3. Scale and Design:**

The questionnaire instrument is intended to be a tool for the study of green marketing in the construction industry and the use of green building materials in SMC and RMC with the objective of understanding the factors that influence the use of green products in the construction industry. Additionally it aims at gathering information about

- a. The customers preference of RMC –vis-à-vis SMC.

- b. Customers concrete procurement pattern.
- c. The customers rating of SMC and RMC in terms of quality, service and costing
- d. The awareness and product knowledge about the green building materials.
- e. The buying behavior of the reference group and the B2B Customer.

**6. Data Analysis and Findings:**

The authors have compiled the data through open sources, personal contact methods and visits to many cities in south India and have studied the spread of RMC Industry in cities of south India and come with the following compilations.

**TABLE 2: CITY WISE RMC PLANTS COUNT AND COMMERCIAL READYMIX INDUSTRY VOLUME- KARNATAKA**

**TABLE 1- CITY WISE RMC PLANTS IN KARNATAKA COMMERCIAL READYMIX INDUSTRY**

No of Locations	City	No of RMC companies- all India count	No. of RMC Plants	Approximate production of RMC/Month in cum
1	Bangalore	55	99	510000
2	Mysore	3	8	22000
3	Shivamogga	2	3	6500
4	Hubli	3	5	18000
5	Mangalore	8	22	43000
6	Gulbarga	1	1	1500
7	Belgaum	2	2	5000
8	Tumkur	1	1	1500
9	Davangere	1	1	2000
10	Bellary	1	1	2500
11	Manipal	1	2	6000
12	Harihar	1	1	1000
13	Hospet	1	1	1000
14	Gadag	1	1	1000
15	Haveri	1	1	1200
<b>KARNATAKA</b>	<b>15</b>	<b>82</b>	<b>149</b>	<b>622200</b>

Source : Data compiled by Authors through survey and open source.

As per the table 2, data compiled by authors for Karnataka, the RMC Industry has grown very fast in Bengaluru having 55 companies operating 99 rmc plants producing approximately 5.1 lakh cum per month and also cities like Mangalore and Mysore are using RMC in a big way.

**TABLE 3: TAMIL NADU RMC PLANTS COUNT AND COMMERCIAL READYMIX INDUSTRY STATISTICS.**

No of Locations	City	No of RMC companies- all India count	No. of RMC Plants	Approximate production of RMC/Month in cum
1	Chennai	25	55	141200
2	Madurai	3	5	10000
3	Trichy	6	7	19460
4	Karur	0	1	2500
5	Tanjavur	1	2	4000
6	Salem	1	1	3000
7	Tuticorin	2	3	6000
8	Tirpur	3	3	8000
9	Coimbatore	10	14	30000
10	Hosur	0	2	5000
11	Pandicherry	2	2	6500
12	Erode	2	4	7000
13	Namakkal	1	1	2000
14	Tirunalveli	1	1	2000
15	Palani	1	1	1500
16	Tiruvarur	1	1	2000
17	Pudukottai	1	1	2500
18	Villupuram	1	1	1500
19	Velur	1	1	4000
20	Dharmapuri	1	1	2000
21	Chidambaram	1	1	1000
TN	<b>21</b>	<b>64</b>	<b>108</b>	<b>261160</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015, pp 99-106

As per the table 3, data compiled by authors for Tamilnadu, the RMC Industry has grown and has spread to maximum number of cities and towns among all the states in India. The RMC industry is present and operating in more than 21 cities across the state.

