Svante

CONFIDENTIAL

Carbon Leadership Forum

Lafarge Project CO2ment Richmond

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Svante Update

Svante has a 15-year first mover advantage

Business snapshot

- **15+** Years of research and development creating a commercially viable way to capture CO_2 for hard-to-abate industries using tailor-made nano-materials
- **84%** Of the broader carbon capture and removal market targeted through "Picks and Shovels" business model[1]
- **50%** Targeted capital cost advantage of Svante contactor versus equivalent liquid amine carbon capture equipment
- **122** Global patents providing strong IP protection on technology and design
- **160** Best-in-class team of experts led by Mr. Claude Letourneau

World renowned customers

climeworks, HOLCIM, Chevron, cenovus ENERGY

Best-in-class partners

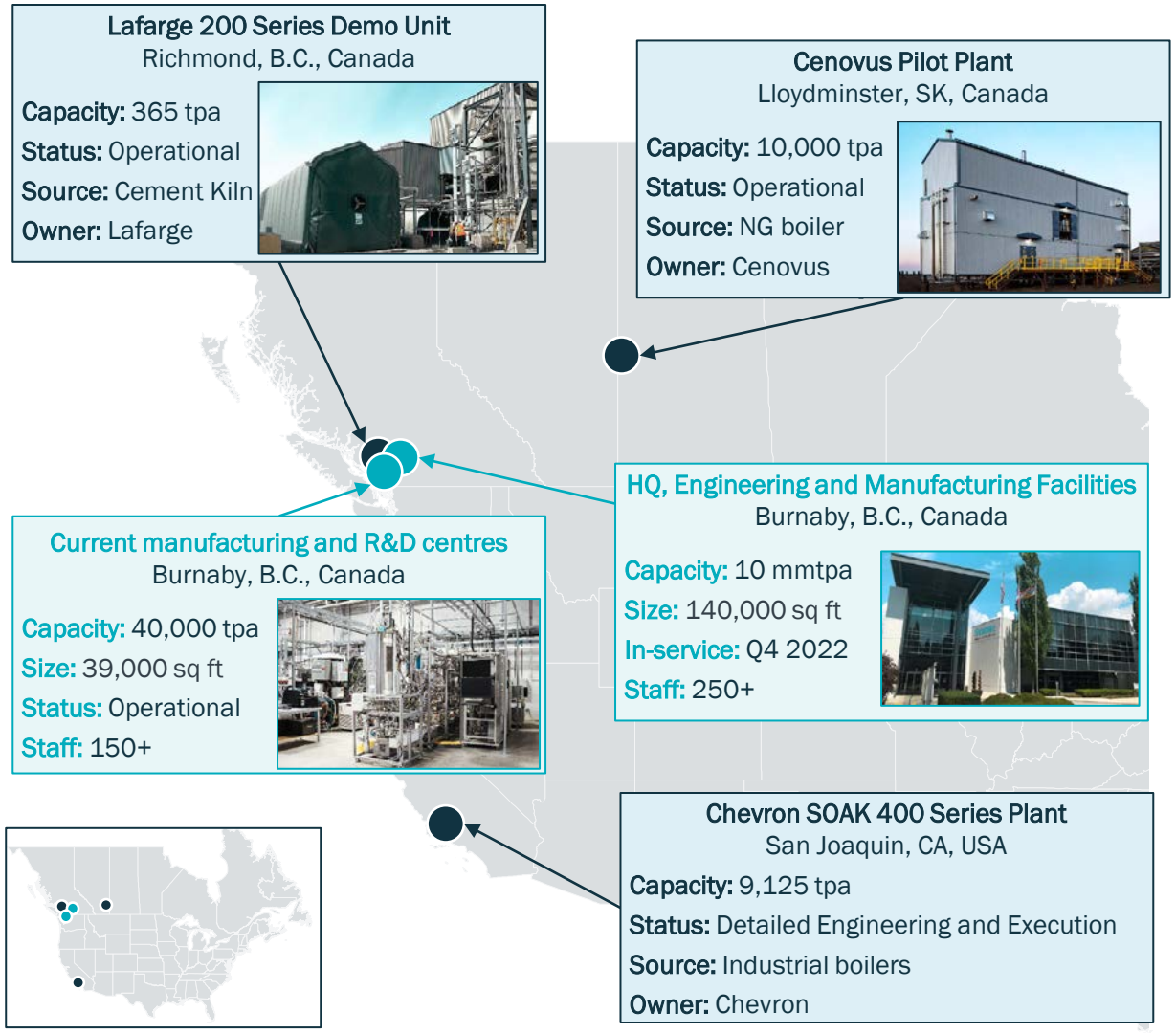
TEN TECHNIP ENERGIES, Kiewit, BASF The Chemical Company

