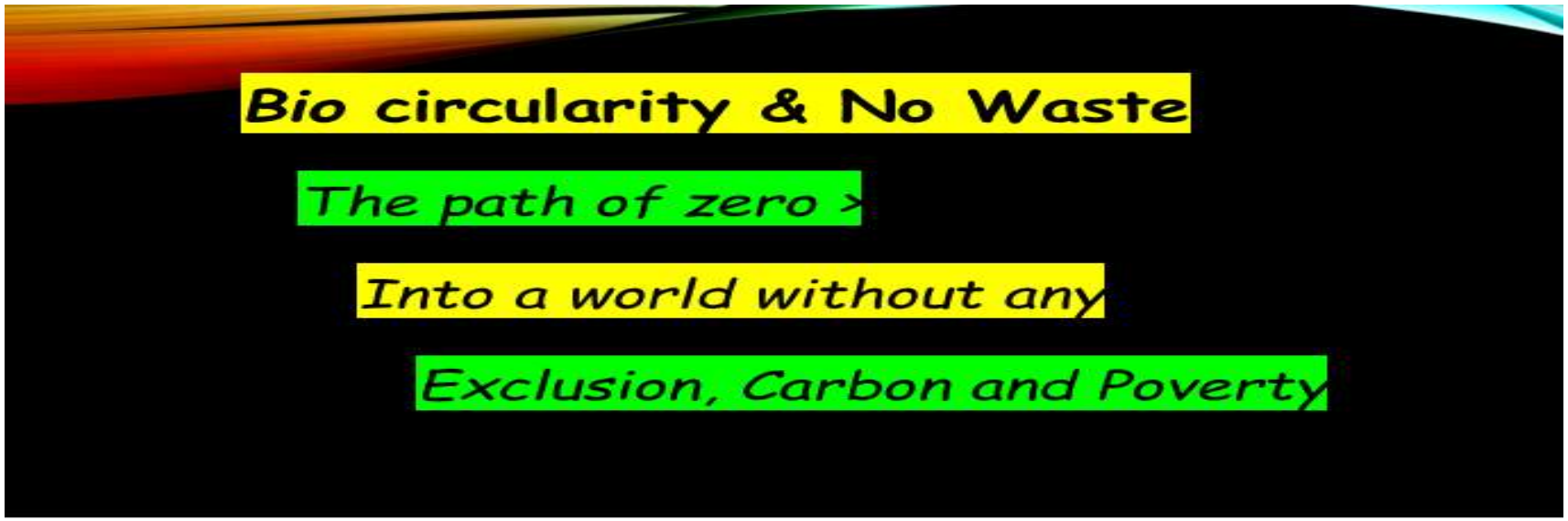
CMC Partners AS

Sustainable Construction Solution

Decarbonized & No-waste Concrete application



BioM -Silica

For

Cement Replacement & Durability Improving >> Concrete Structure

WE MAKE * WHAT OTHER * MIGHT DO

Development that bring

TODAY'S NEEDS

Without destroying coming generations

POSSIBILTY

Background

1. Chemical Engineer with 40 years creating high quality and durable concrete Structures
2. Technical Consultant on cement technology, making innovative and advanced formulation
3. Involved in producing renewable bio-energy and bio-fertilizers in farming
4. Pioneered the use of FeM-Silica, captured ferro silica fume (waste), for replacement of cement in concrete structures

Odd Magnus Tjugum
President

Crazy Mens Club
CMC

Background

About
CMC Partners AS

- Operates primarily in the Scandinavian region
- "CMC" stands for "Crazy Mens Club" = Crazy, but Right in Time for All
- Advocates decarbonized and no-waste concrete application; and environment-friendly construction solutions
- Has reliable technical expertise to make high durability replacement of cement; and verified knowledge out of decades of experience
- Projects worked on:
  - Ambuklao Dam, SN Aboitiz Power, Philippines
  - LNG tank constructions at Isle of GRAIN, UK
  - Adriatic LNG Terminal Project in Spain, concrete work in Madrid
  - Snøhvit, LNG tank construction ; Statoil, Hammerfest
  - Øresund Tunnel Contractors, Copenhagen, sub sea tunnel construction
  - Several Offshore platforms built by Norwegian contractors
  - Ekofisk Protective Barrier

RESCON AS

Concrete - We have the know-how.