**TABLE 4 – TELANGANA AND AP RMC PLANTS COUNT AND COMMERCIAL READYMIX INDUSTRY STATISTICS.**

No of Locations	City	No of RMC companies- all India count	No. of RMC Plants	Approximate production of RMC/Month in cum
1	Hyderabad	20	49	191000
2	warangal	2	2	9000
3	Kurnol	1	1	3000
4	Nelgonda	2	2	5000
5	Mahabubnagar	1	1	3000
<b>TS</b>	<b>5</b>	<b>26</b>	<b>55</b>	<b>211000</b>
1	Vizag	7	12	30000
2	Vijayawada	8	13	25996
3	Rajamandri	2	2	5500
4	Guntur	2	4	10500
5	Nellore	1	3	10500
6	Ongole	2	2	5000
7	Kakinada	1	1	2000
8	Tirupathi	1	2	5000
9	Eluru	2	2	6000
<b>AP</b>	<b>9</b>	<b>26</b>	<b>41</b>	<b>100496</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015,pp 99-106

As per the table 4,data compiled by authors for Telangana and Andra pradesh, the RMC Industry is steadily growing in many cities and towns and we expect a very big jump in the number of RMC plants in the New state of AP due to the announcement for the construction of new capital for AP near Vijayawada.

**TABLE 5– KERALA STATE RMC PLANTS COUNT AND COMMERCIAL READYMIX INDUSTRY STATISTICS**

No of Locations	City	No of RMC companies- all India count	No. of RMC Plants	Approximate production of RMC/Month in cum
1	Kochi	3	5	16580
2	Trivandrum	2	6	11000
3	Trissur	3	4	15000
4	Kannur	2	2	3000
5	Palkhod	1	1	1500
6	Kottam	1	1	1500
7	Pandelam	1	1	1500
8	Calicut	1	1	4000
<b>Kerala</b>	<b>8</b>	<b>14</b>	<b>21</b>	<b>54080</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015,pp 99-106

As per the table 5,data compiled by authors for Kerala state , the RMC Industry is steadily growing in many cities and towns and we expect further expansion of the Industry in the near future due to demand

**Table 6 - South India and Goa Commercial RMC plants Statistics as on JAN 2015**

No of Locations	City	No of RMC companies- all India count	No. of RMC Plants	Approximate production of RMC/Month in cum
Karnataka	15	82	149	622200
Tamil Nadu	21	64	108	261160
AP	9	26	41	100496
Telangana state	5	26	55	211000
Kerala	8	14	21	54080
Goa	3	5	14	30227
<b>TOTAL</b>	<b>61</b>	<b>217</b>	<b>388</b>	<b>1279163</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015,pp 99-106

**TABLE -7**

<b>Western and Central India Locations</b>				
<b>Locations</b>	<b>City</b>	<b>RMC companies</b>	<b>No. of Plants</b>	<b>Industry Volume(m3) /Month</b>
1	Ahmedabad	16	40	99500
2	Surat	9	37	70000
3	Vadodara	9	19	46000
4	Wapi	1	2	5000
5	Rajkot	7	9	18000
<b>Gujarat</b>	<b>5</b>	<b>42</b>	<b>107</b>	<b>238500</b>
1	Mumbai	27	110	302220
2	Navi Mumbai	20	45	125000
3	Pune	37	63	95000
4	Nashik	3	8	18100
5	Nagpur	3	7	15200
6	Kolhapur	0	1	2800
7	Shirdi	1	1	2000
8	Sholapur	1	1	2500
9	Aurangabad	2	2	6000
<b>Maharastra</b>	<b>9</b>	<b>94</b>	<b>238</b>	<b>568820</b>
1	Indore	8	11	40000
2	Bhopal	7	18	20000
3	Jabalpur	2	2	5000
<b>MP</b>	<b>3</b>	<b>17</b>	<b>31</b>	<b>65000</b>
1	Raipur(chatisgarh)	3	6	14188
2	Durg(chatisgarh)	1	1	3000
3	Goa	5	14	30227
<b>City Locations</b>	<b>18</b>	<b>161</b>	<b>396</b>	<b>916735</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015,pp 99-106



**Table- 8**

**North India RMC Industry**

Locations	City	rmc companies	No. of Plants	Industry Volume (cum)
1	NCR-Haryana	45	120	250000
2	NCR-UP	35	70	125000
3	Lucknow	16	20	45000
4	Mohali	2	9	35000
5	Jaipur	5	12	25000
6	Amritsar	3	6	13000
7	Ludhiana	4	8	20000
8	Jalandhar	5	7	17000
9	Kanpur	3	4	6000
10	Derabassi	6	12	30000
11	Agra	1	2	6000
12	Varanasi	1	3	6000
13	panipat	1	2	4000
14	meerat	2	2	7000
15	Gorakhpur(UP)	2	2	6000
16	Jammu	2	2	7000
17	Allahabad	3	3	5000
18	Batinda	3	3	7000
19	Rudrapur	1	1	2500
20	Deharadun	2	2	4000
	<b>20</b>	<b>142</b>	<b>290</b>	<b>620500</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015,pp 99-106

