

PyData to build our future

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Sep 24, 2021 – Big data barbecue, Mannheim





HEIDELBERGCEMENT



HeidelbergCement

Founded 1874 in Heidelberg

Now 50+ countries and 150 cement plants

3 main business lines and products

- Cement
- Ready-mix concrete and asphalt
- Aggregates (sand and gravel)

Where we are

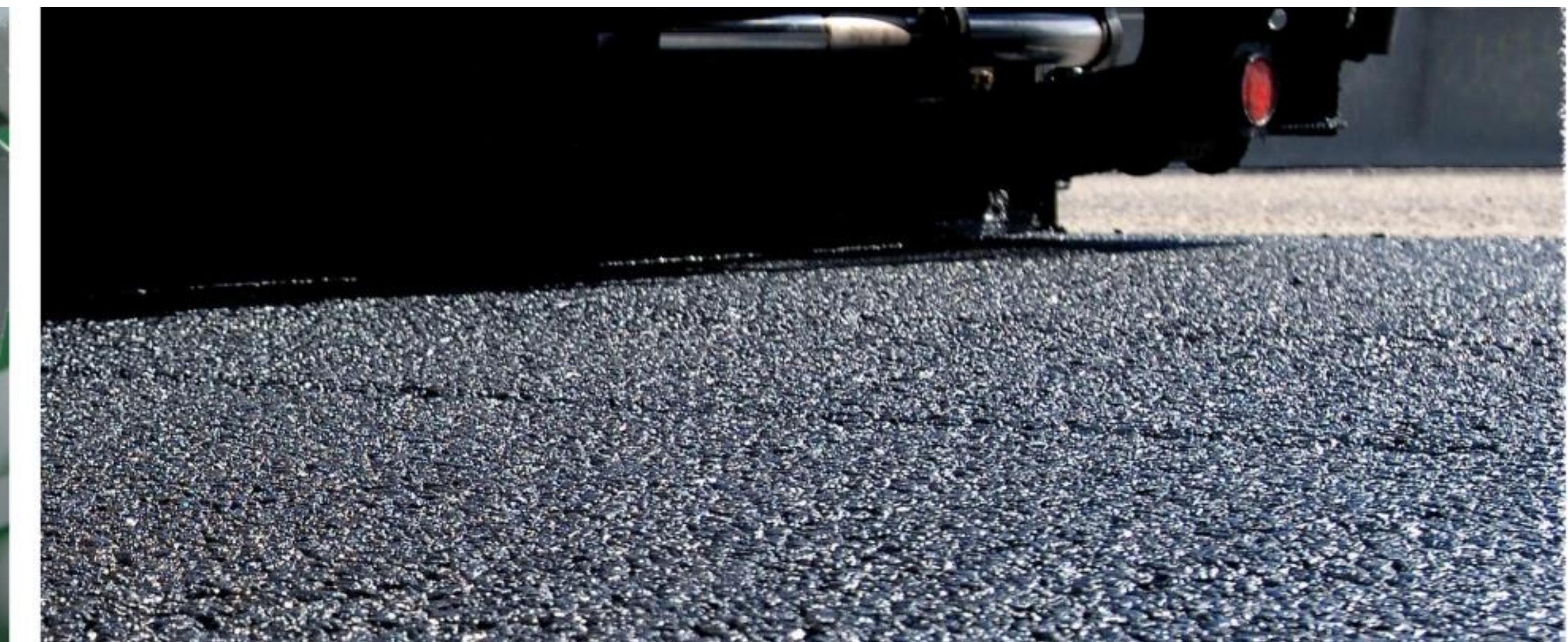


Cement

Cement plants are big, always near a limestone quarry, typically a few decades until CapEx return on invest.