"Thought leader" investors

TEMASEK, bdc, CARBONDIRECT, OGCI OIL AND GAS CLIMATE INITIATIVE, CHART, THE RODA GROUP

Svante footprint

Capture plants | Facilities



Note: [1] Removal refers to DAC and BECCS and excludes nature-based solutions

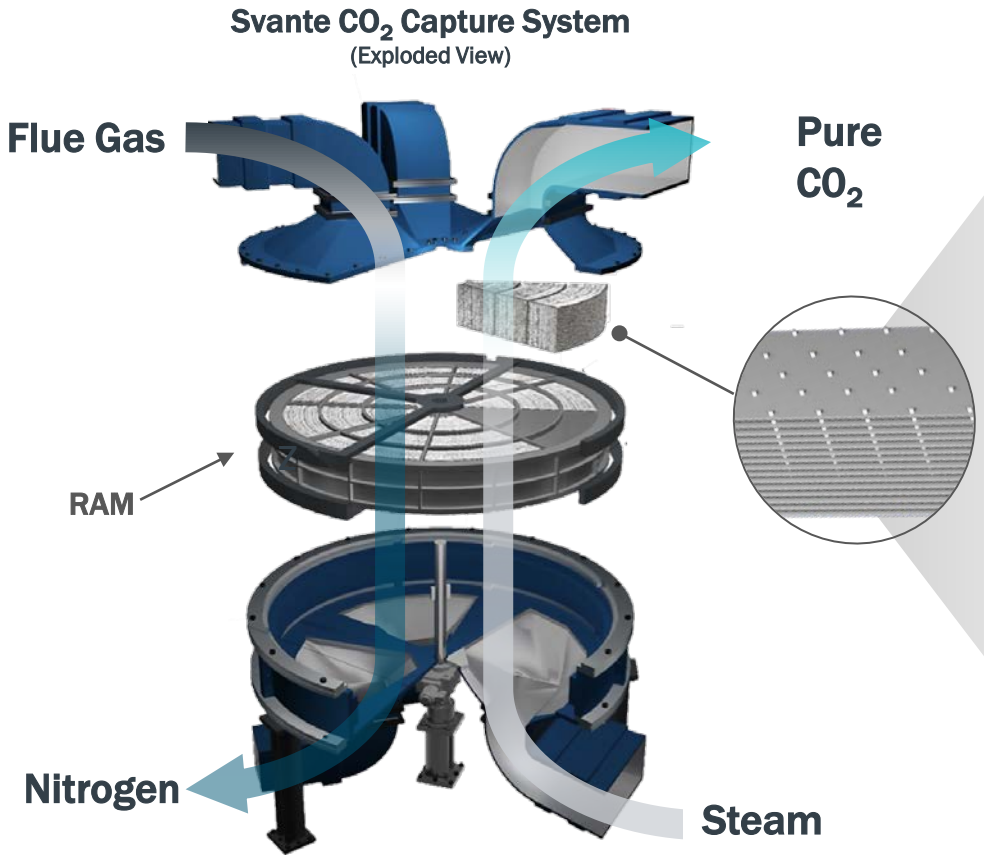
Svante's innovative process

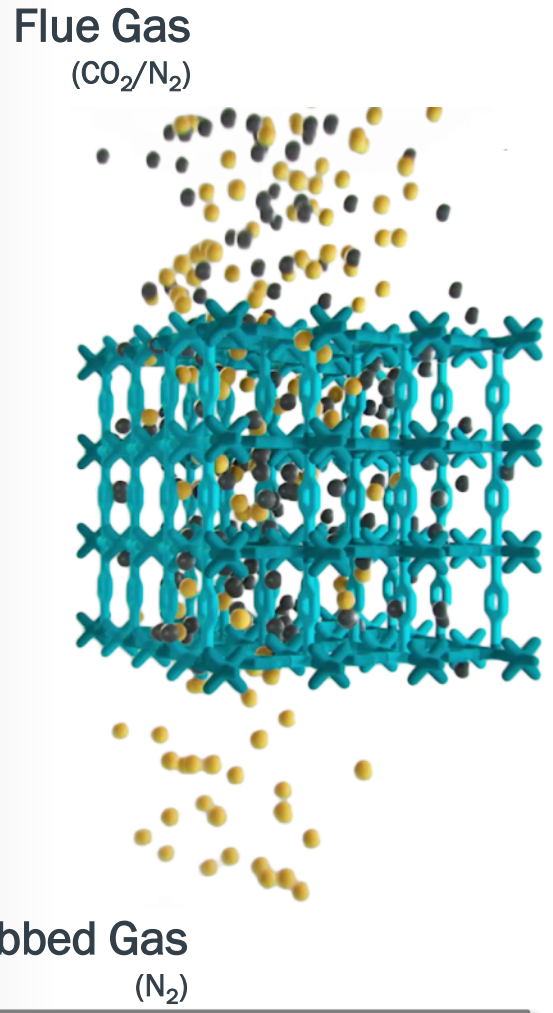
Powerful Nano-Filter
Tailored solid adsorbent with very high CO_2 capacity, robust to industrial emissions

Structured Adsorbents
Optimize mass and heat transfer, maximizing loading of active adsorbent per unit volume

Rapid Cycle
Structured Adsorbents switches between adsorbing and releasing CO_2 in 60 seconds - high productivity with low pressure drop

Low Cost Equipment
Rotary Adsorption Machine allows Rapid Cycle to take place as a continuous process in compact, low cost industrial equipment





Svante's capture system highly productive, scalable, and low cost

Svante is the "Picks and Shovels" for carbon capture and removal

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Source	Capture Technology	Utilization and Sequestration

Reduction

Removal

- Industry — 8–20%[1]
- H_2 Production — 20%
- BECCS — 10%+
- DAC — 0.04%

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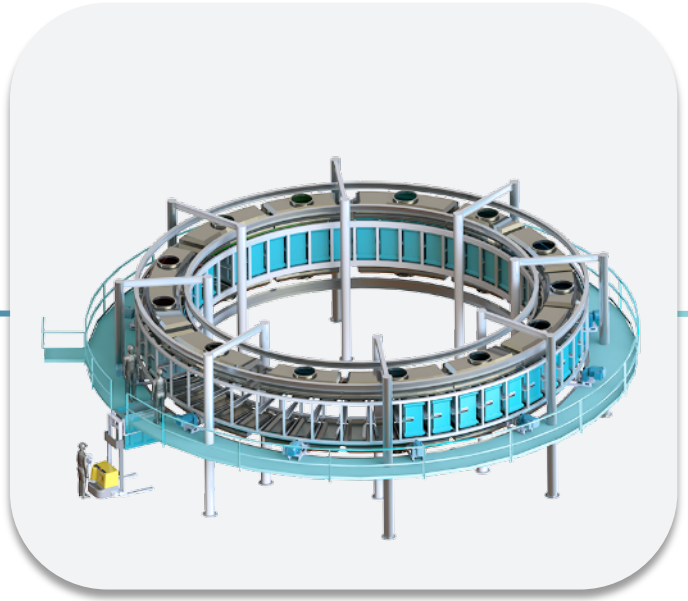


95%

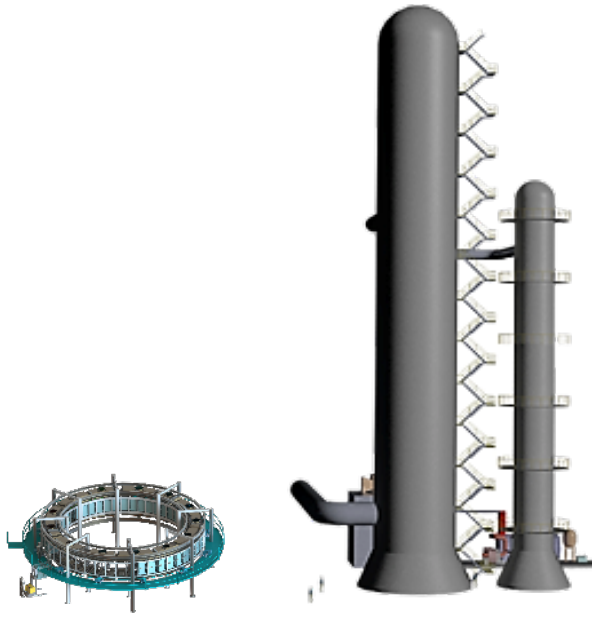
- CO_2 Storage
  - Offshore storage
  - Saline aquifer
  - Depleted oil reservoirs and EOR
  - Salt dome storage
- CO_2 Liquid fuel
  - Jet fuel (SAS)
  - Methanol
  - Gasoline
  - Diesel
- CO_2 Conversion
  - Cured concrete
  - CO_2 to fuel/biomass
  - CO_2 to chemicals
  - Producing a food-grade CO_2
  - Mineral carbonation

Note: [1] Refers to CO_2 concentration

Svante has a significant advantage over traditional solvent technologies

	Svante's Solid Adsorbent	Liquid Solvents (conventional carbon capture)
Technology Description	– Separation relies on adsorption of CO_2 onto a solid surface – Regenerated using direct steam in an intensified temperature/concentration swing process that enables very rapid cycles	– Separation relies on chemical reaction of CO_2 with a liquid solvent – CO_2 regenerated by reversing chemical reaction/liquid absorption through use of indirect heating in regenerator/stripper column
Modularization and Scalability	Adaptable and cost efficient at all scales due to the repeatability of the modular design	Difficult to modularize large towers, restricts scalability and deployment
Ability to Deal with Intermittency of Emitters	High	Low
Toxic Fugitive Emissions	None – solid sorbent	Amines, nitrosamines, nitramines
Capital Intensity[1]	~$200 / annual tonne (nameplate)	$300 – $400+ / annual tonne (nameplate & built)
Near Term Operating Costs	$20 - $30 / tonne of CO_2 captured (lower in future)	$20 - $30 / tonne of CO_2 captured
Potential for Further Cost Reduction	New solid-state technology poised for significant cost reduction learning curve	Established liquid chemical plant technology, limited room for further cost improvements

