

Carbon-neutral/negative Concrete Technology is Taking Shape in Real-world Projects: Strategies and Applications

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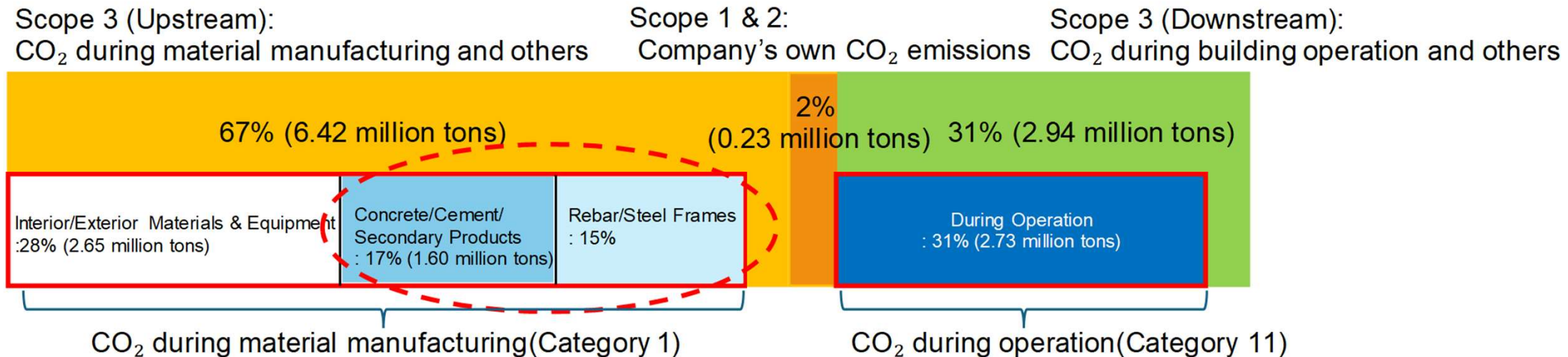
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1. Carbon Emission in Construction Industry

CO₂ Emission Breakdown in Construction Company

- **Total emissions:** approx. 10 million t-CO₂/yr
- **Direct emissions from the company (SCOPE1&2):** very small
- **Client priorities, e.g. Real Estate Developer:**
 - Reducing CO₂ emissions during building operation (construction company's Scope 3 downstream)
 - Additionally, strong interest in reducing CO₂ from capital investment (construction company's Scope 3 upstream + Scope 1 & 2)



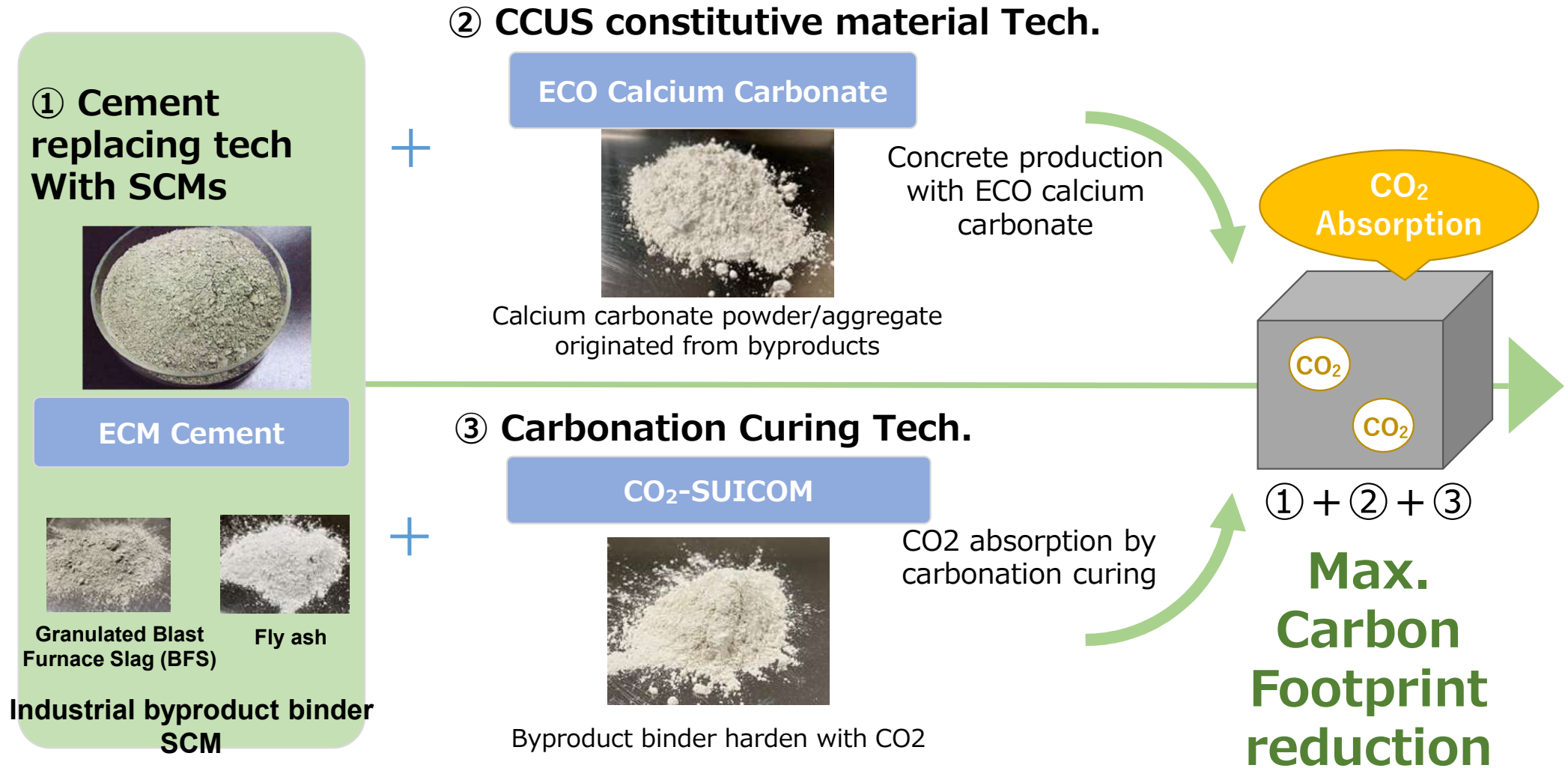
Carbon Neutral Target of Construction Company

