



Rotary Lime Kiln Oxyfuel Retrofit

FECM NETL Carbon Management Project Review Meeting
FOA 2614 Round 4 Kick-off Meeting
08/08/2024 – Pittsburgh (PA)

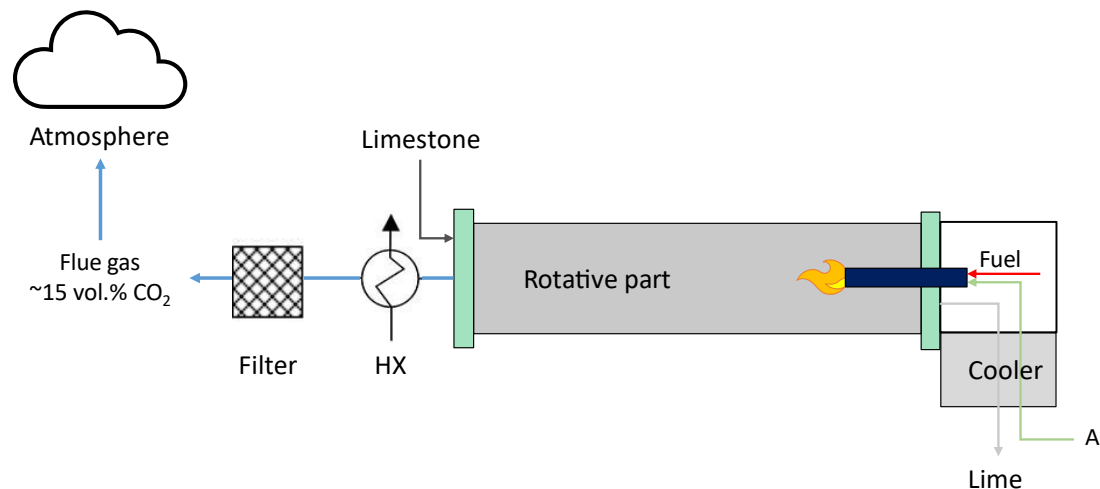
Electricore

Project aims to assess feasibility of increasing CO₂ concentration in rotary lime kiln flue gases

Goal is a concentration of 45% CO₂ at the stack through a combination of oxyfuel combustion and flue gas recirculation

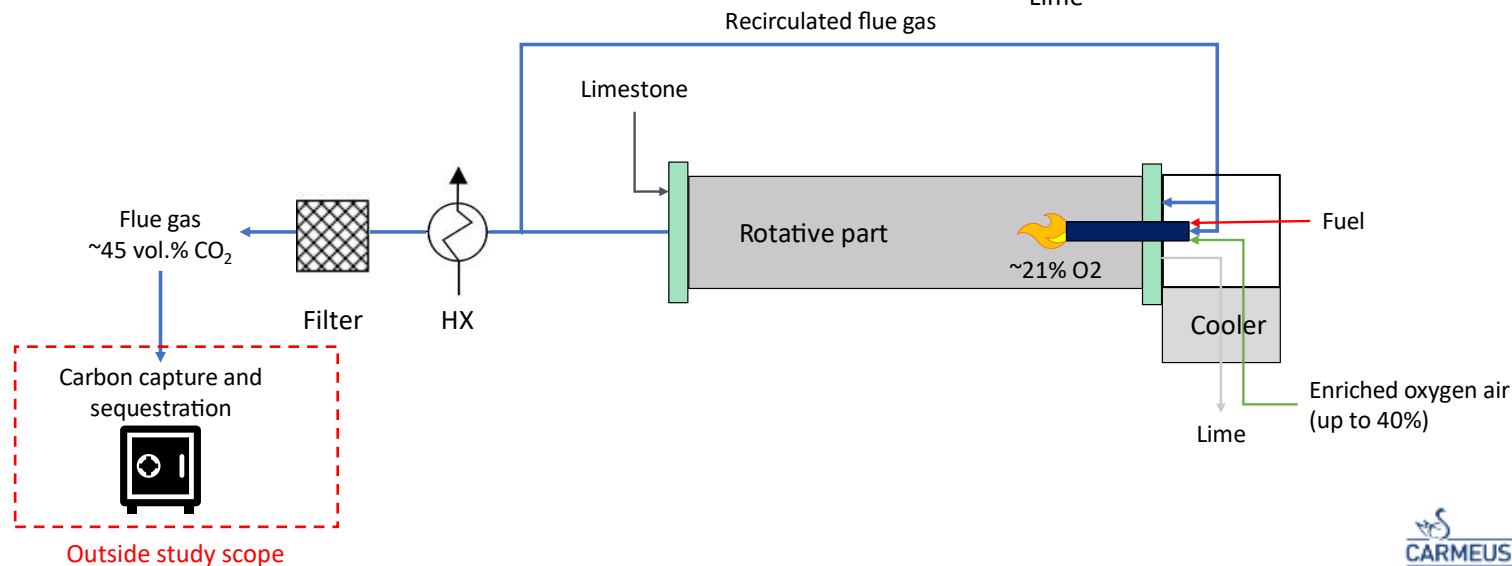
Conventional long rotary kiln

- Most common design in US
- High waste heat (>1000 F)
- 15%vol. (dry) CO₂ at stack
- Flue gases vented



