Maratha Vidya Prasarak Samaj's
Karmaveer Adv. Baburao Ganpatrao Thakare College of Engineering, Nashik
Permanently Affiliated to Savitribai Phule Pune University, Pune and Approved by DTE, Maharashtra & AICTE, New Delhi
KBTCOE
NAAC 'A' GRADE INSTITUTE
"STRONG EDUCATIONAL FOUNDATION TO ADVANCE YOUR CAREER"
DEPARTMENT OF CIVIL ENGINEERING

SANRACHANA

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Department Vision:

To be the leading department providing quality education to develop competent Civil Engineers, Entrepreneurs, and innovators to serve the nation.

Department Mission:

M1- To provide quality technical education.

M2- To prepare competent students for employment.

M3–To focus on developing values and professional skills.

Program Educational Objectives:

1. To ensure that graduates will have a mastery of fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities necessary for entering civil engineering career and/or graduate school.

2. To incorporate verbal and written communication skills necessary for successful professional practice.

3. Demonstrate knowledge of management principles and engineering techniques for effective project management.

4. To prepare graduates to deal with ethical and professional issues, taking into account the broader societal implications of civil engineer.

Self-Healing Concrete by biological additives

[Deore Hritik, Bhamare Shubham, Gaikwad Ajay, Navtakke Akshay(BE civil), Dr. K. T. Patil]

If you get a cut or break a bone, your body heals itself. This biological miracle is what inspired us to try to find a way to make concrete self-healing. We are adding bacteria from Bacillus species to concrete to enable self-repair of cracks and damages.

It isn't just any fungus or bacteria. The conditions in concrete are very harsh, and after testing 10 different kinds, we found that one combination of *SporosarcinaPasteurii, Bacillus Spaericus,Escherichia Coli, Bacillus Subtilis, Bacillus Cohnii, Bacillus Balodurans and Bacillus Pseudofirmus* could survive inside concrete Thesebacteriaare widespread in tropical soil and doesn't pose any threat to humans or the ecology. Mixing nutrients and spores into concrete is easy enough. When cracks form in the concrete, water and oxygen get in and the spores grow. The spores act as a catalyst for calcium carbonate crystals which fill the cracks. When the water is gone, the fungi go back to spores, ready to repair future cracking.

It isn't clear to us why the bacteria don't grow on the outside, but we can imagine several solutions. The research is in the early stages, so perhaps they don't fully know yet, either. Earlier work proposed using bacteria in some sort of encapsulation to do this same trick. However, the fungus creating its own hardy spore that can survive inside the concrete would simplify that greatly.

You might wonder why small cracks in concrete are a big deal. Concrete isn't that strong, so we build steel inside it to produce stronger structures. However, water and oxygen don't agree with steel, so cracks in the concrete eventually damage the interior steel and cause failures. If the cracks self-heal, it would limit the exposure of the steel to the elements.

Adding biological material to building material is an interesting idea and something that probably isn't outside the realm of the common garage or basement.so it could be the future for construction industries but there is no awareness about this in industries.

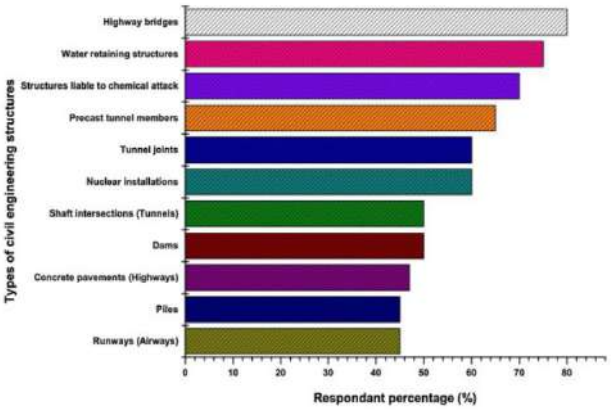
It could help a better way to heal micro-cracks and leakages than using other chemicals additive which is not so effective and it also can help in many other industries where there is a need for maintenance but it could not be possible due to some restrictions or parameters. Below is some chart to study its uses.