System comparison



Svante's Solid Adsorbent Technology

Conventional Carbon Capture Technology Using Liquid Solvents

Note: [1] Capital intensity calculated as total installed capital cost divided by annual CO_2 capture assuming 100% of nameplate capacity and 365 days of operations

Lafarge Project CO2ment Richmond

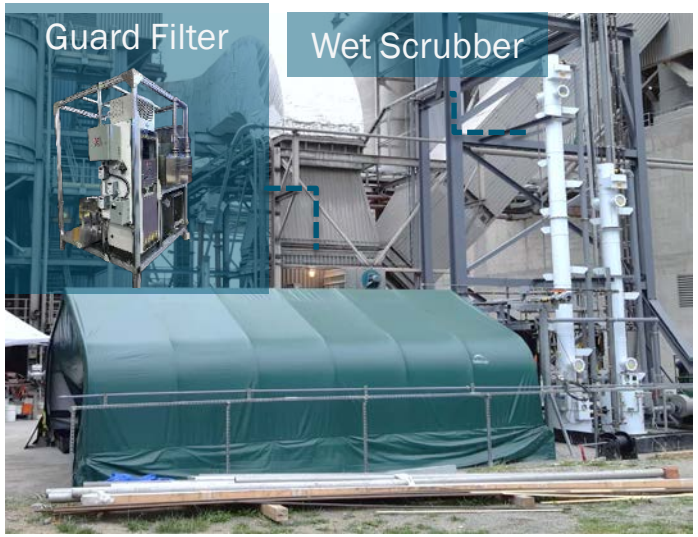
Lafarge Project CO_2MENT

LafargeHolcim TOTAL CCP Svante

PHASE 1

Pre-treatment

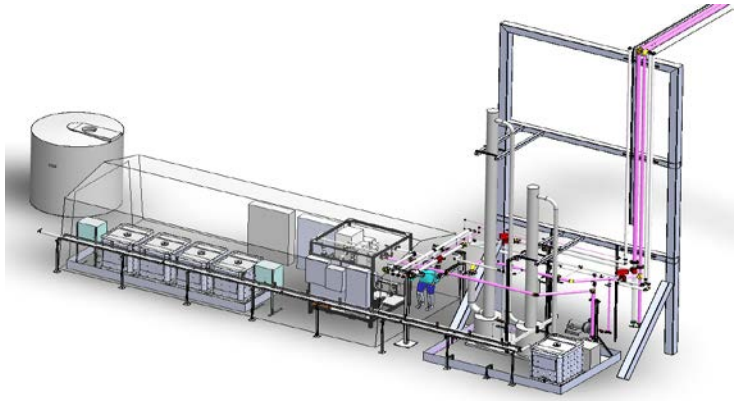
Manage **harmful organic and inorganic** substances in the cement flue gas by **measuring and qualifying** the effect of a contaminant mitigation system



PHASE 2 - CURRENT

CO_2 Capture

Separate the CO_2 from the flue gas using a **customized-for-cement version Svante's** carbon capture technology



PHASE 3

CO_2 Utilization

Prepare CO_2 for reuse and support the **demonstration of CO_2 conversion technologies** on-site such as **low-carbon fuels and CO_2-injected concrete and fly ash**

Blue Planet

Dimensional Energy

Carbon Upcycling Technologies

Cement flue gas – Challenges with CO_2 capture

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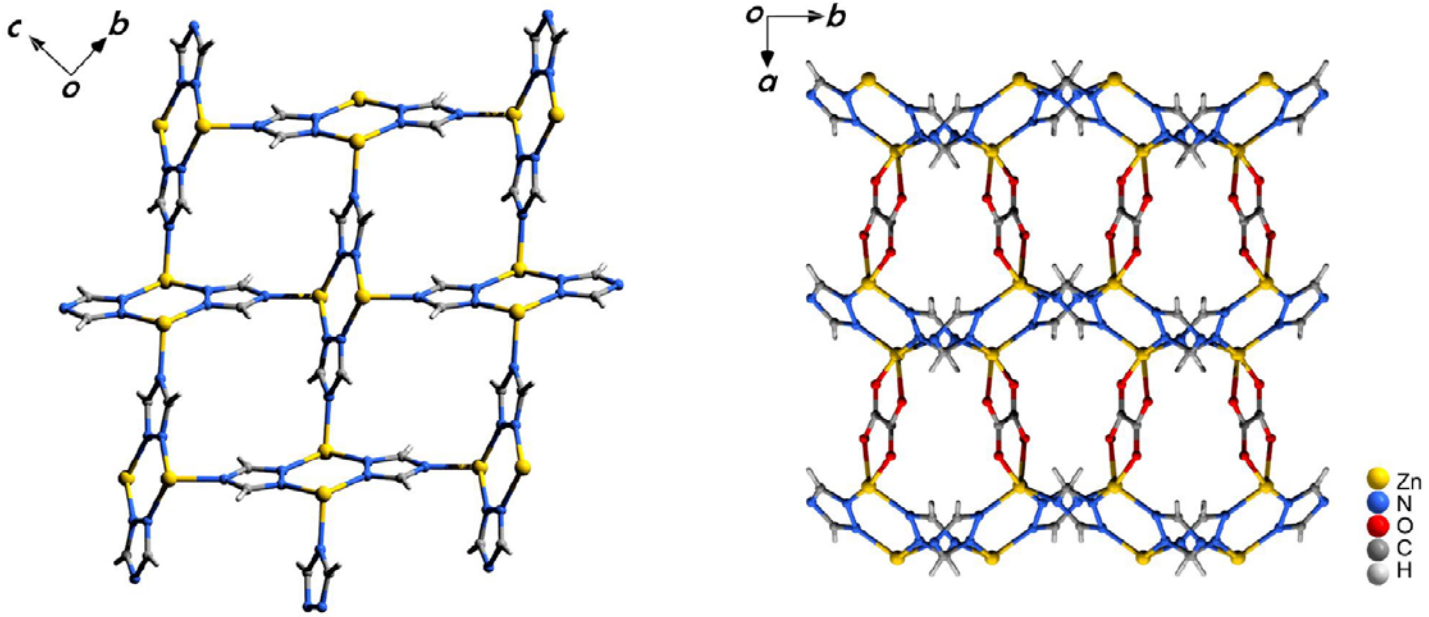
Cement flue gas has relatively **high O_2 content (8-12%)** which increased oxidation and could decrease some sorbent lifetime

High amount of **contaminants (SOx and NOx)** which could significantly decrease the sorbent lifetime and increase the cost of capture if contaminant pre-treatment at very low level is required (< 2 PPM)

Particulates that can contaminate or block the active adsorbent material

Metal Organic Framework (MOF)

CALF-20 – Zinc 1,2,4-Triazolate Oxalate



- Structure from Rietveld – crystals have never grown
- 3-D channels comprising 38% of the volume, ~500 m^2/gm surface area.
- pores (vdW radii) of 2.73 × 2.91, 1.94 × 3.11, 2.74 × 3.04 Å ([100], [011], [0-11]

Taylor, Vaidhyanathan, Lin, Mah, Dawson, Iremonger, Deakin, Shimizu
Patent awarded and licensed for post-combustion and air capture.

