



# Good Golly Miss Moly!

Dan Parnell & Scott Schultz  
JEA

NACWA Pretreatment and Pollution Prevention Workshop  
November 15, 2007



# Overview

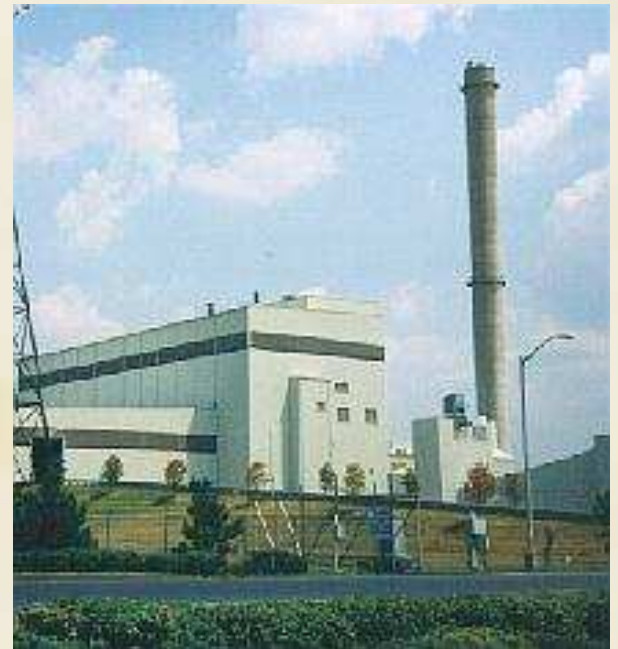
- ▶ Up in Smoke
- ▶ Moly Rising
- ▶ Finding Moly
- ▶ Free Moly!
- ▶ Moly Free is the Way to Be

# Up in Smoke

Until 2002 – JEA 5 regional Water Reclamations Facilities (WRF) sent sludge to central incineration facility in Jacksonville, FL.

## Incineration Issues:

- Air emissions
- Ashes to the landfill
- Power consumption



# Up in Smoke

## New Biosolids Facility

- ▶ Commissioned in late 2002 – \$40 million
- ▶ Produces 39 tons of biosolid pellets/day