**Table -9 East India RMC Industry**

City locations	City	rmc companies	No. of Plants	Industry Volume(cum) per month
1	Ranchi(Jharkand)	4	5	10000
2	Bhubaneswar	8	13	30000
3	Jamshedpur	2	2	7000
4	Durgapur(WB)	1	1	3000
5	Agarthala	2	2	4000
6	Guwahati(Assam)	8	10	20000
7	Rurkela	2	2	5000
8	Kolkata(WB)	20	35	65000
9	Patna	4	5	14000
<b>CITY Locations</b>	<b>9</b>	<b>51</b>	<b>75</b>	<b>158000</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015,pp 99-106

**Table 10, All India Commercial RMC plants and production Statistics as on JAN 2015**

Region wise	city locations	No. of companies	Total RMC plants-All India	RMC Production/ month in Cum
South India	58	212	374	1037936
Western & Central	18	161	396	916735
North India	20	142	290	620500
Eastern India and North East	9	51	75	158000
<b>TOTAL</b>	<b>105</b>	<b>566</b>	<b>1135</b>	<b>2733171</b>

Data Source : L.R.Manjunatha & others, ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015 pp ,99-106

From the above data it is very much evident that the growth of RMC industry is more in the southern part of India compared to the rest of India and also it shows the better conversion ratio from SMC to RMC in southern cities than rest of India. From the table 6 and 7 it can be inferred that south India produces almost equal to 45 to 50 % of the total commercial RMC in India and the commercial RMC Penetration is very high in south India compared to rest of India.

**Table 11**

Period of survey and plant count state wise and city wise	June 2000	April ,2013	January 2015	% growth between Jan 2000 and April 2013	% growth between April 2013 January 2015
No of cities the RMC plants	8	88	105	1000 %	19.31%
Approx production of RMC: Cum/month	95000	2246262	2733171	2264%	21.67 %

As per the table 11, data compiled by authors for all Indian markets, the RMC Industry is spreading very fast to many small towns and cities in many states due to its advantages over site mixed concrete. As of January 2015 India had a spread of commercial rmc plants in 105 cities producing approximately 2.73 million cum of concrete every month and there are about 566 RMC companies operating 1135 commercial RMC plants in India.

The above list of number of RMC plants in number of cities and RMC Production growth shows a big leapfrog jump in numbers and growth of RMC Industry in just 15 years as compared to the listing of RMC plants and cities as per the earlier study and survey and published articles the construction journal of india (CJI), Novmber 2000, Volume 3,Issue 4.[5] and ICDC 2014 Conference research paper (L.R.Manjunatha & Dr.Sandya.R.Anvekar)

**Techniques of Analysis used for the questionnaire for research findings.**

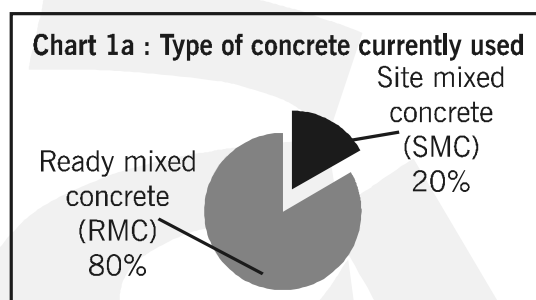
Data Analysis is done on survey techniques, Interviews and customer satisfaction surveys using the simple tabulations and percentage techniques. The demographic profile of the respondents is indicated in the table 12