	FY2030	FY2050
Company Emissions (Scope 1 & 2)	▲42%※	▲100% (Carbon Neutral)
Supply Chain Emissions (Scope 3)(Target for reduction: CO ₂ during building material manufacturing and building operation)	▲25%	▲100% (Carbon Neutral)

The FY2030 target was certified under SBT (1.5C° standard) in July 2023.

2. Three Approaches for Carbon Footprint Reduction in Concrete

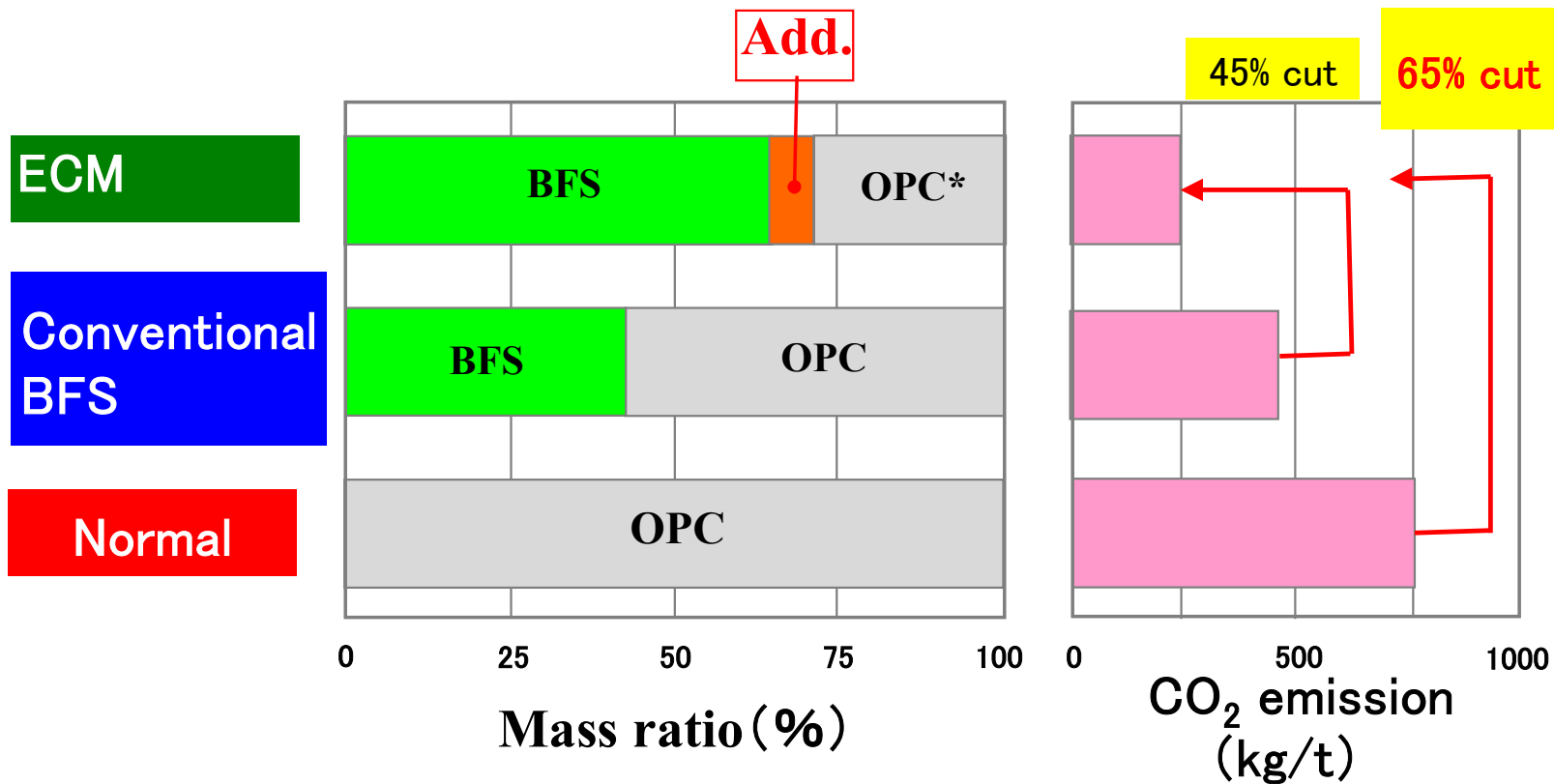
Three Major Ways for Carbon Neg./Nue. Concrete



