

Path of Zero in Philippine Concrete Structures

(by end 2022)

Production, Consumption, Option of use

Under preparation

WAKEUP FROM DREAMS

JOIN INTO

BIO CIRCULARITY & NO WASTE

WITH

CMC PARTNERS AS Org 943458677 Mva  Crazy, but Right at Site in Time NorWay	ODD MAGNUS TJUGUM President Email : cmca@online.no www.cmca.no www.cmc.tips N-6848 Fjearland; Norway Tel : +47 90874761 Unit 712 BSA Mansion, 108 Benavidez Legaspi Village, Makati City Phils. Tel +63 929 196 6297
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200308 A Cmc Project on Bio-SCM Utilization

1/27/2023

Bio circularity & No Waste

The path of zero >

Into a world without any

Exclusion, Carbon and Poverty

Crazy

but Right for All in Time

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WE MAKE * WHAT OTHER * MIGHT DO

Development that bring

TODAY'S NEEDS

Without destroying coming generations

POSSIBILITY

HOWEVER !!!!!

Never ever any Progress

Without - Changes - in - Common Practices

Major- developments - are Discovered
By

Mistakes and Accidents

RICE

PRODUCTION, CONSUMPTION AND RECYCLING

REALITIES OF SUSTAINABILITY BROUGHT BY THE AGRICULTURE

It's the most important basic circularity

○ Foods *feeding the people, that create*

Hydro- and Bio-energy and Construction Material

BIO CIRCULARITY & NO WASTE

CONTRIBUTES TO

Sustainability

without revolutionary innovation

Circular processes

of renewable and biological raw material

Optimization

of existing processes within agriculture

Relationship

between agriculture, energy, and construction

THESE GREEN CLIMATE SOLUTIONS

ARE NORWEGIAN IN ORIGIN AND EXPERIENCE

IT STARTED IN THE EARLY 70'S

GUIDED BY THE WORLD FAMOUS

" GRO " HARLEM BRUNDTLAND



MOTHER OF SUSTAINABLE DEVELOPMENT – IN THE UN

PROJECT FACTS

ALL IN LINE WITH

PRESIDENT OF PHILIPPINE THRUST IN
AGRICULTURE, ENERGY AND CONSTRUCTION

UN DEFINES POVERTY A LACK OF FOOD, EDUCATION AND ENERGY

CARBON EMISSIONS RISE 2-3 TIMES BY MID-CENTURY

The Reliable *Path of Zero in Philippine Concrete Structures*

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The fastest route to make concrete with less CO₂ emission is to partly replace the content of cement. The most common Cement Replacement Materials (CRM) are blast furnace slag from iron production, fly ash from coal burning energy plants and Ferro Micro Silica (FMS) from ferro silicon smelters. Common for all these three CRMs are that they are *politically defined* as not being associated with CO₂-emission even though they are from heavily polluting industries.

Bio Micro Silica is less common in use but exist in huge quantity, in the countries in Asia. The CO₂-emission when burning the Bio-Fuel for energy purpose is *by nature* zero as the same amount of CO₂ was drawn from the air by the plants in the first place. This means replacing 20% of any cement in concrete reduces close to 20% of the carbon-footprint of that concrete since the cement is by far the dominating source of CO₂-emission (probably > 90% compared to the other constituents like natural aggregate and water).

Depending how effective the Bio Micro Silica is burnt, it may contain a small beneficial fraction of pure carbon. This carbon is then actually taken out of the atmosphere and stored permanently in the concrete. So, replacing cement with Bio Micro Silica will be below zero in terms CO₂-emission, **in fact negative**.

Bio Micro Silica has a very high content of amorphous silica with a high surface, rendering it highly potent as an CRM in terms of increased workability, strength and improved durability relative to the cement it replaces. The effect of Bio Micro Silica on concrete properties is well documented in world-wide scientific journal publications and is safe to use.

References

Ferro Micro Silica (FMS) is used in many important structures, for instance in the giant oil/gas platform Troll A in the North Sea where 5% FMS of cement mass is used in the concrete recipe.

Troll A 1991 – 1995. The ultimate Condeep

Built at Hinna and Vats

- Water depth 303 m
- Height 369 m
- 245 000 m³ concrete
- 106 000 tons steel
- 6 mill. manhours

