

Optimization of Process Furnace Emission Reduction Investments for Private Equity Firms

AMERICAN
INDUSTRIAL
PARTNERS

BUSINESS PROBLEM

PE shops that acquire industrial businesses have a difficult environmental challenge because their investments are more emissions-intensive due to the complex supply chains and energy-intensive operations. The lack of universally adopted tools that connect investment decisions and emissions reductions with value creation leads to a lack of conviction for management to take action on climate change, and insufficient deployment of private capital towards global decarbonization. This research focuses on emissions reduction for manufacturing lines, because successful operation of those lines is critical for company profitability.

DATA SOURCES

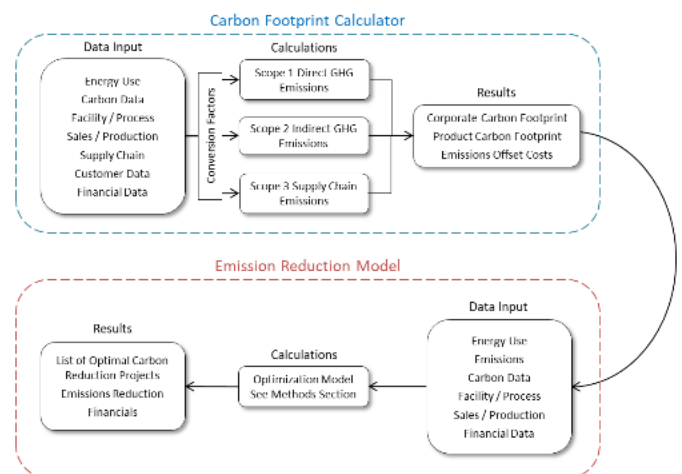
This research used process data collected across multiple manufacturing stages and from all plants across the globe. We also used electricity and gas data from meters and utility bills. We used financial data from historical projects, when available, or estimates, when needed.

Data Types and Format

Majority of process data is time-series, or cumulative annual data. Process data was well structured.

APPROACH

We contribute an integer linear program that finds the most profitable strategy to reduce CO₂ emissions from process furnaces by scheduling furnace upgrades each year within the planning horizon. The model is based on certain emission reduction technologies, fuel and carbon pricing, and process characteristics, and the results are constrained by financial parameters.



IMPACT

The emissions models helped the organization identify the scope of their challenge and set of relevant solutions, plus gave teams a platform to confidently discuss capital allocation and operational decision-making for emission reduction. The host company can profitably meet their 2030 science-based emissions reduction target if there is carbon pricing. That scenario includes 50% cleaner electricity supply through a power purchase agreement. Our research also shows that ignoring the effect of process improvements on manufacturing equipment upgrades greatly undervalues the financial performance of decarbonization initiatives. A main driver for cost savings came from process benefits such as scale reduction and throughput improvement. Accounting for process benefits from furnace upgrades improved cumulative savings through 2030 by 100%.

DRIVERS

The industry faces pressure to reduce emissions, but is not confident that investing in emissions reductions is complimentary to maximizing returns for investors.

BARRIERS

Data availability on benefits of certain emissions reduction projects. Limited budgets and competitive selection process to invest in new projects.

ENABLERS

Strong support from the partner company across many functional roles. Robust history of data collection and KPI tracking.

ACTIONS



Interviews and ongoing engagement across different functional teams to encourage ownership, increase contribution, and build support. Presentations to executive team to secure the investment needed to implement the solutions.

INNOVATION

The use of an optimization model to schedule emissions reduction investments while minimizing costs to the business.

IMPROVEMENT

5-35% reduction in furnace emissions, depending on final implementation of projects.

BEST PRACTICES

Developing relationships with the manufacturing and operations teams ensures you have an accurate source of information and team buy-in, and developing relationships with the executive team ensures you will have support to invest resources into the identified solutions.

OTHER APPLICATIONS

This approach is broadly applicable to any process lines where data is available on energy usage, yield, and process costs.