# **MANAGING** exposure to harmful contaminants in refining

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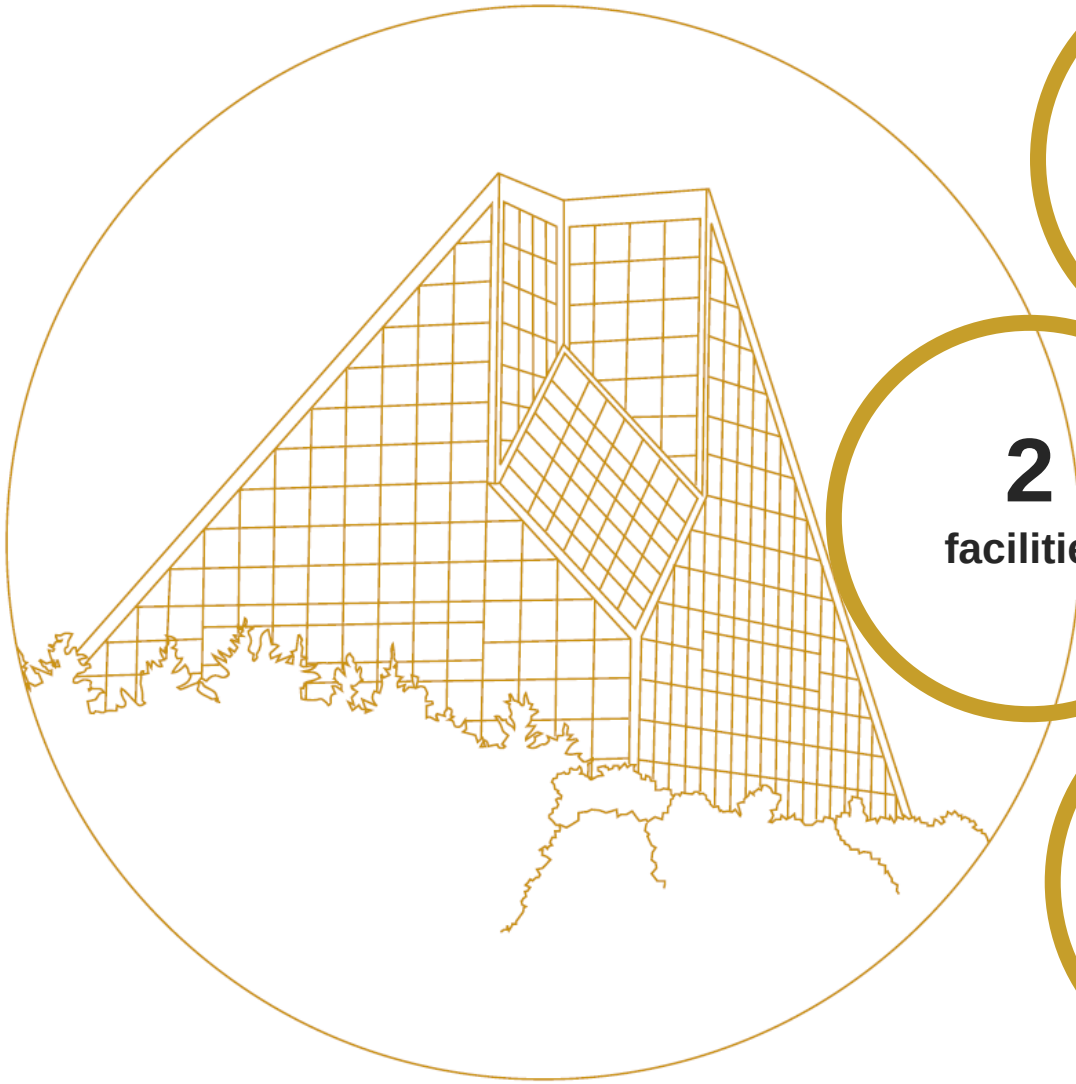
# CANADA'S MINT



