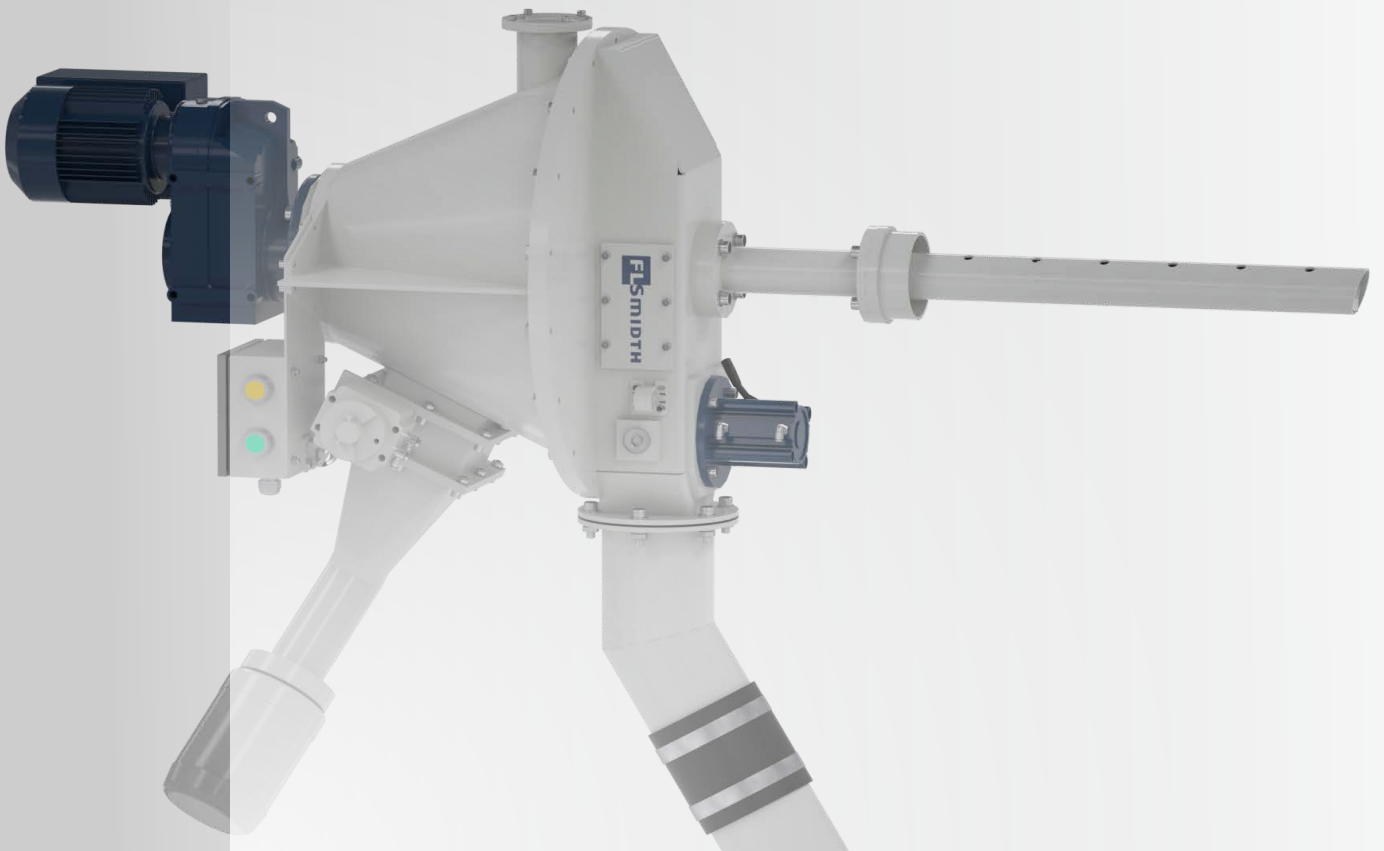


QCX cement works sampling points



Sampling points in a cement plant

Raw Materials

Check of chemical and mineralogical composition of the raw materials for quarry planning, pile mixing control, mill and kiln operation as well as cement quality:

- Elemental analysis by XRF of samples from exploration or blast hole drillings
- Mineral composition by XRD or Microscopy
- Elemental analysis by PGNAA of feed streams to stockpiles
- Moisture content of feed streams.