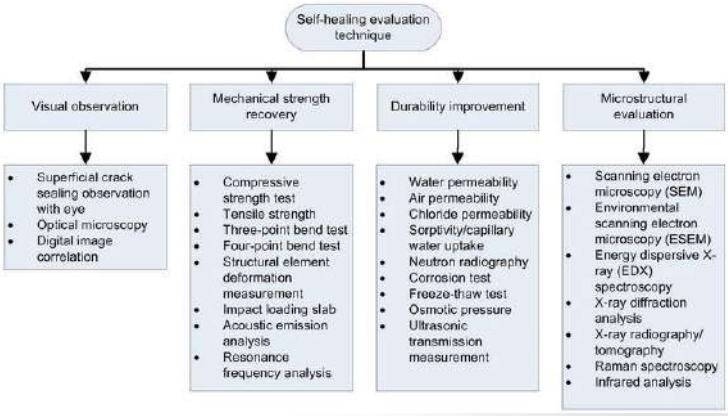
Here we can see the number of civil structures where self-healing concrete can be used like,

1.**Highway bridges** are structures thatneed frequent maintenance and are made of concrete they are continuously facing compression wear and tear and also facing environmental conditions lead to damage and effects on their lifespan.

2.**Water retaining structures** means dam or reservoirs are constantly in contact with water and forces like water pressure, uplift pressure, pore pressure action dam and sometimes leads to damage. This minimum damage can be cured without any interface of human hands.

3.**Nuclear reactors** – The concrete structures around the core of nuclear fission and fusion reactors needs maintenance but it is not possible due to high level of radiation cause DNA damage and skin blusters leads to severe damage to human health so by this technique one can cure the structure damage without harming human health. And other useful structures are as mentioned above.





काँक्रीटचा इतिहास

[डॉ. अजय शेलोरकर, डॉ. अक्षयकुमार भोई (सहाय्यक प्राध्यापक, स्थापत्य अभियांत्रिकी विभाग)]

काँक्रीट हा एक संमिश्र पदार्थ आहे जो सूक्ष्म आणि खडबडीत एकूण पदार्थांनी बनलेला आहे जो द्रव सिमेंट (सिमेंट पेस्ट) सह एकत्रितपणे बांधलेला असतो जो कालांतराने कठोर होतो (बरा होतो). काँक्रीट हा पाण्यानंतर जगात दुसऱ्या क्रमांकाचा सर्वाधिक वापरला जाणारा पदार्थ असून, तो सर्वाधिक वापरला जाणारा बांधकाम साहित्य आहे. जगभरात याचा वापर टनासाठी टन, स्टील, लाकूड, प्लास्टिक आणि ॲल्युमिनियम यांच्या एकत्रित वापरापेक्षा दुप्पट आहे. जागतिक पातळीवर, काँक्रीटच्या बाजारपेठेतील सर्वात मोठा विभाग असलेल्या रेडी-मिक्स काँक्रीट उद्योगाला 2025 पर्यंत 600 अब्ज डॉलर्सपेक्षा जास्त महसूल मिळण्याचा अंदाज आहे. या व्यापक वापरामुळे अनेक पर्यावरणीय परिणाम होतात. विशेष म्हणजे, सिमेंटच्या उत्पादन प्रक्रियेमुळे मोठ्या प्रमाणात हरितगृह वायू उत्सर्जन होते, ज्यामुळे जागतिक उत्सर्जनाच्या निव्वळ 8% होते. इतर पर्यावरणीय चिंतांमध्ये मोठ्या प्रमाणात बेकायदेशीर वाळू उत्खनन, सभोवतालच्या वातावरणावर होणारे परिणाम जसे की पृष्ठभागावरील अपवाह किंवा शहरी उष्णता बेटाचा प्रभाव आणि विषारी घटकांपासून संभाव्य सार्वजनिक आरोग्यावर होणारे परिणाम यांचा समावेश आहे. उत्सर्जन कमी करण्यासाठी किंवा काँक्रीटला कार्बनच्या पृथक्करणाचा स्रोत बनविण्याचा प्रयत्न करण्यासाठी आणि वर्तुळाकार अर्थव्यवस्था साध्य करण्यासाठी मिश्रणात पुनर्नवीनीकरण आणि दुय्यम कच्च्या मालाचे प्रमाण वाढविण्यासाठी महत्त्वपूर्ण संशोधन आणि विकास केला जात आहे. हवामान आपत्तींना अनुकूल अशा संरचनांसाठी काँक्रीट हा एक महत्त्वाचा पदार्थ असणे अपेक्षित आहे, तसेच इतर उद्योगांचे प्रदूषण कमी करण्यासाठी उपाय, कोळसा फ्लाय ॲश किंवा बॉक्साइट टेंपिंग आणि अवशेष यासारख्या कचऱ् यावर कब्जा करणे.