3. New Concrete Technologies Achieving Sustainable Supply Chain in Construction

- 1) Energy and CO2 Minimum (ECM)
Concrete

Fundamental Components in ECM



*OPC: Ordinary Portland Cement



ECM has been applied in **110+ live projects** in Japan since 2014, with a combined total of **470,000m³**

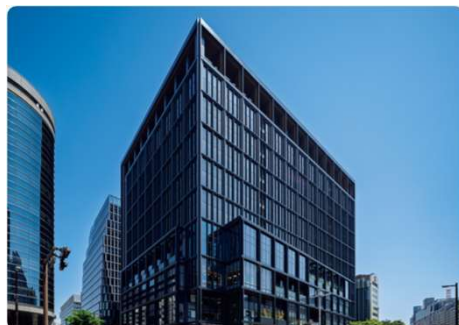
Kajima reference projects in Japan include the below. The first project using ECM in Singapore was completed in 2025.

01 Tokyo Midtown Hibiya



-  2018
-  Tokyo
-  15,000m³ ECM concrete applied
-  ECM used for foundation beams & basement walls
-  Mixed-use Development

02 One Fukuoka Building



-  2024
-  Fukuoka
-  10,600m³ ECM concrete applied
-  ECM used for foundation beams & basement retaining walls
-  Office

HG0

03 Osaka Heavy Ion Therapy Centre



-  2015
-  Osaka
-  7,500m³ ECM concrete applied
-  ECM used for foundation beams and raft foundation
-  Hospital

04 Takeshiba Office Tower



HG2

-  2020
-  Tokyo
-  1,100m³ ECM concrete applied
-  ECM used for basement structural frame and foundation
-  Office