Polymer



Methane



Nutrient  
Enhancement

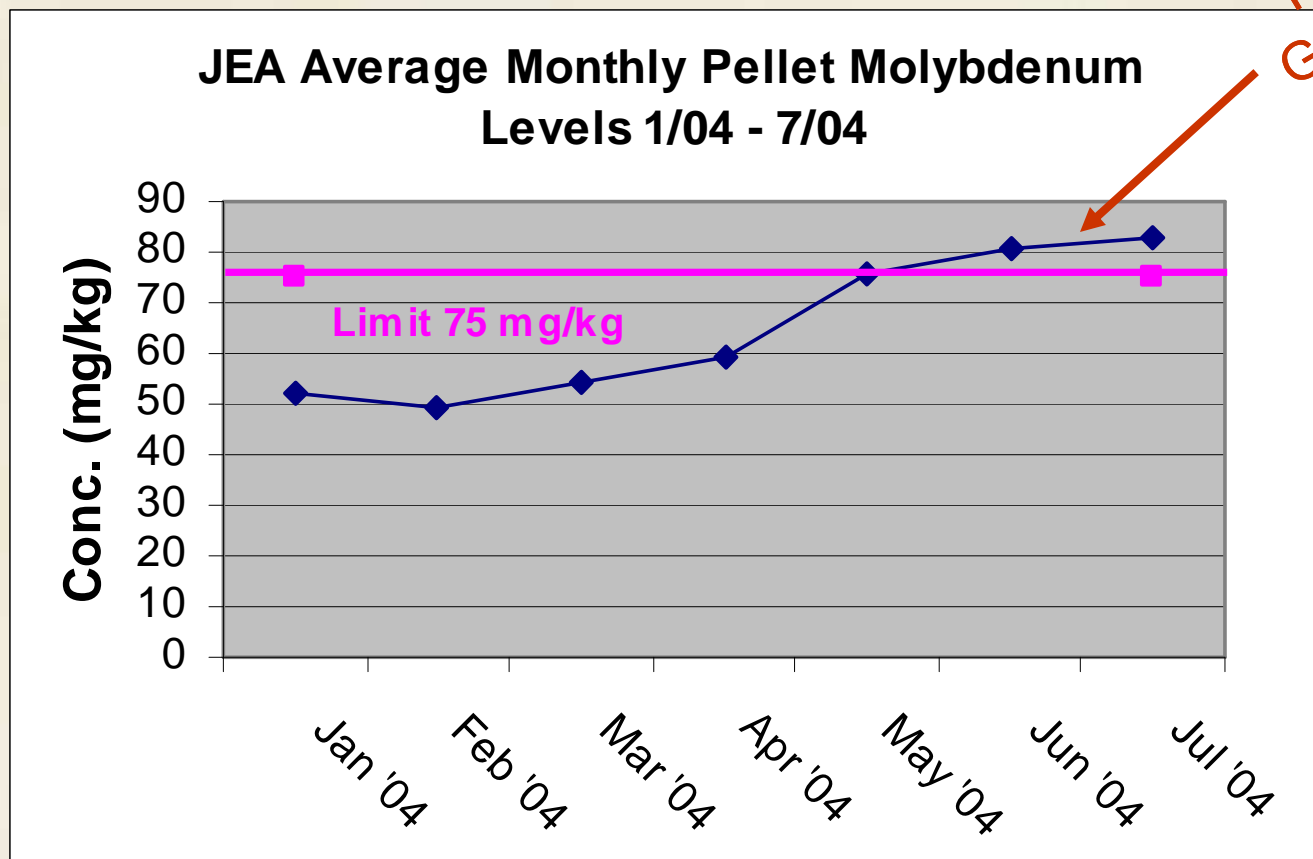


Class AA product





# Moly Rising



Good  
Pellets  
Gone Bad



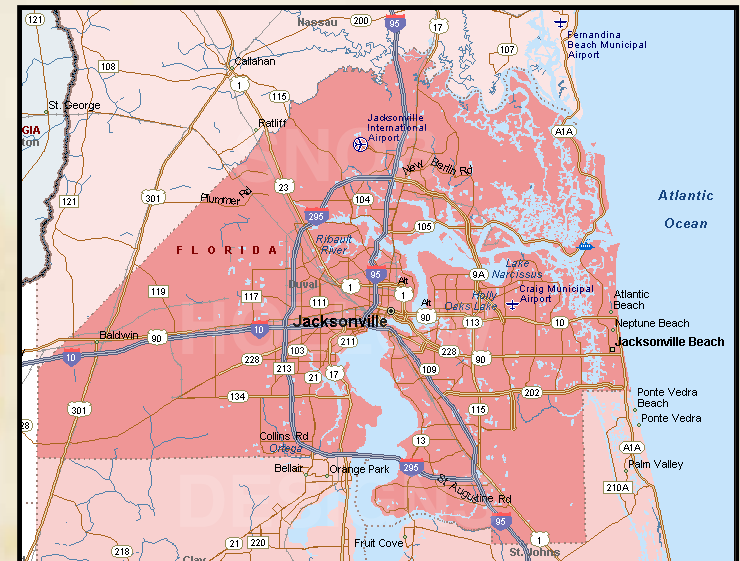
# Moly Rising

- ▶ Beginning of exceedances means:
  - ▶ End of land application
  - ▶ Disposal Costs – averaging \$2000/day for hauling/tipping fees
  - ▶ Loss of a \$40 million dollar investment
  - ▶ IP Coordinator begins to perspire

# Finding Moly

## Challenges

- ▶ Moly internal or external?
- ▶ 85 Permitted Industrial Users
- ▶ > 900 square miles of service area
- ▶ How to start?





# Finding Moly

## Collecting Data

- ▶ 5 Regional Water Reclamation Facilities
  - ▶ Inf/eff data
  - ▶ Raw sludge/pellets
- ▶ Industrial effluent
  - ▶ 85 Industrial Users
  - ▶ Where to start?
- ▶ Research uses of Moly