जेव्हा एकत्रित कोरड्या पोर्टलँड सिमेंट आणि पाण्यात मिसळले जाते, तेव्हा मिश्रण एक द्रव स्लरी तयार करते जी सहजपणे ओतली जाते आणि आकारात साचविली जाते. सिमेंट पाणी आणि इतर घटकांसह अभिक्रिया करून एक कठीण मॅट्रिक्स तयार करते जे सामग्रीला टिकाऊ दगडासारख्या सामग्रीमध्ये एकत्र बांधते ज्याचे अनेक उपयोग आहेत. बर्याचदा, ओले मिश्रण किंवा तयार सामग्रीचे भौतिक गुणधर्म सुधारण्यासाठी मिश्रणात ॲडिटिव्ह्ज (जसे की पोझोलेन्स किंवा सुपरप्लास्टिकायझर्स) समाविष्ट केले जातात. बहुतेक काँक्रीट प्रबलन सामग्रीने ओतले जाते (जसे की रिबार) तन्यता शक्ती प्रदान करण्यासाठी एम्बेड केलेले, प्रबलित काँक्रीट उत्पन्न

होते.

पूर्वी चुनावर आधारित सिमेंट बाइंडर्स, जसे की चुना पुट्टी, बर्याचदा वापरले जात असत परंतु कधीकधी इतर हायड्रॉलिक सिमेंटसह, (वॉटर रेझिस्टंट) जसे की कॅल्शियम ॲल्युमिनियम सिमेंट सिमेंट किंवा पोर्टलँड सिमेंटसह पोर्टलँड सिमेंट काँक्रीट तयार करण्यासाठी (पोर्टलँड दगडाशी त्याचे दृश्य साधर्म्य दर्शविण्यासाठी नाव). काँक्रीटचे इतर अनेक सिमेंटीकरण न करणारे प्रकार एकत्र बांधण्याच्या इतर पद्धतींसह अस्तित्वात आहेत, ज्यात बिट्यूमेन बाइंडरसह डांबर काँक्रीट, जे वारंवार रस्त्याच्या पृष्ठभागासाठी वापरले जाते आणि पॉलिमर काँक्रीटबाइंडर म्हणून वापरतात. काँक्रीट हे मोर्टारपेक्षा वेगळे आहे. काँक्रीट हे स्वतःच एक बांधकाम साहित्य आहे, तर मोर्टार हा एक बॉन्डिंग एजंट आहे जो सामान्यत: विटा, टाइल्स आणि इतर दगडी युनिट्स एकत्र ठेवतो.

व्युत्पत्ती (Etymology)

काँक्रीट हा शब्द लॅटिन भाषेतील "काँक्रीट" (म्हणजे कॉम्पॅक्ट किंवा कंडेन्स्ड) या शब्दापासून आला आहे), "Concrescere" चा परिपूर्ण निष्क्रीय कण, "concrescere" पासून (एकत्र) आणि "क्रेसेर" (वाढण्यास).

इतिहास (History)

प्राचीन काळ (Ancient times)

यूक्समलच्या अवशेषांवरील माया काँक्रीटचा संदर्भ जॉन एल. स्टीफन्स यांनी युकाटनमधील ट्रॅव्हल्सच्या घटनांमध्ये दिला आहे. "छप्पर सपाट आहे आणि सिमेंटने झाकलेले आहे". "मजले सिमेंटचे होते, काही ठिकाणी कठीण होते, परंतु, लांबच्या प्रदर्शनामुळे, तुटलेले होते आणि आता पायाखाली कोसळत होते." "पण संपूर्ण भिंत भक्कम होती; त्यात मोर्टारमध्ये भिरभिरलेले मोठमोठे दगड होते; ते खडकाइतकेच कठीण होते."

काँक्रीटसदृश पदार्थांच्या छोट्या प्रमाणावरील उत्पादनाची सुरुवात नाबाती व्यापाऱ्यांनी केली होती. त्यांनी मरुद्यानाच्या मालिकेवर ताबा मिळविला आणि त्यावर नियंत्रण ठेवले आणि इ.स.पू.चौथ्या शतकापासून दक्षिण सीरिया व उत्तर जॉर्डनच्या प्रदेशांत एक छोटेसे साम्राज्य विकसित केले. इ.स.पू.७०० पर्यंत त्यांना हायड्रॉलिक चुन्याचे फायदे, काही स्वयं-सिमेंटिंग गुणधर्म असलेले फायदे शोधून काढले.

फोटो क्र.1 कॉन्क्रिट

त्यांनी मोडकळीस आलेली दगडी घरे, काँक्रीटचे फरसे आणि भूमिगत जलरोधक हौद यांच्या बांधकामासाठी मोर्टार पुरवण्यासाठी भट्ट्या बांधल्या. त्यांनी हौद गुप्त ठेवले कारण यामुळे नाबातियन वाळवंटात भरभराट होऊ शकली. यातील काही वास्तू आजही टिकून आहेत.