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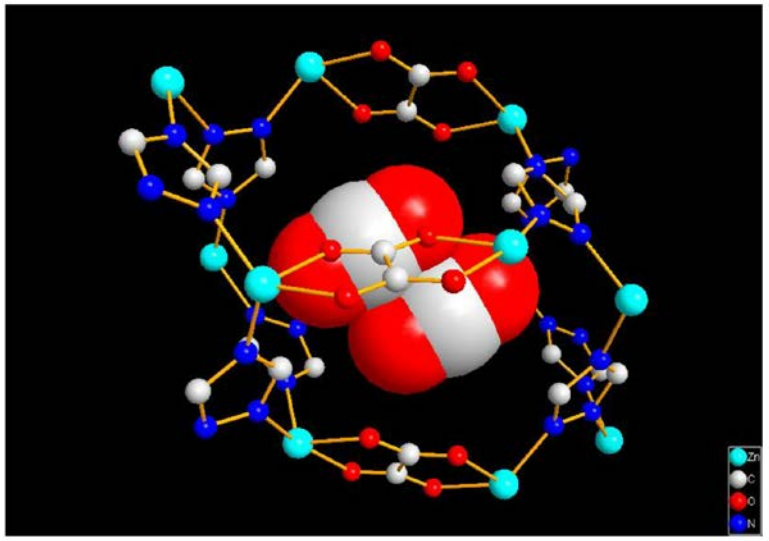
Metal framework (Zn)
Organic Ligand (oxalate)
Not amine based (physisorption)

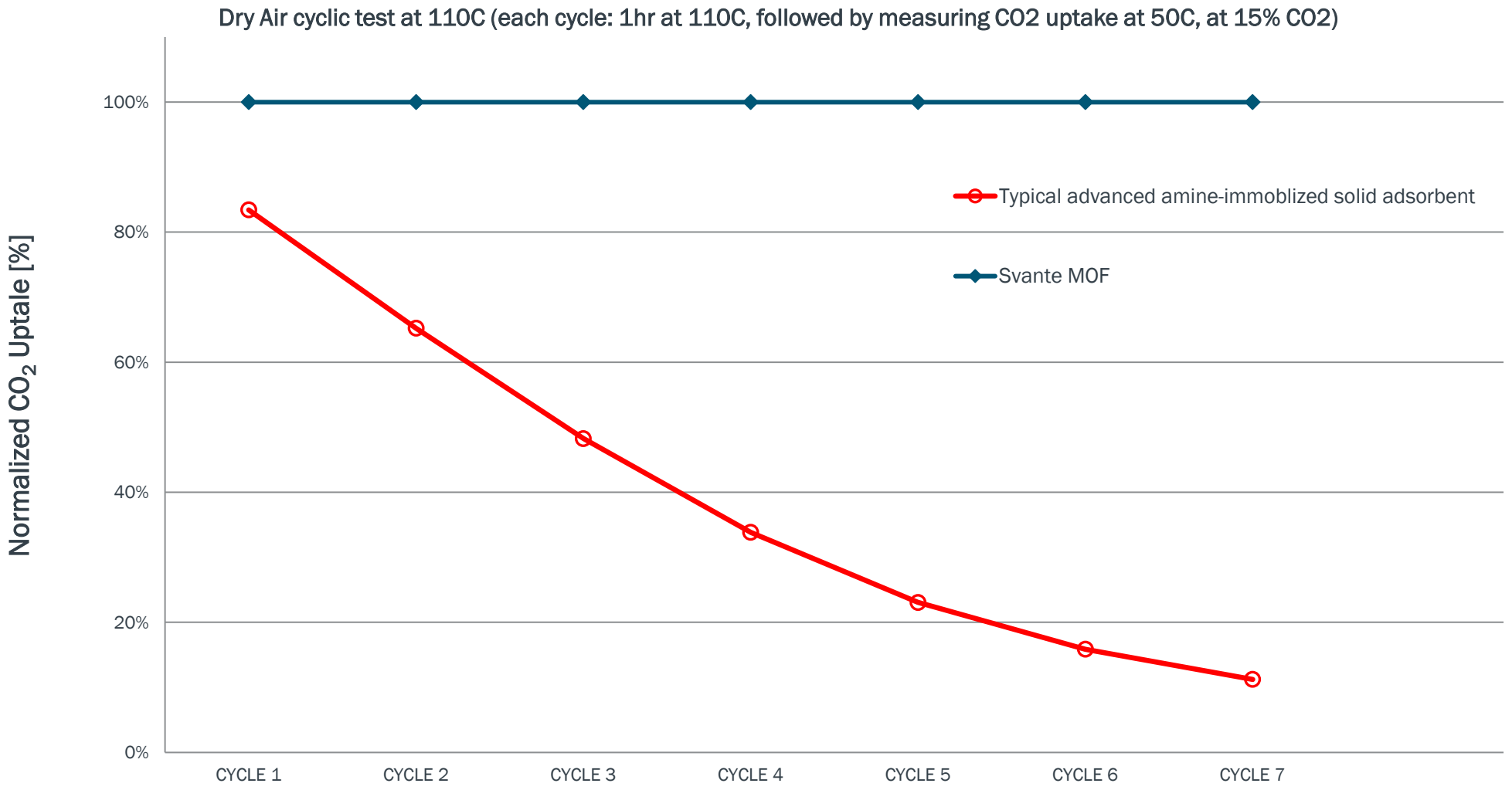


At 1.00 atm pressure, the main CO_2 binding site is between the oxalate groups.

This MOF has very special properties:

High volumetric and gravimetric CO_2 capacity
Stable to water (liquid, steam)
Stable to O_2 up to 140C
Easily scalable (low cost)
Easy to process in a laminate
More stable to NOx and SOx

