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Variability Reduction – Unlocking Plant Performance and Customer Satisfaction

Variability – In 30 minutes!

Discussion of the background to variability reduction

Introduction of the case study plant

Plant areas where variability can be identified and reduced

Impact in the cement and concrete sector

Variability Calculator

Variability – Who needs it!

Not the producers – impact upon process, quality and costs

Not the customers – impact upon concrete performance and costs

Not the sales team – impact upon cement prices

Variability – A natural phenomenon

Changes in raw materials

Wear on equipment parts

Changes in operators

Sampling or measurement errors

Always expect some variability

Put in place upper and lower limits for conformity

Variability – Impacts

Kaizen in the Japanese Automotive Industry

- Scrap or re-work
- Double handling and inputs to re-worked product
- Higher inventories of raw materials
- Lost sales opportunities
- Increased inspection frequency

Variability – how do we measure it?

Three main materials in the cement manufacturing process

- Kiln feed
- Clinker
- Cement

Target chemical and physical values throughout the cement manufacturing process

Measure of the variability is the standard deviation around these values

Some variability is natural and must be accounted for

Variability – some key points

Generally, once variability is introduced into the process it can be seen all through the process.

The earlier in the process the more severe the impact

Much easier to design out early in the process than attempt to correct later

The opposite of variability – consistency – is one of the most important factors to the customer.

Variability – Raw meal – Quarry

No raw materials are the same

- from quarry to quarry
- from bench to bench
- in some places within the bench

Need to have a medium term quarry plan that is regularly updated – actual vs. predicted results

Need to maximise the life of the quarry

Variability – Raw meal - Quarry

Available operating hours

- Reliability of the quarry fleet
- Availability of the quarry fleet
- What contingencies are in place?
- Crusher maintenance regime
- Sampling station maintenance with stacker/reclaimer

Variability – Raw meal – Raw milling

How much work needs to be done?

- Mill maintenance regime
- Storage of raw materials
- Other raw materials
- Mill hopper design – dry/wet conditions
- Feeder accuracy
- Influence of alternative raw materials

Variability – Raw meal – Blending

Aim is to achieve a significant reduction in the variability

- How are they maintained
- How are they operated
- What about ancillaries
- Are they water-tight
- Segregation of materials

Variability – Clinker – Pyro-Processing

Variability in feed = variability in clinker

Consistency of burning zone operations

- Alternative fuel quality and quantity

Consistency of calciner operations

- Control loops and instrumentation

Dust return strategy when raw mill off

Variability – Clinker - Cooler

Rate of cooling and chemical impacts

Recuperation rate of heat and impact upon burning

Temperature of clinker leaving the cooler – impact on cement milling

Variability – Clinker – Cement Milling

Consistency of clinker and source of clinker

Feeders for gypsum and MAC

Strategy for off spec and weathered clinker

Source and quality/type of gypsum

Maintenance of mill and separator

Final product transport – leaking valves

Impact of Variability - Producers

Cost of lost output

Costs on fuel consumption

Cost on refractory

Costs on raw materials

Costs of off-spec clinker

Costs on strength improvers

Impact of Variability - Customers

Overdosing of cement in ready mix

Longer setting times in concrete products sector

Risk of non-performing cement in structures

Impact of Variability – Sales Team

Claims against the company

Larger rebates to secure business

Less negotiating power for price rises

Variability Calculator – Raw Meal

Kiln Feed:

Parameter	Standard Deviation (?)
C3S Potential	3
Silica Modulus	.13
Alumina Modulus	.21
90 micron residue	1.18
MgO	.12
EqNa2O	.19

Please choose either "C3S Potential" or "LSF" from the drop-down menu below, then enter your figures.