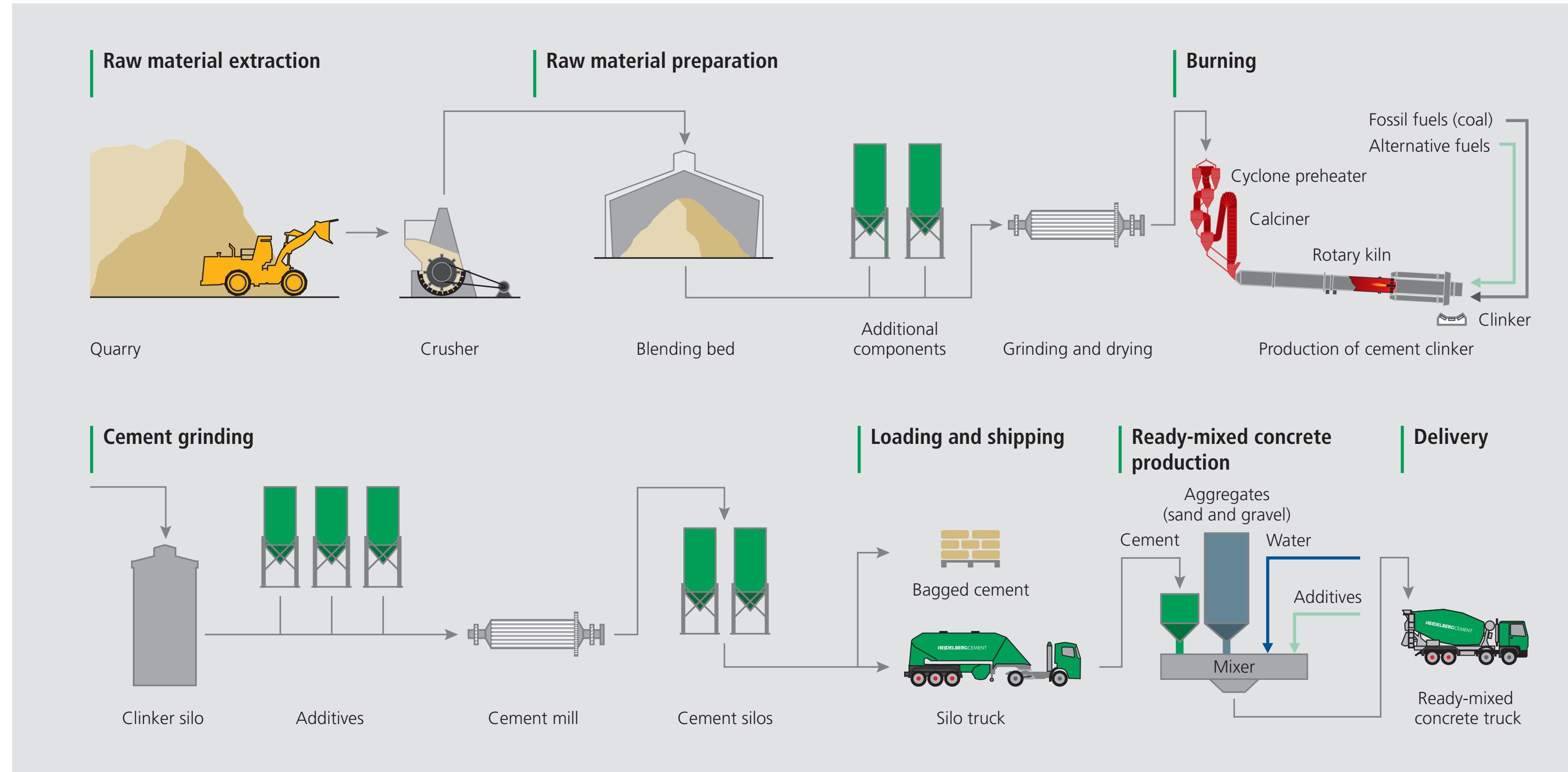
Ready-mix concrete and asphalt



Aggregates



Cement production 101



Turn big rocks into small rocks, then make big rocks again. Clinker!
Then turn those big rocks into small rocks again. Cement!
Then add water, sand & gravel to make rocks again. Concrete!

WTF!

Is this the Big Rock BBQ?



HeidelbergCement – Sustainability

Cement production is very resource intensive:
raw materials, energy, fuels, shipping

8% CO₂ worldwide from cement industry

Ambitious commitments 2025 & 2030
Carbon neutral concrete by 2050



New Chief Sustainability Officer



HeidelbergCement – Digitalisation



Dennis Lentz
New Chief Digital Officer

HConnect



End-to-end experience for
our customers

HProduce



Real-time insights and
advanced analytics optimizers

Our 2025
Target



- All sites consuming HProduce product suite
- 50% of operational excellence savings digitally supported

Enter data science and PyData

We are developing tools to help
our cement plants improve
product quality and cost and
reduce CO₂, energy, fuels



Data science #1 – Optimal production planning

Variable energy price in Germany and other countries.
Buy **electricity price forecast** for the next days.



