RAW MIX OPTIMIZATION WITH NEAR INFRA-RED ONLINE ANALYSIS IN CROSSBELT AND AIRSLIDE APPLICATIONS

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SpectraFlow Analytics Switzerland
Objectives of an Online Analyzer installation

- Process Improvement
  - Real on-line system
  - Kiln feed quality after the raw mill
- Use safe and proven system
  - No radiation!
  - No import hassle or permit requirements
- Return on Investment
  - Very low cost of ownership
  - Reduce fuel consumption @ kiln
  - Reduce maintenance and service cost for the laboratory
Position in Cement Production Process

SPECTRAFLOW CROSSBELT

Blending Bed

Raw Mill

Homo Silo

Kiln (Clinker)

Cem Mill

Cement

SPECTRAFLOW AIR-SLIDE
CrossBelt Application – Analyzer Example
Air-slide Application – Analyzer Example
SpectraFlow On-Line Analyzer

A new development
NIR Analysis Technology

- Rails for lamp positioning
- Light and dust shield
- FTIR Spectrometer
- Entry lens of spectrometer
- 2 or 8 lamps 50 Watt each
- Bulk Material
- Lamp
- Lamp holder
SpectraFlow On-Line Analyzer

Crossbelt Application
Crossbelt Application – Analyzer Pictures

Overall View

Spectrometer Compartment

Service Flap which can be opened to access the lights
Crossbelt Application – Analyzer Pictures

Inside view
during operation

Spots as Infrared Sources
Crossbelt Application – Quarry Optimization

Quarry A
High Limestone

Quarry B
Low Limestone

Quarry C
Clay / Marl

Raw Material delivery

SpectraFlow Analyzer

On-line analysis
CaO
Al$_2$O$_3$
SiO$_2$
Fe$_2$O$_3$
H$_2$O

Decision by quarry management or Blending Software on material demand

Crusher

Stockpile composition
LSF
AM
SM
Tonnage normalized

Belt scale

Blending bed
# Crossbelt Application – Stockpile SF vs PGNAA

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Crossbelt Application – Benefits & Advantages

Benefits:
→ Real-time control of your raw-materials
→ Get stockpile close to module set-point
→ Extend the life of your quarry

Advantages of SpectraFlow over conventional PGNAA analyzers:
→ Independent of belt load variation
→ No requirement for variable belt speed drives to compensate for belt load variations
→ Actual 1-minute analysis values
Crossbelt Application – Benefits & Advantages

- Video – 45 seconds
SpectraFlow On-Line Analyzer

Air-Slide Application
Position in Cement Production Process

SPECTRAFLOW CROSSBELT

Blending Bed

SPECTRAFLOW AIR-SLIDE

Kiln (Clinker)

Cement

Raw Mill

Homo Silo

Cem Mill
Cross Sectional View

FTIR Spectrometer

Rails for lamp positioning

Light and dust shield

2 lamps 50 Watt each

Entry lens of spectrometer

Lamp holder

Air - slide
Analyzer Installation

- Peltier cooling system
- Illumination unit and dust protection cover
- Emergency closing device
- Spectrometer compartment
- Inspection & cleaning opening
- Tight air seal
Analyzer Pictures

Overall View

- Light and dust shield
- Lamp mounting
- Service opening
Raw-Mix Control – Slow Loop

Alternative materials

Blending Bed
Additives
Raw Mill
Homo Silo
Pneumatic tube
Sampler

Manually set points for weigh feeders

Automatic set points for weigh feeders by blending software

Manual set points for weigh feeders

Analysis data

Analysis
Pressing
Grinding

One sample every 15 to 60 minutes

Alternative materials

Additives

Raw Mill

Homo Silo

Pneumatic tube

Sampler
Raw-Mix Control – Fast Loop

- **Blending Bed**
- **Additives**
- **Raw Mill**
- **Homo Silo**
- **Alternative materials**

Automatic set-points for weigh feeders by blending software

One analysis every minute

On-line analysis data
Raw-Mix Optimization

Blending Bed

Additives

Alternative materials

Raw Mill

Sampler

Homo Silo

Analysis data for on-line analyzer comparison

Automatic set-points for weigh feeders by blending software

On-line analysis data

Semi automated transport

One shift sample

Semi automated Laboratory

Analysis

Pressing

Grinding
SpectraFlow On-Line Analyzer

Measurement results
Dynamic comparison SF vs. XRF over a 10 day period

CaO

Fe$_2$O$_3$

Al$_2$O$_3$

SiO$_2$

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LSF Control Comparison

Control by XRF/LAB
LSF STDEV 3.4 based on XRF

Blending Software Control based on SpectraFlow, LSF STDEV 1.7 based on XRF

Orange line = SpectraFlow
Yellow Line = XRF/Lab

Time delay from XRF/Lab one hour
Airslide Application – Benefits & Advantages

**Benefits:**
- Real Time control of your raw-mix
- Kiln feed quality after raw mill
- Reduced requirement for homogenization
- Reduced fuel consumption

**Advantages of SpectraFlow over conventional PGNAA analyzers:**
- Only online analyzer to evaluate raw meal
- Independent of specific element concentrations (e.g. Fe$_2$O$_3$)
- XRF at same location
SpectraFlow On-Line Analyzer

Summary
Summary

- No radioactive materials used
  - very low cost of operation and maintenance
  - no operational permits or extra personnel required
  - no risk to employees during operation or maintenance
- Most accurate measurement for raw meal:
  - raw meal can be controlled close to kiln feed quality
  - less need for homogenizing
  - lower fuel consumption in the kiln due to more stable kiln feed
- Not influenced by belt load variations or specific element concentrations (e.g. Fe₂O₃)
SpectraFlow On-Line Analyzer

Reference List
REFERENCE LIST:

21 Analyzers commissioned, accepted and running in 11 countries
7 Analyzers on delivery in 4 countries

GERMANY: 1 Airslide, 1 Crossbelt
SWITZERLAND: 1 Airslide, 3 Crossbelt

AUSTRIA: 1 Airslide
SLOVAKIA: 1 Crossbelt

TURKEY: 1 Crossbelt, 6 Airslide
IRAN: 1 Crossbelt
CHINA: 2 Airslide

SAUDI ARABIA: 3 Crossbelt

PAKISTAN: 1 Crossbelt
INDIA: 1 Crossbelt, 1 Airslide
OMAN: 1 Crossbelt, 1 Airslide

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THANK YOU FOR YOUR ATTENTION!

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