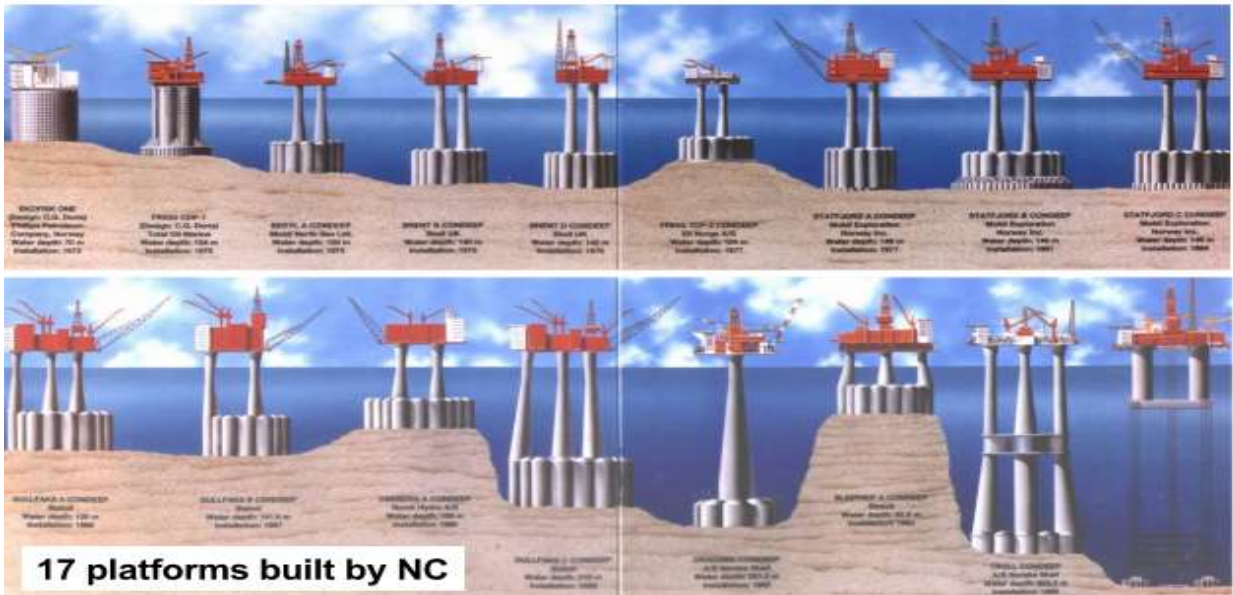
20 years experience and developments in design, construction, materials technology and project management.



202



1971 – 1995: A golden era for norwegian concrete



17 platforms built by NC

2022 JM



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Here is a reliable information on the topic of FeM-Silica (Ferro Micro Silica) which confirm that FeM-Silica is used in a broad spectre of concrete types, due to the good effect on workability, mechanical strength, durability.

Norwegian road authority (Statens Vegvesen) now described that all new Norwegian Bridges shall have a content between 3 – 10 % by the weight of cement in the mixes.

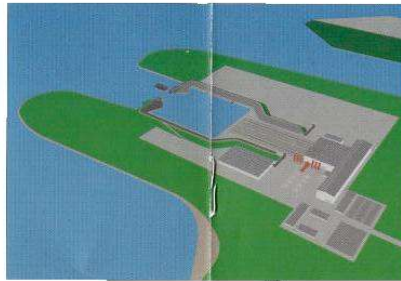
All SCC (self compacting concrete) made in Norway contain micro silica, due to the good effect of holding aggregates in the fresh matrix, combined securing increased mechanical strength, durability, and less porosity. Likewise, close to all concrete we use in Nye Veier AS contain FeM-Silica.

Even in Danmark, during my time as concrete engineer at Øresund Tunnel Contractors, all tunnel concrete contain FeM-Silica.



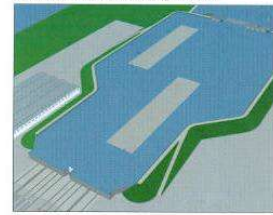
Specialanpassad metod för tunnelbygge

Tunneln tillverkas av 20 förtillverkade, armerade betongelement. De 178 meter långa elementen kommer att gjutas i segment som är 22 meter i en tillfällig fabrik i Köpenhamn. Gjutningen kommer att ske inomhus under kontrollerade klimatförhållanden. Tekniken har använts vid brobyggen sedan 60-talet och bygger på etappvis gjutning och förflyttning på en glidbana.



Vidare transport

Efter produktionen kommer elementen att flyttas till en tillfällig sluss...



I fabriken kommer segmenten att tillverkas vid dubbla produktionslinjer. När ett segment är färdigt flyttas det så att man kan påbörja nästa segment på samma plats.



Armeringen förtillverkas i enheter och flyttas till gjutavdelningen.

När ett tillräckligt antal segment är färdiga kommer de att sättas samman till ett helt element.