**1908**
established

**2**
facilities

**2**
businesses

**1,000**
our team

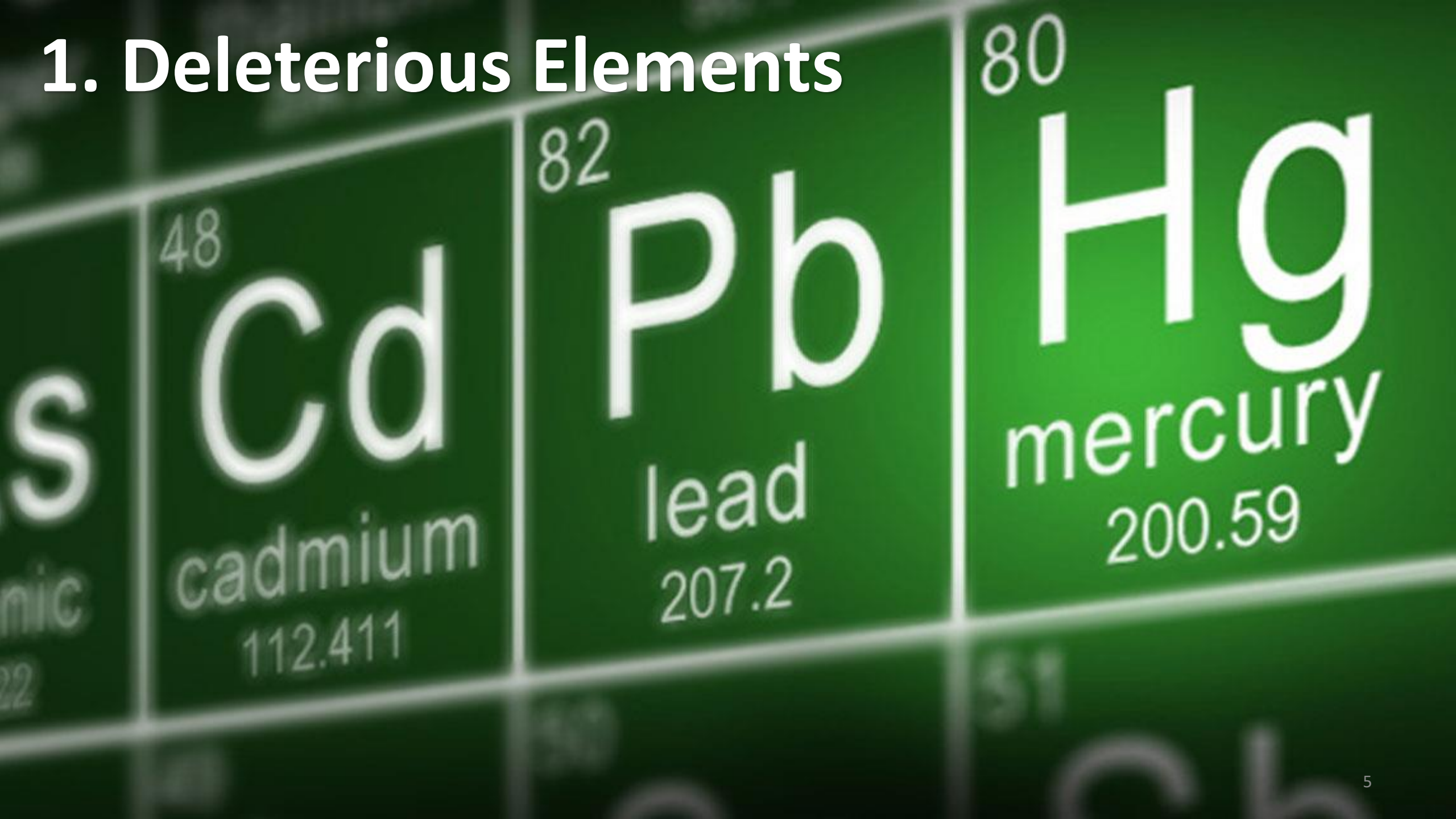
# Awarded Canada's Safest Manufacturing Employer
# 2020 Canada's Safest Employers Award (CSEA)

