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

Industrial PWO Seminar

April 11, 2014

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OLSSON ASSOCIATES

Word association

- Teddy
- Hard
- Ammunition

- Bear
- Hat
- Wastewater?

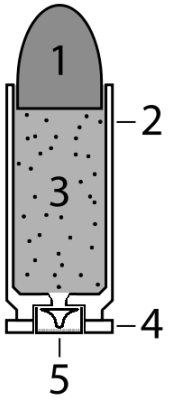
Outline

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

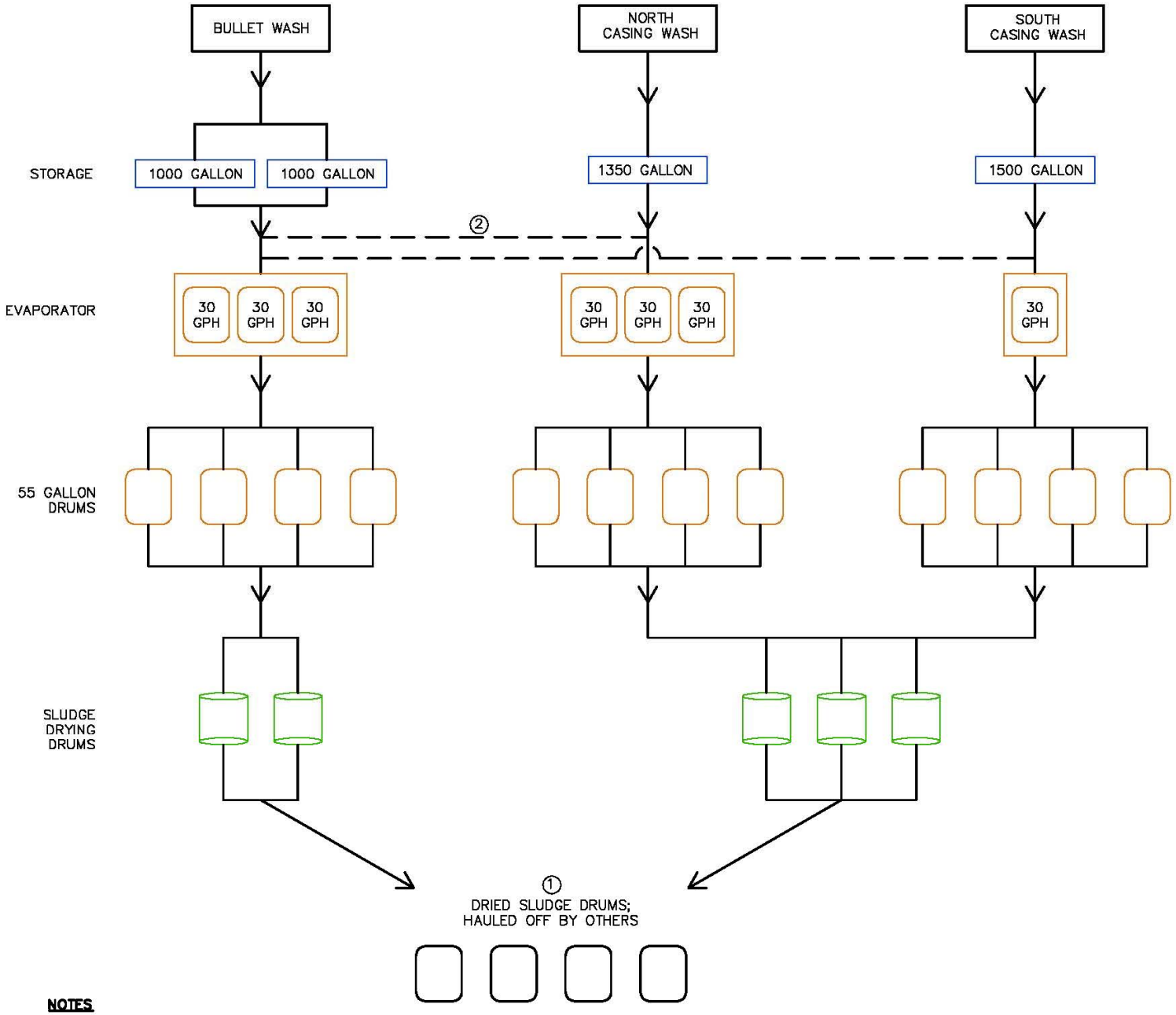
ARIES CHEMICAL
Water Treatment Specialists

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



NOTES

① PER MONTH, (18–24) 55 GALLON DRUMS ARE REMOVED FROM THE SITE

② NORTH AND SOUTH CASING WASTEWATER CURRENTLY IS ONLY SENT TO THE BULLET WASH FACILITY WHEN THE NORTH AND SOUTH CASING FACILITIES ARE OVERLOADED.