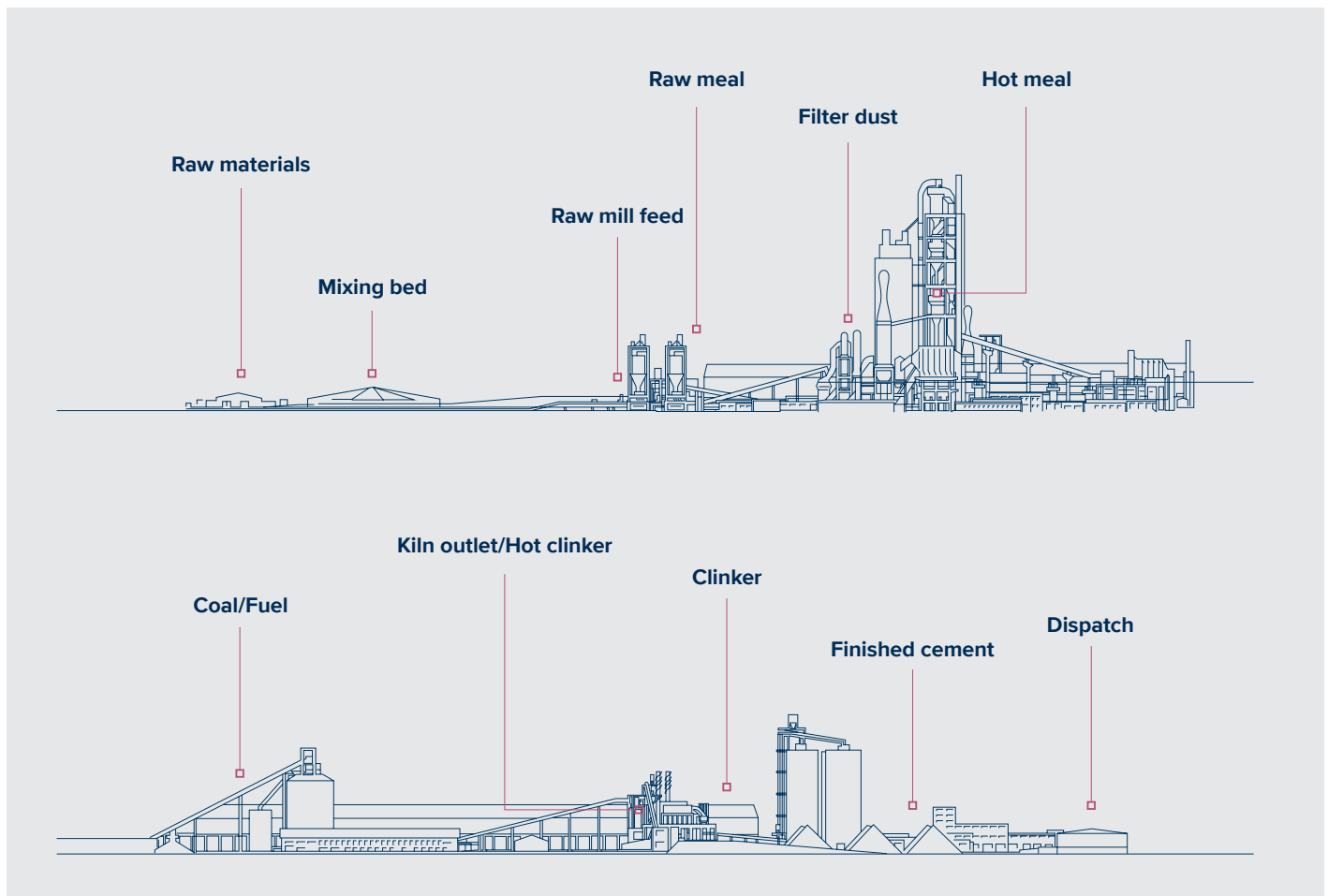
Automation options

- On-line PGNAA & QCX/BlendExpert-Pile

Typical raw materials for cement production:

- Limestone, chalk, marl
- Clay, shale, bauxite
- Quartz sand, sandstone
- Laterite, iron ore, pyrite ash
- Fuel (coal, oil, gas, petcoke, waste)
- Cement additives: Gypsum, limestone, slag, pozzolana, fly ash.