# Finding Moly

## ▶ Internal or External Source?

Mass balance on Moly in raw sludge vs. pellets. Results:

$$\text{Moly (in da raw sludge)} = \text{Moly (in da pellets)}$$

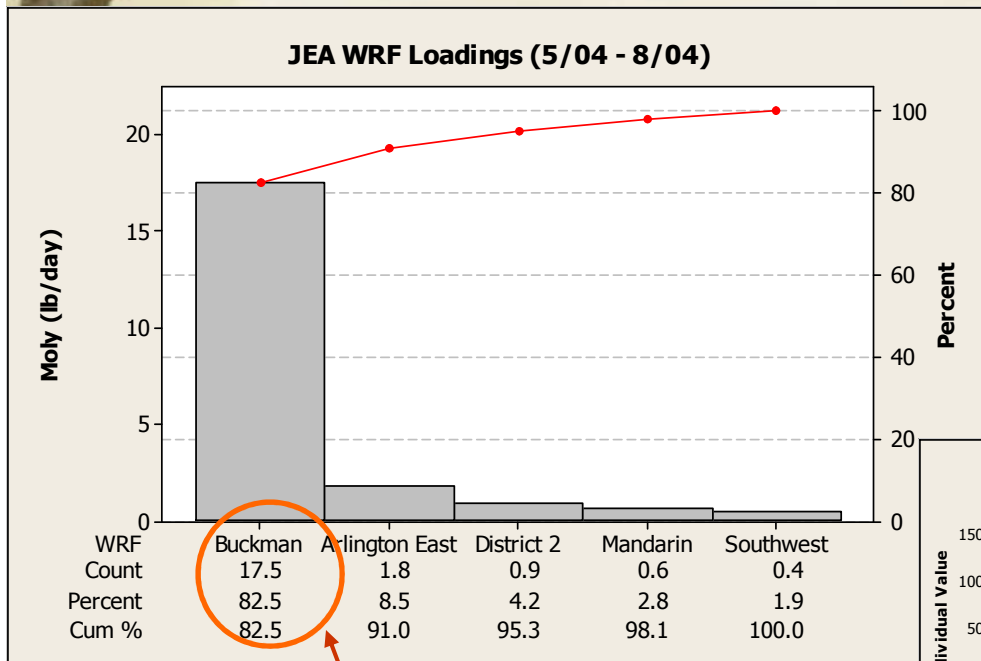
## ▶ External Source confirmed. Responsibility:

**INDUSTRIAL PRETREATMENT**

## ▶ IP Coordinator sweating a lot.

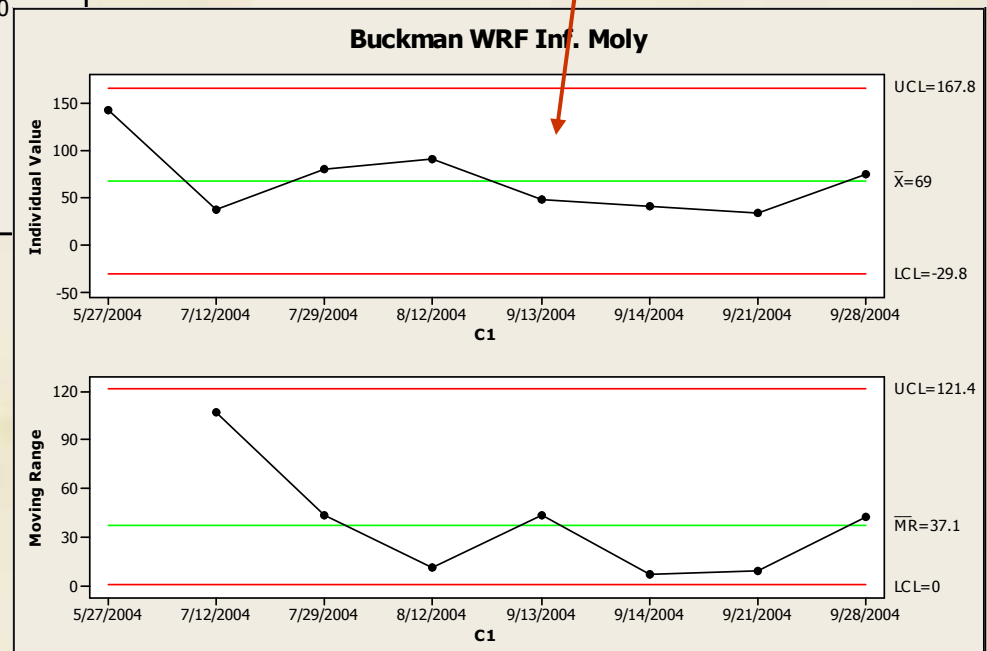
# Finding Moly

## WRF sampling results



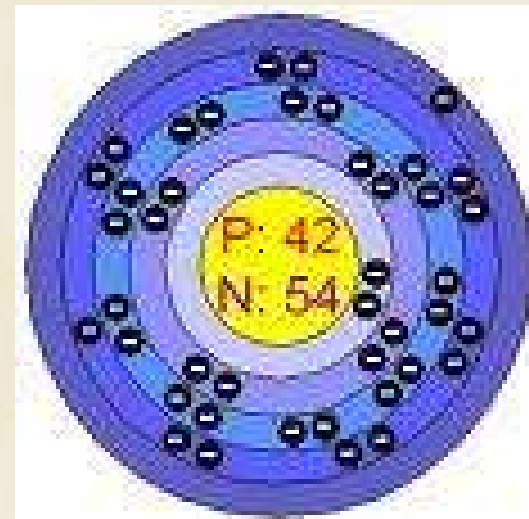
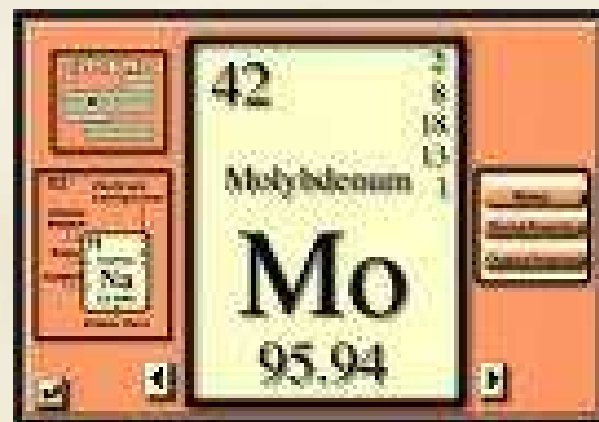
Influent Buckman WRF  
Moly data highly variable:  
Batch discharger?

82% of Moly from 1  
Water Reclamation  
Facility – Buckman  
WRF



# Finding Moly

Research: What is Moly?





# Finding Moly

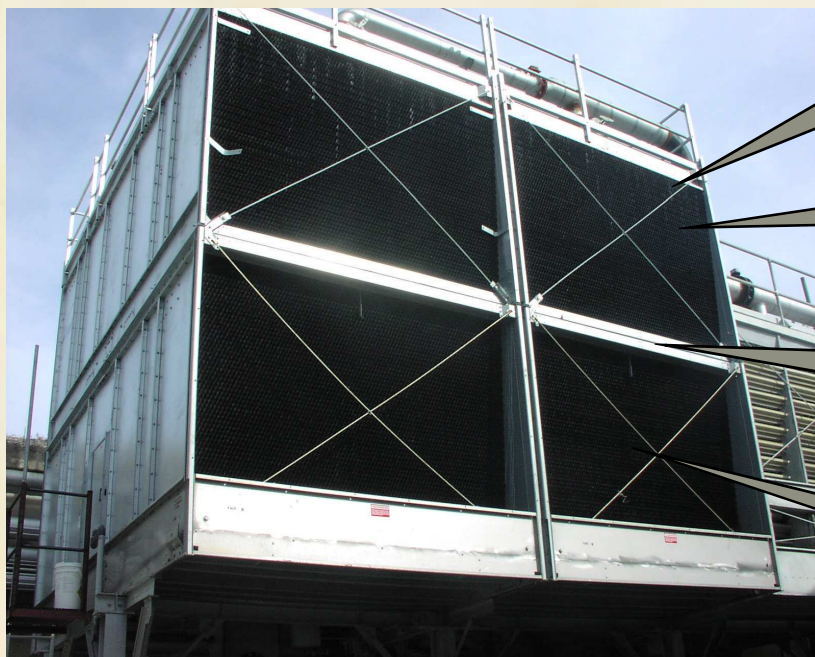
## Research Results:

### Mo applications

- ▶ Cooling tower chemical treatment
- ▶ Petroleum lubricants
- ▶ Catalyst for reactions
- ▶ Corrosion inhibitor
- ▶ Used in alloys

# Finding Moly

Mo applications:  
Cooling Towers (CT)



Cooling towers are widespread in commercial, industrial, and institutional applications

How do you quantify Moly loadings from CTs?

Ask the vendors that maintain them!

