



# **CEMS Challenges of Cement NESHAP**

## **CDAWG November 2017**

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**Mitsubishi Cement Corporation**



**OR....**

**NESHAP TURNED  
MY CEMS INTO  
a MONSTER**



*The dreaded  
“Ka-boo-key”  
monster!*



**CEMS**  
**“In the Beginning”**  
**A couple analyzers and a strip**  
**chart.**

*But the Times they are*  
*A-Changin’*



MCC CEMS in 2005





# Mitsubishi Cement Corporation Cushenbury Plant





## Exhausting Challenges





## California AB32

- **GHG monitoring adds CO<sub>2</sub>, flow and coal mill vents**
- **GHG verification requires auditable DAS, strict QC and high availability**
- **Alternate fuels help GHG liability, but all fuels must have tight accounting.**





## US EPA NESHAP

- Initial limits on D/F and required opacity monitoring  
(D/F Means WHAT???)
- New limits for HCl, Hg, THC, PM with monitoring flow and clinker production
- MCC uses lime injection and activated carbon injection for emissions control





# MCC CEMS in 2015





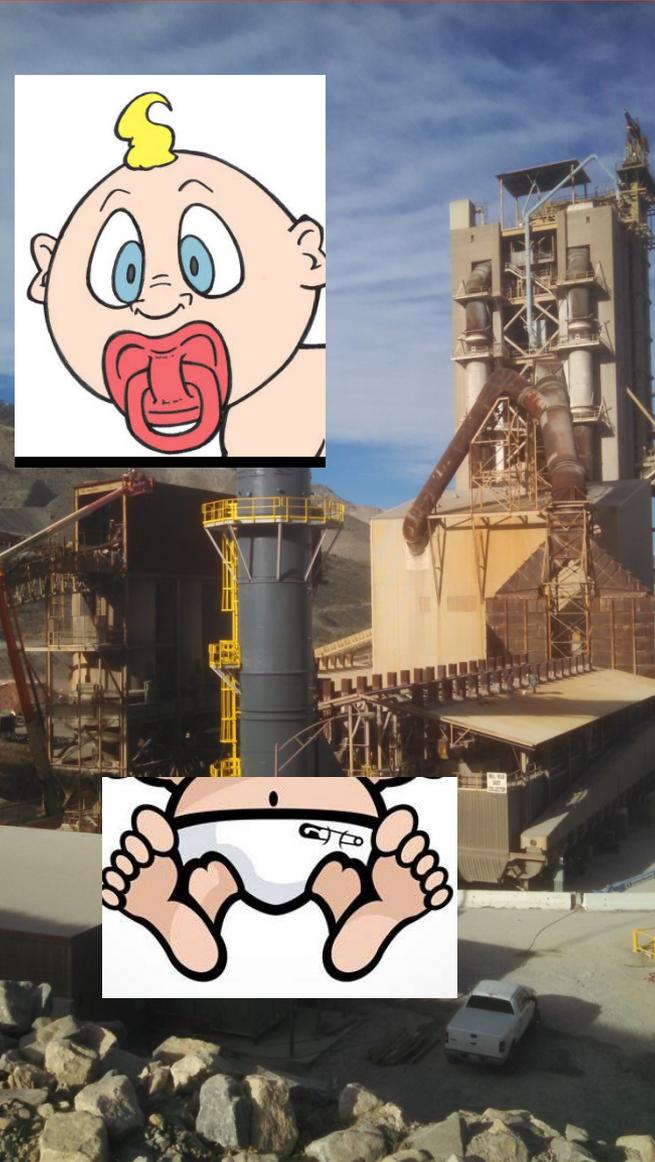
## A New Stack Arises!





Stack of 105' is  
high enough.