शास्त्रीय युग (Classical era)

प्राचीन ईजिप्शियन आणि नंतरच्या रोमन काळात बांधकाम व्यावसायिकांना असे आढळून आले की, मिश्रणात ज्वालामुखीची राख मिसळल्याने ती पाण्याखाली जाऊ शकते.

ग्रीसमधील टायरिन्सच्या राजमहालात काँक्रीटचे मजले सापडले, जे अंदाजे इ.स.पू.१४००-१२०० पर्यंतचे आहे. इ.स.पू.८०० मध्ये ग्रीस, क्रीट आणि सायप्रस येथे चुन्याचे मोर्टार वापरले जात होते. अश्शूरी जेरवान जलवाहिन्यांनी (इ.स.पू.६८८) जलरोधक काँक्रीटचा वापर केला. अनेक प्राचीन वास्तूंमध्ये बांधकामासाठी काँक्रीटचा वापर केला जात असे. इसवी सन पूर्व ३०० ते इ.स.४७६ या काळात रोमनांनी काँक्रीटचा मोठ्या प्रमाणावर वापर केला. रोमन साम्राज्याच्या काळात द्रुत, पोझोलाना आणि प्युमीसच्या एकूण भागापासून रोमन काँक्रीट (किंवा ओपस कैमेंटिसियम) तयार केले जात असे. अनेक रोमन वास्तूंमध्ये त्याचा व्यापक वापर, स्थापत्यकलेच्या इतिहासातील एक महत्त्वाची घटना ज्याला रोमन स्थापत्य क्रांती असे म्हटले गेले, त्यामुळे रोमन बांधकामाला दगड व विटांच्या साहित्याच्या बंधनातून मुक्त करण्यात आले.

यामुळे संरचनात्मक गुंतागुंत आणि परिमाण या दोहोंच्या दृष्टीने क्रांतिकारक नवीन रचना सक्षम झाल्या. रोममधील कोलोसियम मोठ्या प्रमाणात काँक्रीटचा बांधला गेला होता आणि पॅन्थियनचा काँक्रीटचा घुमट हा जगातील सर्वात मोठा न झाकलेला काँक्रीटचा घुमट आहे.

रोमनांना माहीत होते त्याप्रमाणे काँक्रीट हे एक नवीन आणि क्रांतिकारक साहित्य होते. कमानी, तिजोरी आणि घुमट यांच्या आकारात वसलेले, ते त्वरीत कडक वस्तुमानात रूपांतरित झाले, दगड किंवा विटांमधील समान रचनांच्या बांधकाम करणार् यांना त्रास देणार् या अनेक अंतर्गत दबाव आणि ताणांपासून मुक्त होते.

आधुनिक चाचण्यांवरून असे दिसून आले आहे की, ओपस कॅमेंटिसियममध्ये आधुनिक पोर्टलँड-सिमेंट काँक्रीट (कॅ. २०० कि.ग्रॅ./सेंमी.२[२० एम.पी.ए.; २,८०० पी.एस.आय.]) इतकी संपीडक ताकद होती. तथापि मजबुतीकरणाच्या अभावामुळे त्याची तन्यता शक्ती आधुनिक प्रबलित काँक्रीटपेक्षा खूपच कमी होती आणि त्याच्या वापराच्या पद्धतीतही फरक होता:

आधुनिक संरचनात्मक काँक्रीट दोन महत्त्वाच्या तपशिलात रोमन काँक्रीटपेक्षा वेगळे आहे. पहिली गोष्ट म्हणजे, त्याची मिश्रण सुसंगतता तरल आणि एकजिनसी आहे, ज्यामुळे ते एकूण स्थानासह हँड-लेअरिंगची आवश्यकता असण्याऐवजी फॉर्ममध्ये ओतले जाऊ शकते, ज्यात रोमन व्यवहारात, बहुतेक वेळा ढिगारे असतात. दुसरे असे की, अविभाज्य प्रबलन पोलादामुळे आधुनिक काँक्रीटच्या संमेलनांना तणावात मोठे बळ मिळते, तर रोमन काँक्रीट केवळ तणावाचा प्रतिकार करण्यासाठी काँक्रीटच्या बंधनाच्या सामर्थ्यावर अवलंबून राहू शकत होते.

