

CLEAN clinKER by calcium  
looping for low-CO<sub>2</sub> cement

CLEAN<sup>N</sup> KER



9th High Temperature  
Solid Looping Cycles Network Meeting  
Piacenza, 14. - 15.03.2023

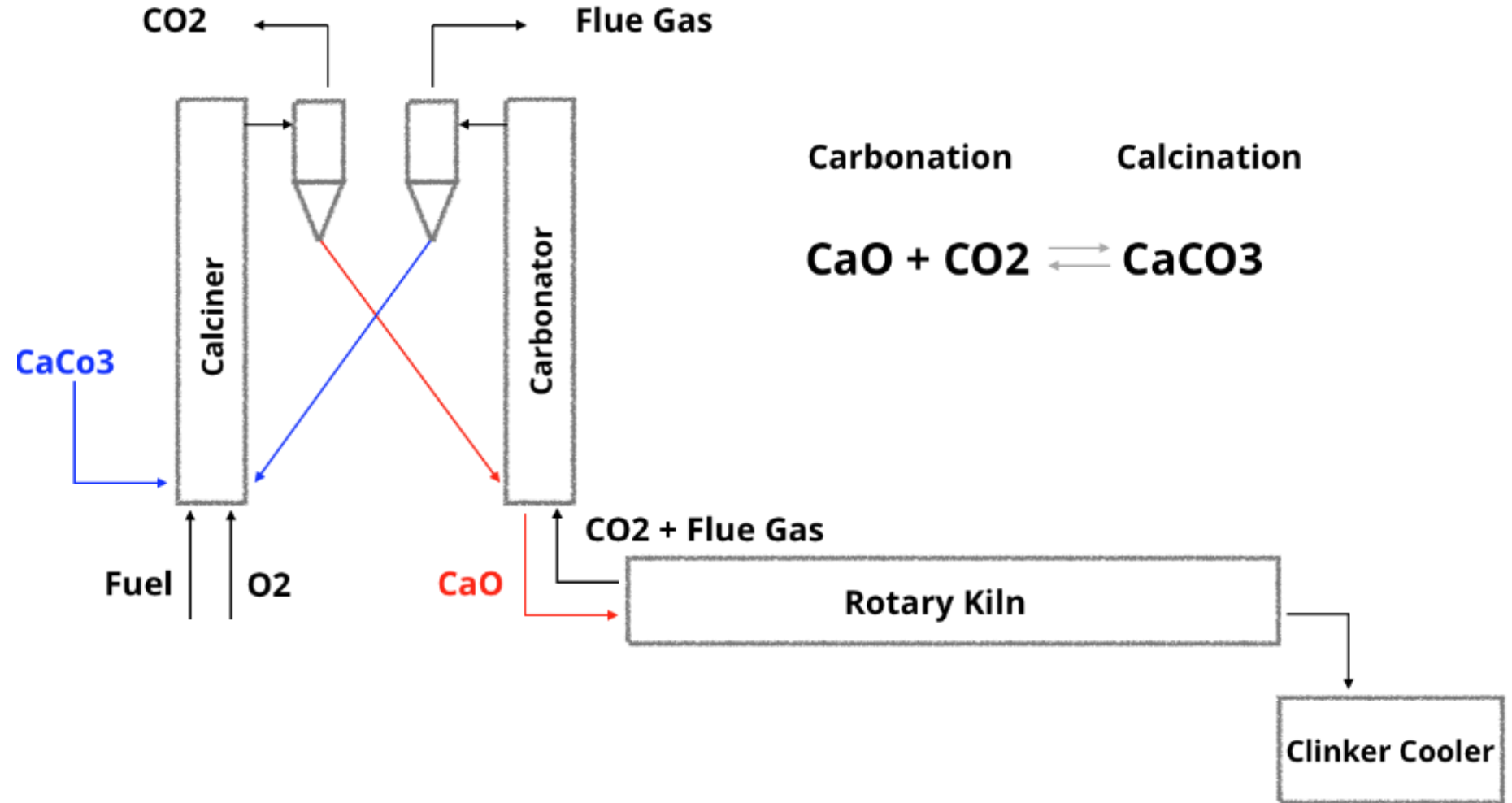
Engineering and Construction of the CaL  
demonstration plant at Vernasca

