



Oxygen Analyzer Optimizations for Carmeuse Lime Kiln



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Background:

- Line kilning facility located in Gary, Indiana
- Fed through kiln at high temperatures to form calcium oxide and carbon dioxide
- Flue gas is used counter-current of feedstock in kiln
- O2 analyzer used with sampling pipe to assess combustion

The Issue:

- Kiln rotation results in excessive lime dust
- Dust builds up in the pipe which the O2 analyzer draws from
- Dust accumulation results in decreased flow and less sound O2 readings

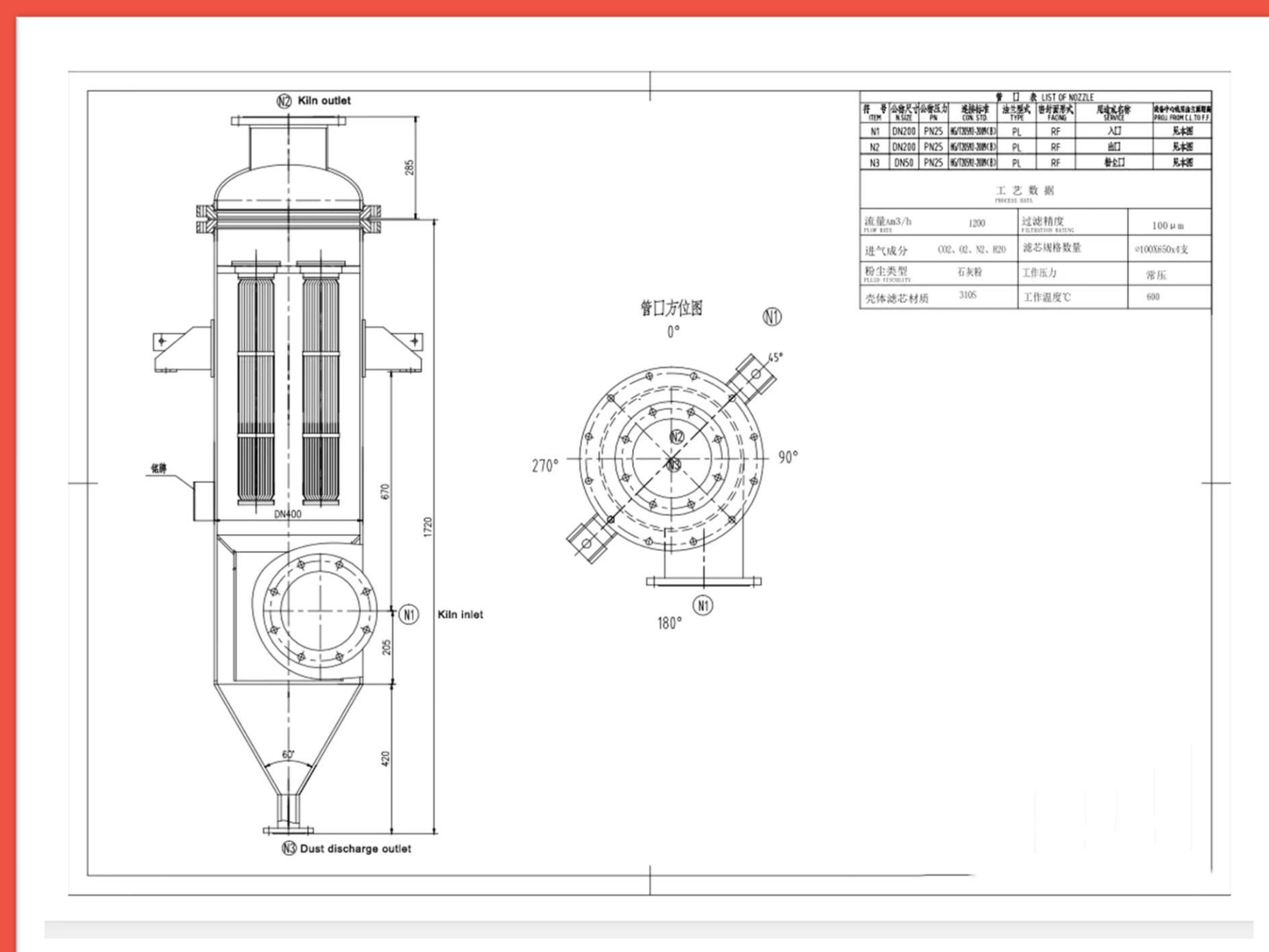
The Economics:

Heating Cost per Percent Excess Oxygen:	\$ 106,723 \$/yr
Current Pipe-cleaning Maintenance Labor:	\$ 43,800 \$/yr



Cyclone Separator

- Pros:**
- Not expensive to install or maintain
 - No moving parts
 - Able to work at high temperatures
- Cons:**
- Cannot separate particles smaller than 10 micrometers
 - Cannot handle sticky or tacky material
 - Would be difficult to install inside kiln to collect the flue gas
- Ultimately rejected because: Still need piping to go to the cyclone separator, so the issue would be the same with buildup of dust in pipe.



Inlet Dust Filter

- Pros:**
- Utilizes current O2 system
 - Relatively minimal investment
 - Minimal space usage
 - Relatively cheap option
- Cons:**
- Blowdown could fail to sufficiently eject filter cake
 - Kiln temp approaching filter temperature rating
 - Inlet pipe may require modifications
- Ultimately rejected because: difficult to find vendors who could accommodate the process conditions, as well as concerns about periodic maintenance.



Infrared O₂ Analyzer

- Pros:**
- No need for separate draw-off pipe
 - Faster rates for collecting data
 - Minimal routine maintenance
 - Overall simpler system
- Cons:**
- Difficult to find an installation location
 - Somewhat higher capital cost
- Ultimately chosen because: very few vulnerabilities in the system to dust buildup.