Sales forecast for each cement type
Use HCystal Ball – uniform interface
for many Python time series forecasting libs

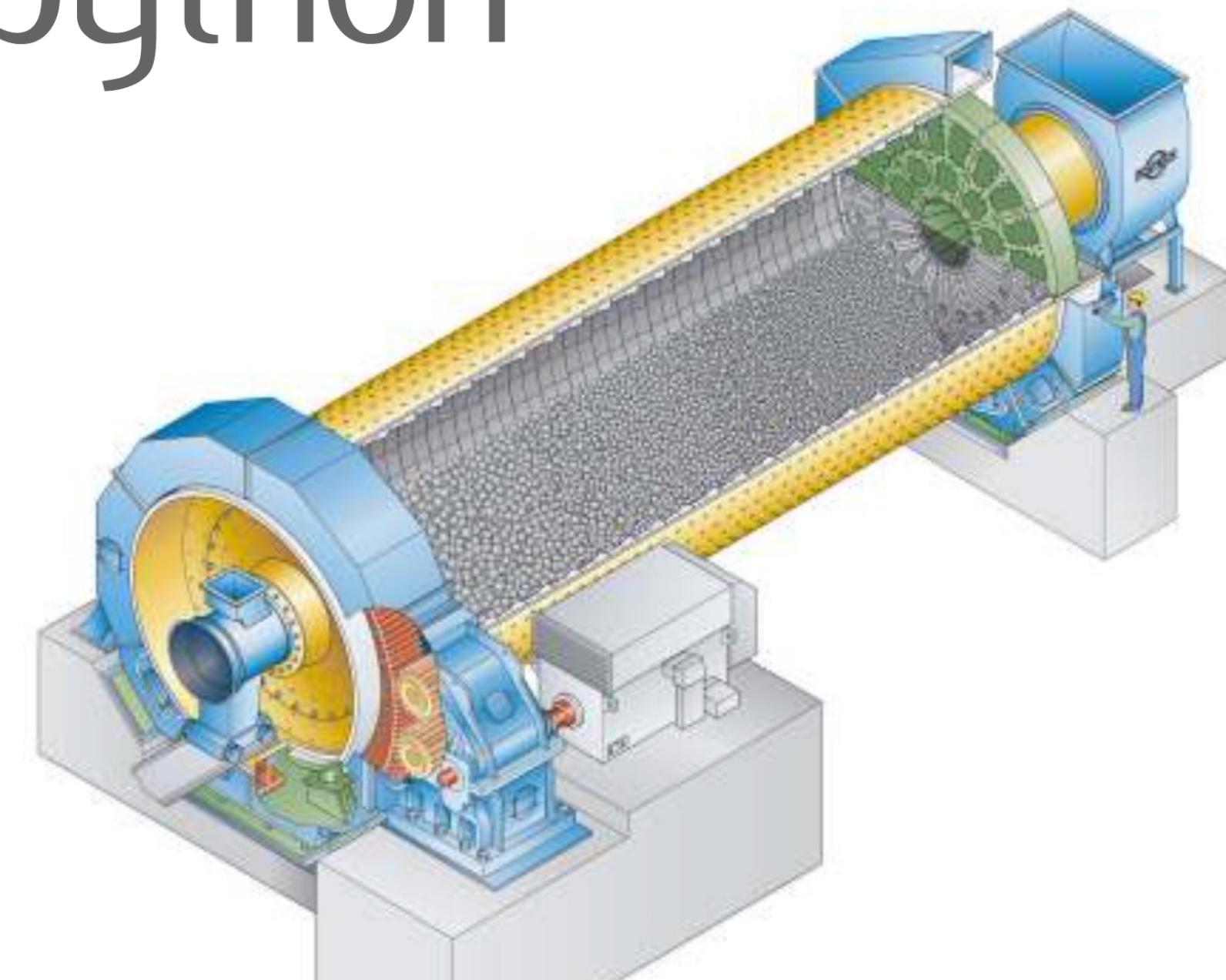


Silo stock levels – work on cloud connection for process data

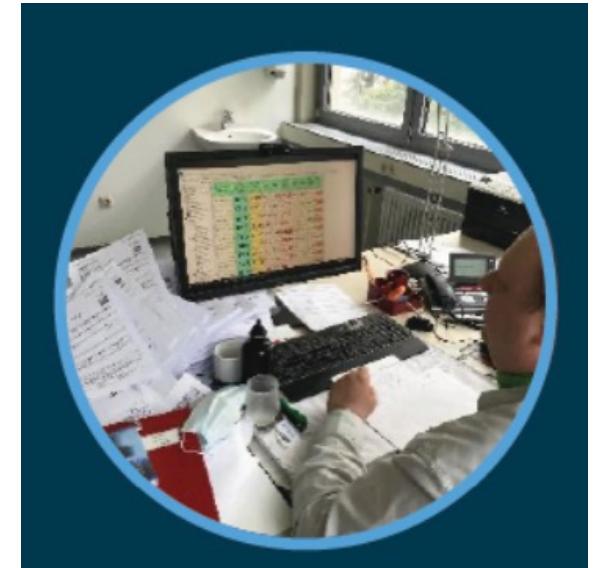
Optimised Discrete cement mill production plan