**Table 12:** Demographic profile of pilot survey respondents

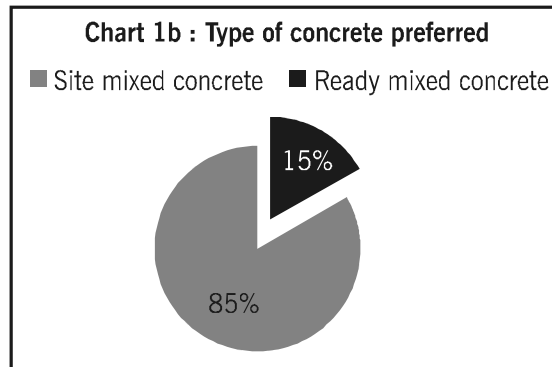
Year of Experience	%	Domain Area	%	segments	%	Turn over	%
< 5 Years	11.86%	Architect Structural Consulting Engineer	6.25%	Residential	14.94%	< 5 crores	36.96%
6-10 years	10.17%	Project Management Consultant[ PMC]	18.75%	Commercial only	3.45%	10-20 crores	19.57%
11-15 years	11.86%	Contractor	10.00%	Both Residential & commercial	24.14%	20-50 crores	10.87%
16-20 years	28.81%	Construction / Infrastructure company	15.00%	Industrial	14.94%	50 -100 crores	8.70%
20- 25 years	37.29%	Builder	16.25%	Infrastructure & Govt.	9.20%	100- 500 crores	6.52%
-	-	Govt	8.75%	Institutional & IT	6.90%	> 500 crores	17.39%
-	-	Individual House builder	3.75%	All the above Segment	22.99%	-	-
-	-	Academic / research and Others	2.50%	Individual Houses(IHB)	3.45%	-	-
-	-		18.75%	-	-	-	-

**6.1 Types of Concrete used:**

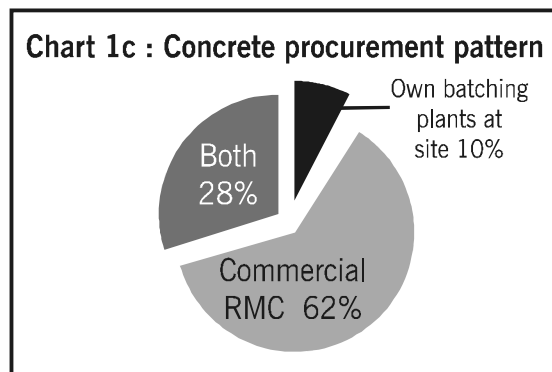
Based on the economic conditions and time constraints customers choose either RMC or SMC or both (Chart 1a) shows that currently about 80% of the respondents are using RMC. Further all companies with turnover greater than 10 Crores use RMC, as large projects consume larger quantities of concrete, RMC is procured. Smaller companies and individual house builders are also seen to be procuring RMC, but also use SMC. For large quantities like slabs, beams and footings RMC is used while columns and minor components are built with SMC



Even though 20 % people use SMC, 85 % people would prefer to use RMC as it is more convenient in terms of time and service (Chart 1b).

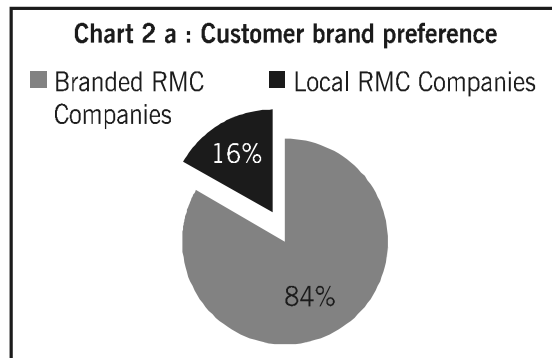


Of the RMC users, 18% use concrete from their own batching plants and 70% from only commercial batching plants. The rest procure from commercial plants only when the demand for concrete cannot be met by their own plants. Also it can be seen that all the respondents using concrete from their batching plants are from companies that have a turnover on more than 50 crores