Our business.

Our operations are based on finding technical solutions to problems, and competitive methods related to the casting and maintenance of concrete structures above and below water.

We have continuous contact with international chemical companies, research institutions and consulting engineers. We are thus able to obtain practical solutions to problems in step with research, both at home and abroad.

Rescon A/S, proves that good technical knowledge and hard work, combined with imagination, initiativ and creative ability, can produce results.

The company.

Rescon A/S, of Sand in Nord-Odal, was etablished in 1976. The companys name is an abbreviation of the term "Resin concrete". The company develops and produces special mortars, epoxy adhesives and other hardening materials, and concrete admixtures.

The company has developed a special method for repairing concrete structures under water. This method has aroused great interest both in Norway and abroad. Rescon A/S has established a network of companies in Norway and abroad with whom the company collaborates.

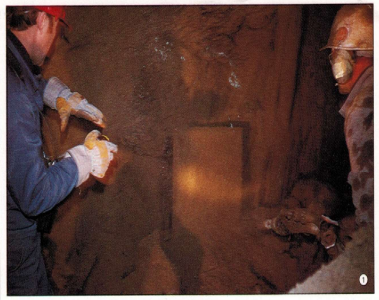
Those who took the initiative and established Rescon A/S, received the Norwegian Federation of Industry's Establishment Award the first time it was presented in the spring of 1981.

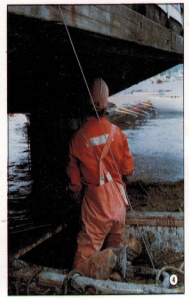
Marketing.

The marked has a great need for tailormade solutions for complicated structures, and it is here we can make a contribution with our expertise. For our part, these solutions demand flexibility, quality, good service and speedy delivery – but this is our speciality.
During the first few years, sales were concentrated on the Norwegian market.

We soon saw the necessity of also developing foreign markets, and today export to the other Scandinavian countries and to Great Britain is considerable.

1. Shotcreting of power station for Oslo Lysverker. 2. Shotcreting of sewage farm for VEAS, Oslo. 15.000 m² were sprayed in 1 year. A robot, with a capacity of c. 50 m³ per day, was also used. 3. Statuette and diploma of the Federation of Industry's Establishment Award. 4. Repairing weathered concrete on the quay of Restaurant Kongen, Oslo.





Special mortars.

These products have been developed for a number of use, e.g. securing rock slopes, injection, levelling (horisontal surfaces), installing machine foundations and anchor bolts. Special mortars may also be required for work done in difficult climatic conditions. This product group also includes more spesific products such as mortar reinforced with steel fibres for protective work and concrete repairs.

Rescon mortars are delivered ready for use, water only needs to be added on site. This is beneficial to both quality and cost, the process being rational and labour-saving.

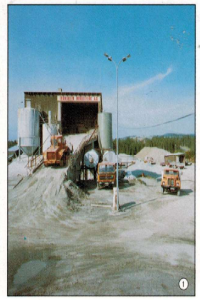
Concrete admixtures.

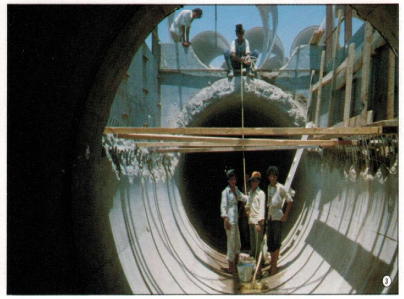
Concrete admixtures change the properties of concrete before it hardens. For example, they can act as air entrainers or water-reducers, or give concrete anti-frost properties. Other accelerate the setting and hardening.

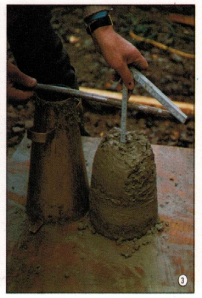
This offers our customers the following advantages:

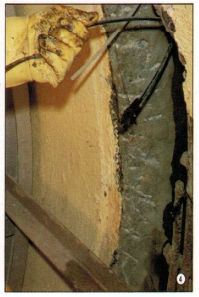
It helps to fulfil strict and difficult functional requirements to both fresh and hardened concrete. The concrete can be tailormade for special purposes. It makes it easier to control the hardening of the concrete and its long-term properties. Work can be done in difficult weather conditions, e.g. cold weather. Admixtures are economical, for they make it feasible to adopt labour saving procedures and, in a number of cases, the cement content may be reduced.