Calculate

OVERALL RESULT:

58.58% of target performance for Kiln Feed
Based on LSF/SR/AR

60.75% of target performance for Kiln Feed
Based on LSF/SR/AR + MgO + Residue control + Alkalis

For an explanation of your results, click here

Click here to send your results to cpi for evaluation

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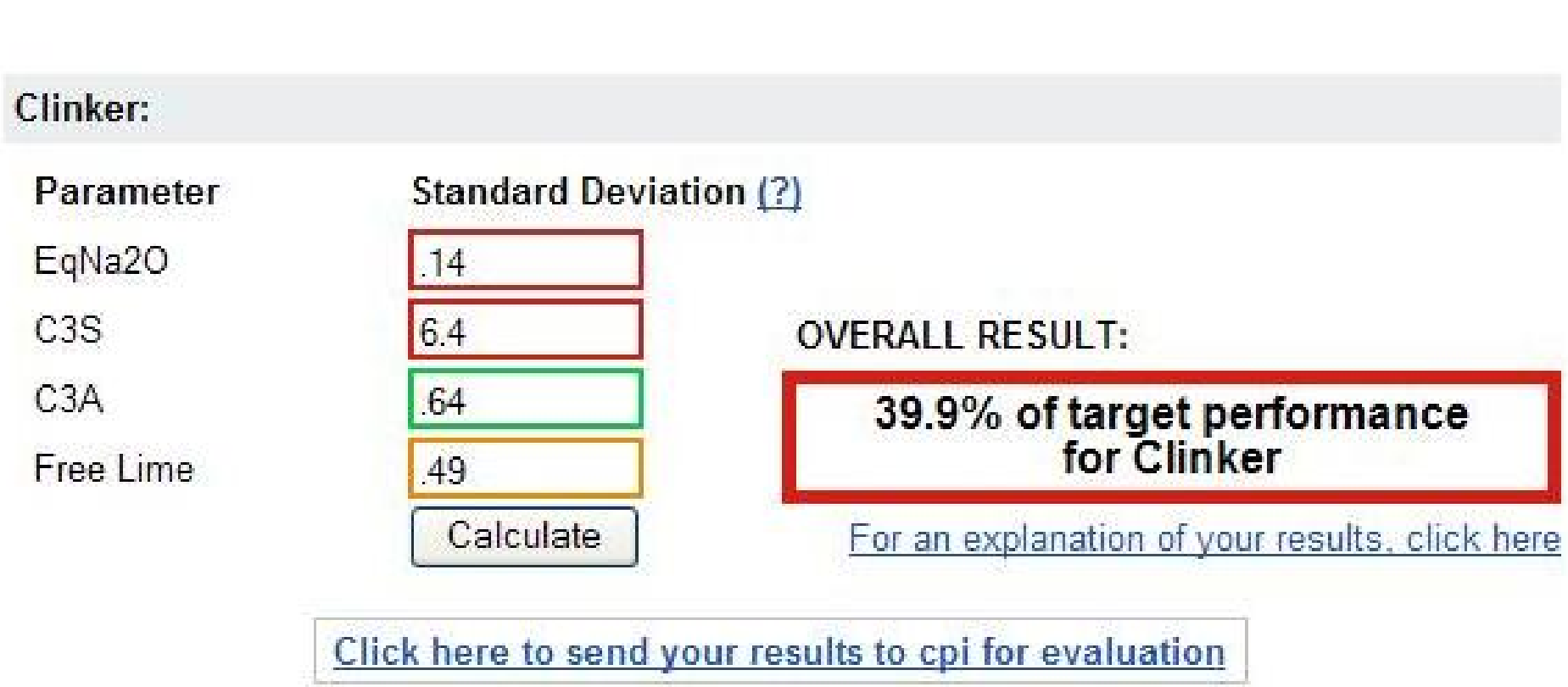
Variability Calculator – Clinker



Variability Calculator – Cement

Cement:

Parameter	Standard Deviation (?)
Blaine (cm2/g)	125
45 micron residue	2.1
SO3	.12
EqNa2O	.09
C3S	3.67
C3A	.5
Free Lime	.38
Loss on Ignition	.47

Calculate

OVERALL RESULT:

56.5% of target performance for Cement

For an explanation of your results, click here

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Thank you and Happy Christmas


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