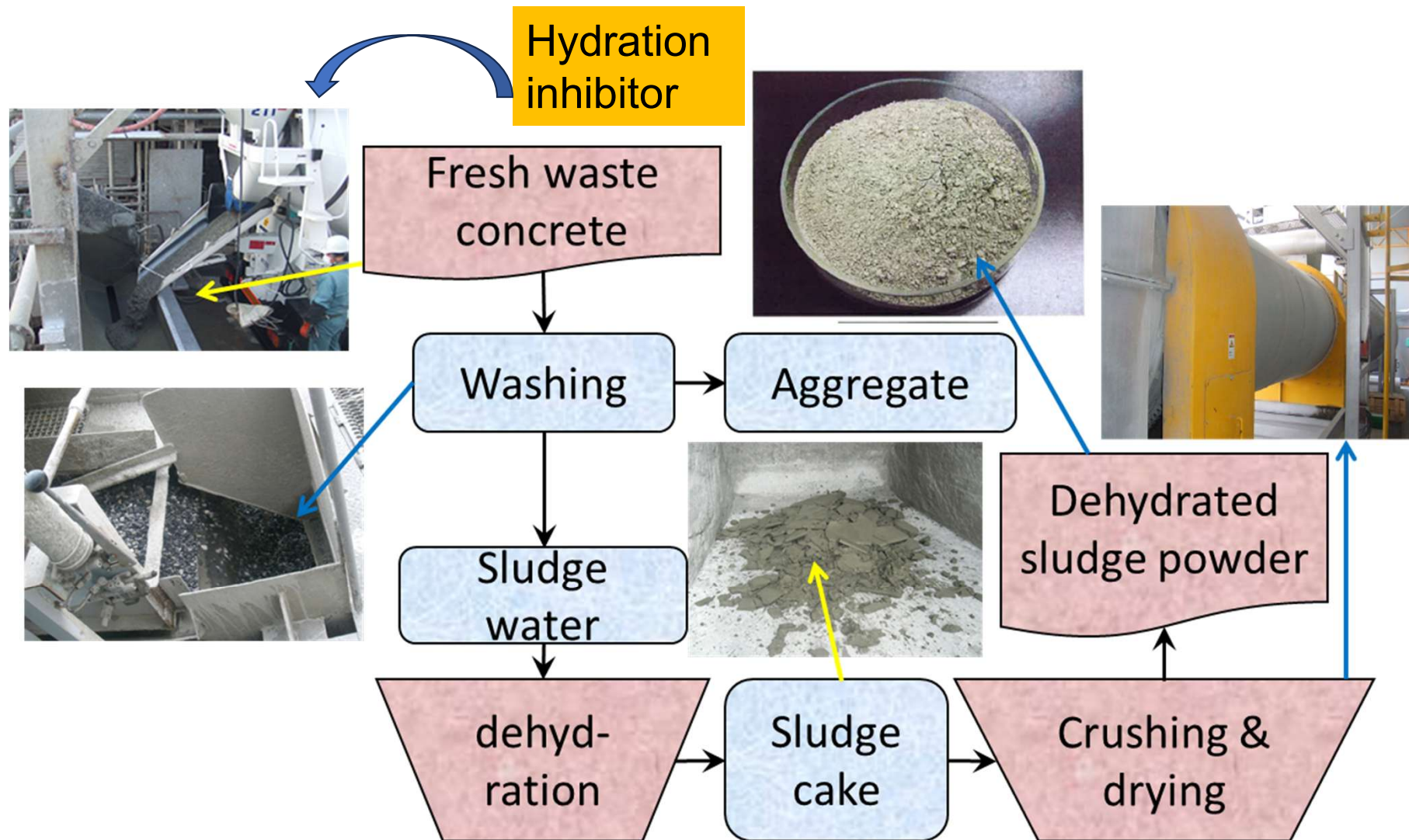
スライド 10

- HG0** Confirm this is the “Shin Fuku” building referenced in the spreadsheet
Image and other details found here: <https://www.kajima.co.jp/english/project/works/detail/202412ofb.html>
HENDERSON, Beth - The GEAR, 2026-07-17T03:05:40.458
- HG1** Check if these are the best 4 examples? Any others worth highlighting for special feature?
HENDERSON, Beth - The GEAR, 2026-07-17T03:27:12.468
- HG2** <https://www.kajima.co.jp/english/tech/kd/works/detail.html?id=169&kind=3>
HENDERSON, Beth - The GEAR, 2026-07-17T03:39:20.990