1. Trondheim Mørtelverk cooperates with Rescon A/S and is a large supplier of ready mixed concrete and mortar. 2. Rock injection with mortar for Oppland Kraftverk (Oppland Power Station). 3. Rescon admixtures are also used in Iraq. 4. Repairs to tunnel wall (epoxy injection) for the Telecommunications Department, Oslo.









Objectives

Advocating sustainable construction solutions by promoting a circular economy model in the use of farm waste (i.e., rice husk) for renewable bio-energy, and using the ash as construction material.

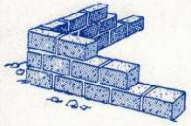
Partnering with companies and institutions to join in this climate action initiative and promote decarbonized and no-waste concrete application.

SILICA
INFORMASJON

HØYVERDIG HJELPEMIDDEL FOR BEDRE BETONG OG MØRTEL

SPESIELT EGNET FOR

VANNTETT BETONG
PUMPE BETONG
HØYVERDIG BETONG
UNDERVANNS BETONG
BESTANDIG BETONG
LETTBETONG
POREFRIE FLATER
GULV OG VEGGPUSS
FROSTBESTANDIG BETONG
SPRØYTE BETONG



ledende produsent og forhandler
av betong- og mørtelprodukter.

TRONDHEIM MØRTELVERK A/S
ORMEN LANGES VEI 9, POSTBOKS 1879
7001 TRONDHEIM, SENTRALBORD (075) 29 673

LEDENDE PRODUSENT AV MØRTELPRODUKTER, EPOXY og TILSETNINGSSTOFFER FOR BETONG

RESCON AS
Brødrene Tjugum
2120 SAGSTUA SENTRALBORD (066) 71 688

Under water concreting will never be the same

The need for SUSTAINABILITY

Rapid increasing population and global economic growth

has led to increased consumption and an unsustainable high level of emissions

Emissions = Climate Change

The need for SUSTAINABILITY

Cement production account for around **8%** of CO_2 emissions