Jörg Hammerich  
IKN Germany



## Engineering

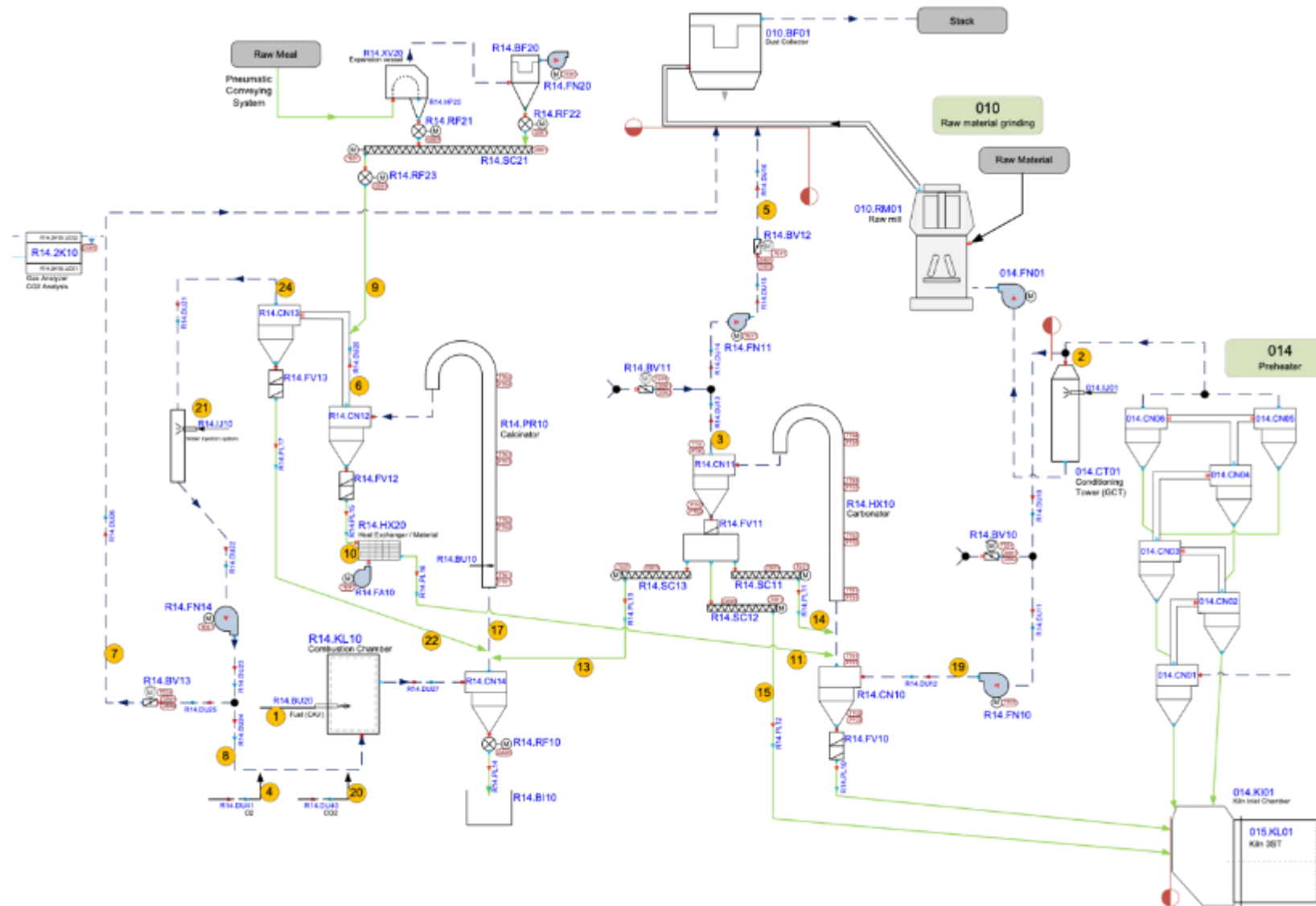
- Basic concept



# Engineering and construction of the CaL demonstration system

## Engineering

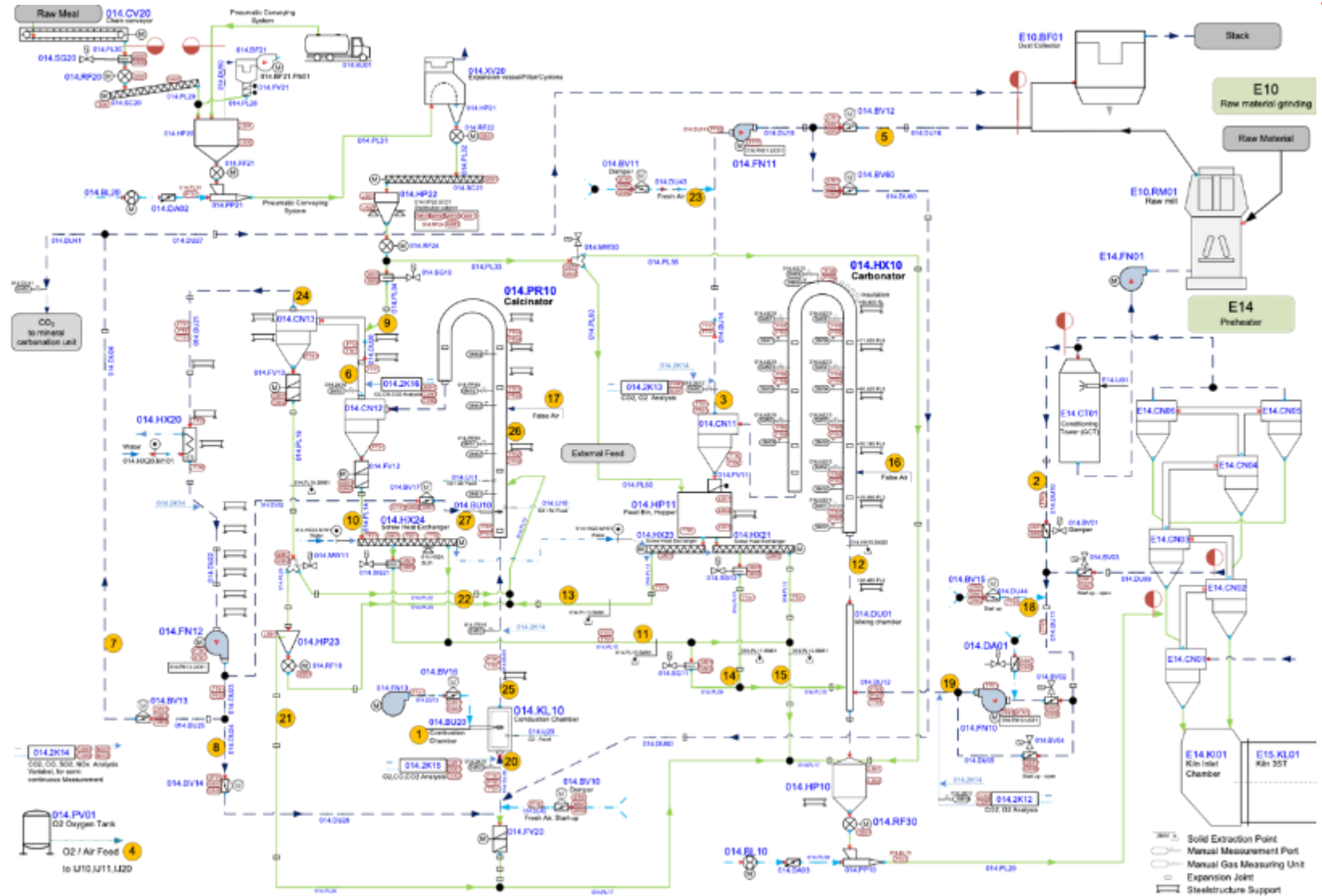
- First Flow sheet
- Basic functions added
  - Fans
  - Heat Exchanger
  - Screws for transport
  - Instruments



# Engineering and construction of the CaL demonstration system

## Engineering

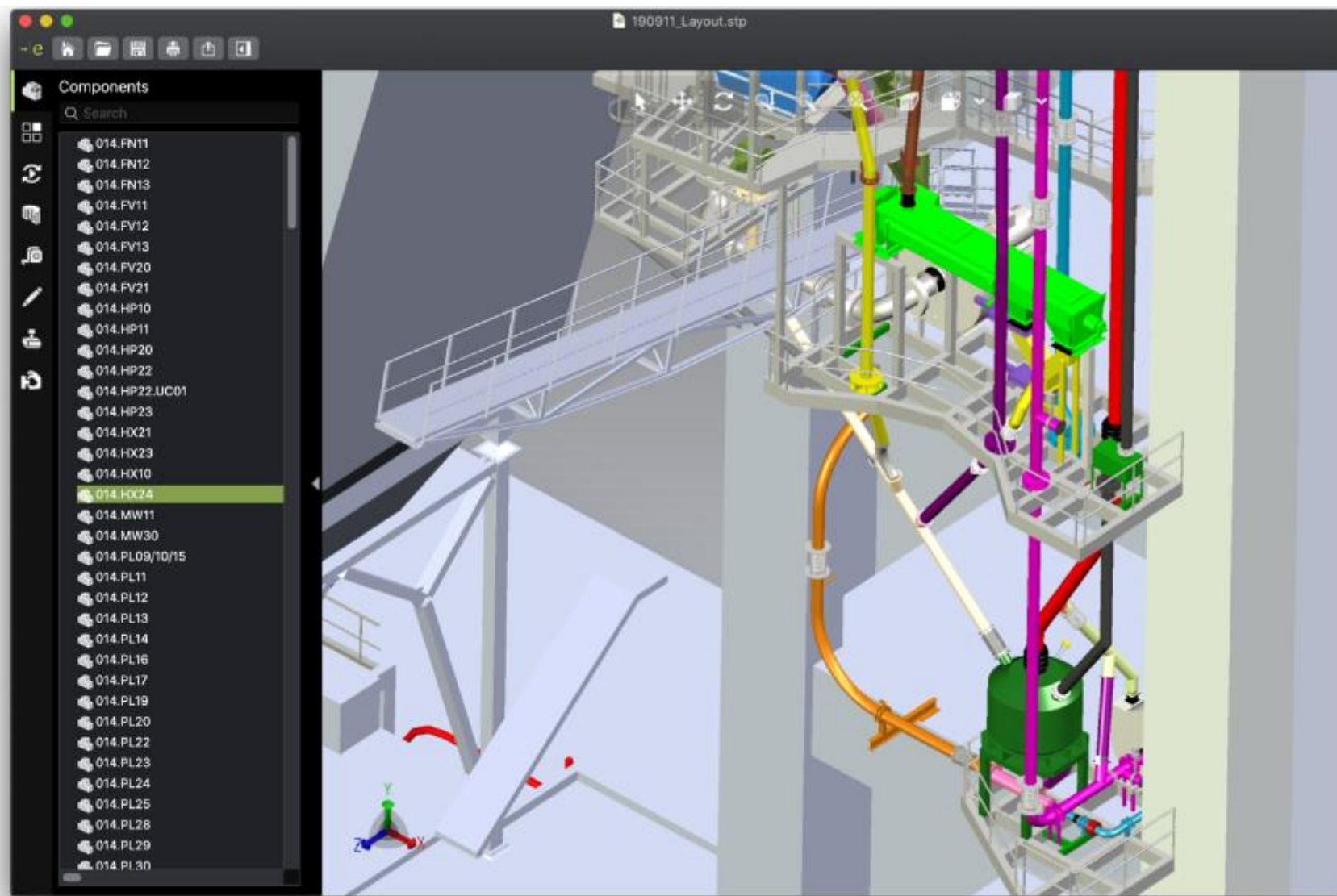
- Basic Engineering
- Flow Sheet
- Final Version, Revision „Q“