Typical routine sampling points for the cement making process



Raw mill feed

Check of chemical composition of raw materials.

- Elemental analysis by PGNAA

Automation options

- On-line PGNAA with QCX/BlendExpert-Mill.

Raw meal

Quality control of raw meal and control of mill operation:

- Elemental analysis by XRF (1-2 per hr)
- Particle sizing by sieve or laser (1 per 2 hr)
- Moisture content (1 per 4 hr)
- Burnability

Automation options

- Aut sampling & aut sample transport to lab
- QCX/BlendExpert-Mill.

Filter dust

Check of chemical composition, material balances (e.g. K, Na, S, Cl):

- Elemental analysis by XRF (1 per 24 hr)

Automation normally not considered.

Kiln feed

Consistency between raw mill product, kiln feed and clinker analyses, material balances (e.g. K, Na, S, Cl), silo blending efficiency, burnability, heat consumption:

- Elemental analysis by XRF (1 per 1-2 hr)
- Particle sizing by sieve or laser (1 per 4-8 hr)
- Heat of reaction
- Burnability

Automation options

- Aut sampling & aut sample transport to lab.

Hot meal

Dust separation efficiencies, dewatering and degree of calcination, material balances (e.g. K, Na, S, Cl), silo blending efficiency, fuel burn-out:

- Elemental analysis by XRF
- Loss on Ignition

Automation options

- Aut sampling & aut sample transport to lab. Automation is valuable due to health and safety issues with hot meal handling.

Coal/Fuel

Check of coal mill operation, fuel consumption, ash absorption in clinker, material balances (e.g. K, Na, S, Cl), burn-out in calciner, NO_x –formation:

- Calorific value, moisture, gas, ash % (1 per 8-24 hr)
- Elemental analysis of ash (1 per 8-24 hr)
- Particle sizing by sieve or laser (1 per 2-4 hr)

Automation options

- Aut sampling & aut sample transport to lab.

Clinker

Check of clinker quality and kiln operation, material balances (e.g. K, Na, S, Cl):

- Elemental analysis by XRF (1 per 1-2 hr)
- FCaO analysis by titration or XRD (1 per 1-2 hr)
- Mineral composition by XRD (1 per 2-8 hr)
- Litre weight (1 per 1-2 hr) (alternative to FCaO)

Automation options

- Aut sampling & aut sample transport to lab
- Both sampling of clinker directly after the kiln for fast analysis and after the cooler is available
- Automation is valuable due to health and safety issues with hot clinker handling.

Finished cement from mill

Control of gypsum and additives, check of mill operation as well as quality of the finished cement:

- Elemental analysis by XRF (1 per 2-4 hr).
- CO₂/SO₃ analysis by combustion (1 per 2-4 hr)
- Particle sizing by sieve or laser (1 per 1-2 hr)
- Specific surface area (Blaine), density (1 per 1-2 hr)
- Mineral composition by XRD (1 per 2-4 hr)
- Thermal analyses (dewatering of Gypsum, Wk)
- Physical testing of cement properties (1 per 24 hr)

Automation options

- Aut sampling & aut sample transport to lab
- QCX/BlendExpert-Mill.

Dispatch

Verification of cement quality before despatch, to test against possible damage during silo storage and for issuing of customer certificates:

- Analyses and tests: The same as for finished cement

Automation options

- Aut sampling & aut sample transport to lab.

NORMAL CEMENT SAMPLING & ANALYSIS SCHEME

Samples & analysis per 24 hours	Samples	XRF	XRD/(FCaO)	Blaine	Particle sizing	Other
Raw materials		Continuously				x
Raw meal	24-48	24-48			12-24	x
Filter dust	6-12	6-12				
Kiln feed	12-24	12-24				
Hot meal	6-12	6-12				x
Coal/Fuel	12-24	Depending on fuel type				
Clinker	12-24	12-24	12-24	12-24		x
Cement blending	12-24	12-24	12-24	12-24	12-24	
Cement dispatch	According to QA scheme in plant					

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