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

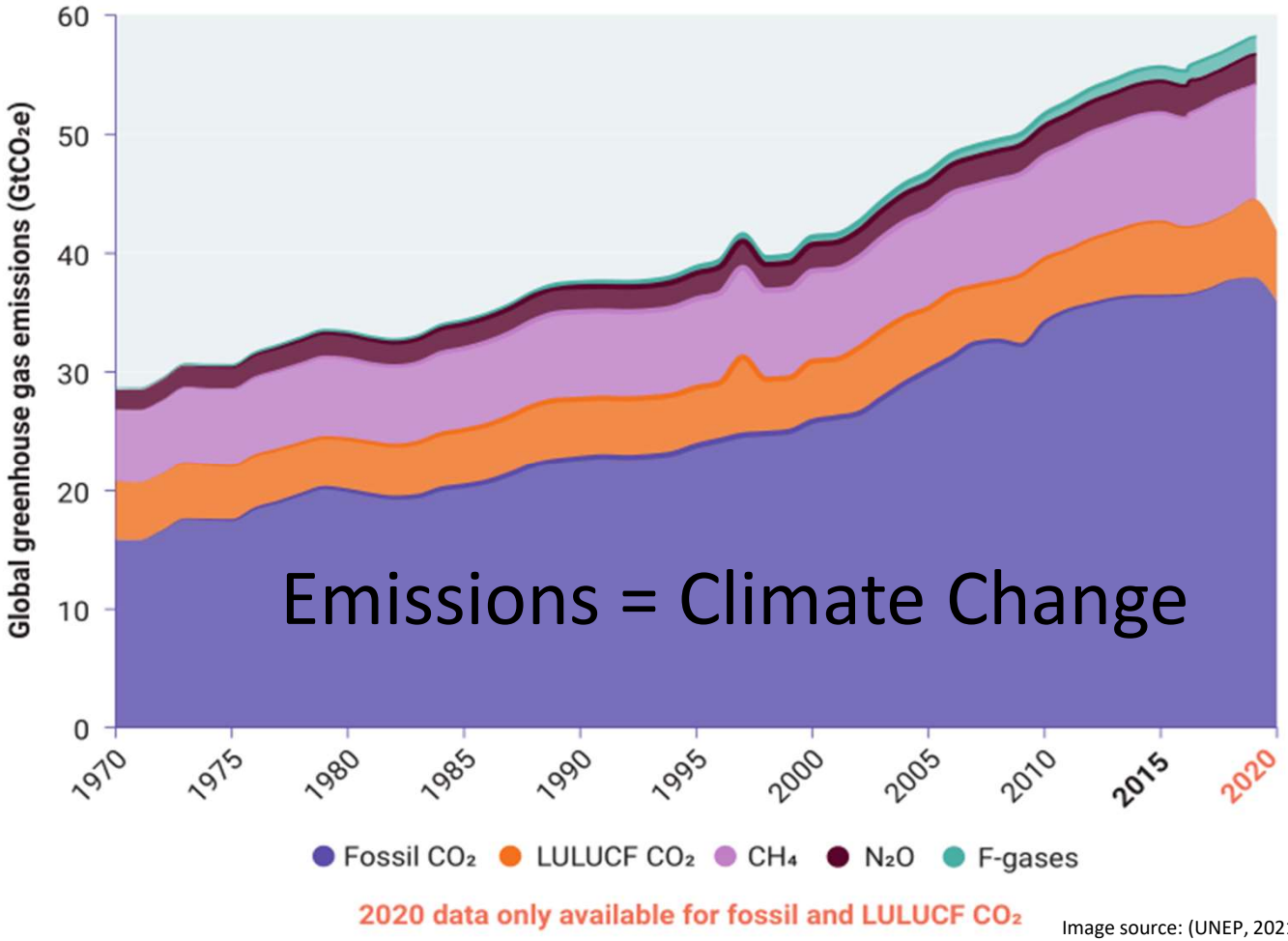


Image source: (UNEP, 2021)

The need for SUSTAINABILITY

1. Required sustainability

is not just about the environment

2. The Securities and Exchange Commission (SEC) will

increasingly require companies to submit Sustainability Reports

3. Government thrust to address climate change,

encouraging sustainability among companies

4. The public are increasingly expecting companies

to be sustainable and environmentally responsible

Public's demand for sustainability

There was a 71% rise in online searches for

sustainable goods globally over the past five years.

Not just in high-income countries,

but is also strong in developing and emerging economies.

In one survey, 66% of all respondents said

they consider sustainability when making a purchase.

Customers switch products or services when a company violates their values.

Dentsu Consumer Vision 2021:

consumers have a growing concern on the environmental impact

of businesses and their response to climate change

Our Proposal: **BioM-Silica replace content of cement**

BioM-Silica mostly rice husk ash

- contains 85% to 95% amorphous silica, a highly active pozzolanic, used for making high quality concrete structures
- requires less energy for production, negative carbon footprint
- come from renewable resource without toxic components
- mostly dumped as Bio-waste (ca 2 million m/tons in 2016)
- turn farm waste to infrastructure circularity
- increasing farmers' income through innovation and development