# Engineering and construction of the CaL demonstration system

## Plant Design

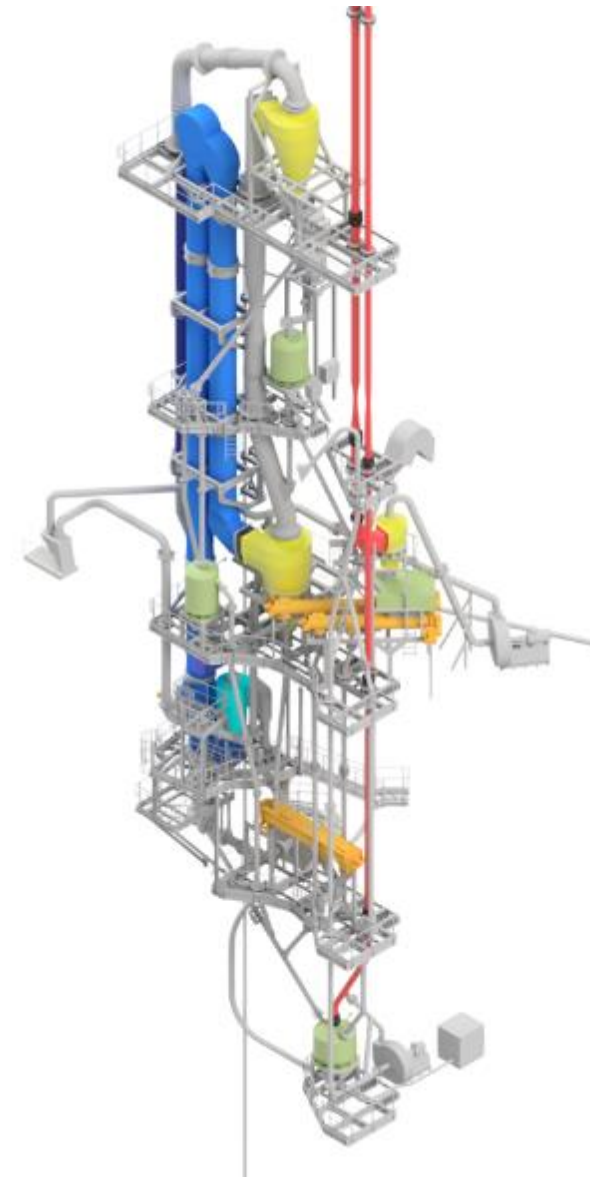
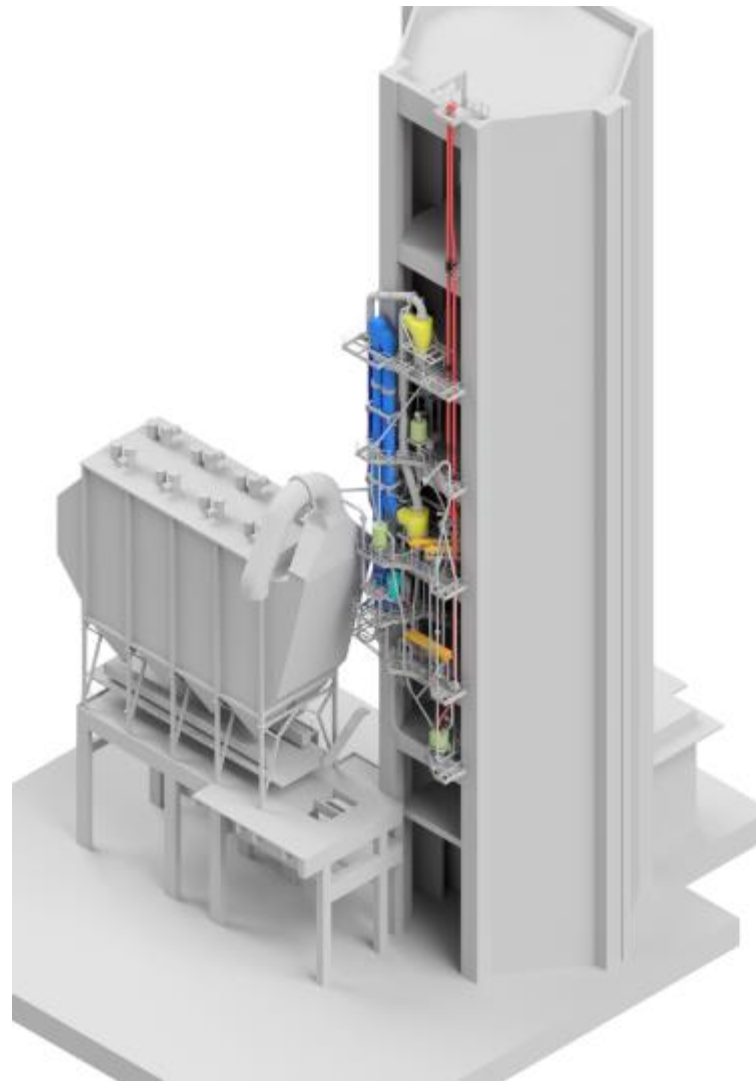
- 3D-Engineering
- Tagging in 3D-model



# Engineering and construction of the CaL demonstration system

## Plant Design

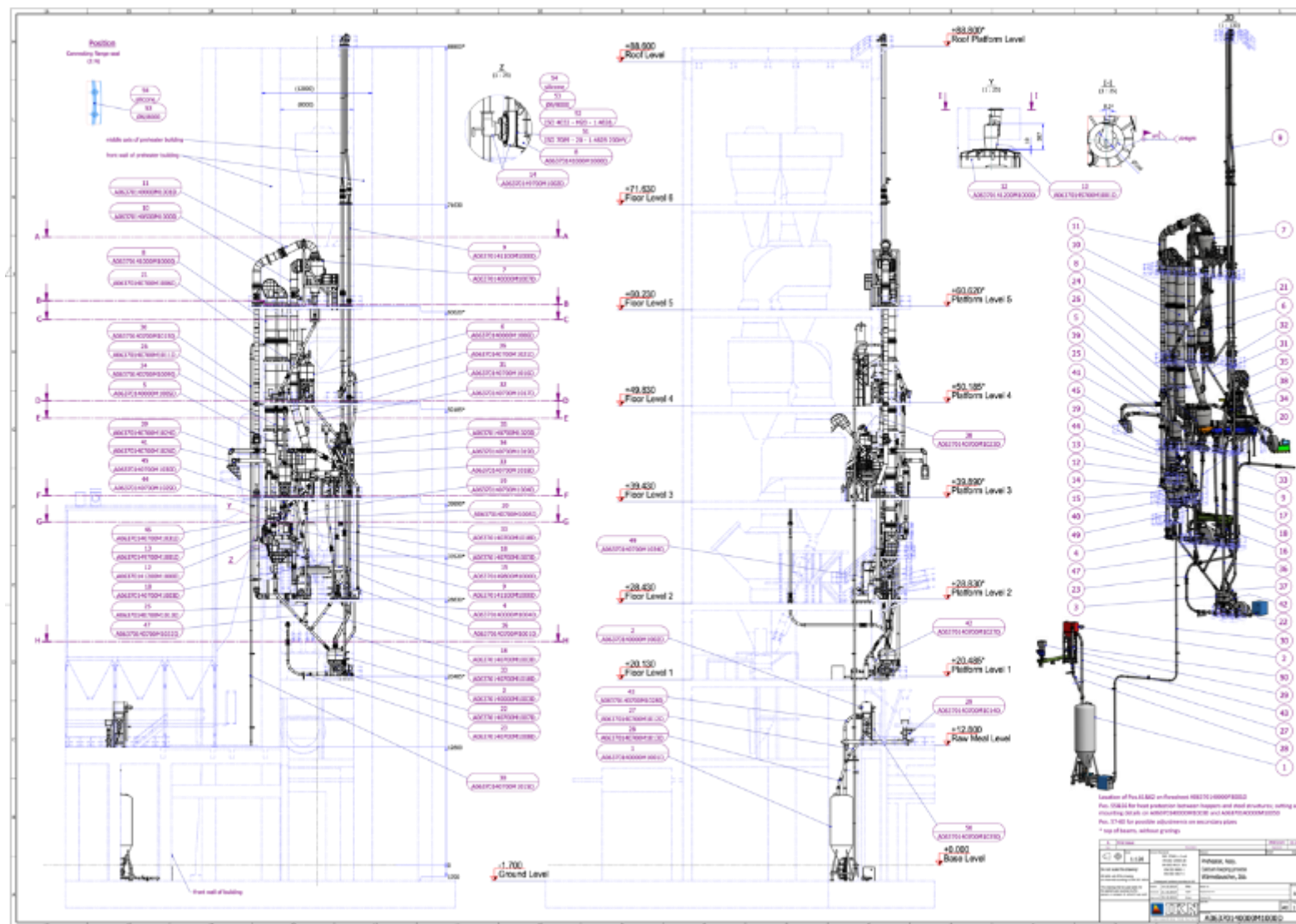
- Plant Layout
- Complete 3D Data Model of the Demo Plant