2020 CANADA'S
SAFEST EMPLOYERS

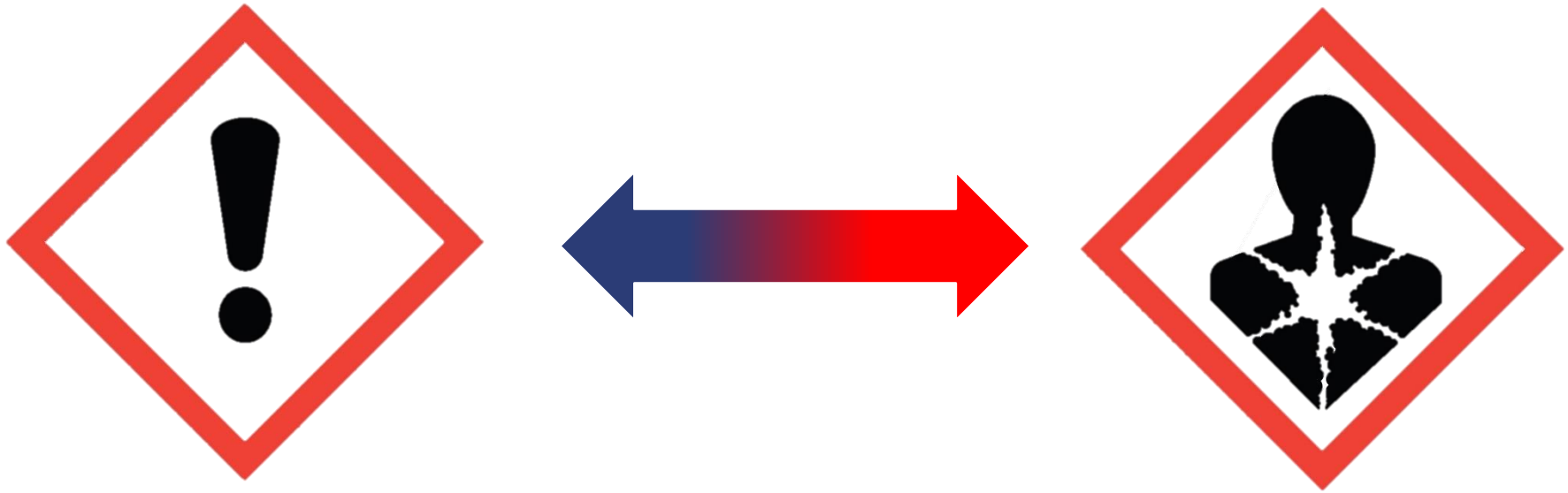
# AGENDA

1. Deleterious elements in feedstock
2. Contaminant loading & industrial hygiene sampling
3. Mitigating risks
4. Monitoring
5. Takeaways

