

**Full Metal Jacket:  
The Challenge of Meeting EPA  
Categorical Pre-Treatment Limits**



Industrial PWO Seminar  
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**Word association**



- Teddy
- Hard
- Ammunition
- Bear
- Hat
- Wastewater?



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**Outline**



- Existing System
- EPA Categorical Limits + Local Effluent Limits
- Treatment Options
- Testing
- Q&A



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## Existing Plant Background



- Ammunitions Manufacturer
- (2) 12 hour shifts, 6 days/week
- 3 operations
  - Bullet Wash
  - North Casing Wash
  - South Casing Wash
- Evaporation/Drum Dryers



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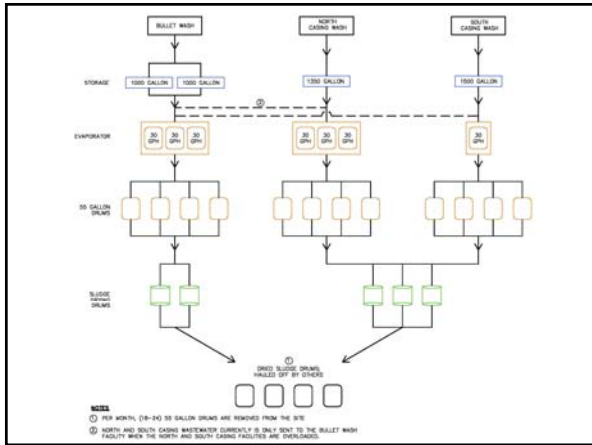
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## Existing Plant Background



	Storage Gallon	Low	High	Evap. Capacity GPD	Diff.	
		Production GPD	Production GPD		Low GPD	High GPD
Bullet	2,000	1,400	3,000	1,440	(40)	1,560
North Case	1,350	1,400	3,000	1,440	(40)	1,560
South Case	1,500	500	1,500	720	(220)	780
<b>Total</b>	<b>4,850</b>	<b>3,300</b>	<b>7,500</b>	<b>3,600</b>	<b>(300)</b>	<b>3,900</b>

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## Existing System

- Rising costs
  - \$80k - \$120k / year
  - Replacing evaporators
  - Hauling sludge
  - Breakdowns / lost production
  - Spills
- Limited capabilities of ext. system
- Politics => variable flows

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## Improvement Goals

- Optimize wastewater treatment
- Centralize the process
  - Combine the streams
- Reduce Costs \$\$\$



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	Units	Bullet Wash	North Casing Wash	South Casing Wash
<b>General Chemistry Parameters</b>				
Alkalinity, Total (CaCO3)	mg/L	1870	<5.00	<5.00
Hardness	mg/L	255	1020	510
Oil & Grease	mg/L	240	188	224
pH	pH units	8.7	4.2	1.2
Total Suspended Solids	mg/L	427	77.3	54
<b>Calculated Analyses</b>				
Hardness	mg/L	33.8	21.4	44.7
<b>Total Metals by EPA 200 Series Methods</b>				
Arsenic	mg/L	0.107	<0.0800	<0.0800
Barium	mg/L	0.106	0.0444	0.0365
Cadmium	mg/L	<0.0200	<0.0200	<0.200
Calcium	mg/L	10.7	6.33	15.1
Chromium	mg/L	<0.0200	0.0332	0.283
Copper	mg/L	30.5	87.6	478
Iron	mg/L	4.3	71.5	9.94
Lead	mg/L	105	0.525	1.97
Manganese	mg/L	0.205	0.573	0.0847
Mercury	mg/L	<0.0002	<0.0002	<0.0002
Nickel	mg/L	<0.05	4.09	0.26
Selenium	mg/L	<0.150	<0.150	<0.150
Silver	mg/L	<0.0200	<0.0200	<0.0200
Zinc	mg/L	6.57	20.2	1100

### Raw WW Analysis

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**EPA Categorical Limits** 

- EPA Categorical Limits
  - What is CFR Title 40?
    - Existing outfall or new 
    - Discharge to POTW or Stream 
    - Based on industrial process
      - Leather tanning,
      - Glass manufacturing,
      - Metal finishing,
      - Pesticide chemicals,
      - Al and Cu forming... the list goes one