Someone  
called it a  
"Baby Stack"





# And a New CEM Building



CONTINUOUS  
EMISSIONS  
MONITORS

CONTINUOUS  
EMISSIONS  
MONITOR



# MCC CEMS in 2016





## “CEMS” Rack:

Moisture

THC

CO<sub>2</sub>

CO

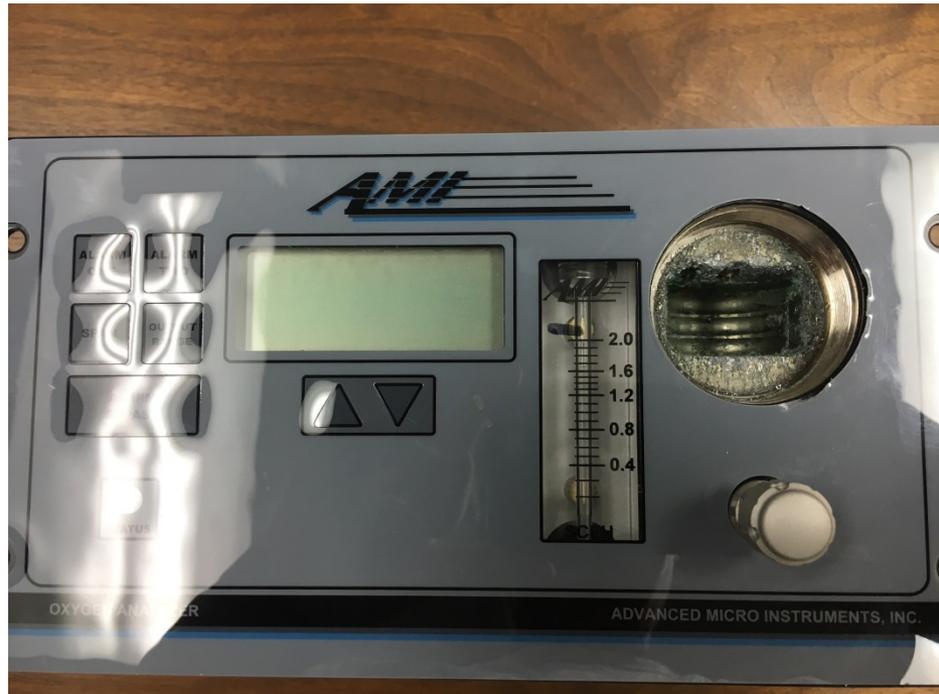
SO<sub>x</sub>

NO<sub>x</sub>

O<sub>2</sub>



Even the reliable  
Oxygen monitor  
is vulnerable to  
corrosive gases!





**FTIR**

**HCl CEMS**

**Backup for:**

**CO<sub>2</sub>**

**CO**

**SO<sub>x</sub>**

**NO<sub>x</sub>**

**Moisture**

**Mr. PS-18**





# Mercury CEMS

Elemental & Ionic  
Calibrator(s)  
Permeater

Permeater permeater





# So many calibrations! It becomes a.....



## Mercury Analyzer QC:

Hg Analyzer QA (PS12A-Procedure 5):

- Weekly Oxidation Test-System Integrity Test
- Monthly Permeation Test
- System Response Times (Elemental and Oxidized)-upscale and downscale
- Quarterly Calibration Gas Audits (Elemental and Oxidized)-Quarterly, Except RATA Quarter.
- Analyzer Linearity Test (Elemental and Oxidized)-Internal Calibrations
- Measurement Error Test (3 Point Test in Triplicate)-Elemental and Oxidized (System Calibration)
- Relative Accuracy Test Audit (RATA)-Annual
- 7-Day Calibration Drift Test: Initial Compliance Test Only



## FTIR HCl QC:

- 7-Day Calibration Drift Test
- Quarterly Calibration Gas Audits: Quarterly, Except RATA Quarter.
- Analyzer Linearity Test (Elemental and Oxidized)-Internal Calibrations
- Measurement Error Test (3 Point Test in Triplicate)-System Calibrations
- Relative Accuracy Test Audit (RATA)-Annual
- Interference Tests: N<sub>2</sub>, CO, CO<sub>2</sub>, SO<sub>2</sub>, O<sub>2</sub>, THC, NO<sub>x</sub>, NH<sub>3</sub>, and Formaldehyde
- System Response Times (upscale and downscale)
- Dynamic Spiking (DS)
- Level of Detection (LOD)