# 1. Deleterious Elements



# Why The Concern?

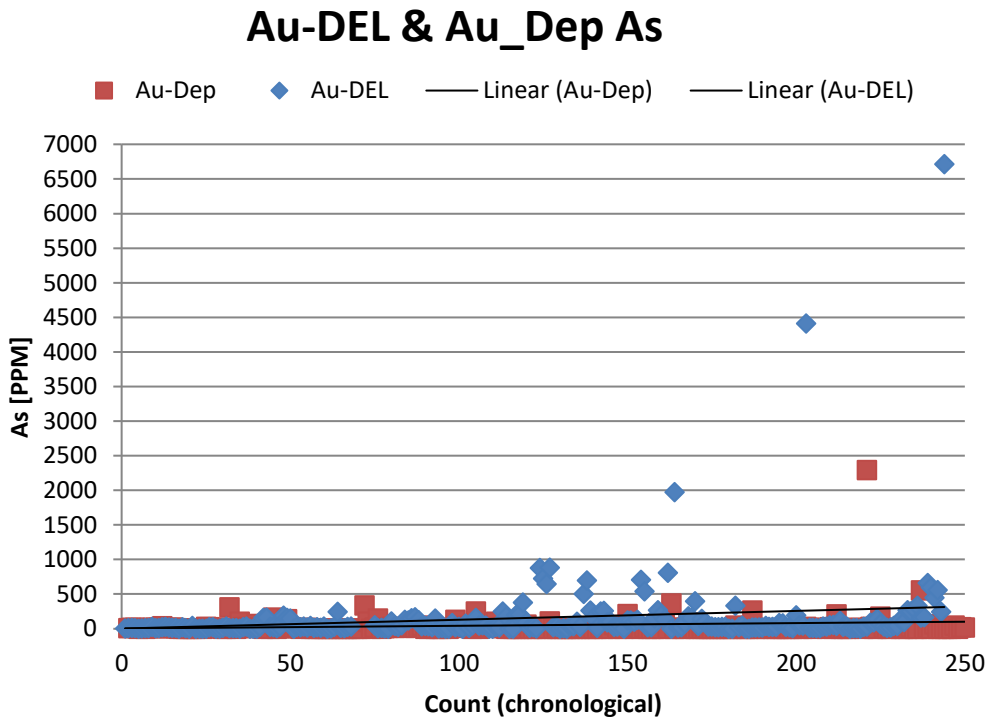


# Where to start?

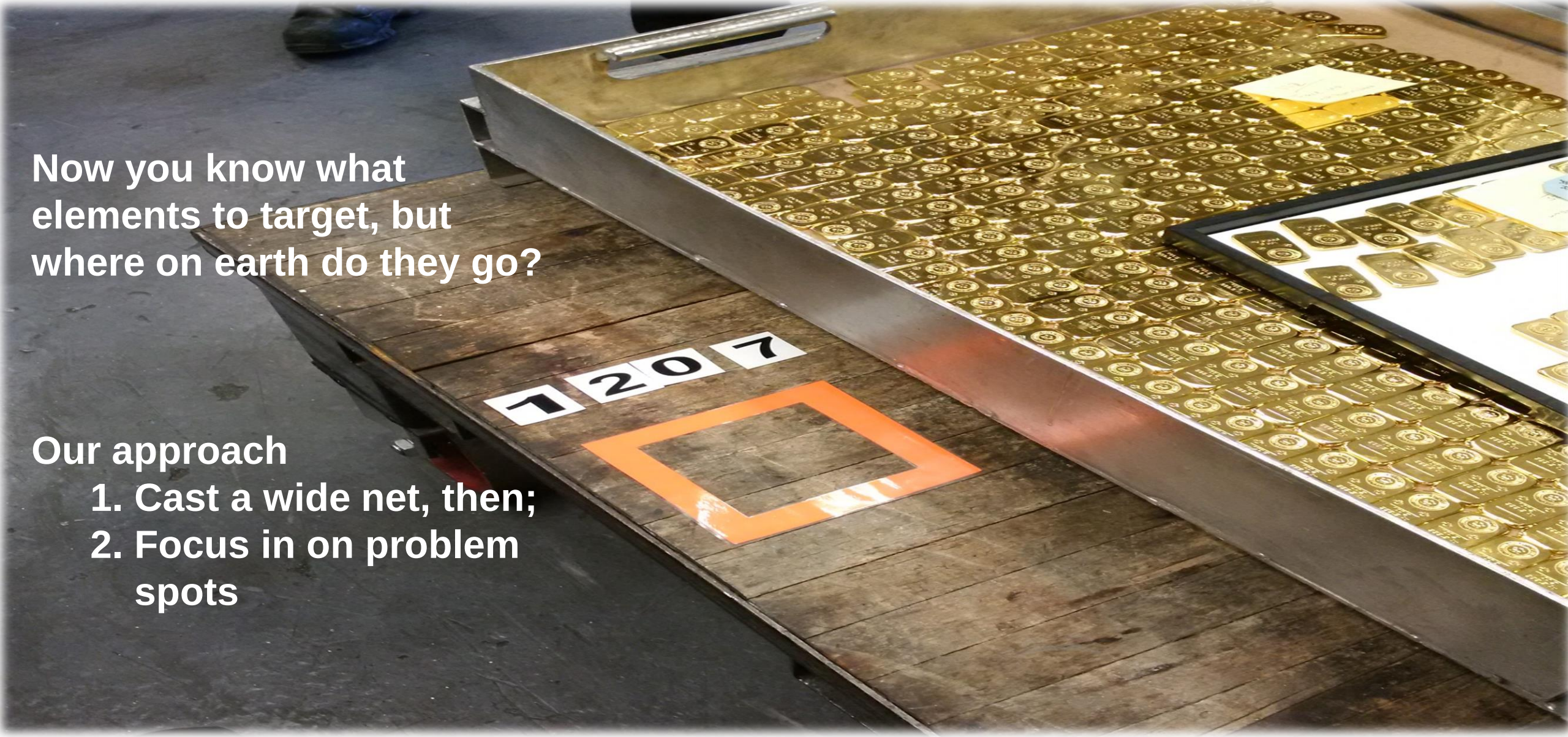
1. Which elements to study?
    - Data! Need to understand inputs

