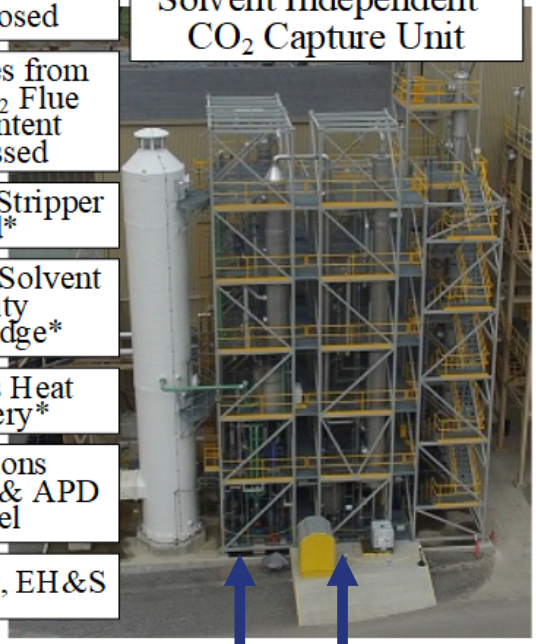
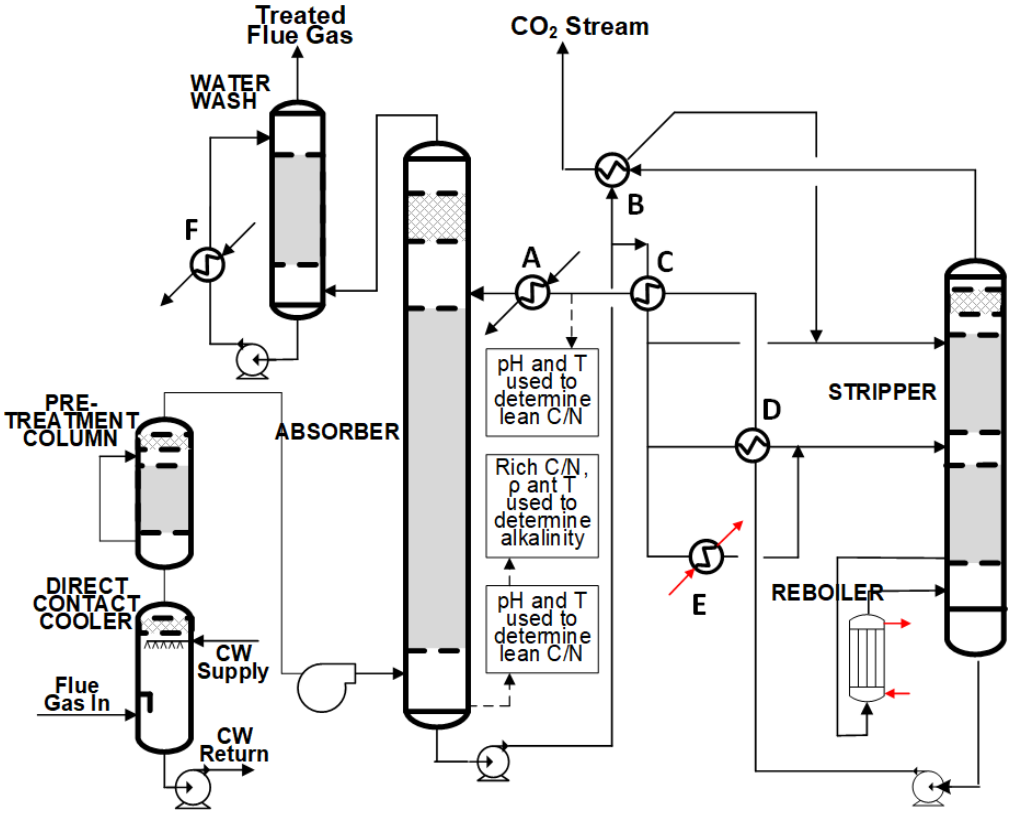
Technology

Existing Equipment Repurposed
Challenges from High CO_2 Flue Gas Content Addressed
Split Rich Stripper Feed*
Real-time Solvent Quality Knowledge*
Flue Gas Heat Recovery*
Emissions Measured & APD Model
TEA, TMP, EH&S

UKy Engineering Scale Solvent Independent* CO_2 Capture Unit



DE-FE0007395



- Process reconfigurement using exiting equipment
- Transformative aspects: 1) split rich stripper feed, 2) UK solvent, 3) real-time solvent quality and performance knowledge, and 4) heat integration
- Temperature controlled absorption configuration
- Improves efficiency, lowers costs, reduces secondary environmental impacts