Sustainable Construction Solution

Crazy Mens Club

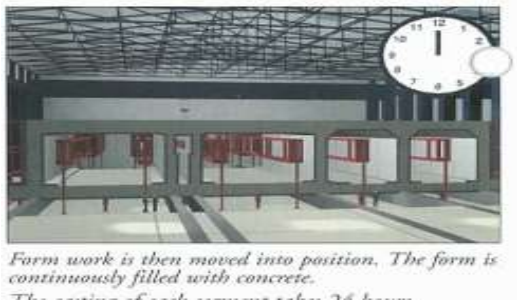
Agriculture no waste value chain

Bio Micro Silica

Agriculture chain supply

Food – Energy – Construction

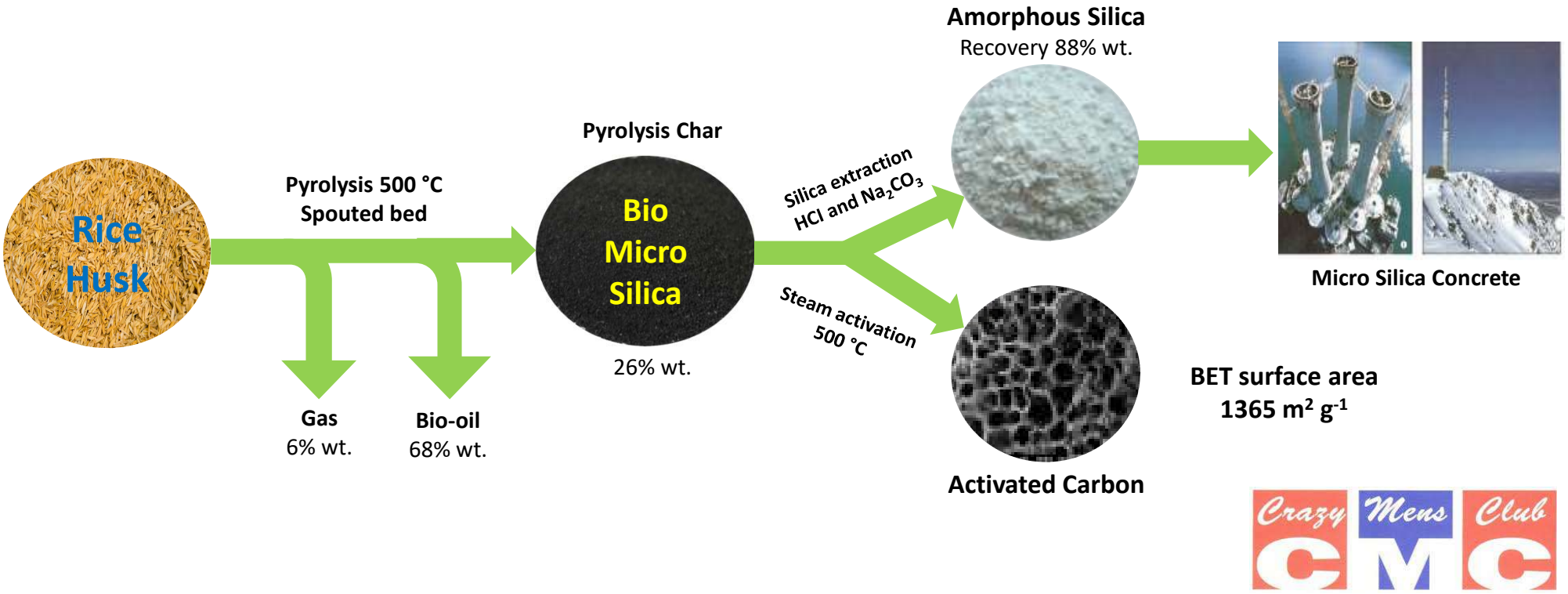
Realities of Sustainable, Renewable, Green, Biological Innovations


Form work is then moved into position. The form is continuously filled with concrete.

Bio Micro Silica (rice husk ash)

Crazy Mens Club CMC

Technical discussion on **Bio Micro Silica Concrete**



Potential benefits

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

Crazy Mens Club
CMC

Service Offering: **Technical Consulting Services and Research Contribution**

Assess the utility of BioM-Silica as a highly

efficient and sustainable cement replacement material

Apply new techniques and processes

utilizing renewable and biological raw-materials

Pursue product development

research and business development activities

Sourcing Bio Micro Silica in the Philippines

Sustainable Construction Solution

Sustainable and Durable, Concrete and Structures

CMC Partners AS

The Path of *Zero in Philippine Concrete Structures*

SINTEF Byggforsk Norway harald.justnes@sintef.no
Mobil +47 930 58 688 / https://www.sintef.no/byggforsk

The reliable path of concrete with less CO_2 emission

is to replace the cement.

The most common CRM - ***Cement Replacement Materials*** are

blast furnace slag from iron production,

fly ash from coal burning energy plants

FeM-Silica from ferro silicon smelters.

But all these CRMs are *politically defined , only*

as not being associated with CO_2-emission even though they

are from heavily polluting industries.

BioM-Silica of huge quantity in Asia

- is less kown being in common use

The CO_2-emission when burning the Bio-Fuel for energy purpose

is *by nature* zero

as the same amount of CO_2 was drawn from the air by the plants

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 CO_2-emission

> >>>>

90% compared to the other constituents like natural aggregate and water

Depending how the BioM - Silica is burnt
it contain beneficial fraction of pure carbon

This carbon is taken out of the atmosphere and stored permanently in the concrete.

So, replacing cement with Bio Micro Silica will be

below zero - in terms CO_2-emission, **in fact negative**.