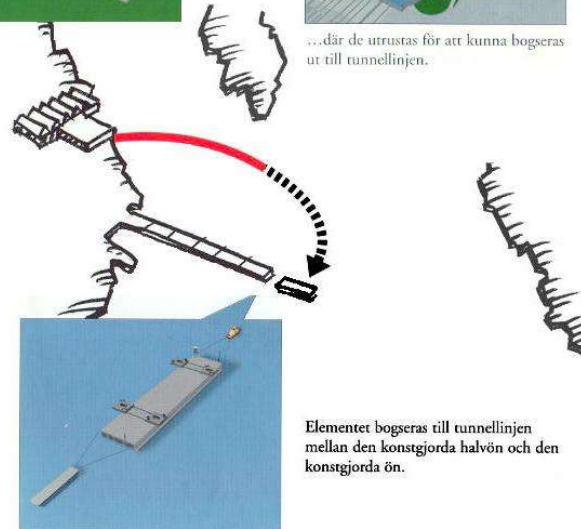


Sedan byggs formen och fylls kontinuerligt med betong. Varje segment tar 24 timmar att gjuta. Betongen hårdnar i 72 timmar. Åtta segment bildar ett 178 meter långt element.

På halvön och på den konstgjorda ön kommer det att finnas anslutningar och ramper som gjuts på plats i armerad betong.

Betongen kommer att tillverkas vid egna anläggningar, dels i Köpenhamn, dels på halvön och på den konstgjorda ön.

Elementfabrik kommer att byggas för projektet. När tunnelbygget är slutfört kan fabriken användas för andra ändamål.



...där de utrustas för att kunna bogseras ut till tunneln.

Elementet bogseras till tunneln mellan den konstgjorda halvön och den konstgjorda ön.



1/27/2023

CMC PARTNERS
FOCUS ON THE REALITIES ABOUT
CEMENT

"The material that built the modern world is also destroying it."





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Some info and references for use of FeM-silica in shotcrete for some big important projects

FeM-silica is very widely used in most of the big tunnel and Under Ground projects world wide. We estimate that approx 12-14Mio m³/year is sprayed in UG projects ww and 40% of this is with use of m FeM-silica in the mixes .Typical dosage is 5% of cement weight.

A few important projects ww where microsilica was used :

- Gotthard railway tunnel in Switzerland -used for all sprayed concrete , normal concrete and tunnel segments
- Crossrail UK - used in all sprayed concrete and in Uk used in sprayed concrete in all n tunnel projects in London and around London last 20 years
- West and North Connex projects in Sydney ,Australia
- Kiruna mine ,Sweden 250.000 m³/year with sprayed concrete with microsilica

Other projects references for use of FeM-silica in sprayed concrete see in my sprayed concrete book pages 59,61,64,66,67,69,70,71,76,80,81 and 108.



BioM-silica means Sustainability

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Sustainability is to secure today's needs without destroying the possibilities for future generations to have their needs met."

During the industrial revolution until today, most people's needs have increased in line with technical development, done by the current, old generation. This mostly, by refining the resources in ways that they become more accessible and beneficial to humanity. This happened in overall communities i.e. food, energy, building materials, quality of life etc.

Sorry to say, developments of today goes in the direction of exploiting the resources for personal and political gains with a short time horizon, especially within Energy, Oil production and IT. Everyone is pushed to buy the latest model mobile phone, and forced to pay overpriced electricity and fuel. This to satisfy those people who do not stand for real sustainability, but who **use the word (sustainability) to carry out their deeds.**

Losers are "ordinary people", in lack of possibility and power to influence.

The "New Normal", however, brought extensive changes in focus, fighting a rising level of CO₂ in the atmosphere. the most important substance in agriculture, forestry and green growth. Now blamed for the alleged overall climate change destroying the world. **Decarbonation the world**

Production of Portland cement release huge amount of CO₂, emissions into the atmosphere, during burning limestone together with quartz and slate, in large rotary kilns, at approx. 1450 degrees Celsius. This process creates clinker granules, which grounded together with gypsum (plaster) ends up as Portland cement.

Limestone is a mass of small petrified, compressed corals and molluscs that lived in the sea many millions of years ago. The major part of limestone are carbon and oxygen, which when heavily heated pose the limestone into lime and CO₂. Therefore the emissions from cement production come mainly from this calcination process (about 60%), the rest comes from the fuel heating the kilns and finally transportation out into the sites.

Producing ordinary Portland Cement releases approximately 1 tonne of CO₂ per tonne of clinker if no measures are taken. Around 40 % comes from fuel for burning, grinding etc and 60 % from decarbonisation of limestone to form clinker.

By replacing Portland Cement with Micro Silica / FeM- / BioM- Silica a significant decarbonation in concrete application/construction / final structures will be achieved.

In figures on decarbonisation of concrete structures this Means;

- for every kg of BioM-silica we add, we reduce emissions by 5 kg of CO₂.

In normal concrete that is **70 kg CO₂-emmission / 1 m³** and **7000 ton CO₂-emmission / 100,000 m³**,

- all like 1,500 cars are CO₂- released per year.

PROJECT GOALS & OBJECTIVES

Develop new product processes by utilizing renewable and biological raw materials



PROJECT GOALS & OBJECTIVES



- Jointly pursue product development research and business development activities for the future-focused use of the RHA

SO NOWADAYS...