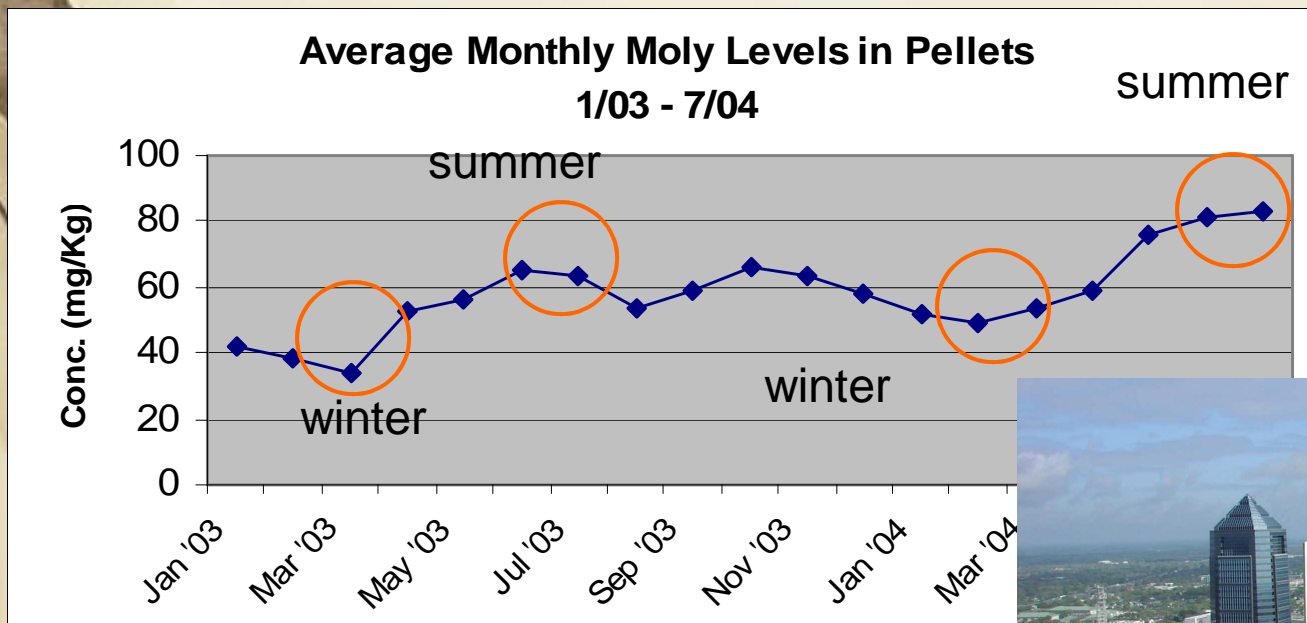
Data from CT chemical treatment vendors estimated 12.5 lb/day of Moly



# Finding Moly

Mo applications: Cooling Towers

Analyzing the Data



# Finding Moly

Cooling Towers – are they the culprit?

Lets do a little mass balance to find out!

| Buckman WRF Moly Data |      |      |           |
|-----------------------|------|------|-----------|
| Sample Date           | Inf  | Eff  | % removal |
| 5/27/2004             | 144  | 53   | 0.63      |
| 7/29/2004             | 79.6 | 46.9 | 0.41      |
| 8/12/2004             | 91   | 48   | 0.47      |
| 9/13/2004             | 48   | 26   | 0.46      |
| 9/14/2004             | 42   | 28   | 0.33      |
| 9/21/2004             | 34   | 28   | 0.18      |
| 9/28/2004             | 76   | 34   | 0.55      |
| Average               |      |      | 0.43      |

- ▶ Average Moly removal rate at Buckman WRF: 43%
- ▶ Estimated CT Moly loading: 12.5 lb/day.
- ▶  $12.5 \text{ lb/day} \times 0.43 = 5.4 \text{ lb/day}$  of Mo in da pellets from CTs
- ▶ It only takes 5.5 lb/day to reach the ceiling concentration limit!
- ▶ Average WRF Inf. Loading: 21lb/day
- ▶  $12.5 \neq 21$



# Finding Moly

Industrial sources of Moly

How Do You Quantify the Industrial Loading of Moly?