3. New Concrete Technologies Achieving Sustainable Supply Chain in Construction

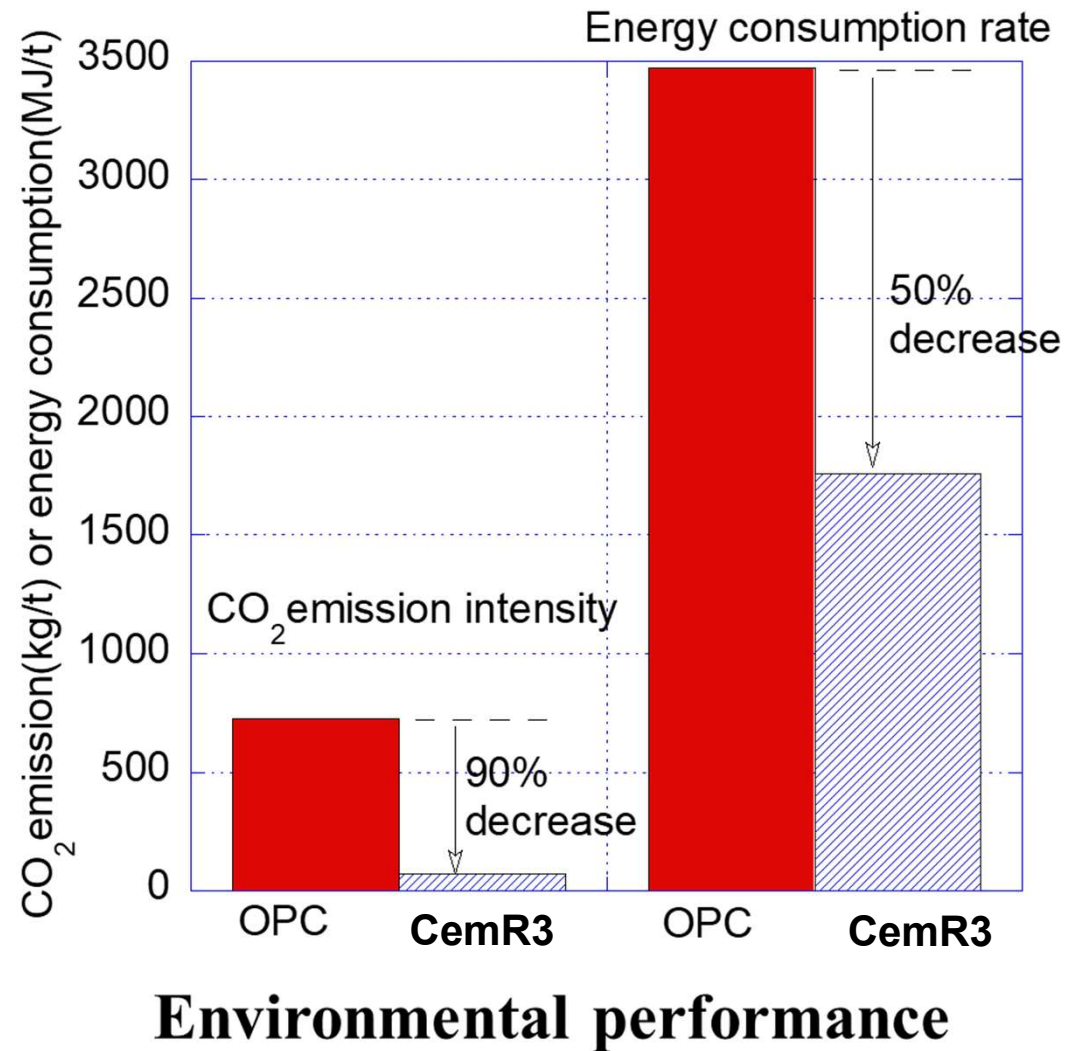
2) Recycle Cement Technology, CemR3

Recycle Cement Originated from Fresh Concrete Waste



Carbon Footprint of CemR3

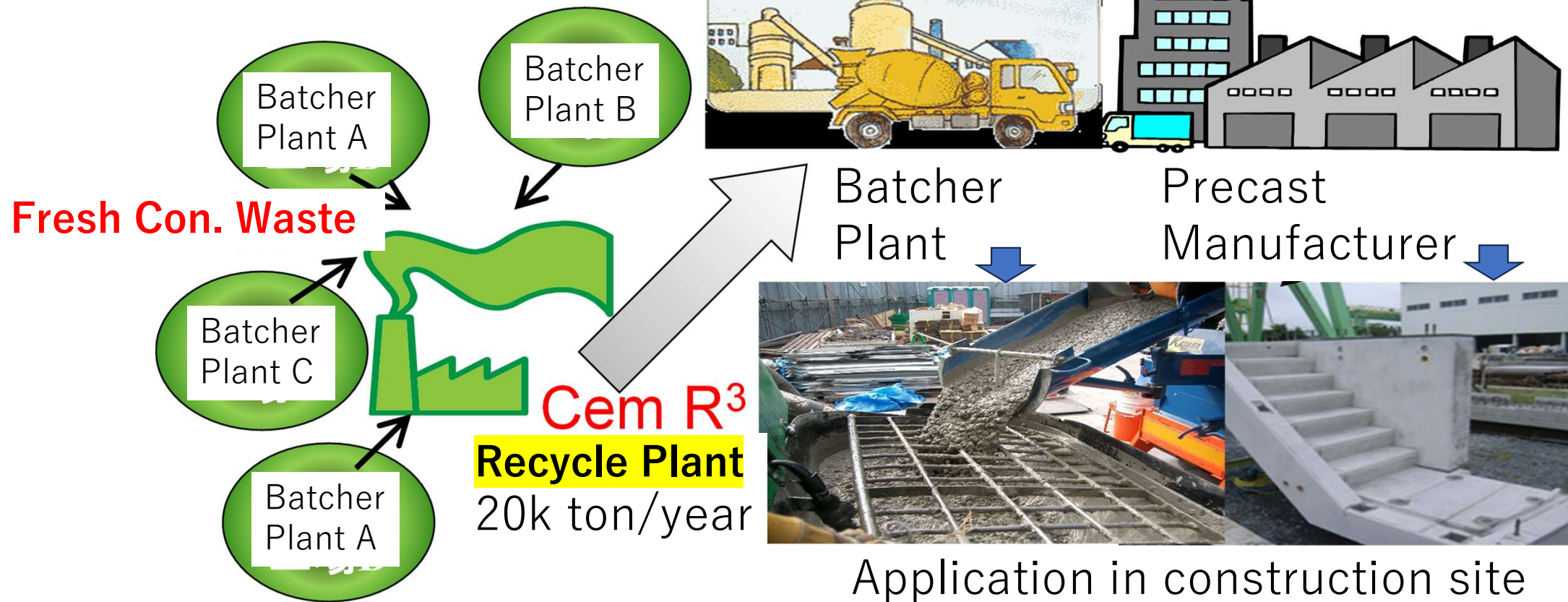
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Circular Supply Chane for Eco-crete R3

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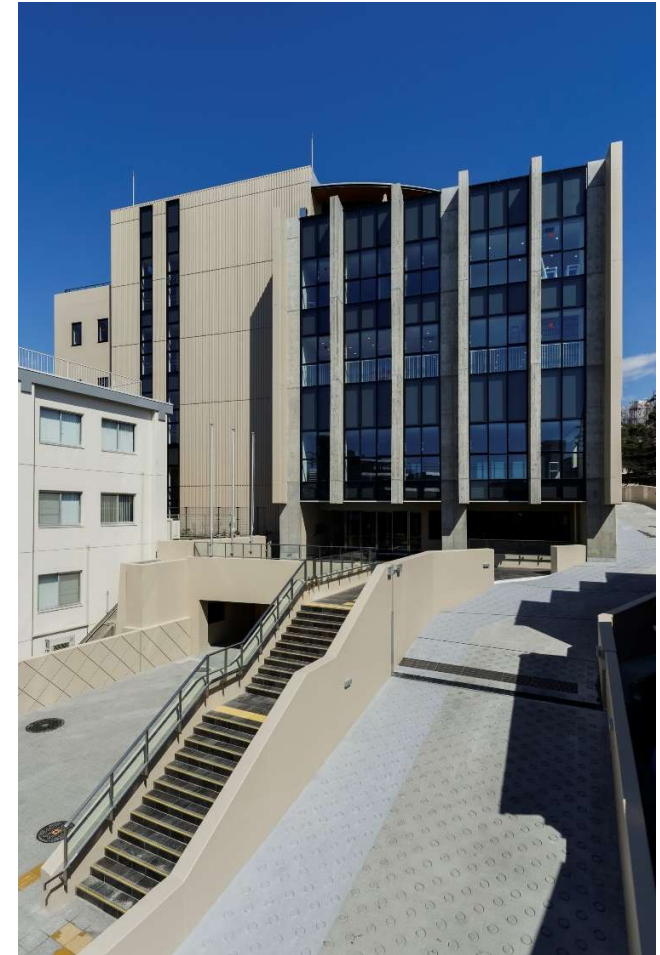
Producing Eco-crete R3