“Being less bad is simply not good enough”

Philippine Cement- production

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The estimated average commercial

price ; PhP 240 per 40 kg bag >r @ PhP 6,000 per ton

quantity; 40Mt (Mt - million tons).

carbon footprint 0.5 ~ 0.6 per 1,000 tons / 20 ~ 24 Mt in the atmosphere.

With the expected rise in cement consumption due to the Build, Build, Build policy of the present administration, the carbon foot prints will proportionally increases.

This is not in line with the COP27 conference late last year in Egypt.

PROJECT BENEFITS



5 kg. RHA = 30-40 kg. conventional cement




- Less packaging cost
- Less warehouse cost
- Less transport cost

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CONCLUSION

- CO2 emissions of cement and concrete are Solved Technically but Not Economically
- Solutions of today are mostly inadequate response to the climate crisis

Crazy and Right – But let us not forget !!!

FeM- /BioM- Silica -

- **Use, Need and Benefits in the Philippines**

All FeM-Silica used by the construction industry are imported.

The price ; Php 800 per 20 kg bag / @ PhP 40,000 per ton

The extent of use in the construction industry is basically in high compressive strength and high durability concrete mixes.

High rise buildings usually require very high compressive strength concrete mix designs.

Replacing 5 kg of cement / 1 kg / **Ferro Micro Silica**, results in a remarkable carbon footprints reduction in the concrete of structures.

FeM- Silica are also used during the construction of structure foundations especially where sulphate and chloride are present in the strata.

Should also be used on offshore structures to enhanced durability of concrete against chloride attack. Due to its extreme fineness, **FeM-Silica** replacement (which prevents autogenous cracking) produces very durable concrete structures

BioM- Silica (mostly adjusted Rice Husk Ash) appear as a biproduct, mostly treated and deposited as waste, by Bio power plants, feed / fueled with most, rice husk.

This adjusted ash, **BioM - Silica** has qualities that satisfy international standard for the similar **FeM- Silica**, used as additive / replacement to cement in concrete structures worldwide.

- Disposing of untreated **BioM- silica** becomes a serious environmental issue in the nearby communities, problems its use eliminates.

BioM -Silica creates major benefits, collected, bagged, labelled and marketed for use in concrete structures, especially those in the Build, Build, Build initiative by the DPWH and DOTr. Its carbon footprints are greatly reduced, structures decarbonized.

- The farmers are getting additional income, more motivated, an overall activity enhancing food production and food security for the humanity community.
- Likewise, marketing is an added revenue for the power plant and the host community. It provid additional income generating employment for the marketing staff and connections.

All reasons and incentives mentioned, the remarkable decarbonizing achieved, make it easy and very beneficial to invest in use of **BioM – Silica**.

PROJECT BENEFITS

Rice husk ash (RHA) contains around 85% to 90% amorphous silica

Bio-energy combustion has zero CO₂ emission

Approximately 50 tons of raw RHA can be collected from the plants in a day

2.5 million m³ concrete/ ash can be collected at one site without cost, today



200308 A Cmcip Project on Bio-SCM Vitalization

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BUT NOTE THE UTMOST PROBLEM

Inflexible codes and standards,

- making concrete has to be the right way" only

Than the natural issue of cost?

None willingness to pay additional cost to save the world?

New and advanced solutions do not always cost more than "conventional

in short, newer technologies are prevented, just to cover own "Ace",

simply announced to ensuring life safety in structures

"You have to be sure - what you're doing is right and work on it."

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THE ENVIRONMENTAL AND ECONOMIC BENEFIT OF INCORPORATING LOCAL RHA IN THE ALIMIT HYDROPOWER COMPLEX IS CONSIDERABLE:



Rice -food for the people

Hydropower

Bio-energy

Bio-SCM

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1/27/2023

PROJECT RATIONALE

Improper handling and disposal of Rice Husk Ash (e.g., dumping into ponds and streams) seriously pollute the land and surrounding areas



CMCP PROJECT ON PROJECT BIO CIRCULARITY

SUMMARY OF REALITIES

CMC Partners AS and Odd Magnus Tjugum

is Crazy, but Right at Site in Time for CareTaking our World

Origin and idea, its planning and execution follow gained experiences, documented references, on previous similar work of developments done by CMC Partners AS

Imply major worldwide dissemination of new and improved technologies and application of the various methods and products developed

More than 40 years of practical experience and, to a high degree, one of the most responsible for technical development and application within his special field in Scandinavia.

200308 A.Cmcp Project on Bio-SCM Visualization

1/27/2023

PROJECT BENEFITS

- **Safeguarding supply of food, waterpower and bioenergy**
- More and more standard requirement, classified as Low Carbon Concrete
- In line with government's thrust of use of renewable materials for construction