# Engineering and construction of the CaL demonstration system

## Design

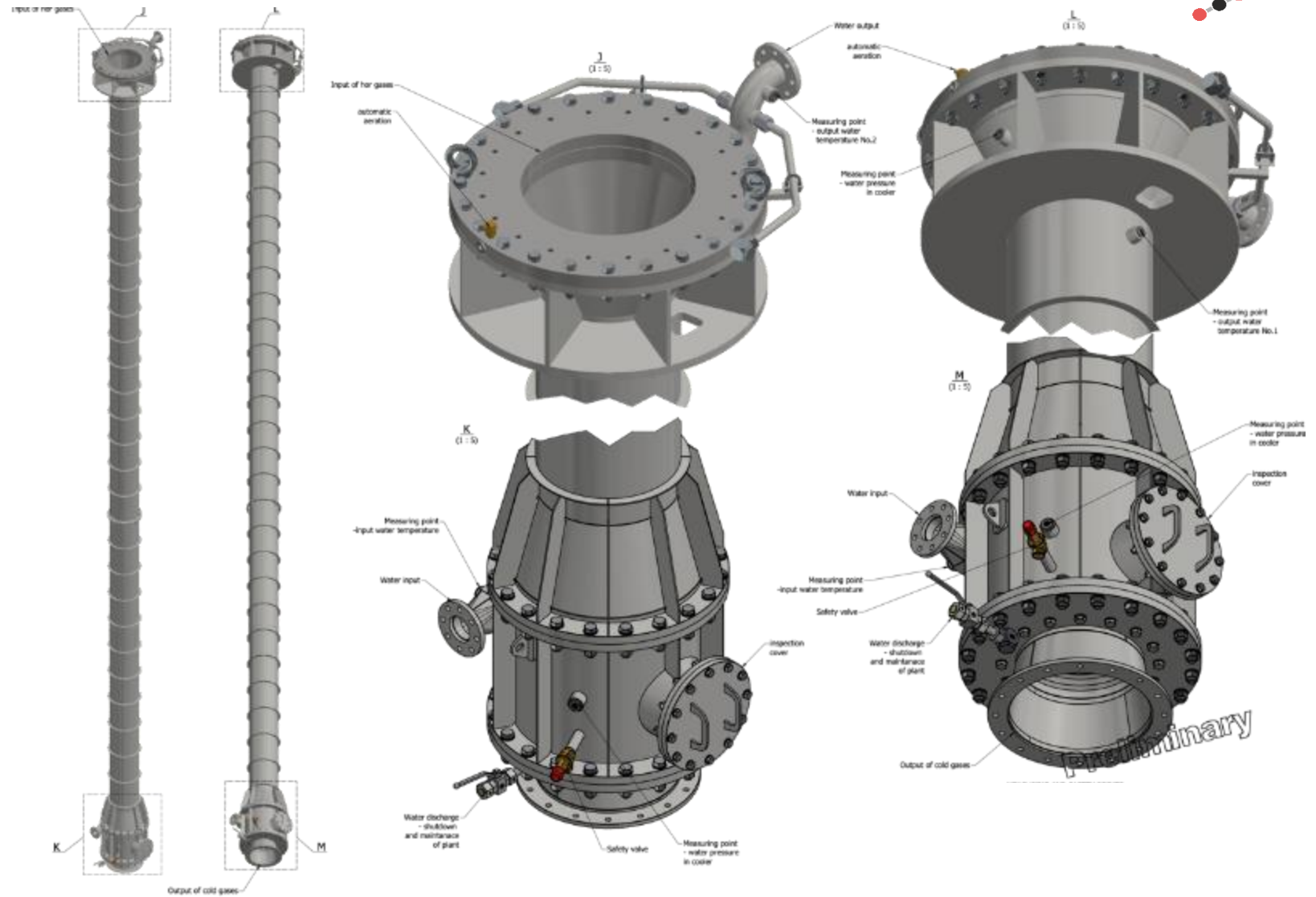
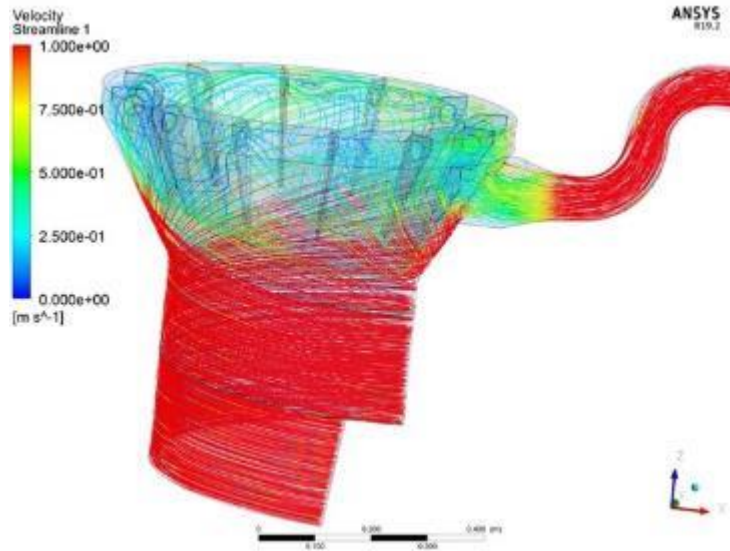
- Overall assembly drawing
- Total height: 90 m
- Total weight: 110 tons
- + Refractory: 40 tons