Ask the Industries

# Finding Moly

## Industrial sources of Moly – Petroleum Lubricants

Centralized waste treaters, 2 of 'em:

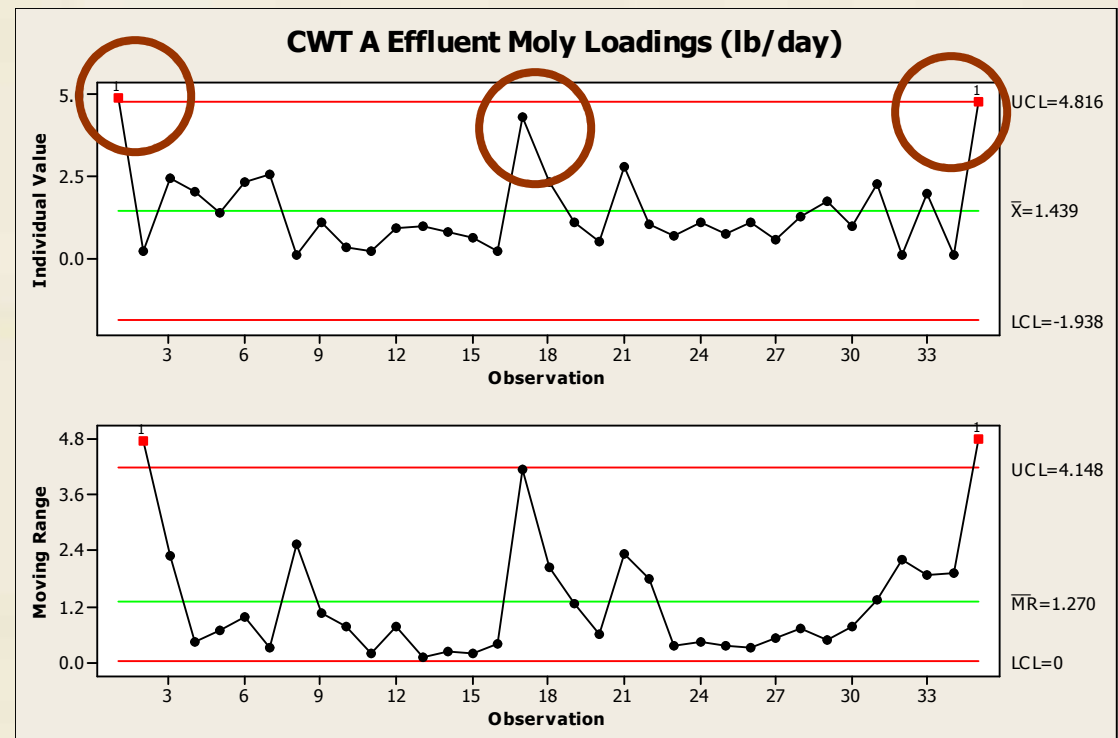
- ▶ CWT A – 1.4 lb/day Moly
- ▶ CWT B – 0.7 lb/day Moly



# Finding Moly

## Industrial sources: CWT A

Moly spikes due to a single Moly used oil waste stream called "red oil". Up to 5 lb in a day.





# Finding Moly

## Other Industrial sources of Moly

Organic chemical manufacturer, 3 of 'em, but only one used it as a catalyst:

**4.5 lbs/day - consistent loading**

Brewery - This Mo's for you!

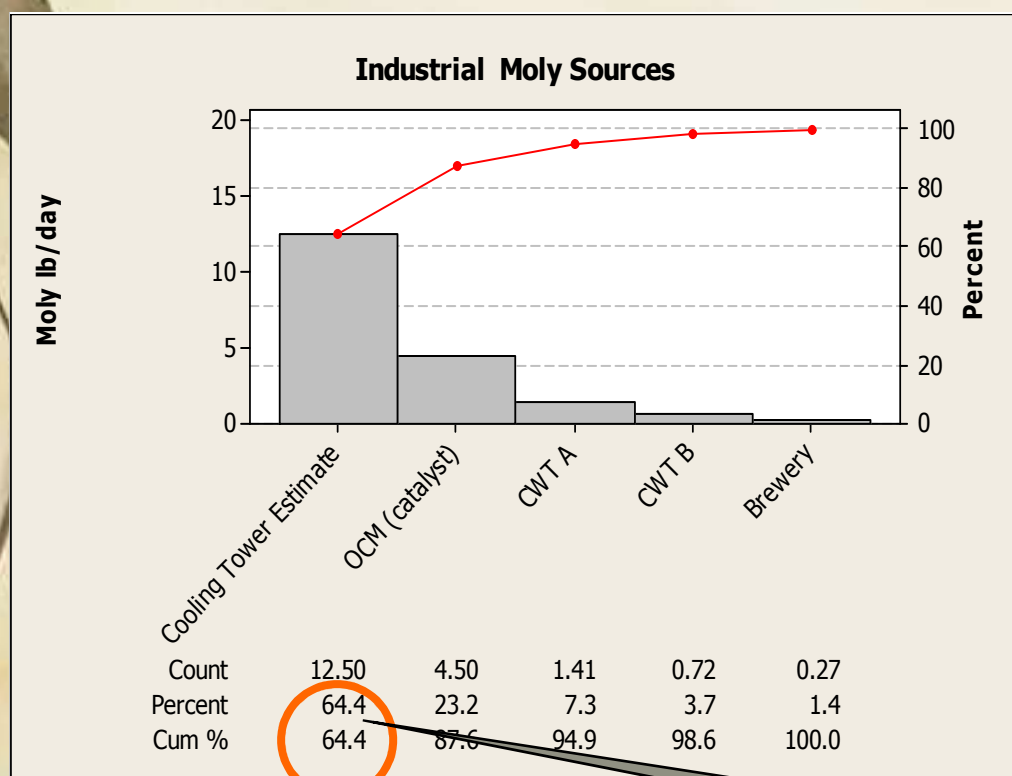
Used in can rinse as a corrosion inhibitor:

**0.27 lb/day – consistent loading**



# Finding Moly

## Total estimated industrial loadings



**Mo Fun w/ Mass Balances!**

- ▶ Total estimated industrial Moly loadings: 19 lb/day.
- ▶ Actual daily average WRF Moly loading: 21 lb/day
- ▶ 19 lb/day ~ 21 lb/day

64% of Moly from CTs

# Free Moly!

Local limit

vs.

Pollution Prevention

**Long process**

**Affects everyone**

**Costly to re-engineer or pretreat for industries**

**Facilities w/ CTs to sample & report for compliance**

**Admin burden on IP to monitor CTs**

- **Moly not an active ingredient in CTs**
- **Moly used as an indicator**

**There was an Moly free alternative**

**Substitution: >50% reduction in Moly**

**Minimal impact on customers**

**Minimal effort to implement**

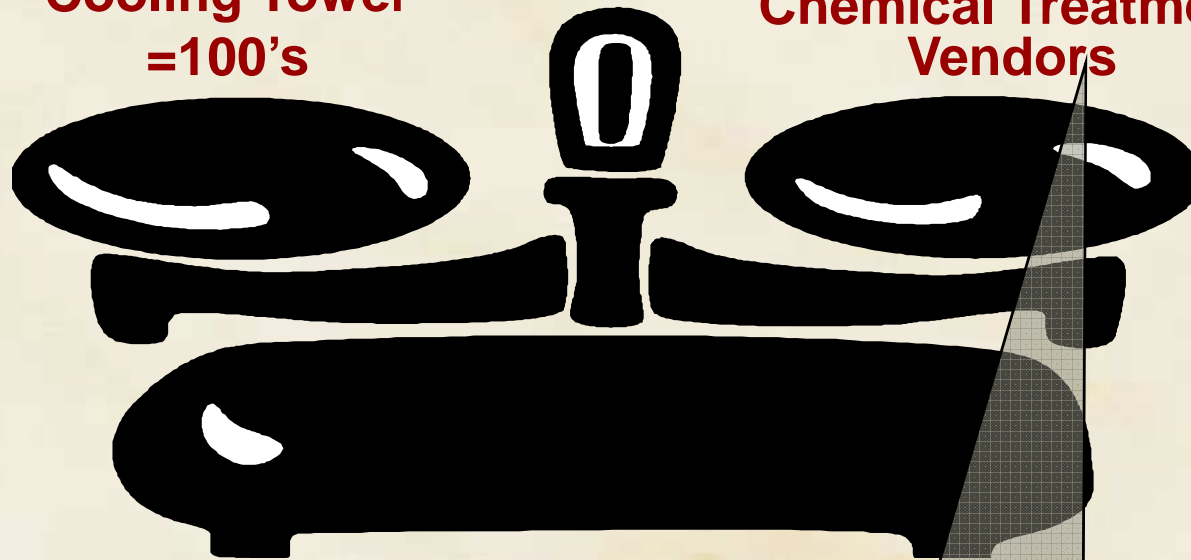


# Free Moly!

## Pollution Prevention: Making the Switch

**Find & Contact  
every facility w/ a  
Cooling Tower  
=100's**

**Contact 10 Known  
Chemical Treatment  
Vendors**



Agreed to switch to Moly free  
- eventually

# Free Moly!

Meanwhile back at the Biosolids facility....