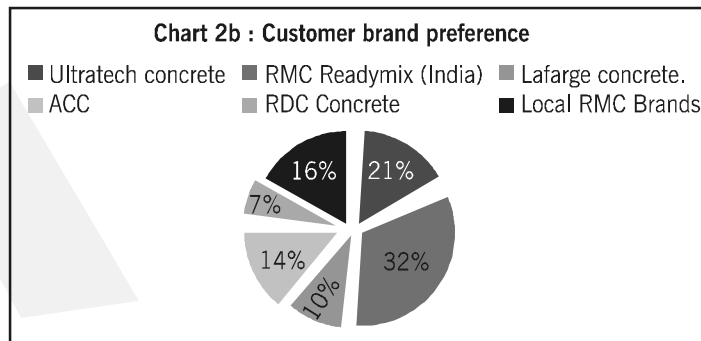


**6.2. Customer brand preference:**

Even though 16% of the respondents procure RMC from local manufacturers, only 10% are advised by their engineers/architects to procure RMC from branded companies (Chart 2a).



From Charts 2a and 2b, it can be seen that RMC INDIA is the most preferred brand, followed closely by Ultratech, ACC and Lafarge. 10% of the respondents recommend local brands as well. This goes to show that local suppliers are doing satisfactorily as well.

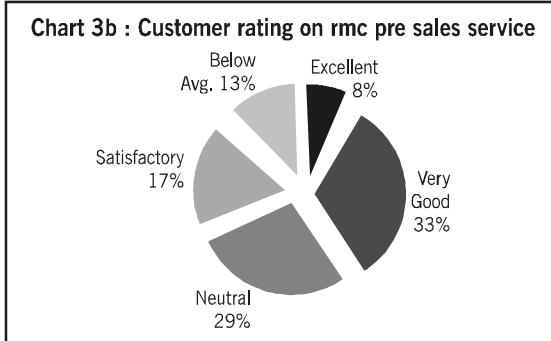


6.3: Customer rating on RMC Quality/price/after sales service

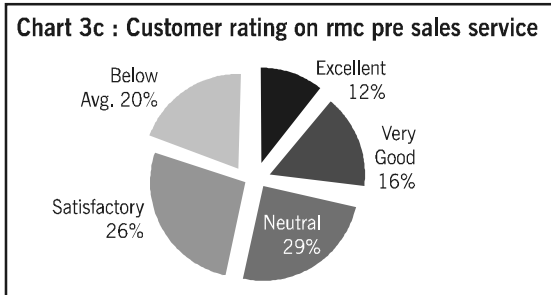
The respondents were asked to rate the quality, services, cost and punctuality of RMC suppliers in the City. The following charts depict the responses given by them.

Majority of the customers about 33% felt that the RMC pre sales service is Very Good

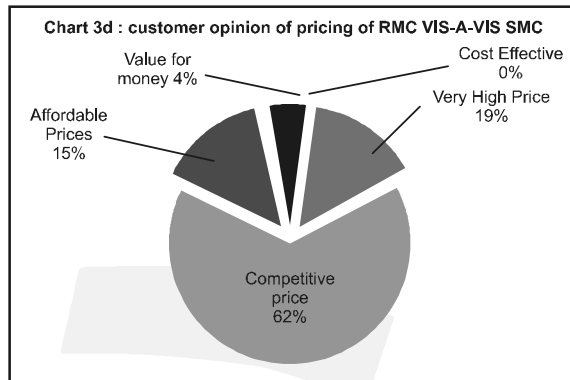
29% of the customers were neutral, 17% felt it was satisfactory and 13% felt it was below average. About 8% felt that the pre sales service was excellent for Ready Mix concrete.



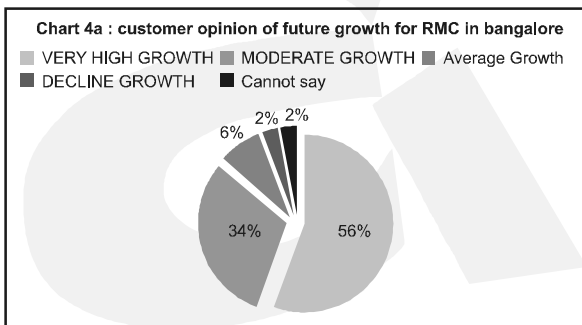
The respondents have rated the presale services are better than the after sales services in the RMC Industry ,which needs improvement in future to retain and keep the customers.