# Engineering and construction of the CaL demonstration system

## Equipment Design

- Equipment design
  - Heat Exchanger HX20

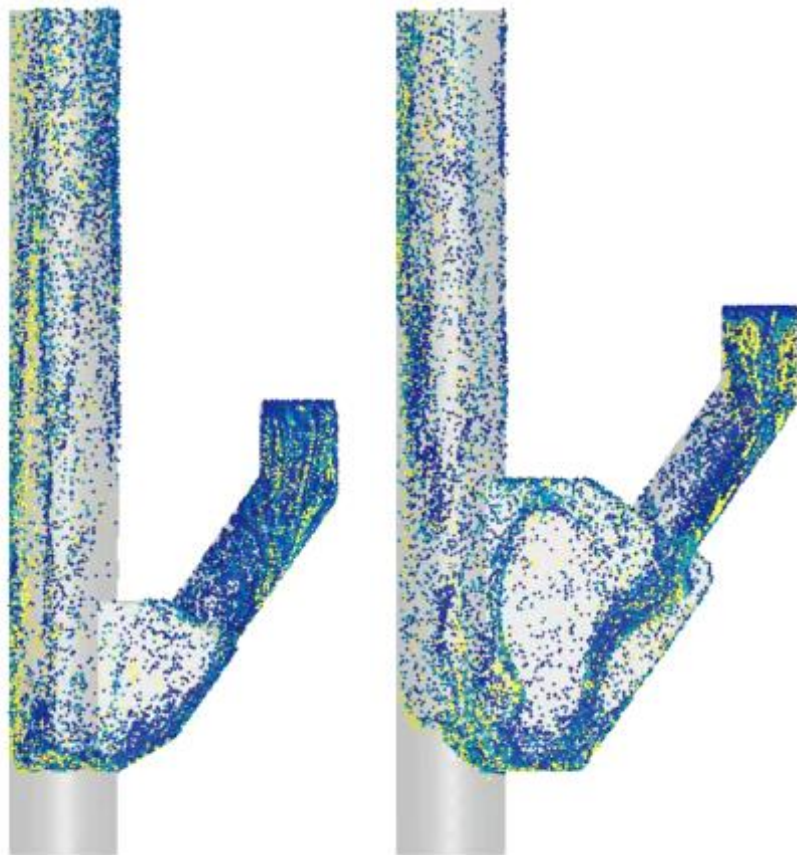




# Engineering and construction of the CaL demonstration system

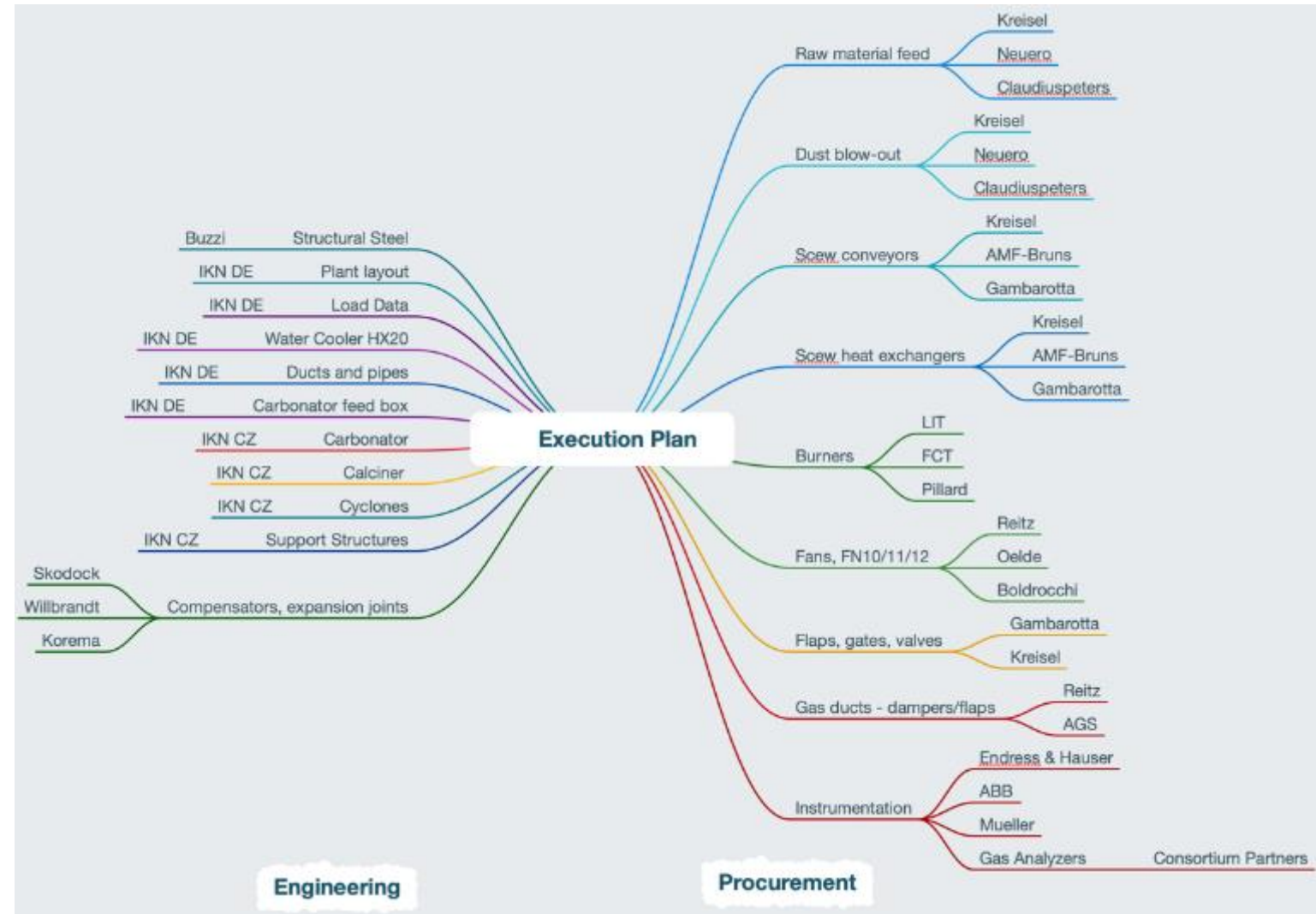
## Equipment Design

- Equipment design
  - Splash boxes



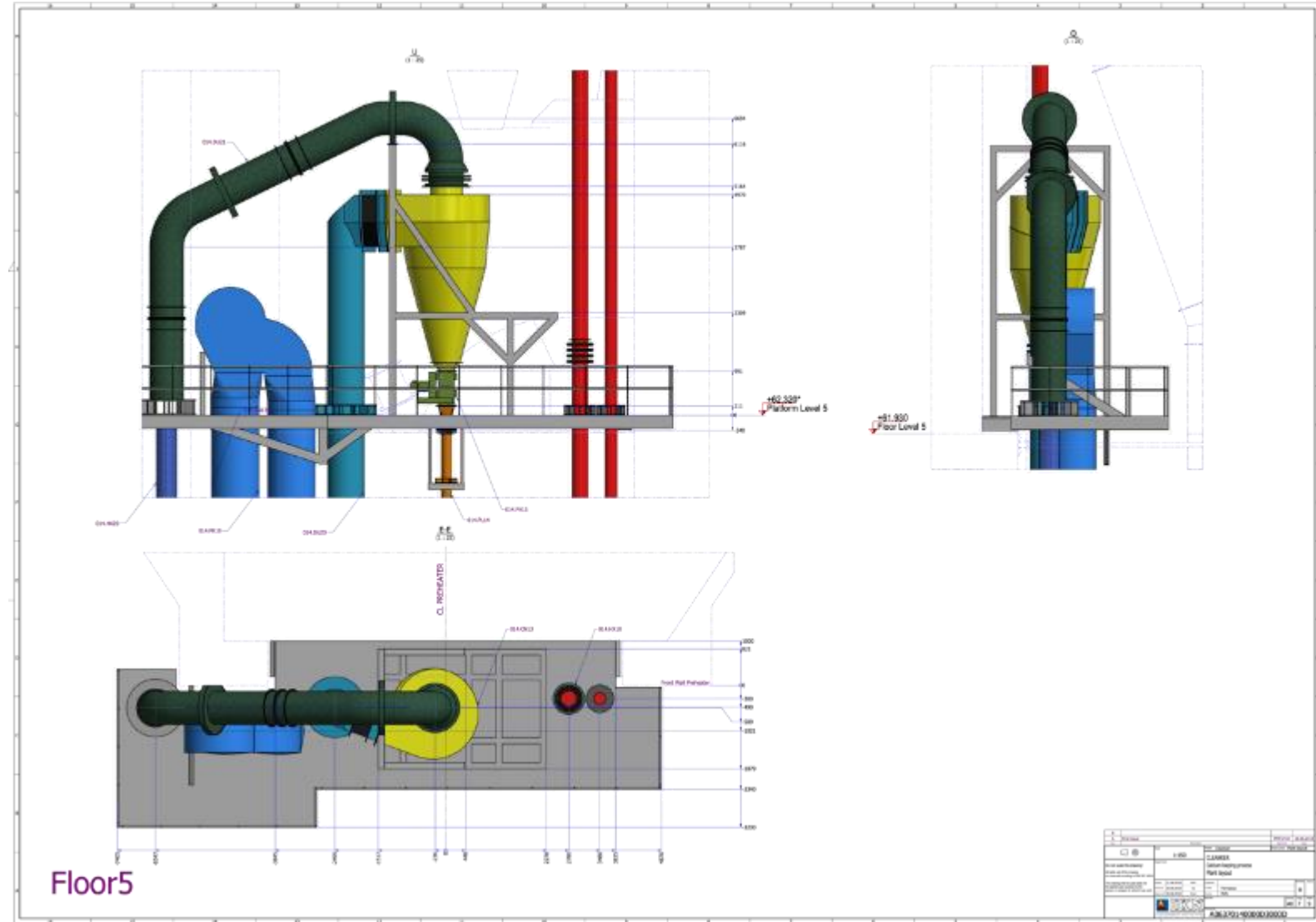
## Engineering

- Procurement, Basic Decision: Make or Buy ?