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**EPA Categorical Limits** 

- EPA Categorical Limits for Ammunition Plant
  - Part 468: Copper Forming Point Source Category
  - Part 471: Nonferrous Metals Forming and Metals Powders Point Source Category
  - Production (Pounds / million off-pounds)
  - Know your process → avoid double dipping

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**EPA Categorical Limits** 

- EPA Categorical Limits for Ammunition Plant
  - Part 468: Copper Forming Point Source Category
    - Tumbling/burnishing
    - Pickling bath
    - Pickling rinse
    - 87,500 pounds/day 
  - Part 471: Nonferrous Metals Forming and Metals Powders Point Source Category
    - Alkaline Cleaning Spent Bath
    - Alkaline Cleaning Rinse
    - 43,750 pounds/day

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	EPA 7500 gpd mg/L Monthly Avg	Local Agency Limits mg/L	Combined Avg 40/40/20 mg/L
Antimony	0.175	nl	0.36
Chromium	0.097	3.000	0.04
Copper	0.397	1.000	158
Lead	0.085	0.100	27
Nickel	0.241	1.000	0.77
Zinc	0.273	nl	294
TTO	0.221	nl	0.05
O&G	6.532	100	216
O&G (petroleum)	nl	25	22
Arsenic	nl	0.050	0.06
Barium	nl	1.000	0.20
Cadmium	nl	0.100	0.002
Cyanides	nl	2.000	
Manganese	nl	1.000	0.24
Mercury	nl	0.005	0.0002
Selenium	nl	0.030	0.01
Silver	nl	0.100	0.01
Chloride	nl	230	38
BOD	nl	250	884
TSS	nl	nl	218
pH	5-10	6-9	5.4

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Treatment Options



- Heavy Metals
  - Reverse Osmosis
  - Ion exchange
  - Chem precip and filtration
- O&G
  - DAF
  - GAC
  - Organo-clay



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Bench Testing



- Aries Chemical
 


- Started prior to final effluent limits
- 13 iterations to break “the code”

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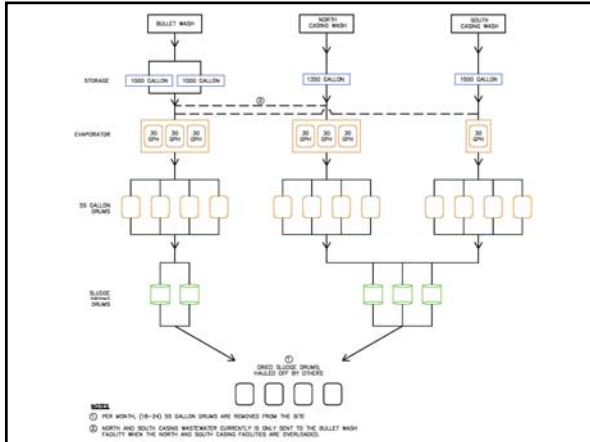
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## Bench Testing



- Aries Chemical
- Started prior to final effluent limits
- 13 iterations to break “the code”
  - Changing targets
    - O&G vs. TTO
    - Chloride limits added
  - South Casing ‘problem child’




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TEST	Source	Treatment	Antimony	Copper	Lead	Nickel	Zinc	Oil & Grease
		City Limits	nl	1	0.1	1.0		100 and 25
		EPA limit at 7,500 gal/day	0.175	0.397	0.085	0.241	0.273	
Raw blend	Blend 40/40/20  JAN 14-15 RESULTS	Raw – Untreated	0.415	164	15	0.22	332	22 non-polar
A		Treatment # 3 (low chloride)	0.147	7.8	0.26	< 0.1	1.2	101
		Supernatant clarity only fair.		(3.2 sol)			(0.48 sol)	<8.0 non-polar
B		Treatment # 4 (low chloride, higher conc.)		1.3	< 0.2	< 0.1	0.25	
		Supernatant clarity good, better than #3		(0.25 sol)			(0.2 sol)	
C		Organo-clay filtration of Test A effluent		6.7	0.25	< 0.1	0.78	78
D	GAC filtration of Test C filtrate			3.5	< 0.2	< 0.1	0.32	14
GAC X2	Jan 27 samples	2 x GAC filtration of Test C filtration		0.22			0.034	<12

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**Q&A** 



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