As per Chart 3d,majority of 62 % of the respondents are said that the RMC price is very competitive compared to SMC and willing to buy and use RMC at their project sites



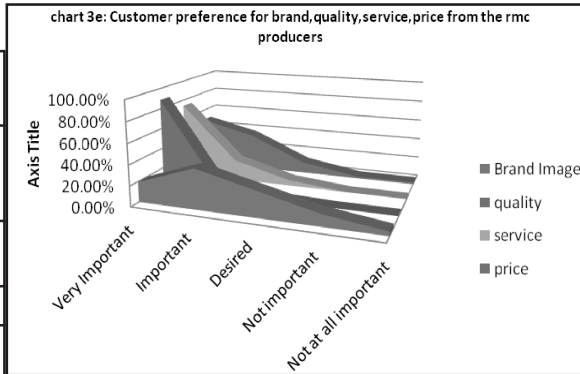
As per the table the respondents have said that there is very good growth for RMC and green products in the construction industry for better quality, service and sustainability.



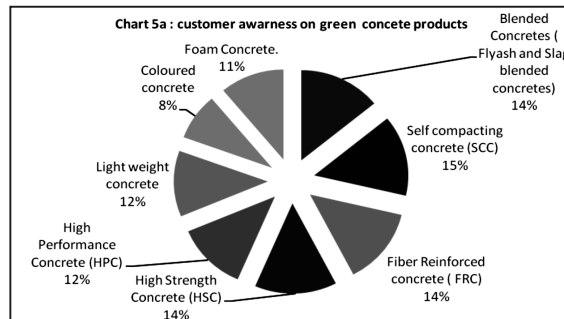


Customer preference for brand, quality, service and price for RMC

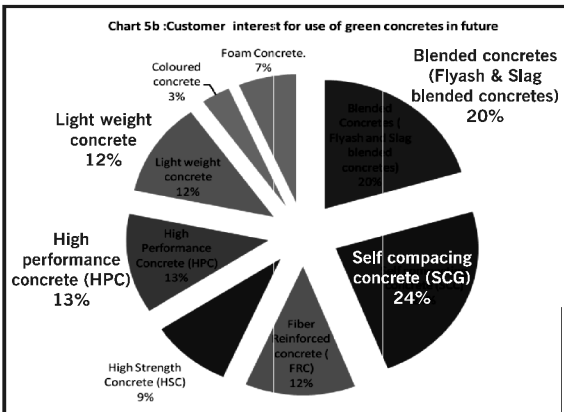
Scale (5-1)	Brand Image	quality	service	price
Very Important	19.61%	88.68%	74.07%	49.06%
Important	39.22%	9.43%	20.37%	35.85%
Desired	25.49%	1.89%	5.56%	11.32%
Not important	11.76%	0.00%	0.00%	1.89%
Not at all important	3.92%	0.00%	0.00%	1.89%



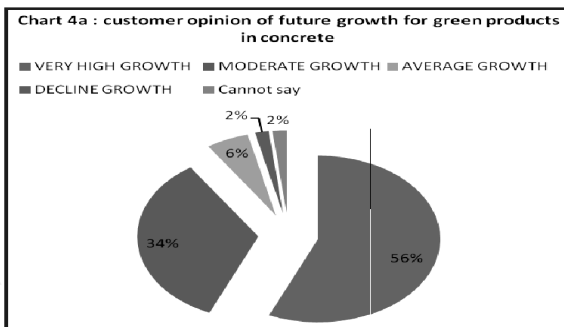
Only 14 % Respondents were aware about the use of green concrete products (Blended concrete products) with Fly ash and GGBS .Which means lot of customer education is required for promotion of Green marketing in the construction Industry.



As per the Chart 5a & 5b and survey results, there is increased interest among the respondents to know more about and use the greener concrete products like blended concretes, Light weight concretes, SCC, Foam concrete etc and only more and more awareness has to be created.