For every hour in next days, which mill should produce
which cement type to minimise energy cost and not run out of stock



Google OR-Tools



Data science #2 - Cement strength prediction



Leon
Quality Manager

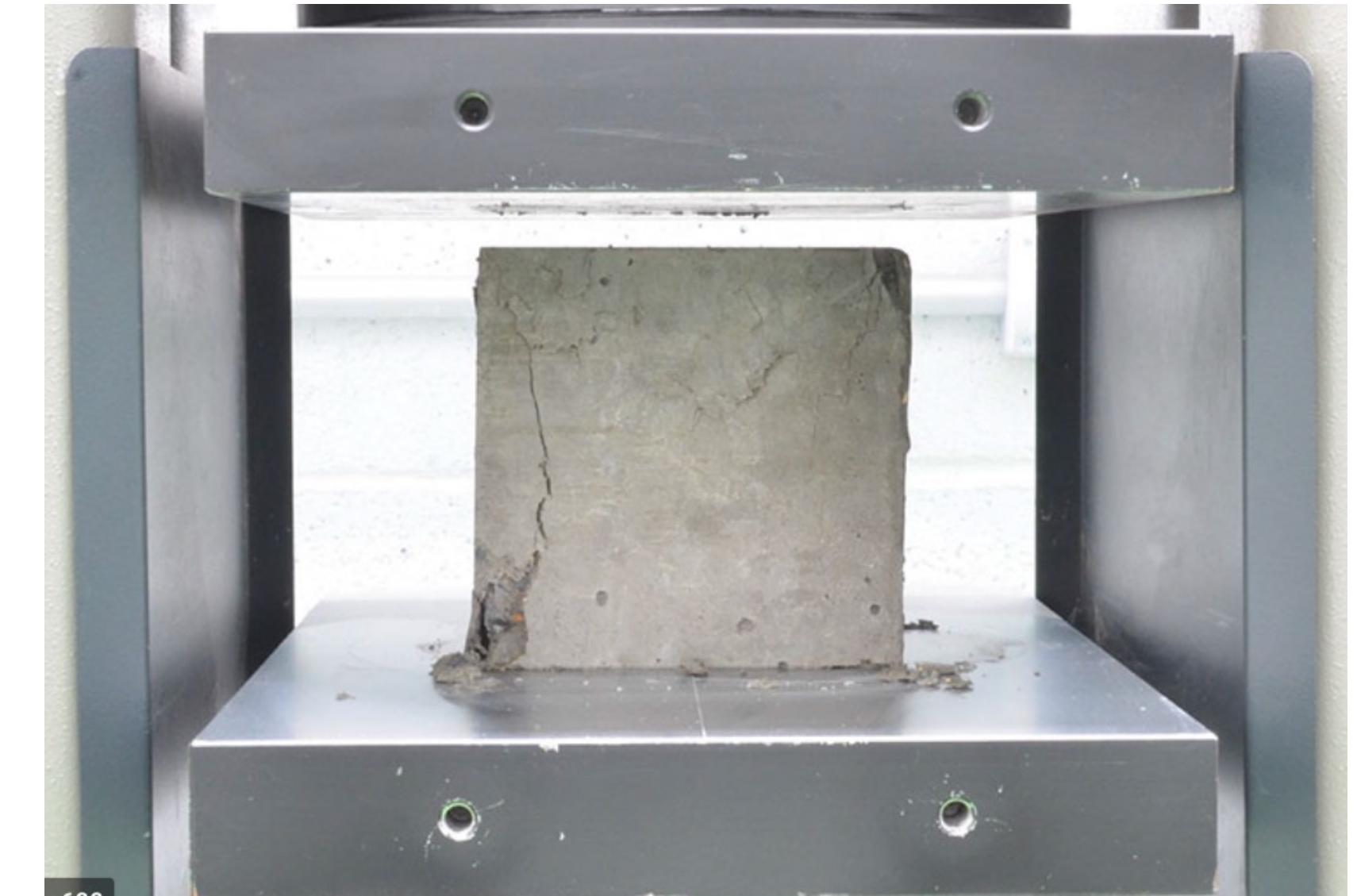
“Help me produce optimal quality cement”