Partial oxyfuel retrofit

- Partial oxyfuel to reduce air dilution
- Waste heat recovery through FGR
- ~45%vol. (dry) CO₂ at stack
- Flue gases sent to carbon capture



Increasing CO₂ concentration reduces downstream carbon capture cost

Combination of oxyfuel and FGR increases CO₂ concentration while improving energy efficiency

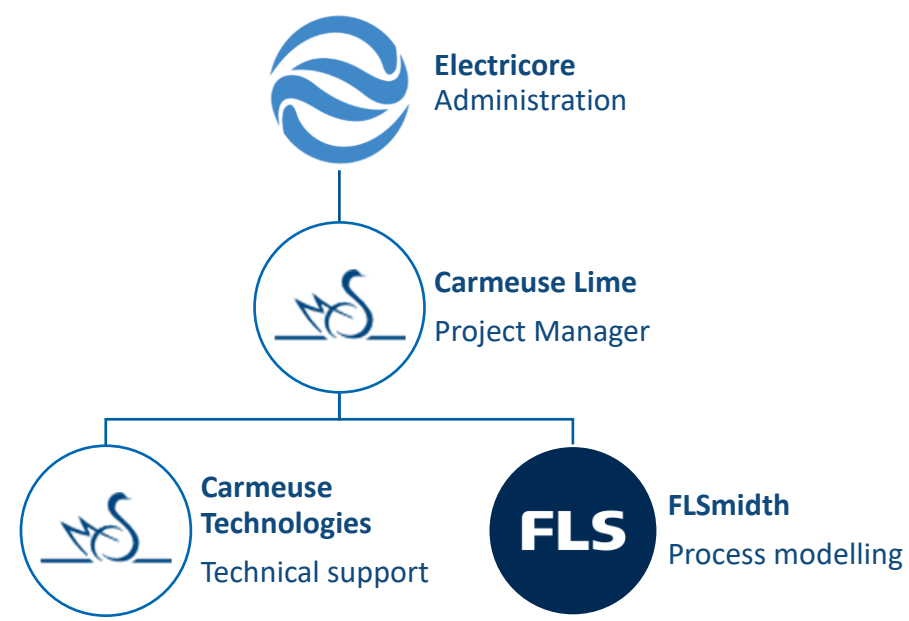
- Increasing CO₂ concentration reduces carbon capture CAPEX and OPEX
 - Reduced flue gas volumes results in:
 - Reduced flue gas (pre-)treatment equipment size
 - Reduced fan power consumption
 - Reduced carbon capture equipment size
 - Increased CO₂ partial pressures results in:
 - Accelerated carbon capture kinetics
 - Reduced carbon capture energy consumption

- Flue gas recirculation to maintain 21% O₂ at burner
 - Simplifies flame management
 - Partial waste heat recovery increases overall energy efficiency by 15 to 25%
 - Increased energy efficiency reduces required O₂ consumption to reach target CO₂

Carmeuse contracted FLSmidth and Carmeuse Technologies to perform conceptual engineering design

FLSmidth scope includes process modelling and CFD analysis with support from Carmeuse engineering & R&D teams

- **Electricore (Prime)**
 - Non-profit managing public-private partnership research projects
 - Award administration
 - Budget: \$50,000
- **Carmeuse Lime (Sub-recipient)**
 - World leader in lime production, operating 13 lime production sites in the USA
 - Project management, data collection, capital cost estimates, preliminary TEA, LCA and EH&S analysis
 - Budget: \$62,500
- **Carmeuse Technologies (Vendor)**
 - Engineering / R&D branch of the Carmeuse group (based in Belgium)
 - Technical support and advice to the engineering study
 - Budget: \$28,000
- **FLSmidth (Vendor)**
 - Leading equipment and engineering supplier for the mineral processing industry
 - Generate process models using METSIM software, CFD analysis of FGR mixing and support equipment selection and budget estimations
 - Budget: \$172,000



Task	Description	A-24	S-24	O-24	N-24	D-24	J-25	F-25	M-25	A-25	M-25	J-25	J-25
1.1	PMP	█											
1.2	TMP	█											
1.3	CBP	█	█	█	█	█	█	█	█	█	█	█	█
2.1	Project scope	█	█	█	█	█	█	█	█	█	█	█	█
2.2	Conceptual design	█	█	█	█	█	█	█	█	█	█	█	█
2.3	OBDI											█	
2.4	Preliminary TEA										█	█	
2.5	Preliminary LCA							█	█	█	█	█	
2.6	EH&S							█	█	█	█	█	
2.7	TGA										█	█	
3.0	Phase 2 application										█	█	█

Acknowledgement

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