2. Sampling strategies
    - Incoming
        - bars, vs powders, vs recyclers
    - Post melt & by-products

3. Technologies for sampling
    - XRF
    - Spark
    - ICP



# 2. Contaminant Loading



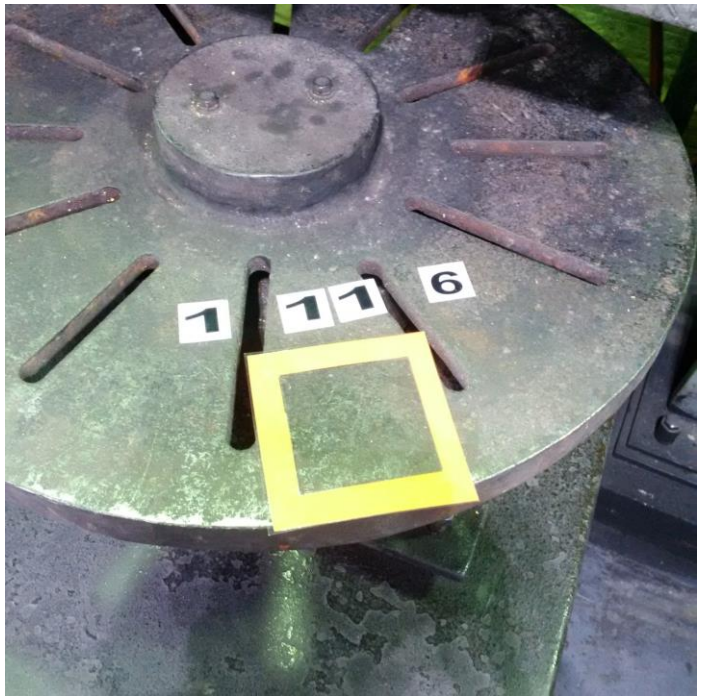

**Now you know what elements to target, but where on earth do they go?**

**Our approach**

1. **Cast a wide net, then;**
2. **Focus in on problem spots**

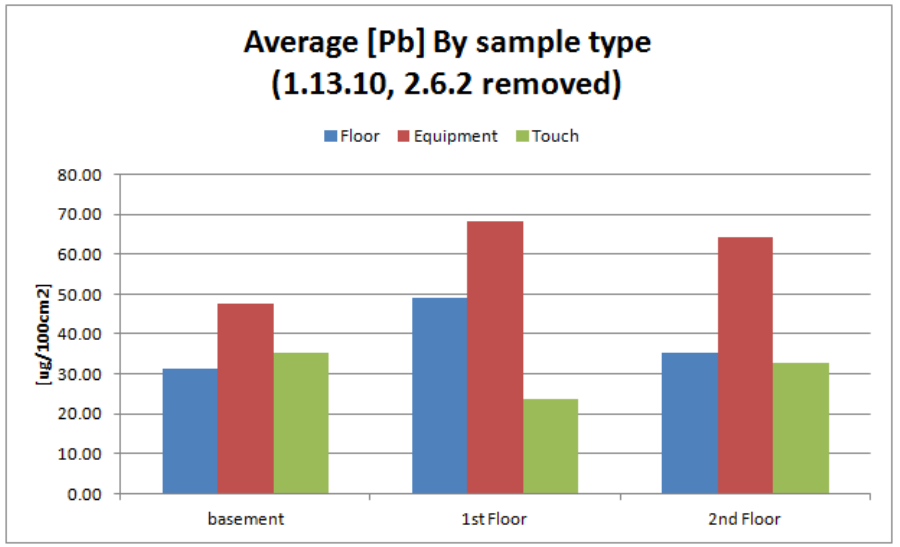
# Casting our net

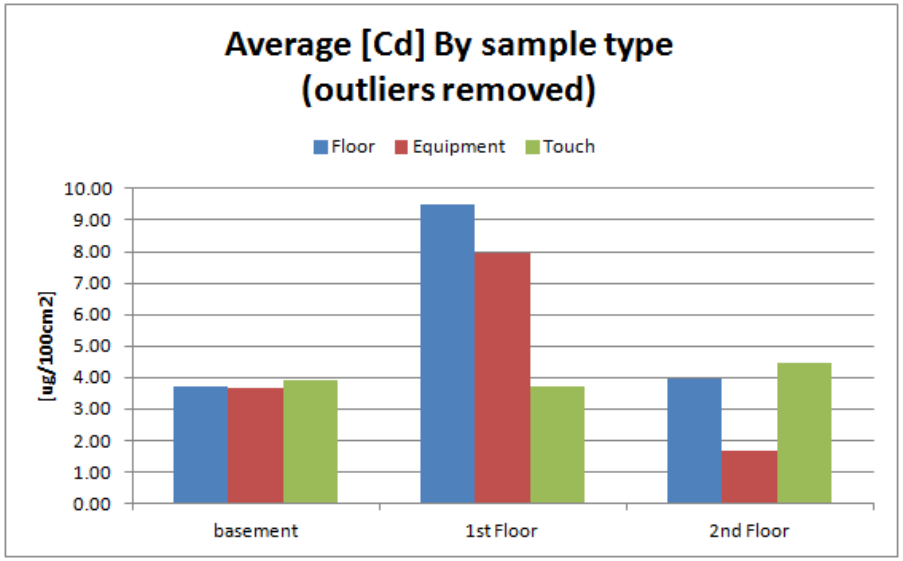
Refinery Plant wide study to see if and where deleterious elements are present and in what concentrations