Metal Organic Framework (MOF) – **Oxidation stability**



This MOF material is showing complete **stability to dry O_2 up to 150C**

Temperature Profile of Metal Organic Framework Adsorbent

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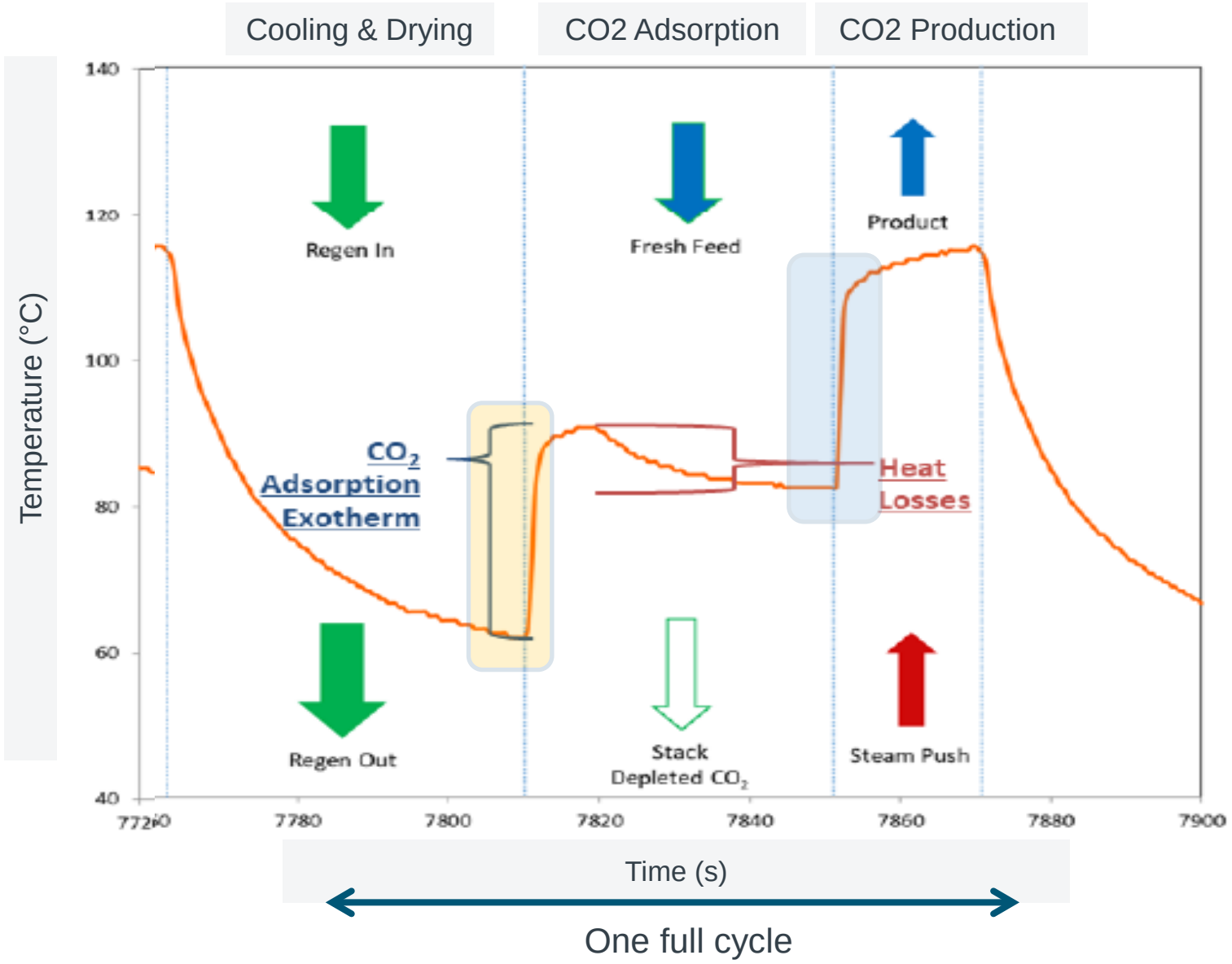

Svante's technology uses **low pressure steam** to directly regenerate the adsorbent due to a fast temperature increase of te bed

Short cycle time increases the productivity of the process decreasing the required adsorbent and makes CO_2 capture more economical

Project CO_2MENT – **Phase 1 Operational**

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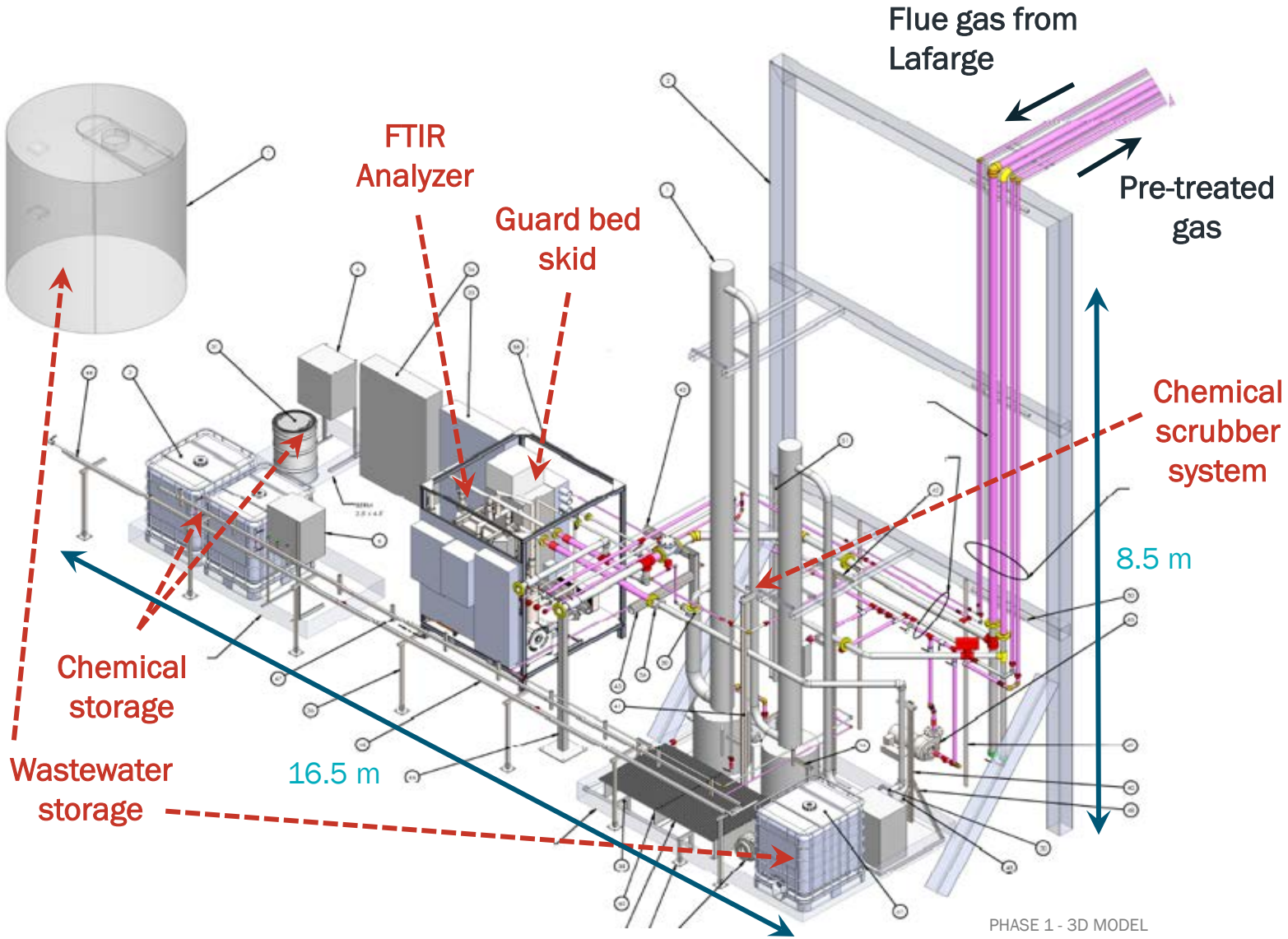
PHASE 1
in operation since Nov. 2019

Contaminants Pre-treatment System (CPS)