BioM- 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 benefical effect of BioM - Silica on concrete properties

is well documented in world-wide scientific journal publications

>> and is safe to use.

References

FeM - Silica is used in many important structures

<u>as the giant oil/gas platform Troll A in the North Sea</u>

where 5% FeM - Silica by weight of cement is used

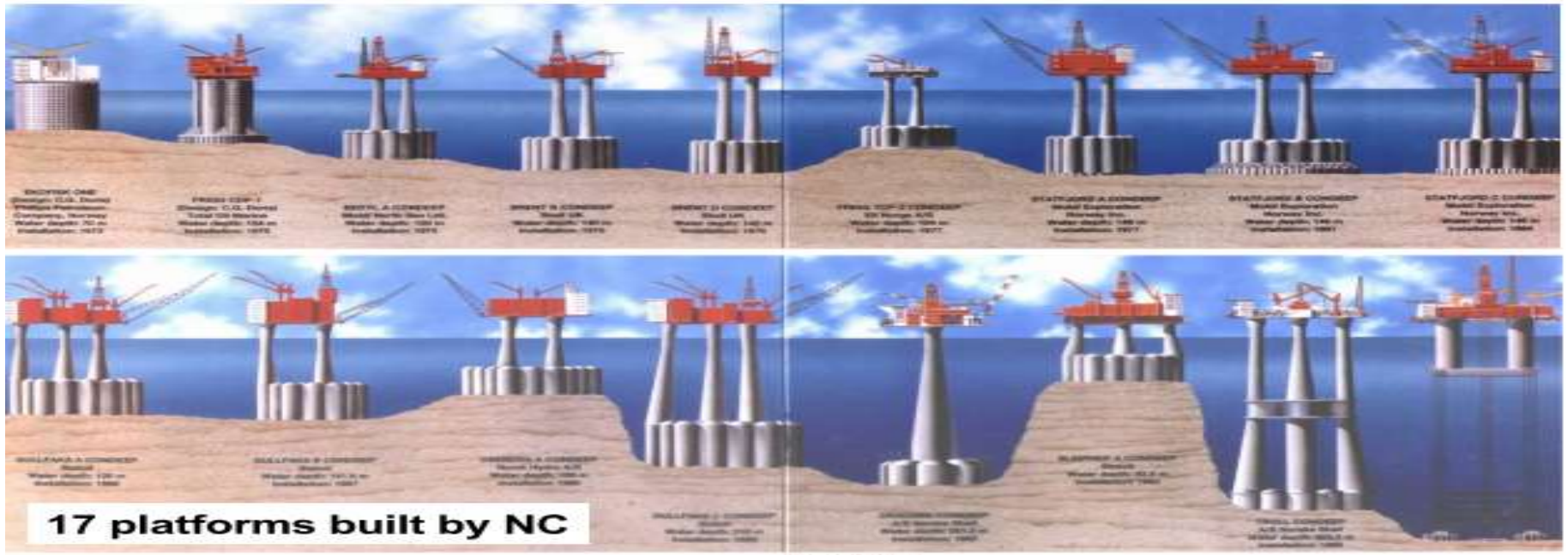
Troll A 1991 – 1995. The ultimate Condeep

Built at Hinna and Vats

- Water depth 303 m
- Height 369 m
- 245 000 m^3 concrete
- 106 000 tons steel
- 6 mill. manhours

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

1971 – 1995: A golden era for norwegian concrete



2022 JM

HARTMUTH WESTBY
Senior kvalitetsrådgiver
+47 974 89 291 | Hartmuth.westby@nyeveier.no
Nye Veier AS | Vangsvegen 73 | 2317 Hamar

Here is a reliable topic of FeM-Silica

Confirming comman use in a broad spectre of concrete types

due to the beneficial effect on workability, mechanical strength, durability.

Norwegian road authority,now described that all new Norwegian Bridges

shall have a content between 3 – 10 % by the weight of cement

All SCC (self compacting concrete) made in Norway contain micro silica,

due to the good effect of holding aggregates in the fresh matrix,

scuring increased mechanical strength, durability, and less porosity.

Likewise, close to all concrete we use in Nye Veier AS contain FeM-Silica.

Crazy Mens Club CMC

Even in Danmark, during my time as concrete engineer at ØTC
<u>all tunnel concrete contain FeM-Silica</u>

CMC PARTNERS
FOCUSES ON THE REALITIES ABOUT CEMENT

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.