Respondents have opined that there is very high growth opportunity for RMC as well as green blended concrete and special products in future



## 7. Conclusions

- This survey has revealed that most consumers of concrete have accepted RMC as an alternative to SMC in the cities like Bengaluru and other cities .
- The growth of RMC Industry has been study since its inception in Pune in the year 1992 and had a hockey stick growth in terms of city wise growth and number of plants through out India.
- The increased usage of green substitute materials like Fly ash, GGBS has made RMC a sustainable alternative to SMC.
- Branded RMC is preferred more comparatively than the local RMC Companies.
- Based on IS codes cement can be replaced by fly ash up to 35% and GGBS up to 70%. For making the green blended concretes in India
- From the above research ,it may be inferred that, southern market is the major market for promotion and marketing of Green products like GGBS, Fly ash and M-Sand and special concrete products etc
- Majority of the people are not aware of sustainable green concretes but the sustainable concrete recipe is made by adding 15-60% of the supplements like fly ash and GGBS based on the grade of concrete.

There is an increased interest to use green concrete products made out of supplements like fly ash/ggbs in concrete in future and there is very good scope and growth for making green concrete products and green marketing in India.

By knowing the numerous advantages of industrial byproducts, Ready-mixed concrete (RMC) industry in India especially in south Indian metros and towns have started using and partially replacing OPC cement with GGBS, which are by-products of steel industries. Currently over 40-45 % of the

concrete supplied by RMC companies in India has a replacement of either Fly ash or GGBS.

The research made has given a new dimension to green marketing of building products to the Ready mix concrete industry and construction sector in the Indian cities as a emerging market and also to Ready mix concrete manufacturing companies, Readymix concrete buyers (B2B Customers) and there by to the civil engineering and construction industry field on the aspects of RMC as better replacement product vis-a-vis Site mix concrete (SMC) in terms of quality, service, durability environmental friendliness ,faster work and customer satisfaction.

Green marketing is based on the premise that businesses have a responsibility to satisfy human needs and desires while preserving the integrity of the natural environment. Green marketing should not be considered as just one more approach to marketing, but has to be pursued with much greater vigor, as it has an environmental and social dimension to it. There are significant indications that environmental issues will grow in importance over the coming years and will require imaginative and innovative redesign and reengineering of existing marketing efforts on the part of many businesses.

Marketers also have the responsibility to make the consumers understand the need for and benefits of green buildings for a healthier living through awareness programs and continuous education programs.

### 7. Limitations:

1. The research work is primarily limited to the construction industry consumers and consultants in Bengaluru city and some samples from other south Indian cities only.
2. The research work will be primary limited and based on the information obtained from the secondary data and the sample size survey taken in the primary data.

### 8. Implications:

Implications for future research: Since not much research/study work has been done in India on green marketing aspects on Ready mix concrete and other green cement replacement products, the research done has helped and become a reference for the future researchers to carry out more research and publications on the subject in cities and metros in India on the green initiatives in the construction sector for sustainability.