## Design

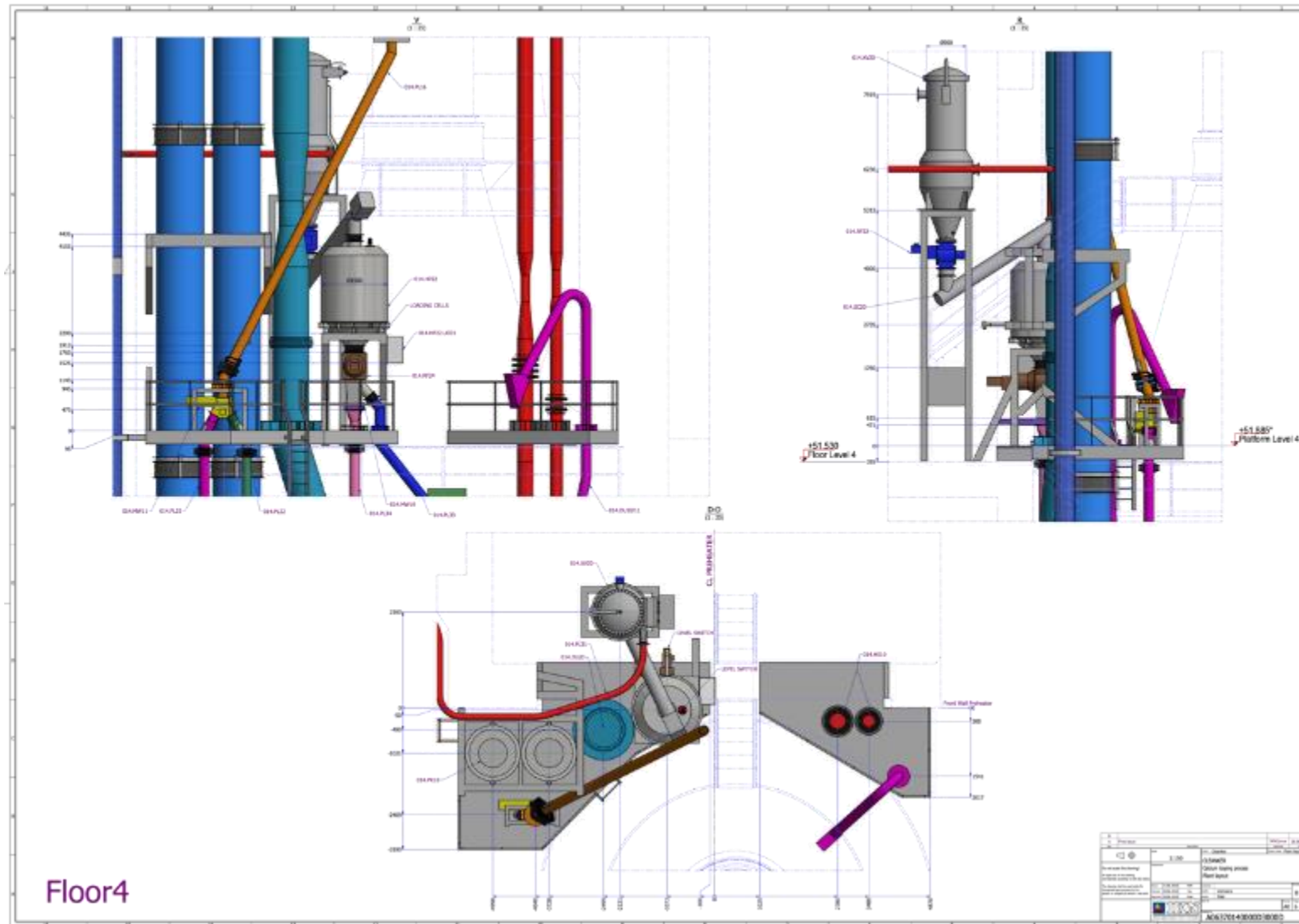
- Assembly drawings
- Level 5
- Calciner Swirl Head
- Preheater Cyclone CN13



# Engineering and construction of the CaL demonstration system

## Design

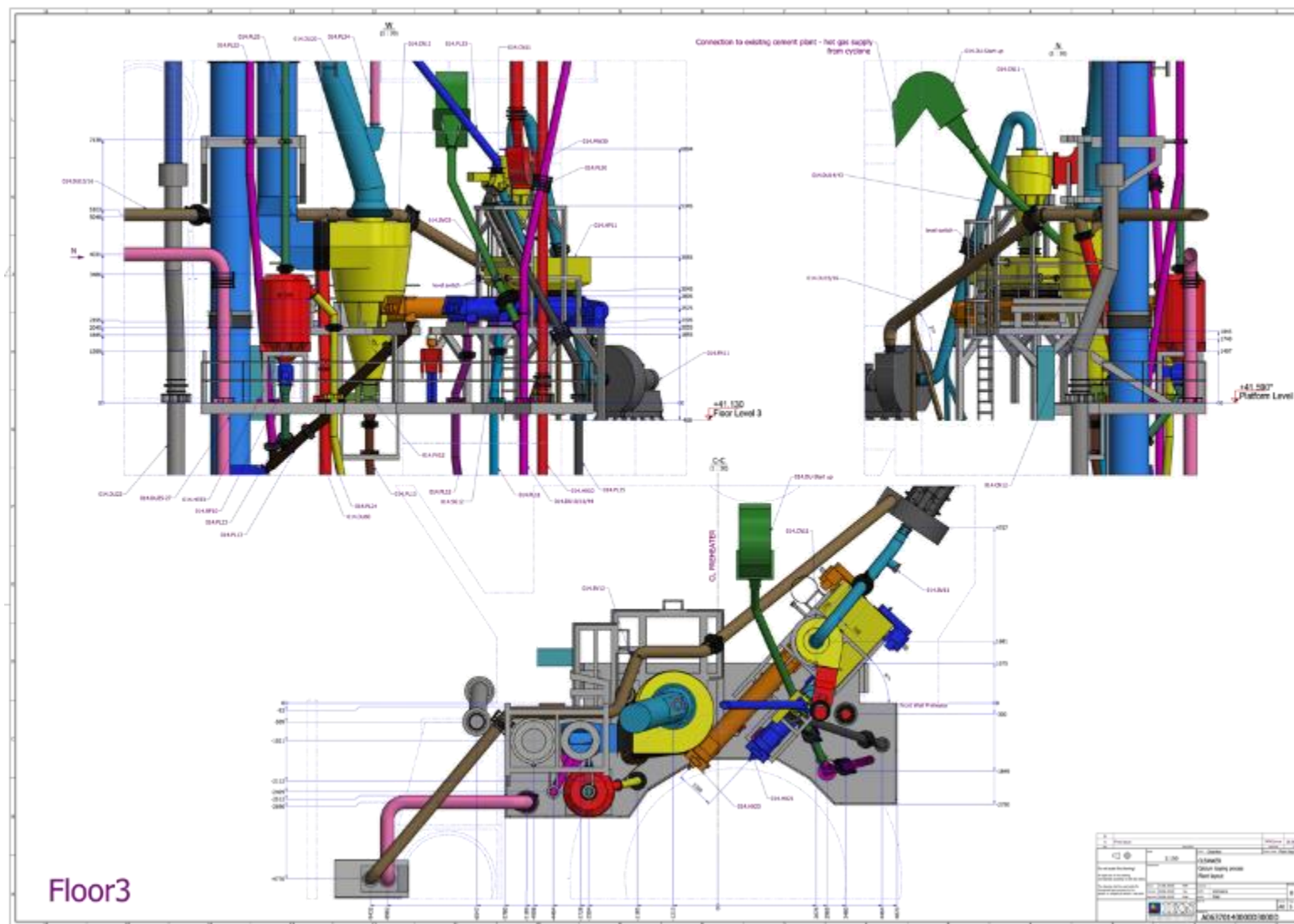
- Assembly drawings
- Level 4
- Raw Material Feed
- Filter XV20, Bin HP22