Understand and measure cement plant flue gas

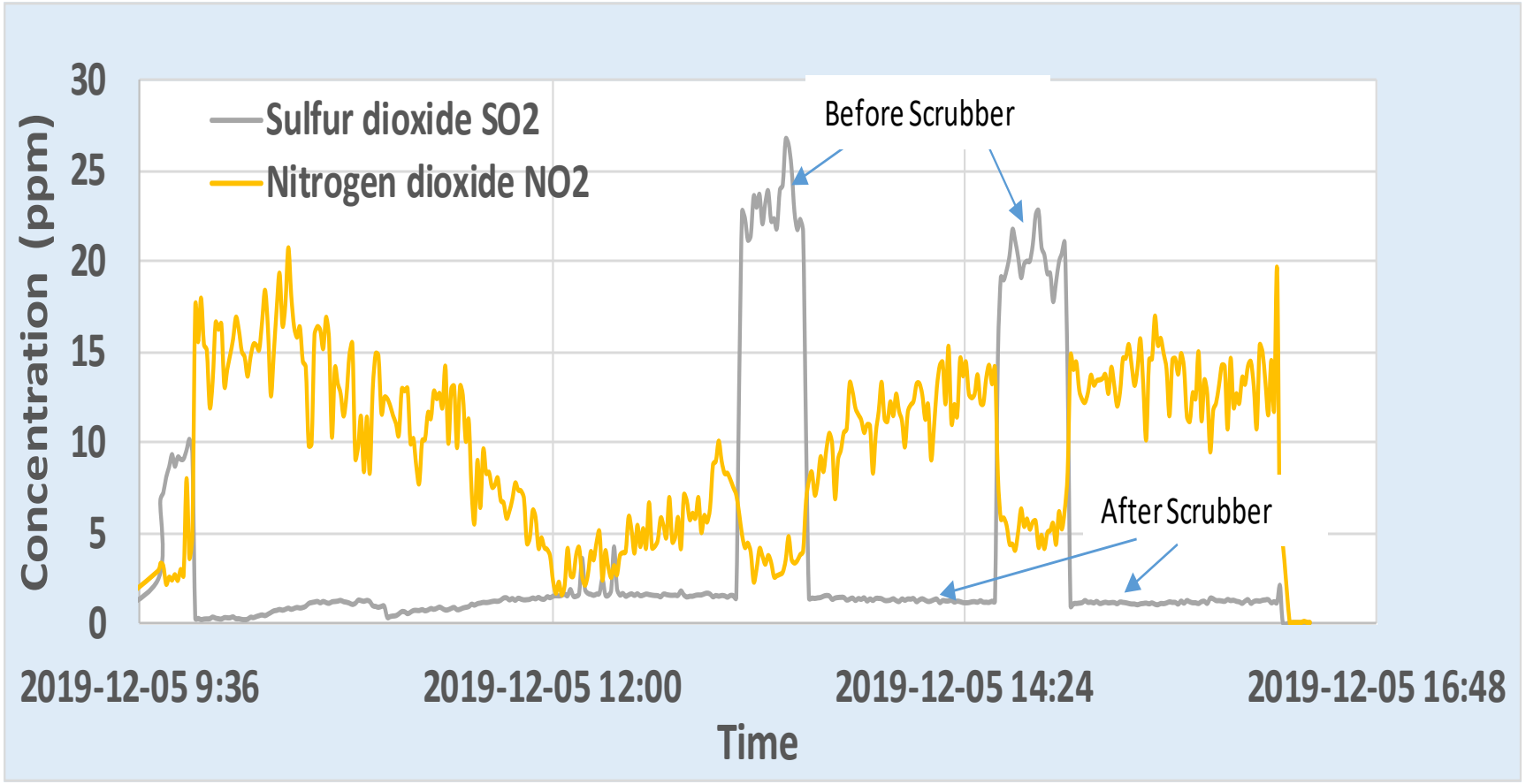
Assess Svante's guard bed performance

Provide controlled contaminants to Phase 2 for sensitivity analysis



PHASE 1 - 3D MODEL

Project CO_2MENT – **SO_2 and NO_2 before & after liquid scrubber**



Stage 2 only (NaOH)

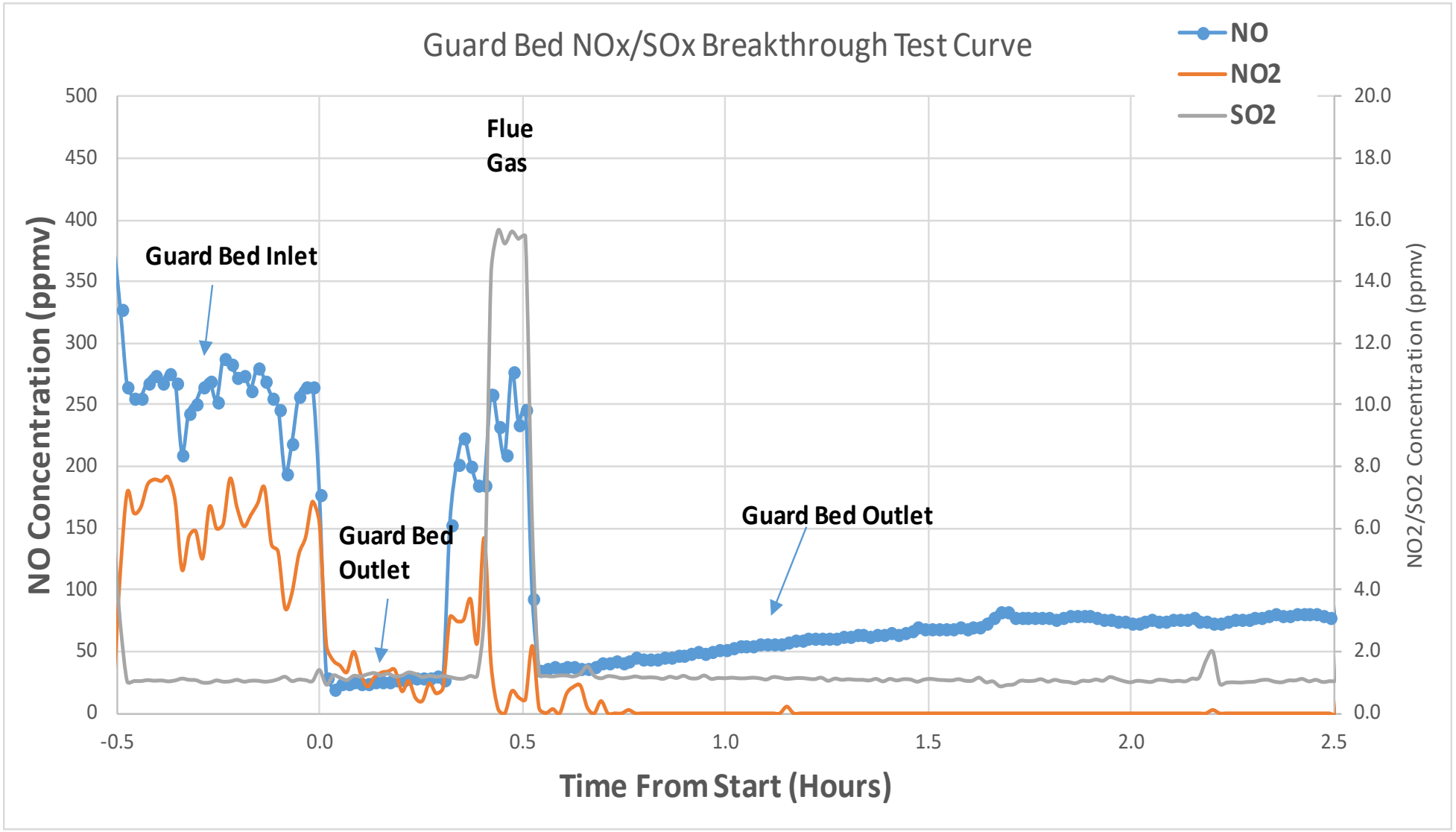
PH 6.8-7

Make-up water ~ 5GPH

No CO_2 loss

It was possible with this liquid scrubber to decrease the SO_2 < 2 PPM

Project CO_2MENT – **Guard Bed Scrubbing**



Svante proprietary guard beds will be used to control the amount of NO and NO_2 going to capture plant