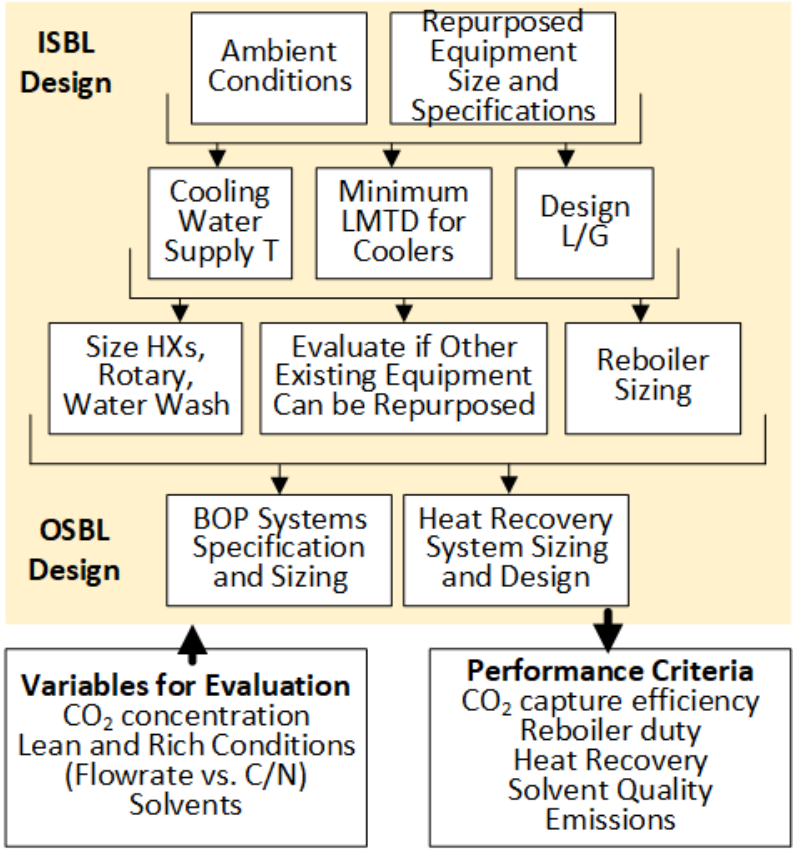
Application of Engineering Scale UKy CO_2 Capture to Glass Production Facility, DE-FE0032460, Heather Nikolic and Kunlei Liu

Host Site

- Vitro Flat Glass Manufacturing in Meadville, PA
- 9.3 tonne CO_2/day capture.
- Oxy-combustion with a smelter exhaust T=2250 °F, air ingress for temperature control
- 1700 lb/hr flue gas taken from after heat recovery at the temperature of 250 °F.
- Key challenge is high viscosity associated with high C-loading resulting from high CO_2 concentration leading to CO_2 diffusion resistance, column maldistribution and high gas side ΔP
- Heat recovery is key to cost reduction.

Application of Engineering Scale UKy CO_2 Capture to Glass Production Facility, DE-FE0032460, Heather Nikolic and Kunlei Liu

Planned Approach



Parameter and Scenario Under Investigation	Resulting Quantification and Improved Confidence
- **Parametric study** to identify and verify the sensitivity of key operating parameters on flue gas pretreatment and heat recovery performance, and operability, specifically in inlet flue gas T, P and CO_2 concentration, which result from varied glass production methods - **Column flexibility** on various liquid to gas mass flow ratios (L/G), ambient conditions and solvent chemistry (kinetics/heats of reaction ($H_{abs/des}$)) in terms of gas ΔP, CO_2 absorption capacity and specific reboiler duty - Deliberately varied lean and rich loadings to **validate and refine the model** for real-time solvent quality knowledge based on pH, density and T - **Emissions** after the absorber and water wash will be monitored via in-situ FTIR with validation from manually collected gas samples - At least **2 months of continuous steady state operation** for long-term process and solvent evaluation following established protocols for process control, solvent quality management, emission and waste characterization and management	- A cost-effective **flue gas pre-condition** prior to absorber for high moisture and SO_2 flue gas application - Establish the **optimal glass production parameters** with CC and heat recovery parameters - Quantification of minimum/maximum levels associated with **process upsets** of: process/equipment downtime; equipment maintenance requirement and cost; process response time and inability to maintain capture goal; variation in solvent quality, make-up and cost; nature and amount of waste generation and cost; emissions; operating costs; and CO_2 product quality