Typical Application in Public Construction Project

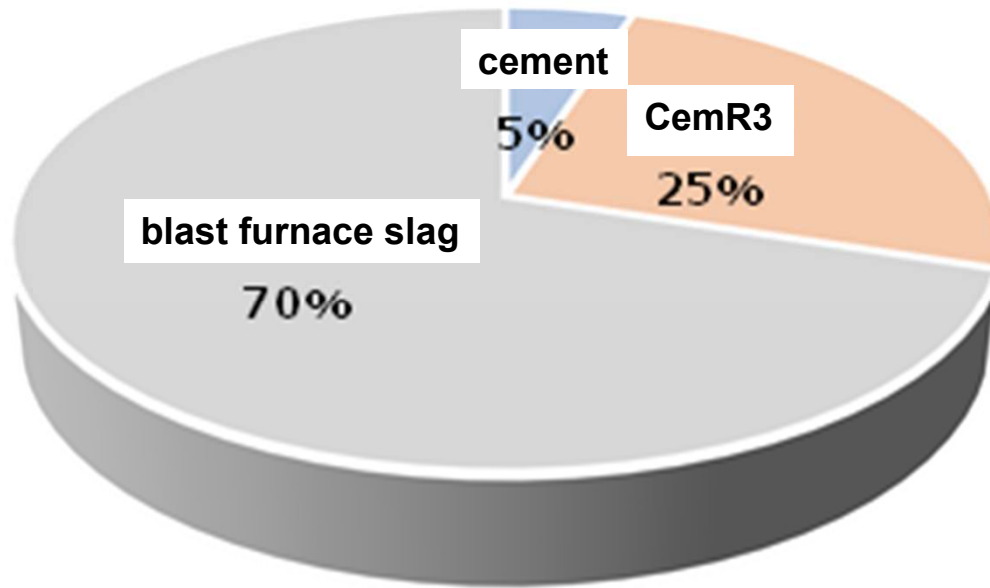
- Building name: F-place, Community Center in Fujisawa City
- Construction period 2016.6~2019.2
- Concrete with 30% CemR3 replacing OPC
- Cast-in-place, 6000m³ applied

Application examples reach more than 10 projects



Panoramic view of the building

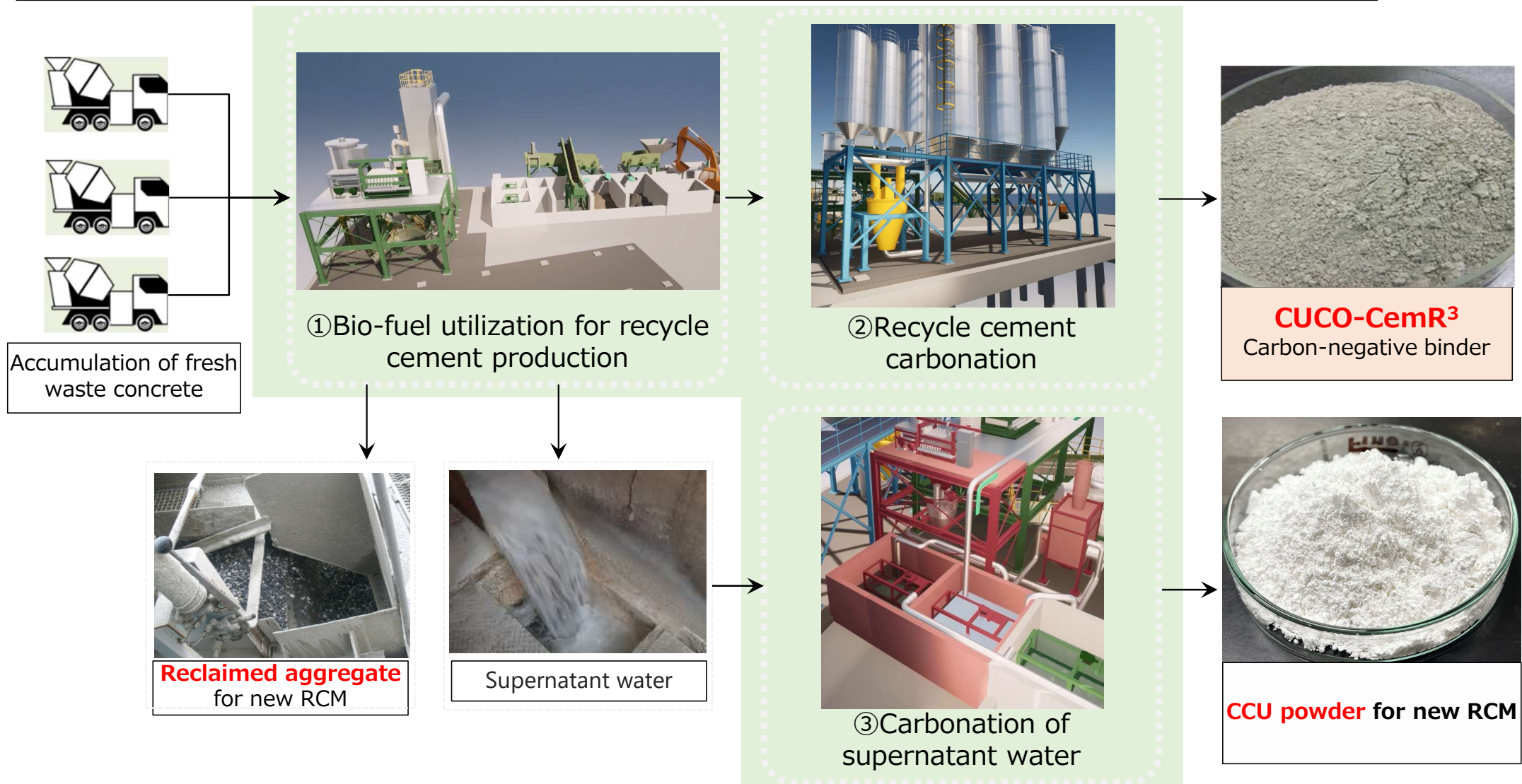
Further Progress: High-End Low Carbon Concrete



