



STANDARD OPERATING PROCEDURE

PLANT	HOPE
AREA	Shale Quarry
TASK	Raw Meal Sulphur Control
SOP Number	HSQ-SOP1
Written by	Keith Rowland

Safety: Always consider your actions as to how they may affect others.

Background

Shale is the secondary raw material used for the manufacture of cement clinker at Hope Works. It comprises up to 20% of the total material used in raw meal manufacture. Shale contains the largest proportion of sulphur compounds within the raw materials used and these have a direct impact on the emissions of sulphur dioxide from the kilns. The correct amount of sulphur is also required to ensure stable process conditions and clinker quality within the kiln system. As a result, to ensure stability of the kilns, together with the emissions of sulphur dioxide, it is vital to control the input of sulphur compounds from within the shale.

Control Philosophy

The sulphur content within the shale is very variable. The upper 15m of Hope's shale reserve is classed as low to medium sulphur shale, containing SO₃ levels ranging from between 0.3% and 3.2%. The next 13m depth of reserve is classed as high sulphur shale with an SO₃ content ranging between 4.5% and 7.2%. Below this point, we classify the shale as ultra-high sulphur with an SO₃ content ranging from 10% to 12.5%. The blends of high, medium and low sulphur shales used for raw mix have to be monitored continually and adjusted as the SO₃ content of the different shales vary.

Control Methodology

Raw meal samples are taken hourly and analysed by the laboratory. The resultant SO₃ content of the raw meal is displayed continually on the site's Process Information system.

Quarry management monitor the raw meal SO₃ results on a daily basis and instruct the shale extraction operators to increase or decrease the amount of high sulphur shale input into the blend to maintain the raw meal SO₃ target.

Representative samples the shales crushed are collected from the shale quarry on a daily basis and analysed by the laboratory. These results are displayed on the AQNet quality information system and this provides supporting data to inform of changes in the SO₃ content of the shales being extracted.

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Furthermore, the shale extraction team are instructed only to feed low sulphur shale at the start of each day as part of the blending process. This is to avoid a sudden spike of high SO₃ raw meal being produced which could cause process instability and elevate the SO₂ levels in the kiln exhaust gas.

Kiln exhaust gas emissions, including SO₂, are continually monitored, levels and this information is displayed on the environmental screen in the Control Room.

If additional secondary raw materials are being used for raw meal production, such as Pulverised Fly Ash, then the effect of this on the overall SO₃ content of raw meal will need to be monitored. The amounts of such materials available, together with a review of the kiln process as a whole, is conducted weekly at a technical review meeting. All this information is then considered when reviewing the raw meal SO₃ target.

This process is summarised in the flow diagram below.

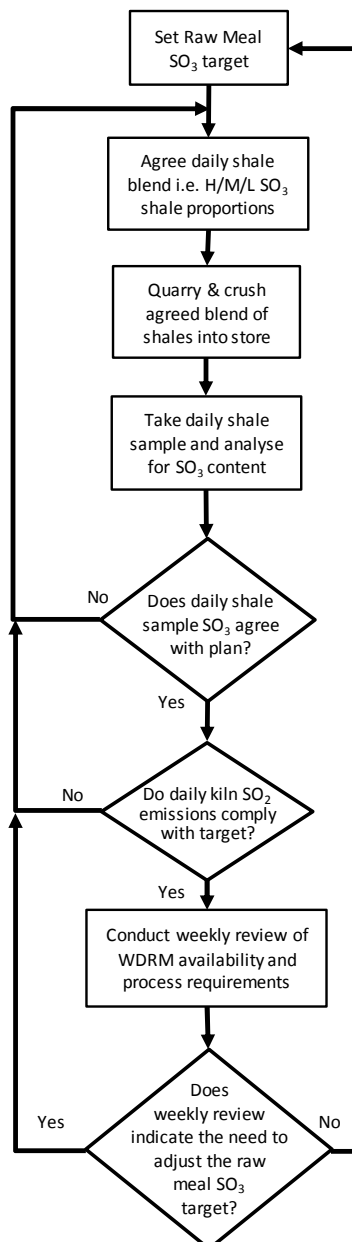
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