### REFERENCES:

1. Peattie, Ken (2001). Towards Sustainability: The Third Age of Green Marketing. Marketing Review. Vol. 2, No. 2, pp. 129-147.
2. Feldman, L. and Staehler, S.(1996). Green Marketing: Do corporate strategies reflect experts' advice? The Journal of Marketing Management. Vol. 5, No. 1, pp. 20-28.
3. Roy, M. and Epstein, J.M. (2000). Strategic Evaluations of Environmental Projects in SMEs.Environmental Quality Management. Vol. 3, pp. 37-47.
4. Gartner E, Industrially interesting approaches to "low-CO2" cements. CemConcr Res 2004; 34(9):1489-98.
5. Peng J, Huang L, Zhao Y, Chen P, Zeng L, Zheng W. Modeling of carbon dioxide measurement on cement plants. Adv Mater Res 2013;610-613:2120-8.
6. Li C, Gong X, Cui S, Wang Z, Zheng Y, Chi B. CO2 emissions due to cement manufacture. Mater Sci Forum 2011;685:181-7.
7. Huntzinger DN, Eatmon TD. A life-cycle assessment of cement manufacturing: comparing traditional process with alternative technologies. J Clean Prod 2009;17(7):668-75.
8. Meyer C. The greening of the concrete industry.CemConcr Compos 2009;31(8):601-5.
9. Flower DJM, Sanjayan JG. Green house gas emissions due to concrete manufacture. Int J LCA 2007;12(5):282-8.
10. L.R.Manjunatha and Dr.Sandhya.R.Anvekar "Ready-mixed concrete, a boon to modern day's fast track construction projects and a research study on Customers" Preference ,Perceptions on quality, timely delivery and durability aspects of Ready Mixed Concrete (RMC):"EPC & I Magazine, April 2013 Issue
11. L.R. Manjunatha and Dr. Sandhya R.Anvekar,Dr.Aswath and Mr.Suresh Rao "Innovative special concrete applications using RMC :Some case studies" Universities press—Innovations in concrete for meeting Infrastructure Needs ISBN 978 81 7371 912 7
12. L.R. Manjunatha and Dr. Sandhya R.Anvekar and Mr.Suresh Rao "Innovative applications of concrete for modern day constructions with special focus on Indian concrete industry Examples" Indian Concrete Institute, ISBN 978 -81928912-00
13. L.R. Manjunatha ,Dr. Sandhya R. Anvekar,Savitha and Archana "An Economic and Embodied Energy comparison of Geo-Polymer blended cement and traditional Concretes" Journal of Civil Engineering Technology and Research-Volume 2 Issue 1, Jan-June 2014, ISSN 2349-9575.
14. Suresh Rao and L.R.Manjunatha" Innovative use of concrete for modern day constructions" The master builder,October 2013.PP78-86, ISSN 2249-1228
15. Heena Dua "Green marketing-the growing marketing mandra",VSRD International Journal of Business and Management Research, Vol. III Issue X October 2013 / 447,e-ISSN : 2231-248X, p-ISSN : 2319-2194 © VSRD International Journals.

16. Charter M, Polonsky MJ (eds). 1999. Greener Marketing: a Global Perspective on Greening Marketing Practice, 2<sup>nd</sup> edn. Greenleaf: Sheffield.
17. Kotler, Keller, Koshy Jha, "Marketing Management- A South Asian Perspective", Pearson Education, 12th Edition, Pg-75-76.
- 18.. Green marketing, The Marketing Book (Sixth Edition), 2008, Chapter Chapter 28, Pages 562-585 by Ken Peattie.
19. Ottman, J.A. et al, "Avoiding Green Marketing Myopia" Environment, Vol-48, June-2006.
20. L.R.Manjunatha & others, The growth of RMC Industry in India ICI-KBC Concrete Panorama and Deminar 2015 seminar Document, Feb 2015, pp 99-106
21. Dr.M.U.Aswath and L.R.Manjunatha "Use ready-mixed concrete from a certified manufacturer for good quality and Durability" Built Expression Magazine ISSN2277, Volume 9, Sept 2013 Issue
22. Dr.M.U.Aswath and L.R.Manjunatha "Use ready-mixed concrete from a certified manufacturer for good quality and Durability" Built Expression Magazine ISSN2277, Volume 9, Sept 2013 Issue.
- 23 ICI-KBC Deminar 2013 Seminar document " Innovative and Decorative Concretes" National seminar and Deminar Edition 4, January 11 and 12, 2013.
  1. A.K.Jain (2000)"RMC A durable and cost effective construction material" Construction Journal of India, Volume 3, Issue 4, Nov 2000.
24. A.K.Jain (2000)"RMC A durable and cost effective construction material" Construction journal of India, Volume 3, Issue 4, Nov 2000.
25. L.R.Manjunatha & Dr.Sandhya.R.Anvekar ,others "RECENT DEVELOPMENTS IN THE INDIAN CONCRETE INDUSTRY IN THE USE OF GGBS IN CONCRETE AT RMC BATCHING PLANTS " ICDC , Dec 2014, New Delhi.