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.

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

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

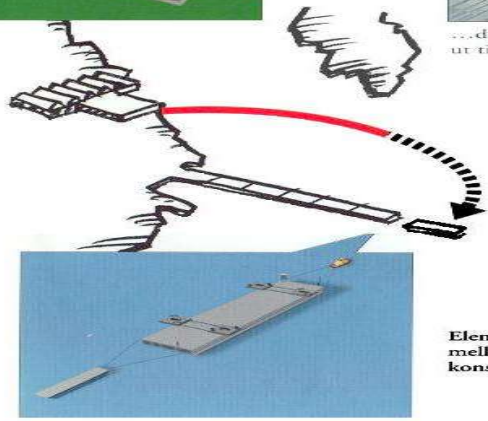
Armeringen förtillverkas i enheter och flyttas till gjutavdelningen.

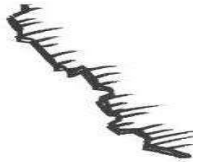
Sedan byggs formen och fylls kontinuerligt med betong.
Varje segment tar 24 timmar att gjuta.
Betongen härdar i 72 timmar. Åtta segment bildar ett 178 meter långt element.

Vidare transport

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

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





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

Tom Melbye | Senior Advisor **Normet International Ltd.**
Rothusstrasse 21 | 6331 Hünenberg | Switzerlan | Mobile +41 79 449 8555
tom.melbye@normet.com | www.normet.com

References for use of FeM-silica in shotcrete ww for some big important projects

FeM-silica is widely used in most of the big tunnel and Under Ground projects world wide.

We estimate approx 12-14Mio m3/year in UG projects ww

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 added microsilica::

Gotthard railway tunnel in Switzerland -

- all shotcrete , normal concrete and tunnel segments

Crossrail UK and tunnel projects around London last 20 years

West and North Connex projects in Sydney ,Australia

Kiruna mine ,Sweden - 250.000 m3/year shotcrete added microsilica

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

Crazy Mens Club

UGC

BioM-silica means Sustainability

Magne Sollie - Norway
004790591594 / masolli@online.no
http://solliesolution.no

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

mobile phone and overpriced electricity and fuel.

- This to satisfy those people who do not stand for real sustainability,

but use the "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 CO_2 in the atmosphere.***
  - ***the most important substance in agriculture, forestry and green growth***.

The CO_2 now blamed for the overall climate change destroying the world

Production of Portland cement release huge amount of CO_2, emissions into the atmosphere

- during burning limestone together with quartz and slate,
  - in large rotary kilns, at appox. 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 CO_2. T

herefor 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 CO_2 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 of concrete structures this Means;

- for every kg of BioM-silica we add, we reduce emissions by 5 kg of CO_2 .

In normal concrete that is

- **70 kg $CO_{2\text{-emmision}}$ /1 m^3** and **7000 ton $CO_{2\text{-emmision}}$ / 100,000 m^3** ,
  - all like 1,500 cars are CO_2 released per year

SO NOWADAYS...

"Being less bad is simply not good enough"

PROJECT GOALS & OBJECTIVES

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

Philippine Cement- production

Roberto Caballero, Manila, Construction Materials Consultant
+63 969 181 8804 / rbrtcaballero@yahoo.com
https://www.linkedin.com/in/roberto-caballero-0a3b4b14

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.

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.

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

Replacing 5 kg of cement **/** 1 kg / **Ferro Micro Silica**, results in

a remarkable carbon footprints reduction in the concrete of 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

Should also be used on offshore structures to

enhanced durability of concrete against chloride attack.

Due to its extreme fineness **FeM-Silica** replacement

prevents autogenous cracking

produces very durable concrete structures

This adjusted ash, **BioM - Silica** has qualities

that satisfy international standard as the similar

FeM- Silica frequent used as additive/ replacer to cement in concrete structures worldwide.

Disposing of untreated **BioM- silica** becomes

a serious environmental issue in the nearby community

problems its use eliminates.

The European Norm for (ferro)micro silica

does NOT cover Bio Micro Silica.

I am the convenor for the silica fume committee...

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**

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."

PROJECT BENEFITS

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

Bio-energy combustion has zero CO_2 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

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

PROJECT RATIONALE

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

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

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.