Cement production continuously running.

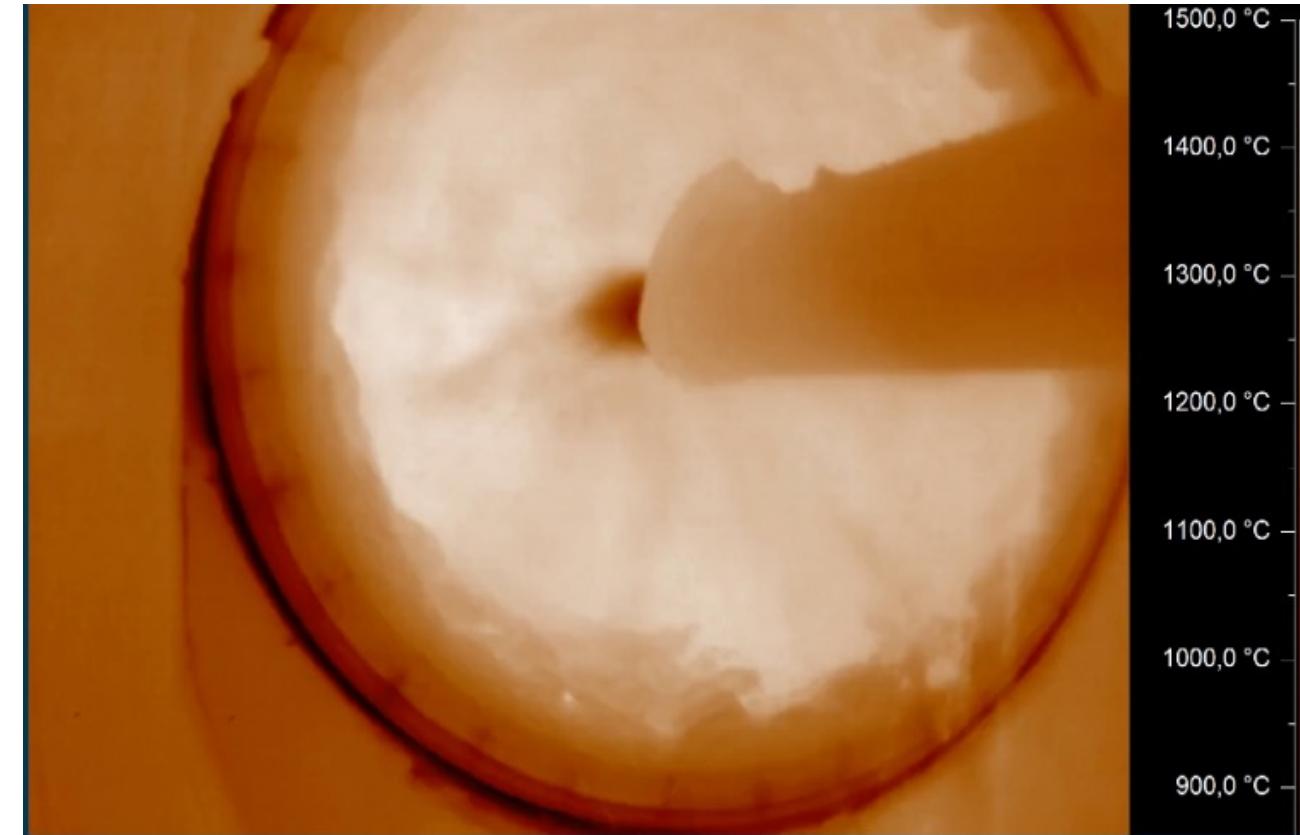
Measure compressive strength after 2, 7, 28 days

Predict strength using lab data measured 1 hour
after production (composition, fineness, ...)