## O & M Efforts to Reduce Moly Levels in Pellets

- ▶ Increase fertilizer enhancement
- ▶ Reduced Moly enough to land apply some batches
- ▶ Salvaged about 3000 tons pellets

But.....

- ▶ Moly levels still increasing and
- ▶ IP Coordinator sweating profusely





# Free Moly!

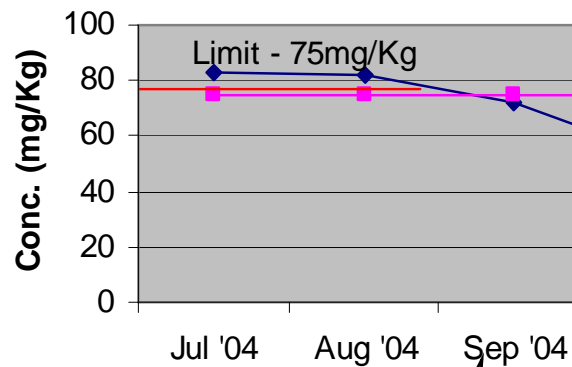
Fostering a collaborative  
relationship paid off!!

## Industry voluntary efforts:

- IUs went CT Moly free immediately
- CWT dropped Moly laden “red oil”
- Brewery switched to Moly free can rinse

# Moly Free is the Way to Be!

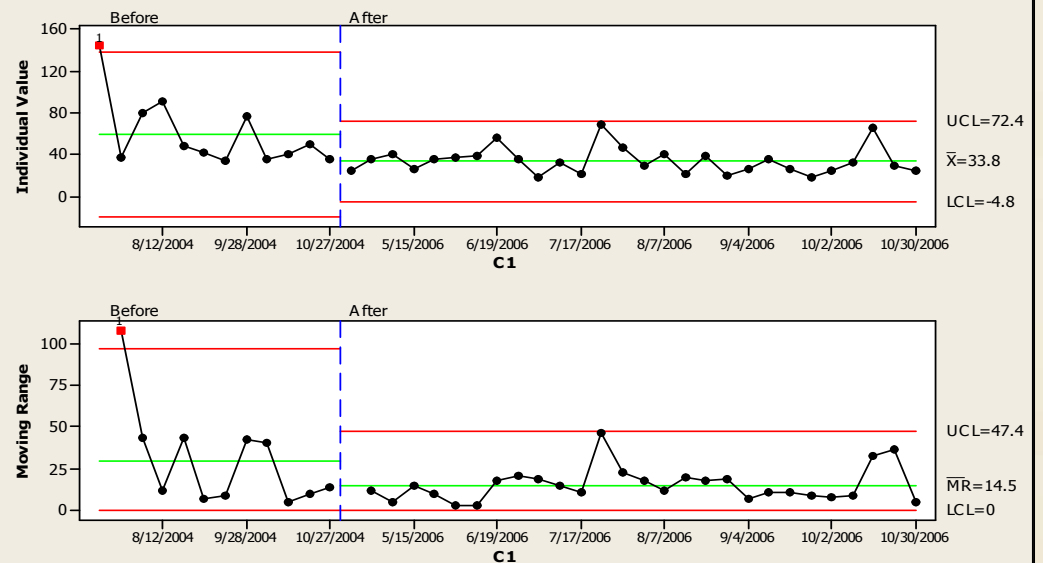
**Average Monthly Moly Levels in Pellets**



36% drop in Moly concentrations

Pellets return to re-use again – mid Sept.

**Buckman Inf Moly Concentration Before/After P2 Implementation**



# Moly Free is the Way to Be!

## Current Status:

- Best Management Practice for Cooling Tower established.

Did not negatively impact customers

- Local Limit eventually established.

With Moly out of CTs  
– plenty to allocate to  
the few industries  
that need it

- IP Coordinator still sweating.

But not as much and not over Moly!



# Moly Free is the Way to Be!

## Conclusions

Returning biosolid pellets to marketable status was achieved through:

- ▶ Conducting data driven root cause analysis.
- ▶ Developing a simple yet effective P2 program.
- ▶ Implementing the program through collaboration w/ chemical vendors & industries.

# Questions?



Everything's Mo  
Better!