# Findings

| Location | Tl | As | Cd | Pb | Se | Te | Sb |
|---|---|---|---|---|---|---|---|
| HSSE Staircase | 0.7 | 0.6 | 2.32 | 14.8 | 10.2 | 4 | 2 |
| Lower Dissolvomat | 2.3 | 1.2 | 0.72 | 6.1 | 9.6 | 3 | 0 |
| Cementation | 0 | 0 | 3.2 | 33.6 | 9.8 | 4 | 0 |
| Old Gemstone | 0.9 | 0 | 2.94 | 23.1 | 7.7 | 4 | 0 |
| Cementaiton Hallway | 0 | 0 | 2.1 | 22.3 | 20.8 | 5 | 0 |
| Refinery Cafeteria | 0.6 | 1.2 | 0.2 | 4.6 | 1.6 | 3 | 0 |
| Washroom | 0.7 | 0.6 | 0.9 | 7.7 | 3.7 | 3 | 0 |
| Locker Room | 0.5 | 0 | 0.27 | 3.6 | 2.3 | 0 | 0 |
| Electrical Room | 1.5 | 1.6 | 2.69 | 34 | 6.8 | 5 | 0 |
| Barrel Storage | 0.9 | 1.2 | 2.64 | 24.2 | 8.3 | 7 | 0 |
| Barrel Storage | 0 | 2.7 | 3.66 | 31.5 | 16.2 | 23 | 3 |
| Hydromet | 0 | 1.6 | 5.21 | 47.8 | 10.8 | 13 | 3 |
| Lower Sweeps | 0 | 11 | 16 | 96.2 | 26.9 | 17 | 7 |
| WWT | 1.6 | 6.3 | 8.8 | 87.1 | 20.5 | 29 | 6 |
| IF-14 | 0 | 0.6 | 0.6 | 4.9 | 4.8 | 2 | 0 |
| HSSE | 0 | 0.7 | 2.56 | 19.2 | 16.2 | 4 | 0 |
| HSSE | 0 | 0.6 | 0.73 | 4.8 | 6.3 | 2 | 2 |
| Atrium | 0.9 | 0 | 1.64 | 12.2 | 6.1 | 3 | 1 |
| Atrium | 0 | 0.8 | 1.32 | 11.3 | 5.4 | 3 | 0 |
| ICC Vault | 2.2 | 5.1 | 116 | 543 | 43.4 | 13 | 2 |
| ICC Area | 0.6 | 0.8 | 2.52 | 17.5 | 6.3 | 4 | 1 |
| ICC Area | 1.6 | 0 | 0.43 | 2.9 | 2.7 | 2 | 0 |
| Vulcan Room | 1.2 | 1 | 0.35 | 1.9 | 5.3 | 3 | 0 |
| Panelled Office | 0.3 | 0 | 0.48 | 4.6 | 3.8 | 0 | 0 |



# Focusing

Air sampling – closer look at the controls around equipment

We limit any potential exposure against a baseline of TLV-TWA *(threshold limit values - time weighed average)* for 8 hours of exposure set forth by the ACGIH *(American government of industrial hygienists)*.

One practical example

Grouped data points between 8k-12k ppm.

<u>Refiner</u>:

Mean = 0.0094 mg/m3

GSD = 1.49

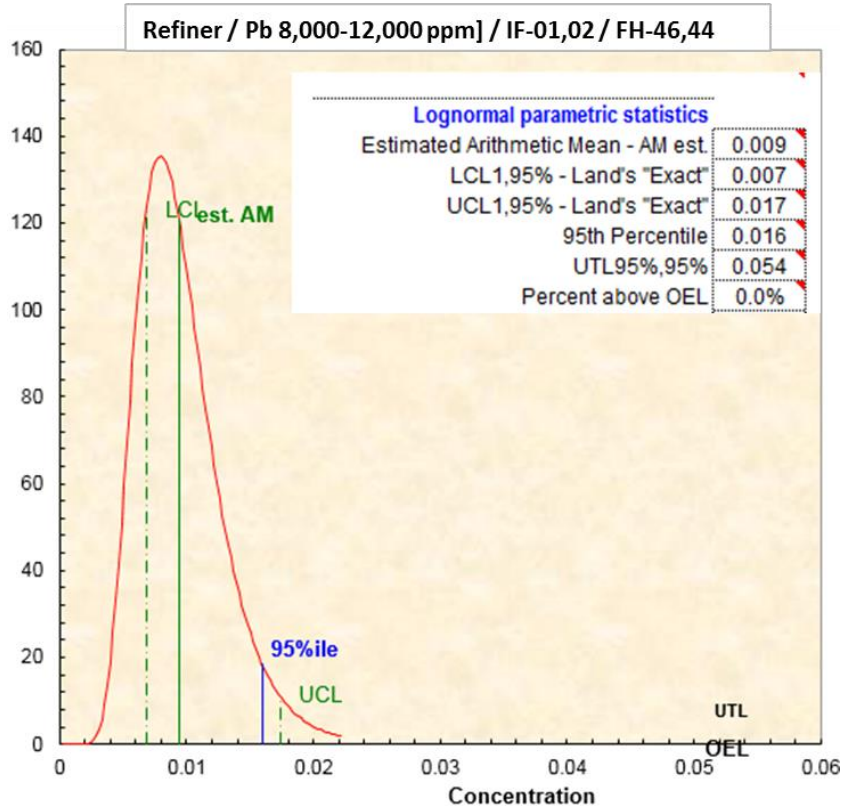
Ratio = Mean/TWA = 0.188

# of data points required= 3

UCL =0.017mg/m3

UCL<TWA

95% confidence level that long term average exposure is <TWA



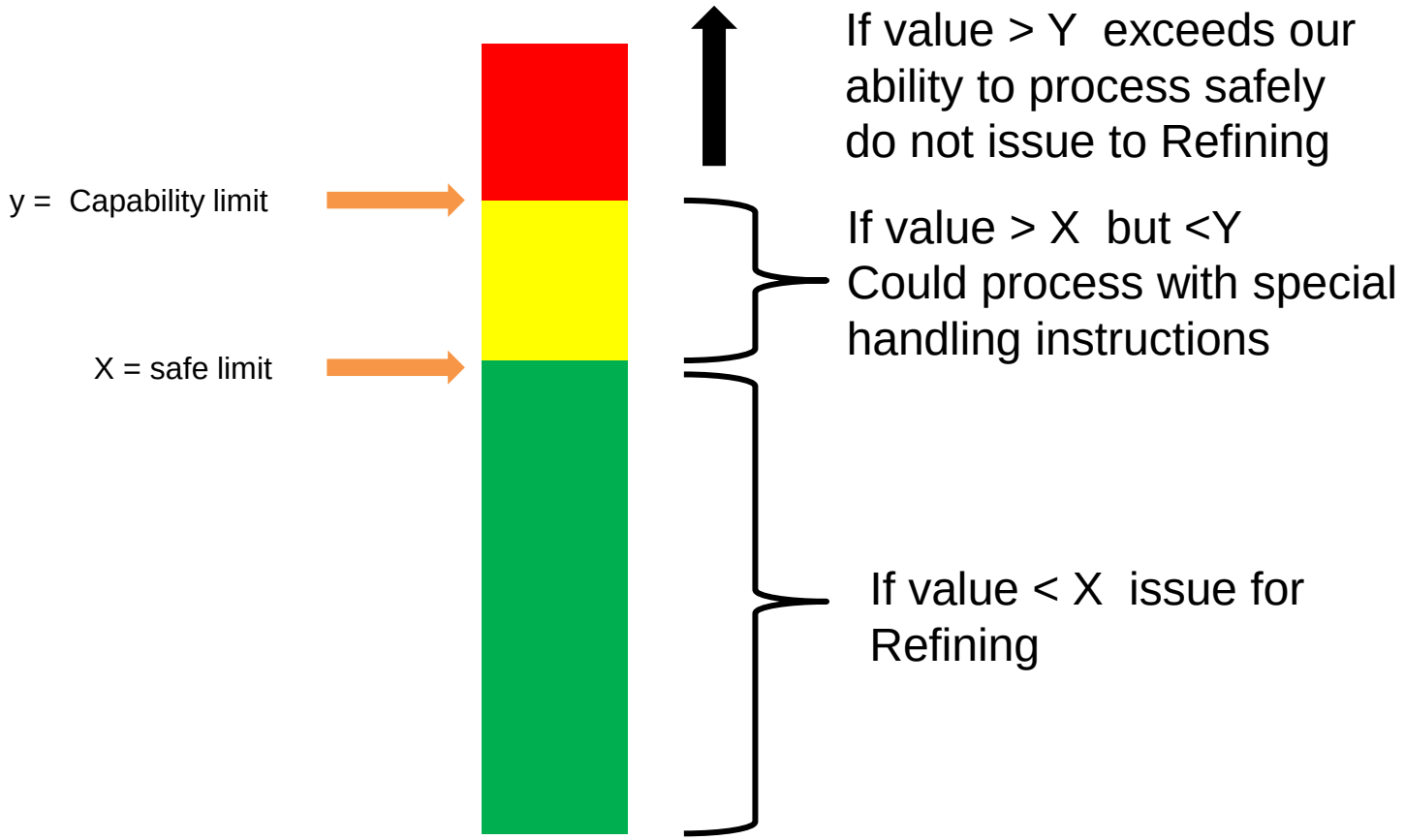
# 3. Mitigating Risk


**Inspect our material and set limits**

**Safest and strictest industrial practices and processes**

**Test blood and urine**
**Repeat IH sampling**

# Controlling the ‘ins’


y = Capability limit
X = safe limit
If value > Y exceeds our ability to process safely do not issue to Refining
If value > X but <Y Could process with special handling instructions
If value < X issue for Refining