Train regression and time series models
on historic data using scikit-learn.

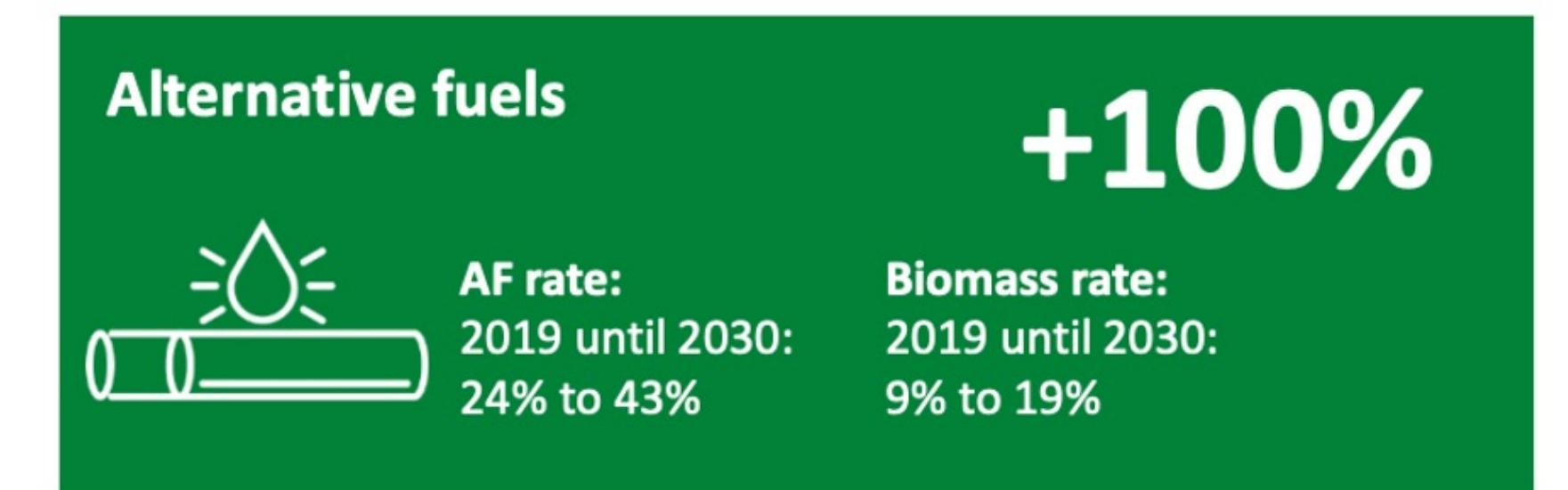
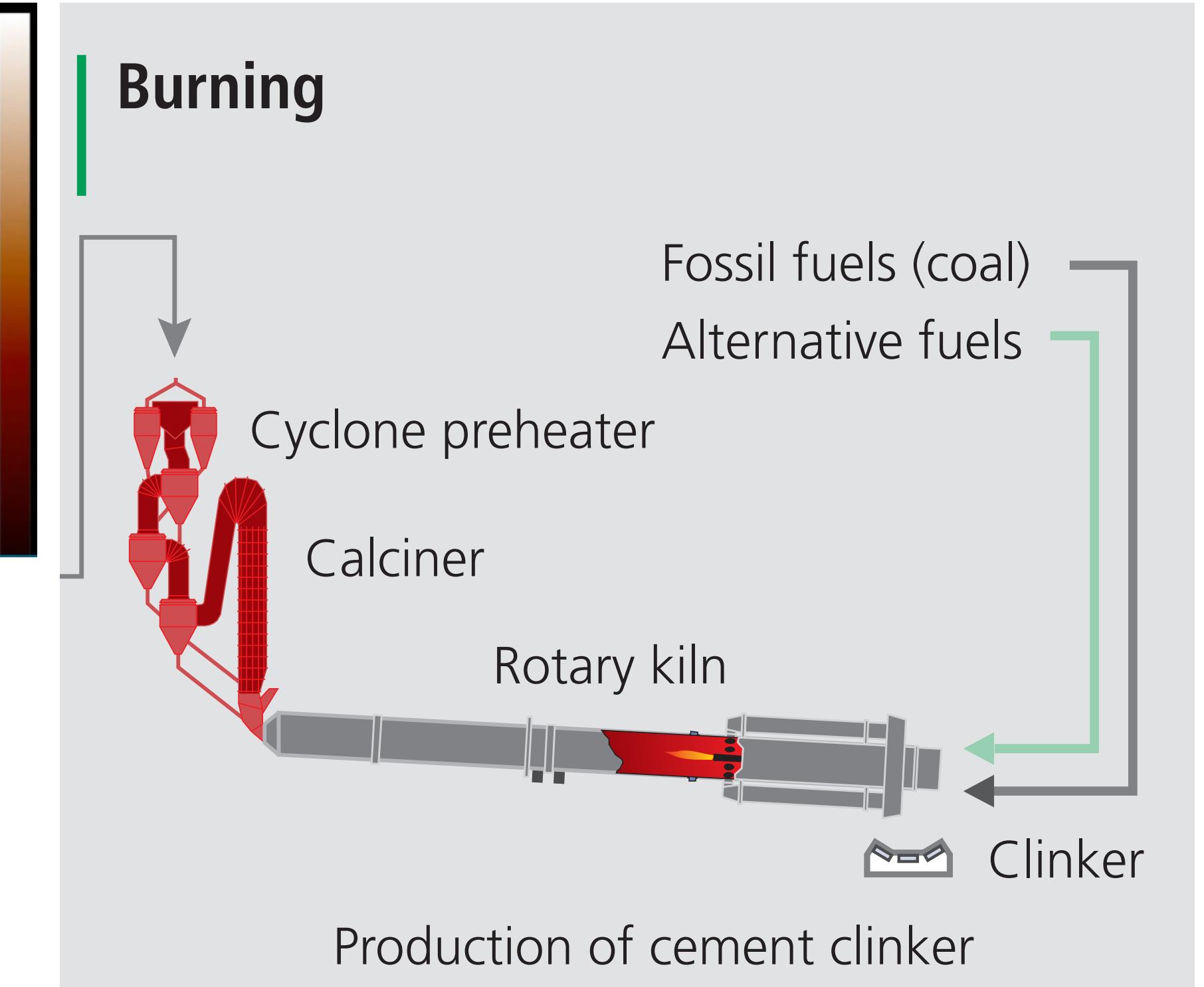