रोमन काँक्रीटच्या संरचनांची दीर्घकालीन टिकाऊपणा पायरोक्लास्टिक (ज्वालामुखी) खडक आणि राख यांच्या वापरामुळे असल्याचे दिसून आले आहे, ज्यायोगे स्ट्रॅटलिंगाइट (एक विशिष्ट आणि जटिल कॅल्शियम ॲल्युमिनोसिलिकेट हायड्रेट) चे स्फटिकीकरण आणि या आणि तत्सम कॅल्शियम-ॲल्युमिनियम-सिलिकेट-हायड्रेट सिमेंटिंग बाइंडर्समुळे काँक्रीटला भूकंपीयदृष्ट्या सक्रिय वातावरणातही फ्रॅक्चर रेझिस्टन्सची अधिक प्रमाणात मदत झाली. रोमन काँक्रीट आधुनिक काँक्रीटपेक्षा समुद्राच्या पाण्याने होणाऱ्या क्षरणास अधिक प्रतिरोधक आहे; त्यात पायरोक्लेस्टिक पदार्थांचा वापर करण्यात आला जो समुद्राच्या पाण्याशी अभिक्रिया करून कालांतराने अल-टॉबरमोराइट स्फटिक तयार करतो. अनेक रोमन वास्तूंमध्ये काँक्रीटचा मोठ्या प्रमाणावर वापर केल्यामुळे अनेक जण आजतागायत टिकून राहतील याची खात्री पटली. रोममधील काराकालाची स्नानगृहे हे त्याचेच एक उदाहरण आहे. दक्षिण फ्रान्समधील भव्य पोंट डू गार्ड यांसारख्या अनेक रोमन जलवाहिन्या आणि पुलांमध्ये पॅन्थियनच्या घुमटाप्रमाणे काँक्रीटच्या गाभ्याला दगडी बांधकाम केलेले असते.

रोमन साम्राज्य कोसळल्यानंतर १८ व्या शतकाच्या मध्यात तंत्रज्ञानाचा पुनर्विकास होईपर्यंत काँक्रीटचा वापर दुर्मिळ झाला. सबंध जगात काँक्रीटने पोलादाला मागे टाकले आहे, ज्याचा वापर केला जातो.

मध्ययुग (Middle Ages)

रोमन साम्राज्यानंतर जळालेला चुना व पोझोलाना यांचा वापर मोठ्या प्रमाणावर कमी झाला. चुना जळण्यामध्ये भट्टीचे कमी तापमान, पोझोलानाचा अभाव आणि खराब मिश्रण या सर्वांमुळे काँक्रीट आणि मोर्टारची गुणवत्ता कमी झाली. ११ व्या शतकापासून चर्च आणि किल्ल्यांच्या बांधकामात दगडाच्या वाढत्या वापरामुळे मोर्टारची मागणी वाढली. बाराव्या शतकात चांगल्या प्रकारे दळण व चाळणीतून गुणवत्ता सुधारू लागली. मध्ययुगीन चुन्याचे मोर्टार आणि काँक्रीट हे अपरिवर्तनीय होते आणि त्यांचा उपयोग दगडी बांधकाम, "हृदयस्पर्शी" (बाइंडिंग वेस्टल चिस्त्री कोर) आणि पाया बांधण्यासाठी केला जात असे. बार्थोलोमायस ॲंग्लिकसने त्याच्या डी प्रोप्रायटिटिबस रेरम (१२४०) मध्ये मोर्टार बनविण्याचे वर्णन केले आहे. १३९७ च्या एका इंग्रजी भाषांतरात त्यात "लाइम... एक दगडी ब्रेंट आहे; मेडलींजद्वारे सोंडे आणि पाण्याचे तुकडे केले जातात". १४ व्या शतकापासून मोर्टारची गुणवत्ता पुन्हा उत्कृष्ट होती, परंतु केवळ १७ व्या शतकापासून पोझोलाना सामान्यपणे जोडला गेला. १६७० मध्ये काँक्रीटचा वापर करून कॅनॉल डु मिडी बांधला गेला.

औद्योगिक युग (Industrial era)

काँक्रीटच्या आधुनिक वापरातील कदाचित सर्वात मोठे पाऊल म्हणजे १७५६ ते १७५९ च्या दरम्यान इंग्लंडमधील डेव्हन येथे ब्रिटिश अभियंता जॉन स्मीटन यांनी बांधलेला स्मिटॉनचा टॉवर. या तिसर् या एडीस्टोन दीपगृहाने काँक्रीटमध्ये हायड्रॉलिक चुन्याचा वापर करण्यास पुढाकार घेतला, दगड आणि चूर्ण विटांचा एकत्रित वापर केला. पोर्टलँड सिमेंट तयार करण्याची एक पद्धत इंग्लंडमध्ये विकसित केली गेली आणि १८२४ मध्ये जोसेफ अ ॅस्प्डिन यांनी त्याचे पेटंट घेतले. इंग्लंडमधील डॉर्सेट येथील आयल ऑफ पोर्टलँडवर उत्खनन करण्यात आलेल्या पोर्टलँड दगडाशी साधर्म्य दाखवल्याबद्दल अस्प्डिनने हे नाव निवडले. त्यांचा मुलगा विल्यम