- CO2 emissions reduced by 90%, economically feasible
- Commercialized in construction projects after public certification, complies with building standards in Japan

Functions for total RCM total recycling plant

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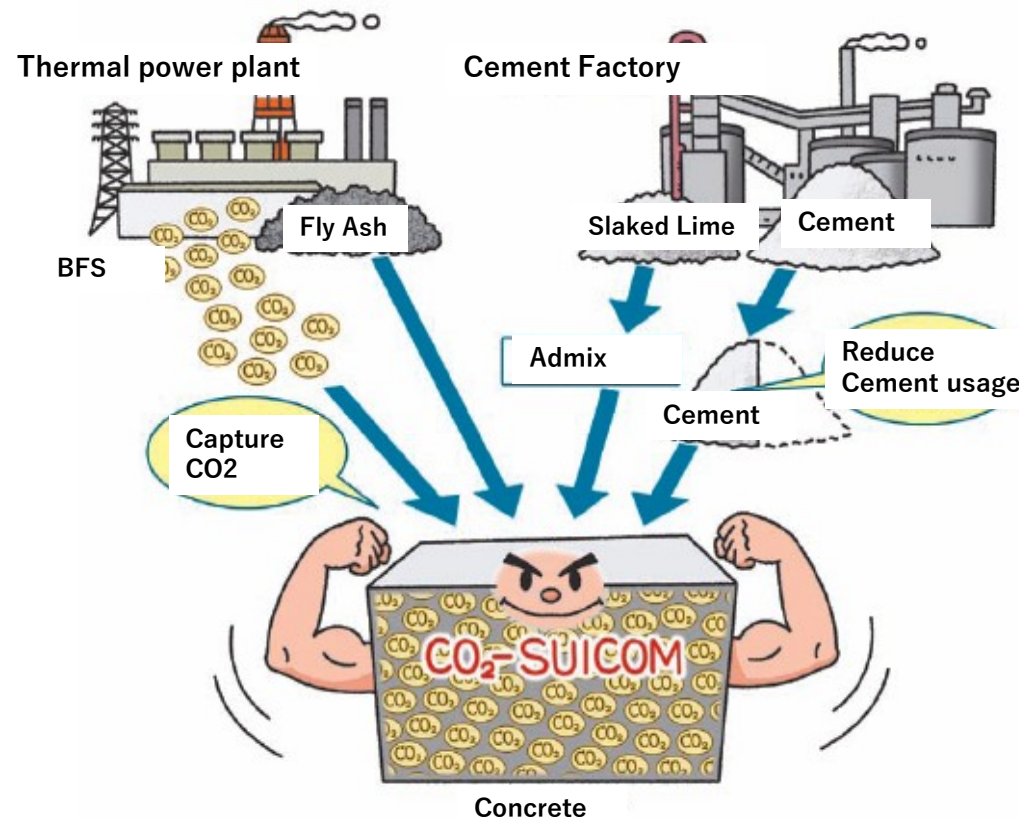


3. New Concrete Technologies Achieving Sustainable Supply Chain in Construction

3) CO2-SUICOM

What is CO₂-SUICOM?