Liquid scrubbers will be used for SO_2 control

Project CO_2MENT – 1TPD Phase 2 MOF Capture Plant

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PHASE 2
start-up in December 2020

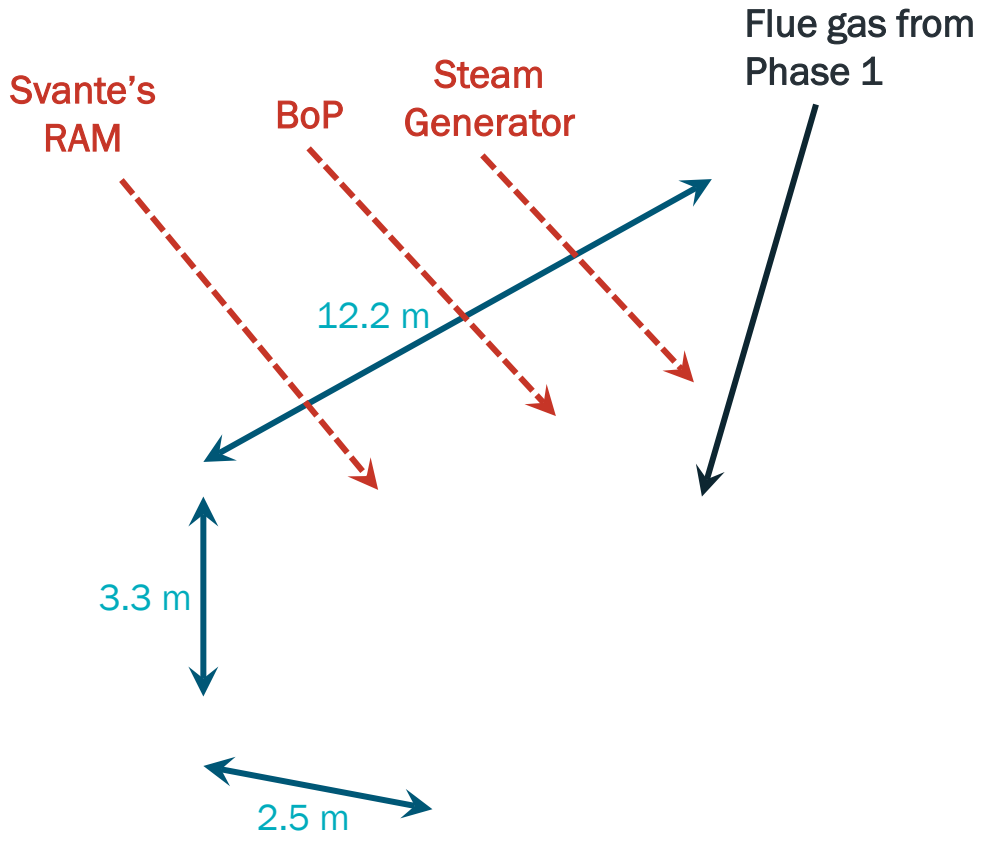
CO_2 Capture ~1TPD skid unit

Test new **Metal Organic Framework** adsorbent

Test new **Rotary Adsorption Machine** (RAM) design

Test new **Waste Heat Recycle** process cycle

Assessment of plant efficiency and durability



DRAFT - PHASE 2 - 3D MODEL

Project CO_2MENT – 1TPD Phase 2 MOF Capture Plant

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Pre-Treatment System & Capture Plant