याने १८४० च्या दशकात सतत घडामोडी सुरू ठेवल्या आणि त्याला "आधुनिक" पोर्टलँड सिमेंटच्या विकासासाठी मान्यता मिळाली. प्रबलित काँक्रीटचा शोध १८४९ मध्ये जोसेफ मोनीअर याने लावला. आणि पहिले प्रबलित काँक्रीटचे घर फ्रॅन्कोइस कोइग्नेट यांनी १८५३ मध्ये बांधले.पहिल्या काँक्रीट प्रबलित पुलाची रचना आणि बांधकाम जोसेफ मोनेयर यांनी १८७५ मध्ये केले होते.

Flood Control: A Sponge City Project

[Aditya Gujrathi (TE Civil), Dr. P. N. Balve]

As we all know the world is facing many environmental issues due to human activities, therefore, focus on the city drainage and water networks which will play a vital role in providing a green and clean environment. Therefore, my topic sponge city focuses on improving the water quality of the city, also reducing the chance of flooding and wastage of water by collecting and storing rain water by rain water harvesting and reusing the precipitated water. This study is mainly to explore the prevention and control role of a sponge city on waterlogging problems, which is a focus on rainfall runoff control. One of my main motive behind this project is to reduce the urban heat island intensity. The only challenges being land scarcity in urban areas, poor geographical location and climate and the main issue being lack of guidance, training and education in this field.

BIO- CNG

[Shubham Nikam(TE Civil), Dr. P. N. Balve]

As our Road Transport & Highway Minister Hon. Nitin Gadkari sir, giving more attention to the use of renewable fuels to reduce the pollution & there is shortage of fossil fuels in future. To avoid this, sir is focusing on Bio- Diesel & Bio- CNG. Straw burning after harvesting is a current environmental issue causing loss of nutrient to soil and many hazardous effects to the environment. To overcome the problem of straw burning is Bio-CNG generation from agro-waste. Converting stubble into energy is an innovative way to address the matter as it helps to reduce the greenhouse effect and fight against the threats of global warming. The Bio-CNG is an ideal fuel for automobiles and its low emission levels also make it a more environment friendly fuel than biogas and other fuels. Bio-CNG is much cheaper than other competitive fuels. Bio-CNG enhances the rural economy by imparting development in the available resources and employment generation.

Solid Waste Management Using Vermicomposting

[More S.G., Bachhav H. P., Patil C. V., Patil S. D.(BE Civil), Dr. S. J. Kadbhane]

Nowadays, solid waste management is a big challenge in urban areas due to the lack of solid waste management methods in public places. The decomposable and non-decomposable materials are disposed of here and there along the roads at public places. Environmental degradation is a major threat confronting the world, and the rampant use of chemical fertilizers contributes largely to the deterioration of the environment through depletion of fossil fuels, generation of carbon dioxide (CO2), and contamination of water resources. It leads to loss of soil fertility due to imbalanced use of fertilizers that have adversely impacted agricultural productivity and caused soil degradation. Now there is a growing realization that the adoption of ecological and sustainable farming practices can only reverse the declining trend in global productivity and environment protection (Alshehrei and Ameen 2021).

In this study, we used the vermicomposting method for decomposable solid waste management and the collecting buckets for non-decomposable waste. In the education college campus, five vermin-compost beds are fixed with non-decomposable buckets. The 3 kg of Vermi-culture is placed in each bed and the beds are filled with the waste materials such as waste food, used paper, dead leaves of trees, and other organic materials. Non-organic waste is collected separately in buckets such as plastic, packaged food covers, study is carried out for 6 months in the end, it is found that 98% solid waste is managed without extra efforts and the vermin-compost generated from the waste. The

vermin-compost can be used for plants nutrients on the same campus.

Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce a better product. Vermicomposting differs from composting in several ways. It is a mesophilic process, utilizing microorganisms and earthworms that are active at 10–32°C (not ambient temperature but temperature within the pile of moist organic material). The process is faster than composting; because the material passes through the earthworm gut, a significant but not yet fully understood transformation takes place, whereby the resulting earthworm castings (worm manure) are rich in microbial activity and plant growth regulators, and fortified with pest repellence attributes as well, in short, earthworms, through a type of biological alchemy, are capable of transforming garbage into 'gold' (Suthar and Singh 2008).

Objectives of study

The prime objective of this study is to use vermin-compost method of soiled waste for safe disposal in MVP's KBT COE Campus. To study the suitability of vermicomposting technology or safe disposal of organic waste and monitor daily/weekly composting quantity of earthworms and analyze all the components of vermicomposting and vermi-wash.