# Clinker Cooler Dust Collector

Retrofitted for particulate monitoring  
Two new ducts with particulate CPMS





# Particulate spiking feeder





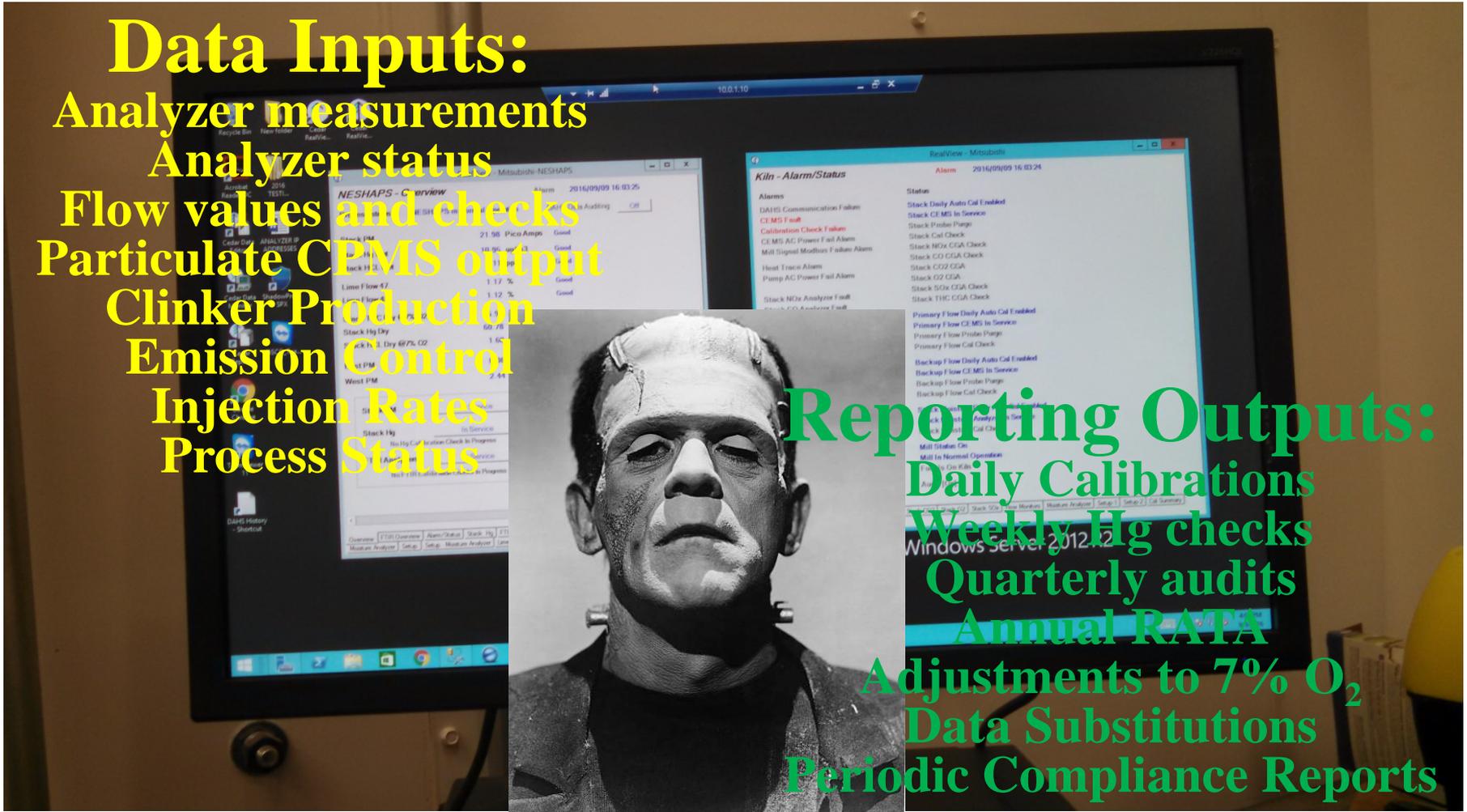
# Data Acquisition System

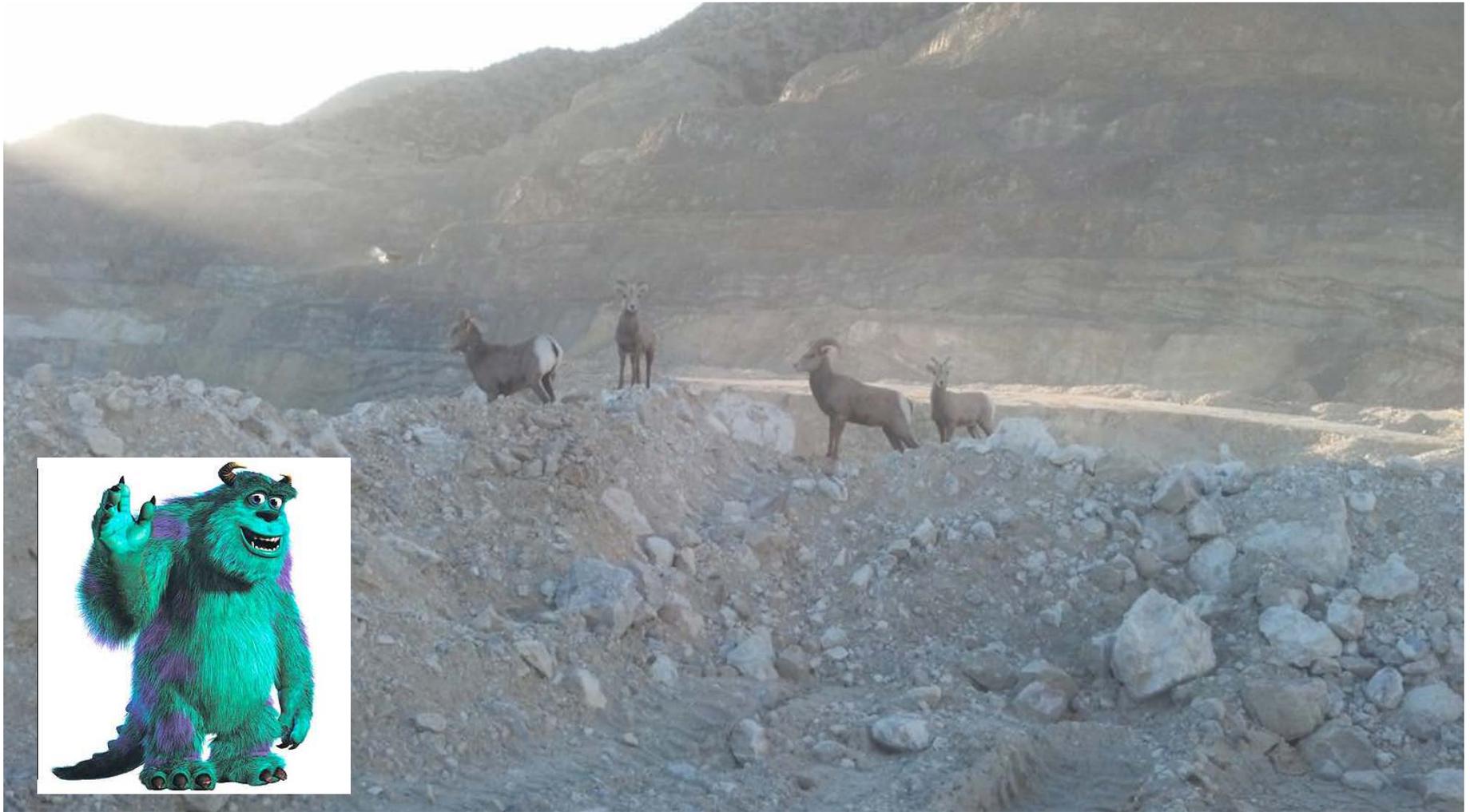
## Data Inputs:

Analyzer measurements  
Analyzer status  
Flow values and checks  
Particulate CEMS output  
Clinker Production  
Emission Control  
Injection Rates  
Process Status

## Reporting Outputs:

Daily Calibrations  
Weekly Hg checks  
Quarterly audits  
Annual RATA  
Adjustments to 7% O<sub>2</sub>  
Data Substitutions  
Periodic Compliance Reports





**Can cement manufacturing and environment sustain each other?**