# Engineering and construction of the CaL demonstration system

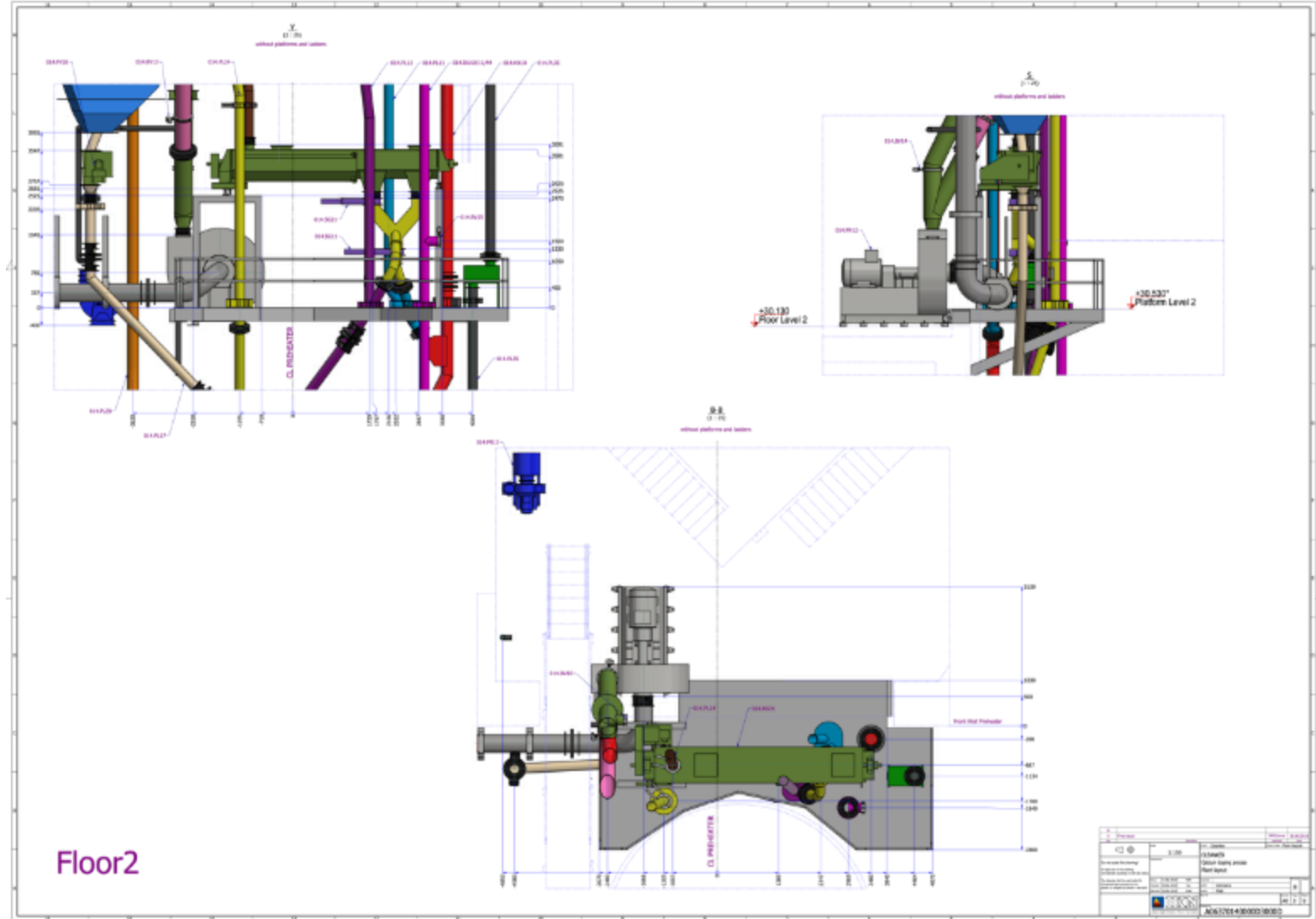
## Design

- Assembly drawings
- Level 3
- Carbonator Outlet, HX21/23
- Carbonator Fan FN11
- Overflow Bin HP23
- Calciner Cyclone CN12
- Carbonator Cyclone CN11