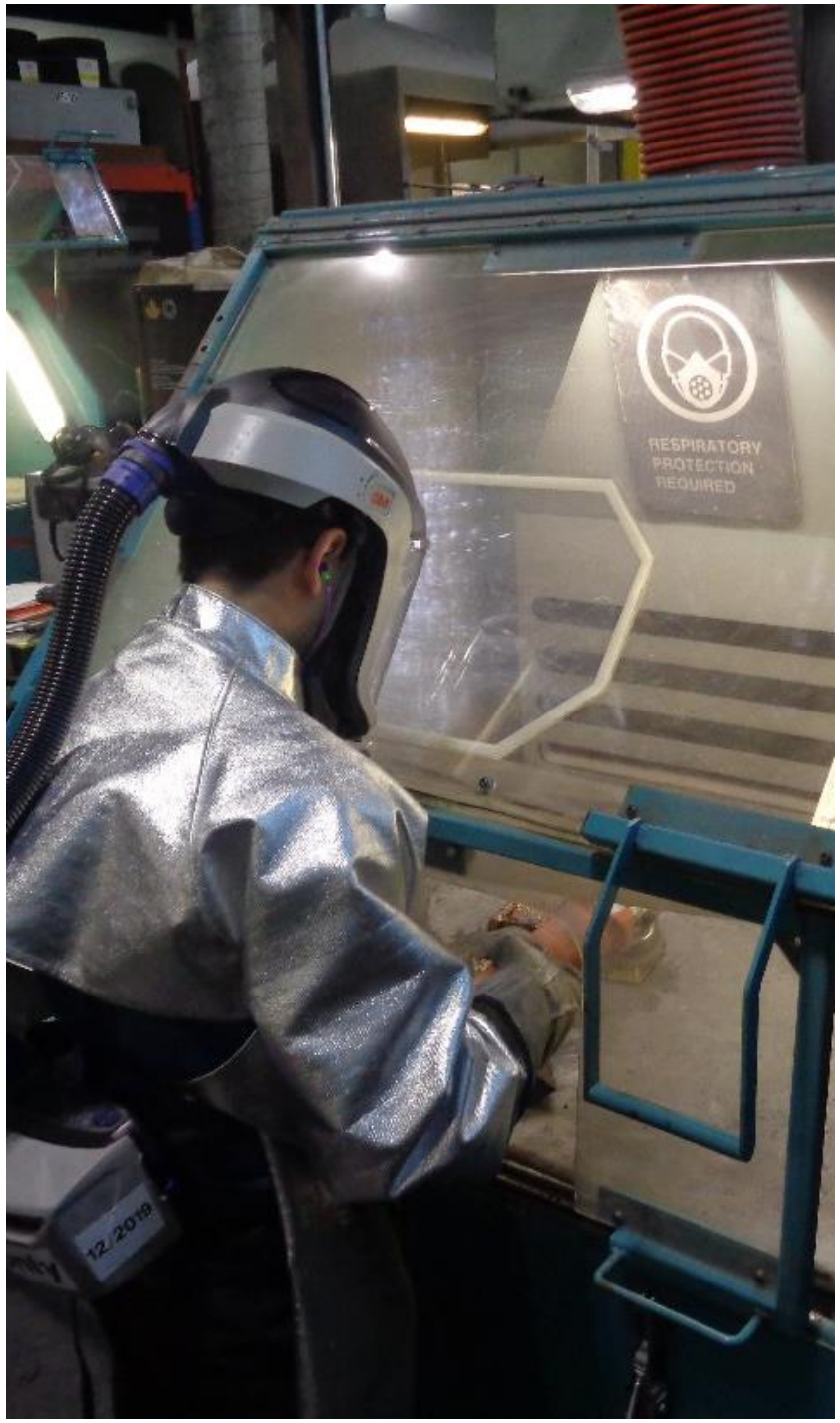

CONTROL

# Mitigate Risk of Exposure

- Engineering controls
  - Ventilation
  - Fume rings
  - Grinding stations

- Personal Protective Equipment
  - Respirators
  - PAPR
  - Clothing
  - Gloves

- Good industrial hygiene practices
  - Educate workforce on importance of good hygiene practices
    - Donning and Doffing PPE
    - Hand washing
    - Equipment cleaning
    - Training & education


RESPIRATORY
PROTECTION
REQUIRED

# How do you know it works?

BEI (Biological Exposure Indices Monitoring)

1) Baseline employees when start work in the Refinery

2) Yearly Blood and Urine testing for heavy metals

3) Any deviation from baseline is retested

4) Continued deviation from baseline and we remove employee from that area/process

# Today’s takeaways

Understand your capabilities

Control the material you accept

Safe practices protect employees

Baseline and monitor

# THANK YOU