Vermi-compost process:

Processing involves the collection of wastes, shredding, mechanical separation of the metal, glass, and ceramics, and storage of organic wastes. Pre-digestion of organic waste for twenty days by heaping or dumping the material along with cattle dung slurry. This process partially digests the material and is fit for earthworm consumption. Preparation of earthworm bed As shown in Fig.1 and Fig. 2. A concrete base is required to put the waste for vermin-compost preparation. Loose soil will allow the worms to go into the soil and while watering; all the dissolvable nutrients go into the soil along with water. A layer of 15-20 cm of chopped dried leaves/grasses should be kept as a bedding material at the bottom of the bed. Beds of a partially decomposed material bed of size 12x4x2 feet should be made. Each bed should contain 1.5 -2.0 m^3 of raw material and the number of beds can be increased as per raw material availability and requirement. Red earthworms (350 -360 worms per m^3 of bed volume) should be released in the upper layer of the bed (Aalok A et al. 2008). Water should be sprinkled with the can immediately after the release of worms. Beds should be kept moist by a sprinkling of water (daily) and by covering with gunny bags/polythene. Bed should be turned once after 30 days for maintaining aeration and for proper decomposition. Compost gets ready in 45-50 days (Kulkarni, 2017). The weight of the finished product is about 75% of the raw materials used.

Conclusion: From this study, it is concluded that the use of the vermicomposting method of solid waste management is an effective method to maintain the ecological and environmental sustainability. Vermicomposting is an advantageous technology for waste management. Vermicomposting results in earthworms, vermin-compost, and vermin-wash as products. There are multiple benefits of vermi-technology; low-cost production of bio-fertilizer, environmental management of solid wastes and agricultural residues enhanced soil productivity, tastier quality food, among others. A growing number of individuals and institutions are taking interest in the production of vermin-compost utilizing earthworm activity. The operational cost of production of vermin-compost in a year works out to be around Rs. 4.2/Kg on average, thus, it is quite profitable to sell the compost at Rs. 10/Kg.

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Impact of Quality Management and Safety Culture on Construction Performances

[Ms. Gauri Handge (ME), Mrs. M. C. Aher]

Quality is one of the main factors in the success of construction projects. Quality is measure of excellence. Quality of project as well as satisfaction of project builder / contractor is important. The quality in construction industry is linked with client's satisfaction and implementation of QMS is a key tool in consistency and reliably managing goal of client satisfaction. Quality management systems are set of policies, processes and procedures(production/development/service) in core business area of an organization. Today, the application of quality management system is not only becoming popular but also mandatory in all construction industry. The concept of Quality Management System has been introduced to control the product quality and continually improve the effectiveness and efficiency of the performance. Quality management system takes a preventative approach towards effective and efficient completion of construction project, an effective QMS will identify the risks to an organization and provide ways to mitigate them. The QMS approaches the organization as a system of processes which interact to deliver products and services. As quality became a major focus of business throughout the world, various organizations started to practice standards and guidelines. This sees the introduction of the ISO 9000 series in 1987, which has since become a worldwide quality management norm for organizations, regardless of their sizes and products ISO 9000 standards are supposed to help companies identify mistakes, streamline their operations and be able to guarantee a consistent level of quality. The standard also drew the attention of quality professionals worldwide. Construction projects and quality are inseparable parts of each other. Quality in construction cannot exist without a project and a construction project cannot exist without quality. The modern construction market requires construction companies to guaranty the quality of their product to their clients. The quality is a key function in all infrastructure development environments like cost and time. It becomes one of the vital factors in any construction project. In construction projects lack of quality results in delays, cost overrun and unsafe structure. Quality is one of the critical factors in success of construction project. Since the quality outcomes of the projects are not according to required standards, faulty construction takes place. Consequently, additional investments are required for removal of defects and maintenance of work.

Price Escalation in Construction Materials Due to Covid-19 Pandemic

[Mr. Bhavesh Kapure (BE Civil)Mrs. M.C. Aher]

Corona virus (COVID-19) outbreaks have severely disrupted the economy, with devastating effects on global trade and it has simultaneously affected households, businesses, financial institution, industrial establishments and infrastructure companies. Prices increase of building materials is a common trend in both developed and developing countries. The prices increase of building materials results in high cost of housing. The aim of this study is to identify the major determinants of prices increase of building materials. Building material cost accounts for about 65% of the engineering cost, and some even reach more than 75% in the current formation of the construction installation engineering cost in our country, so the price of materials determines the engineering cost to a great extent. It is essential for proprietor to master the price fluctuations of building materials to control engineering cost, and it is also important for contractor to determine the bid price. According to the market price theory and the basic characteristic of the building materials, this report analyses and summarizes the influencing factors of building materials price changes. This report is a combination of researches made by experts on the price escalation and also and overview of thoughts of market people who have been working in for years now and also are active in the time of covid-19 pandemic.