CO₂-Storage and Utilization for Infrastructure by COncrete Materials

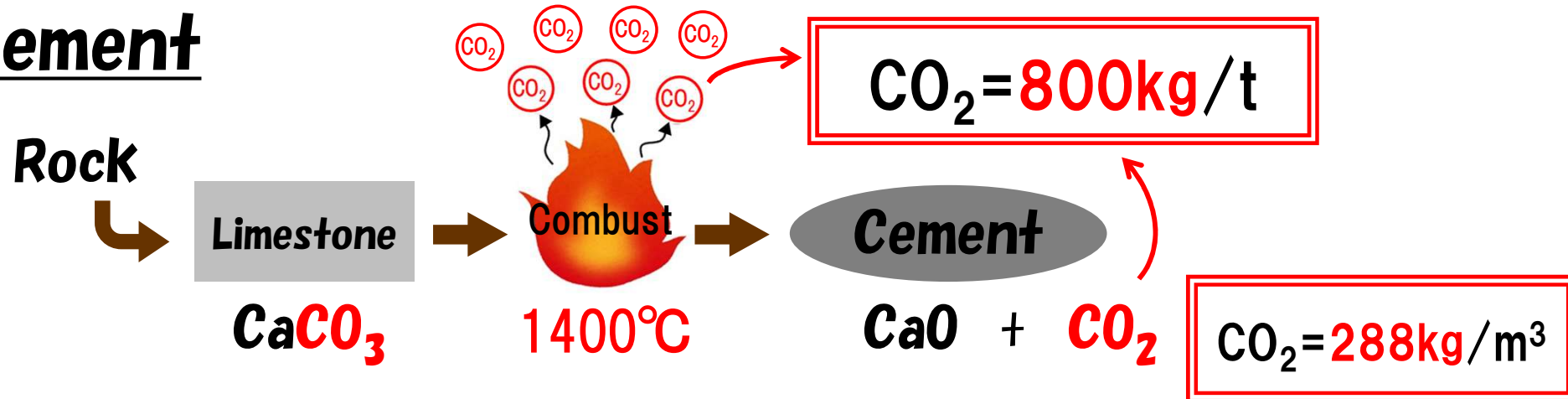


- During the initial curing process of the concrete, it takes a substantial amount of CO₂ and stores it inside the concrete, by forming CaCO₃.
- It is the first concrete enabling CO₂ negative without injecting CaCO₃ from outside.

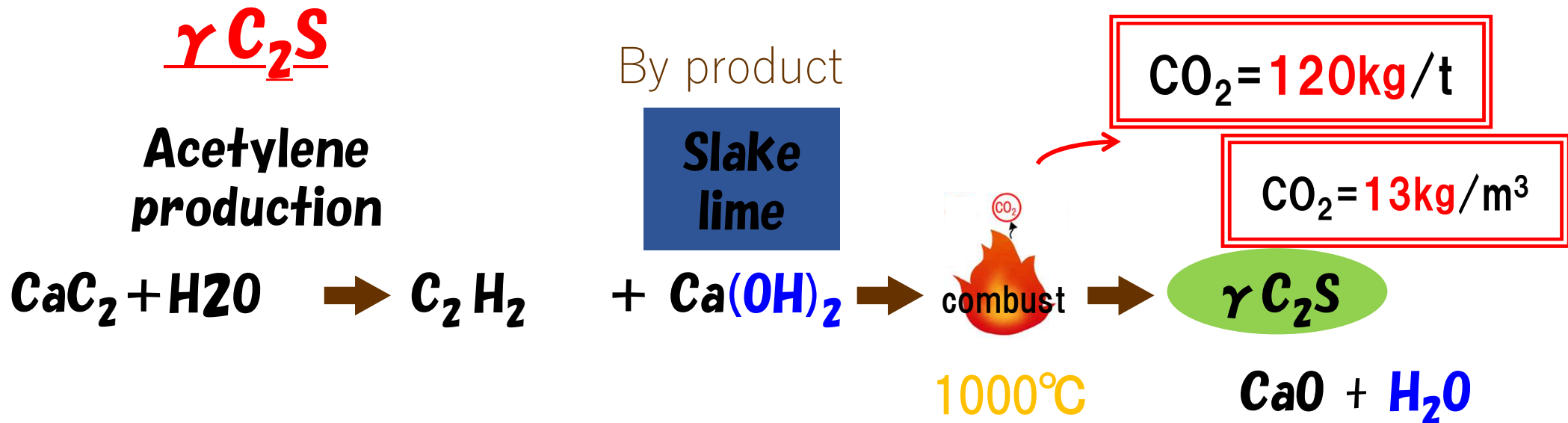
【Co-development by Kajima Corporation/
Chugoku Electric Power Company/Denka/Landes】

Comparison of CO₂ emission between Cement and γ C₂S

Cement



γ C₂S



Admixture γ -C₂S

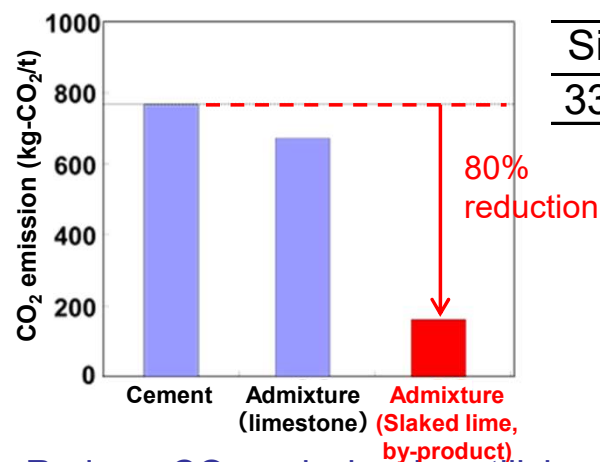
- Admixture γ -C₂S actively carbonizes with CO₂ (no hydration). Densification by the carbonization enhances the strength.

γ -C₂S



Atomization after calcination and cooling

CO₂ emission



Reduce CO₂ emission by utilizing by-product as the material

Chemical Composition

SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	CaO
33.5	0.3	1.2	64.6

Mineral Composition

γ -C ₂ S	β -C ₂ S
93.7	1.4

Chemical Reaction Formula for Carbonation of γ -C₂S



Conclusions

- Construction industry under strong pressure to reduce CO2 emission by society and customers
- SCOPE3 upstream dominates CO2 emission by material production, concrete and steel
- Three major approaches are to be adopted to reduce carbon footprint in concrete
- ECM concrete, high vol. SCM utilizing concrete with BFS, is effectively in practice in Asian region
- Recycle cement tech. with CemR3 is also large potential in application there.
- CO2-SUICOM is initiated to apply to reinforced concrete structures