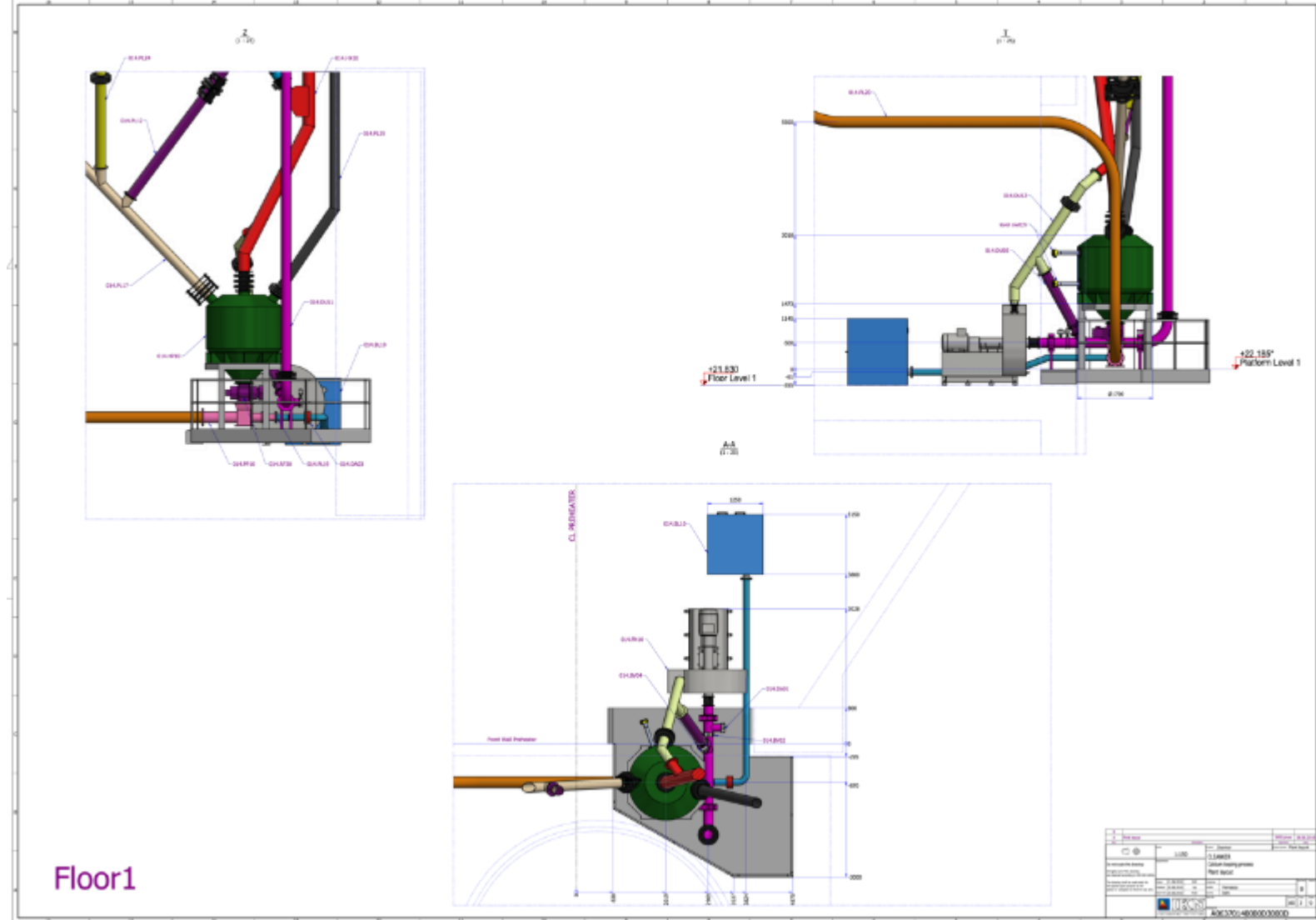
## Design

- Assembly drawings
- Level 2
- Screw HX24
- Calciner Fan FN12



## Design

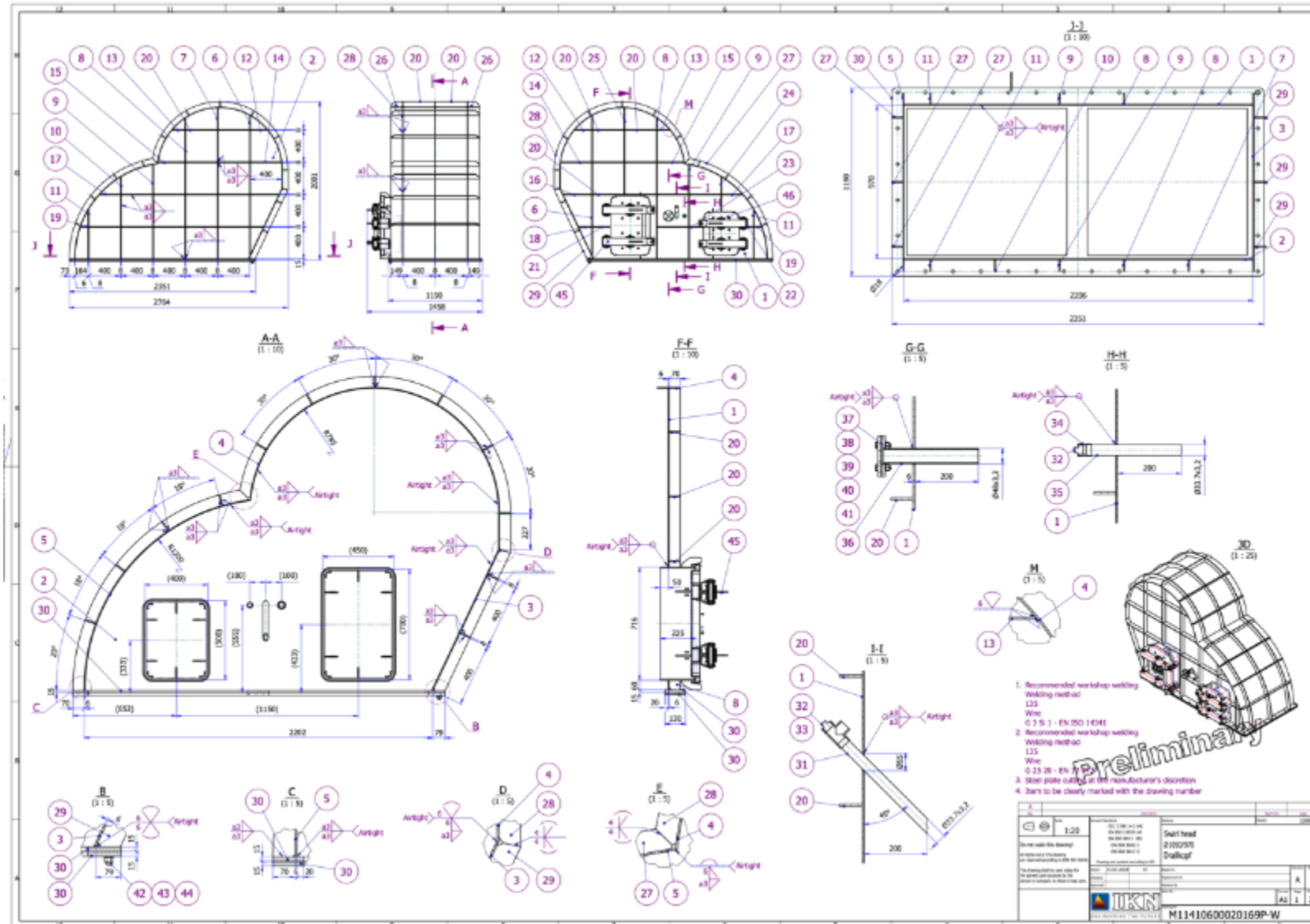
- Assembly drawings
- Level 1
- Hot Dust Collector HP10
- Carbonator Fan FN10
- Blower BL10
- Pneumatic transport



# Engineering and construction of the CaL demonstration system

## Detail Design

- Fabrication dwgs
- Swirl Head





# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, TR
- Calciner Swirl Head



# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, TR
- Carbonator Parts
- Venturi nozzle



# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, TR
- Quality Inspections
- Cyclones, Ducts



# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, TR
- Heat Exchanger HX20
- Pressure test
- Preassembly



# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, DE
- Kreisel
- Reitz



# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, DE
- Quality Inspections
- Expansion joints



# Engineering and construction of the CaL demonstration system

## Progress

- Fabrication, TR
- Quality Inspections
- 2nd Piping, Stainless steel



# Engineering and construction of the CaL demonstration system

## Progress

- Refractory Installation, IT



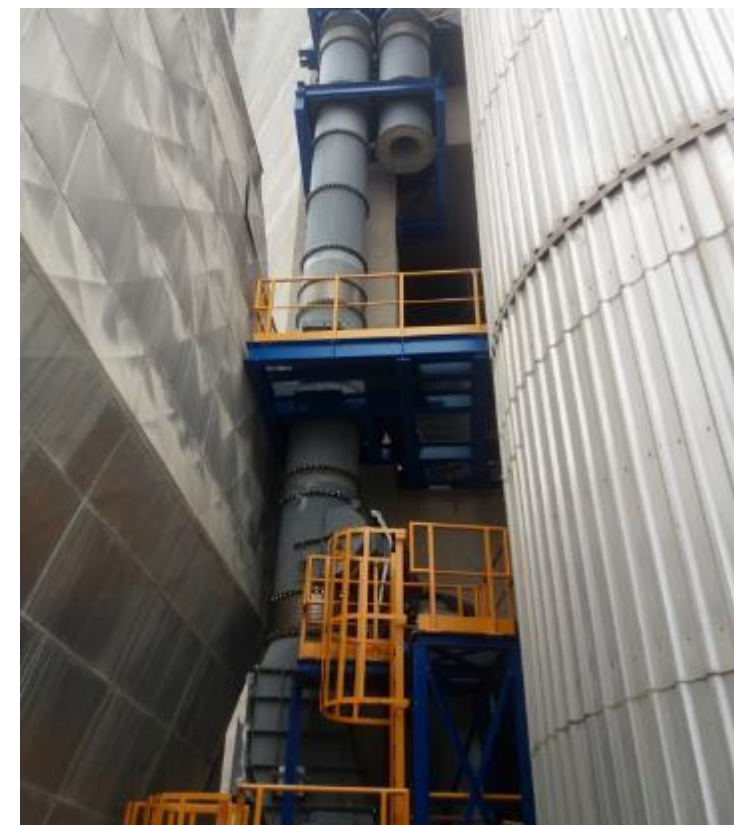
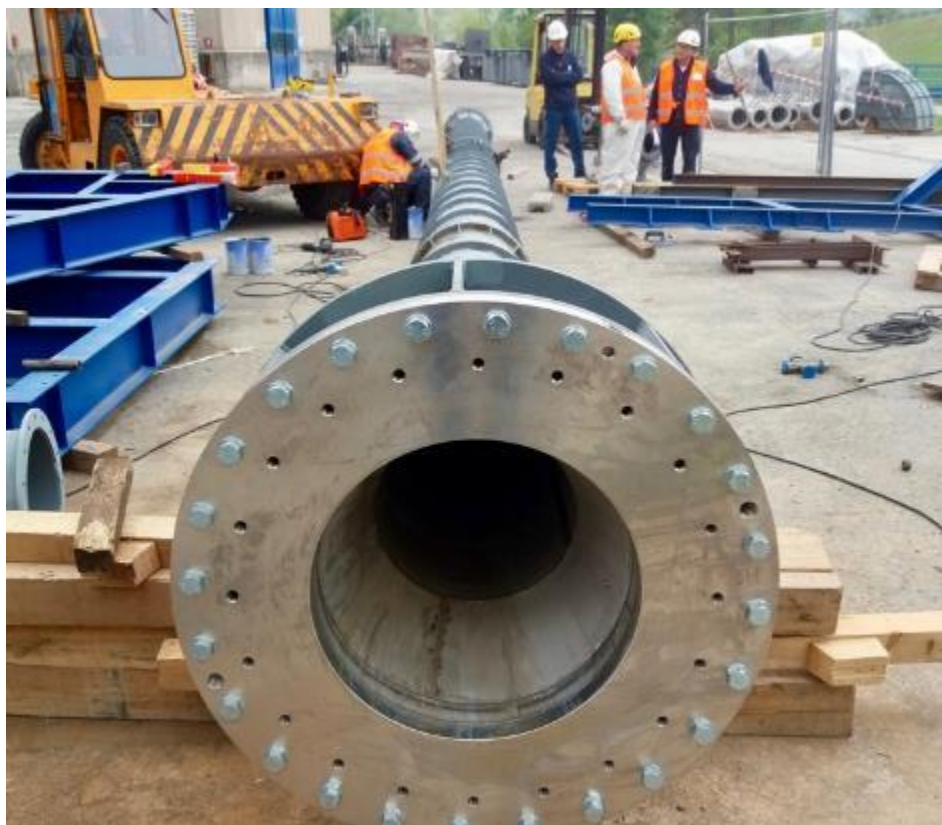


# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
- Assembly of the Heat exchanger HX20
- Calciner Installation

October 2019



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
- Heat Exchanger HX20
- Calciner finished

November 2019



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
- Calciner Swirl Head
- Cyclone CN12

November 2019



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
- Heavy parts in place
- December 2019



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
  - 2nd piping
  - Intermediate hoppers
  - Expansion Joints
- 
- January 2020



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
- Carbonator
- Smaller parts and hoppers
- January 2020



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
  - Screws HX22/23
  - Measuring Devices
- 
- February 2022



# Engineering and construction of the CaL demonstration system

## Progress

- Vernasca Installation
  - Oxygen Valve Train
  - Oxygene Tank / Gasifier
- 
- February 2022





# Engineering and construction of the CaL demonstration system

## Shit Happens

- Vernasca Installation
  - Damaged Screw conveyor
  - BagHouse damage
- 
- October 2020



# Engineering and construction of the CaL demonstration system

## Shit Happens

- Vernasca Installation
  - Overheated Burner
  - Clogged Dust Transport
- 
- February 2022



# Engineering and construction of the CaL demonstration system

## Final Installation

- Vernasca Plant



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