Data science #3 – Clinker free lime prediction



Cement kiln continuously running, need to adjust feed and flame to counteract changes in raw materials and fuels and process parameters.

Starting now on data-driven or possibly hybrid process + data science model, using process sensor and lab data

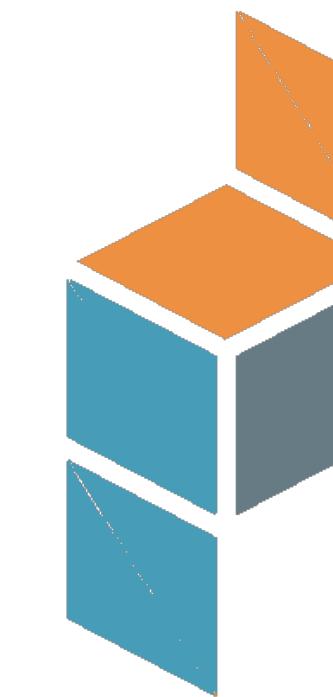


Thank you for wonderful open source tools and community!

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PyData
Südwest



We're hiring!

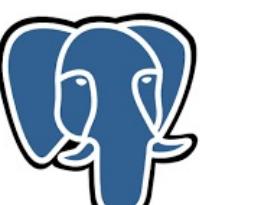
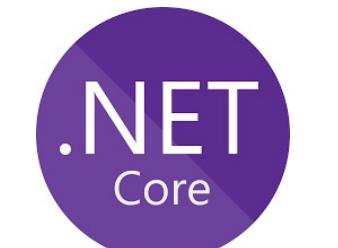


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Data scientists, data engineers, software developers

<https://www.heidelbergcement.com/en/job-offers>

Hope to see you there soon for a PyData meetup



PostgreSQL