RAM

Improvement of Adsorbent Stability Over Time

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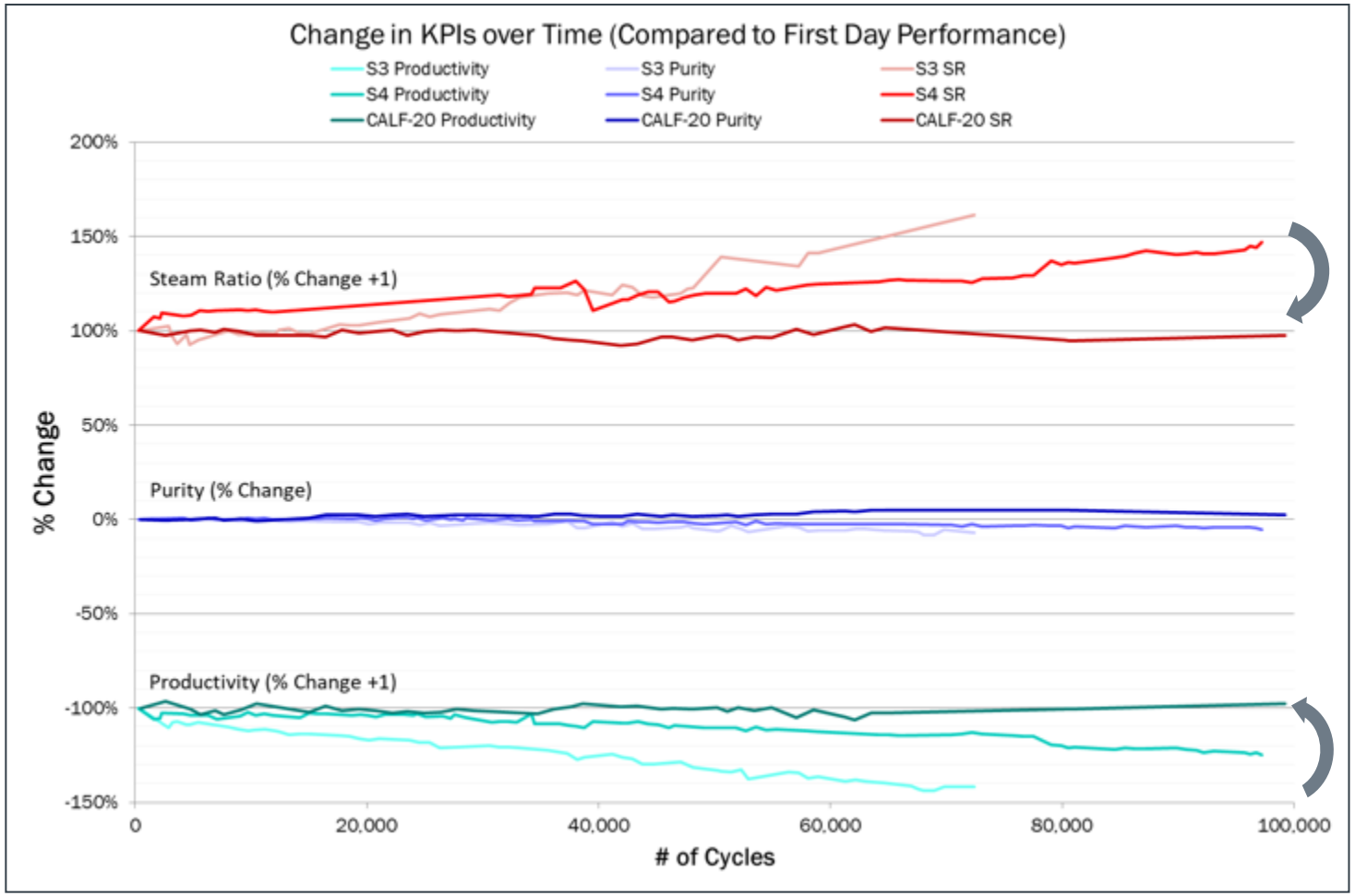
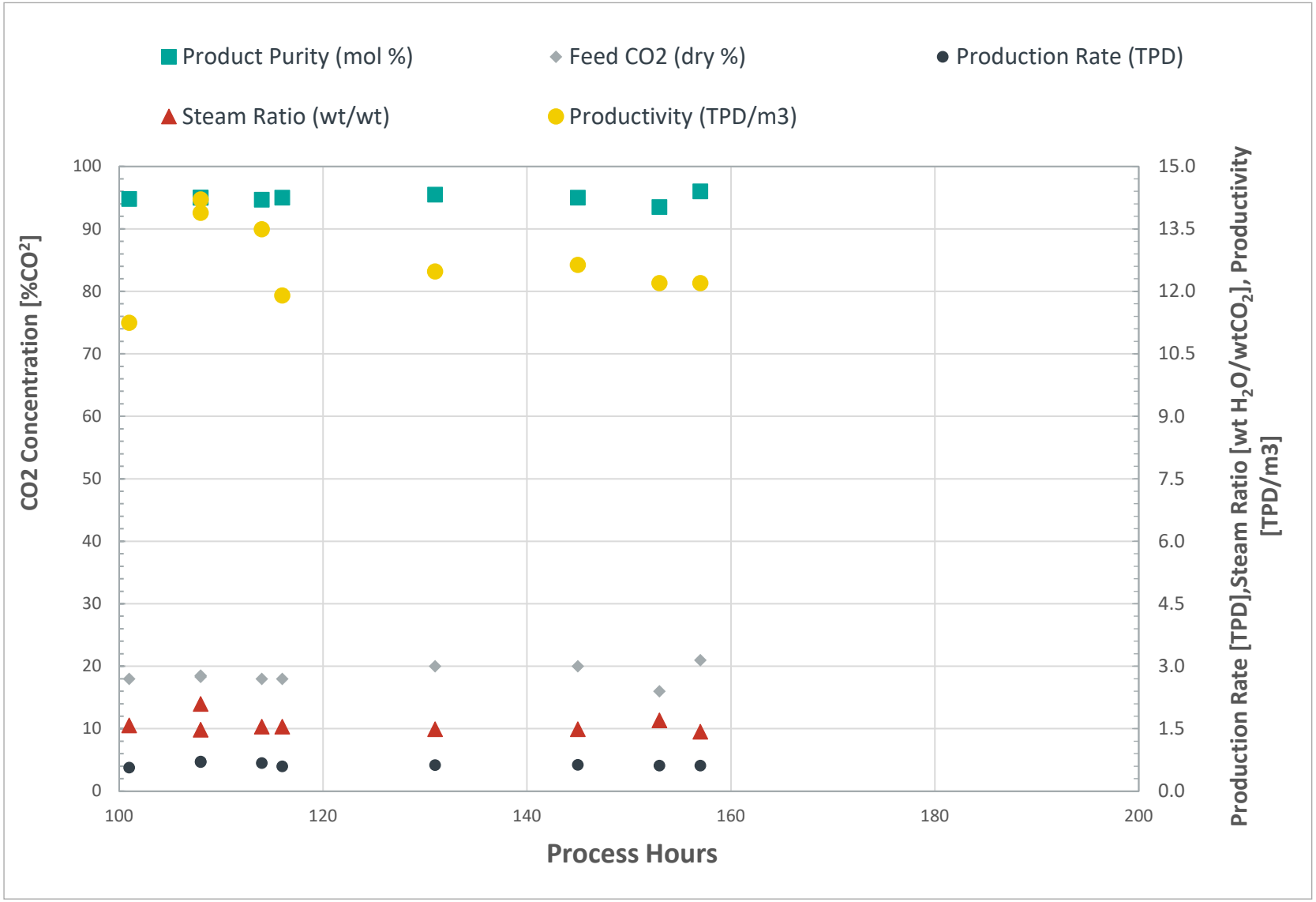
Major Improvements Over Time

- Adsorbent stability has improved dramatically through adsorbent and cycle development
  - Better stability to liquid water
  - Less sensitive to oxidation
  - Cycle development designed to avoid/minimize degradation conditions
- Bed autopsy after testing provides feedback for adsorbent development, bed build, mechanical, etc.



CALF-20 Field Performance | Lafarge Richmond (Cement)

- Testing of CALF-20 SAB filter beds in a full 48-bed configuration and with a waste-heat recycle cycle implemented began on May 4, 2022, after ~100 hours of cycle tuning and run-in
- The Richmond field demonstration has demonstrated the 2022 performance KPI targets of a simultaneous achievement of a steam ratio of <1.5, CO_2 purity >95% and CO_2 recovery > 90%



LAFARGE

A MEMBER OF HOLCIM

Richmond Cement CO2 Utilization Options

- The vision for Richmond is to establish an innovation hub, to scale Svante's capture technology and trial a small cohort of promising utilization technologies to ensure long term removal or displacement of the CO2 from the atmosphere in alignment with Lafarge's Sustainability Goals.

- Ideal technologies would provide a long term commercial benefit for Lafarge

- The CO2MENT Project has advanced at Richmond to consistently capture 1 tonne/CO2 day. Over the course of the last year, a variety of clean technologies for CO2 utilization have been assessed considering captured CO2 as a feedstock. Capture remains a priority to achieving net-zero.

- Demonstration of technologies in an industrial environment will enable future investment decisions in support of net-zero goals and decarbonization of the cement manufacturing process. This approach will also open doors for strategic partners and government funding applications.

Summary of Technologies

Company	Proposal	Timeline
Carbon Upcycling	Reactor (200t/day) to use flue gas CO2	>6 months
Dimensional Energy	Pilot at RMD to produce syncrude, to transfer to Parkland for production of diesel and sustainable aviation fuel	6-12 months
Windset Farms	Utilize captured CO2 at Greenhouses in Delta (*requires liquefaction trailer)	6 months
Svante	*Liquefaction Trailer	5 months
	Scoping Study for increased capture	6 months
Blue Planet	*Liquefaction Trailer - Providing liquefied CO2 from Lafarge for testing	6 months

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Capturing Carbon, Economically Today

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