"Analysis of Multi Storied Diagrid Structure using ETABS Software"

[Mahajan Anjali Jitendra , Bare Krishna Jalindranath Kakad Priya Rajendra ,Kale Sanika Sharad (BE Civil), Mr. S. M. Waysal]

Construction of multi-storey building is rapidly increasing throughout the world. Recently the diagrid structural system has been widely used for tall buildings due to the structural efficiency and aesthetic potential provided by the unique geometric configuration of the system. The diagrid structures are buildings with diagonal grids in the periphery at a particular angle and in modules across the height of the building. Basically, diagrid is a framework of diagonally intersecting metal, concrete or wooden beams that is used in construction of buildings and roofs. It is a design for constructing large buildings with steel that creates triangular structures with diagonal support beams.

Why should we adopt diagrid structures instead of vertical column?

The diagrid are diagonal members which are involved both in gravity and in lateral load resisting system. Typically, columns are used to provide vertical load carrying capacity, and diagonals or braces provide stability and resistance to large forces, such as wind and seismic loads. The diagonal member of the diagrid carries both shear and moment. Another advantage of diagrids is their versatility to resolve force concentration in the structure. The grid density or topology in diagrid structures can be effectively adjusted according to the intensity of the internal forces in diagonals. The problems associated with geological factors related to building location, soil conditions, limited area, uneven land

surfaces and not proper geometrical shape of the plot can be solved by using diagrid in a building. For example.

1. In any plot area with asymmetrical dimensions where high rise building FSI is permitted can show more deflection and can cause failure of structure. In this conditions diagrid structural concept can be used.

2. In metropolitan cities like Mumbai Pune or Delhi where there is less area left to increase urbanisation, we can construct high rise buildings using diagrid in it to reduce lateral displacement of building.

Experimental Analysis:

Various theoretical investigation has been carried out on diagrid structural system in high-rise building. Evolution in high-rise buildings, i.e., different technologies and patterns to form grid structures are discussed. The analysis of high-rise diagrid structure using ETABS to know the behaviour of high-rise structure under earthquake loading is done. Selection of a building model for the study in ETAB Software is done.

Model 1: Normal hexagonal shaped building without bracing.

G+16 storey hexagonal shaped building without any diagrid is consider. After the analysis the maximum drift observed was 0.001321. Storey drift in any storey shall not exceed 0.004 times the storey under the action of design base of shear [IS 1893 part-1:2016]. Therefore, the building is not safe as it shows more deflection than required i.e., 0.0012.

Model 2: Building with diagonal bracing(diagrids) at Ground floor, 1st floor and 2nd floor.

G+16 storey hexagonal shaped building with diagrid at ground floor, 1st floor and 2nd floor is consider. After the analysis the maximum drift observed was 0.001248. Therefore, the building is safe as it shows same deflection than required i.e., 0.0012.

Model 3: Building with diagonal bracing at 13th floor, 14th floor, and 15th floor.

G+16 story hexagonal shaped building with diagrid at 13th floor, 14th floor, and 15th floor is consider. After the analysis the maximum drift observed was 0.001069. Therefore, the building is safe as it shows less deflection than required i.e., 0.0012.

Model 4: Building with cross bracing at 7th floor and 8th floor.

G+16 storey hexagonal shaped building with diagrid at 7th floor and 8th floor is consider. After the analysis the maximum drift observed was 0.00099. Therefore, the building is safe as it shows less deflection than required i.e., 0.0012.

The seismic analysis of the selected building model and a comparative study on the results obtained from the analysis in ETAB Software is evaluated. Conclusion:

1. It is observed that lateral displacement of hexagonal building is more than expected as per IS 1893 part-1 2016.

2. After placing diagonal bracings (Diagrid) at ground 1st and 2nd floor it was observed that the maximum drift was accurate to the required drift according to IS code. 3. After placing diagonal bracings (Diagrid) at 13th ,14th and 15th floor, it was observed that the maximum drift was less than the required drift according to IS code.

4. After placing diagonal bracings (Diagrid) at 7th and 8th floor, it was observed that the maximum drift was accurate to the required drift according to IS code.

5. Hence, we can say that the drift at bottom storey is more than the drift at top storey, after adding diagrids. Also, when

the diagrids are placed at center of structure it is observed that the drift reduces to minimum.