Existing Plant Background

	Storage	Low Production	High Production	Evap. Capacity	Diff.	
					Low	High
	Gallon	GPD	GPD	GPD	GPD	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
Total	4,850	3,300	7,500	3,600	(300)	3,900

Existing System

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

Improvement Goals

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

Raw WW Analysis

	Units	Bullet Wash	North Casing Wash	South Casing Wash
General Chemistry Parameters				
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
Calculated Analyses				
Hardness	mg/L	33.8	21.4	44.7
Total Metals by EPA 200 Series Methods				
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

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

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

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

EPA Categorical Limits: Ex.

Pollutant of Concern		40 CFR, Part 468, Subpart A			40 CFR, Part 471, Subpart A		Combined Daily Limit (lbs/day)
		Tumbling/ Burnishing 40%	Pickling Bath 25%	Pickling Rinse 35%	Alkaline Cleaning Spent Baths (35%)	Alkaline Cleaning Rinse 65%	
Antimony	Daily Max (lbs/day)				0.345	0.678	**0.025**
					0.005	0.019	
	Monthly Avg (lbs/day)				0.154	0.302	**0.011**
					0.002	0.009	
Copper	Daily Max (lbs/day)	0.746	0.148	0.748			**0.052**
		0.026	0.003	0.023			
	Monthly Avg (lbs/day)	0.355	0.070	0.356			**0.025**
		0.012	0.002	0.011			
Lead	Daily Max (lbs/day)	0.058	0.011	0.058	0.051	0.099	**0.008**
		0.002	0.000	0.002	0.001	0.003	
	Monthly Avg (lbs/day)	0.052	0.010	0.052	0.024	0.047	**0.005**
		0.002	0.000	0.002	0.000	0.001	

Daily Facility Production:

Copper	87,500	lbs/day
Lead	43,750	lbs/day

Ex: Copper

$$\left(\frac{0.746 * 87{,}500}{1{,}000{,}000}\right) * 0.4$$

= 0.026 lbs/day

EPA Categorical Limits: Ex.

Pollutant of Concern		40 CFR, Part 468, Subpart A			40 CFR, Part 471, Subpart A		Combined Daily Limit (lbs/day)
		Tumbling/ Burnishing 40%	Pickling Bath 25%	Pickling Rinse 35%	Alkaline Cleaning Spent Baths (35%)	Alkaline Cleaning Rinse 65%	
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	Monthly Avg (lbs/day)	0.052	0.010	0.052	0.024	0.047	**0.005**
		0.002	0.000	0.002	0.000	0.001	

Daily Facility Production:

Copper 87,500 lbs/day

Lead 43,750 lbs/day

Ex: Copper

$0.026 + 0.003 + 0.023$

= 0.052 lbs/day

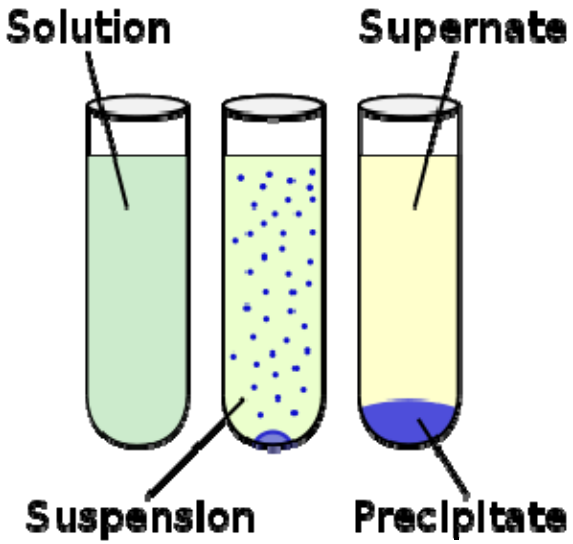
Permit Limits

	EPA Limits			Local Agency Limits
		3,300 gpd	**7,500 gpd**	
	lbs/day Monthly Avg	mg/L Monthly Avg	**mg/L Monthly Avg**	**mg/L**
Antimony	0.011	0.398	**0.175**	nl
Chromium	0.006	0.221	**0.097**	3.000
Copper	0.025	0.903	**0.397**	1.000
Lead	0.005	0.194	**0.085**	0.100
Nickel	0.015	0.547	**0.241**	1.000
Zinc	0.017	0.621	**0.273**	nl
TTO	0.014	0.503	**0.221**	nl
O&G (Alt)	0.409	14.846	6.532	**100**
O&G (petroleum)	nl			**25**
Arsenic	nl			**0.050**
Barium	nl			**1.000**
Cadmium	nl			**0.100**
Cyanides	nl			**2.000**
Manganese	nl			**1.000**
Mercury	nl			**0.005**
Selenium	nl			**0.030**
Silver	nl			**0.100**
Chloride	nl			**230**
BOD	nl			**250**

	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

Treatment Options

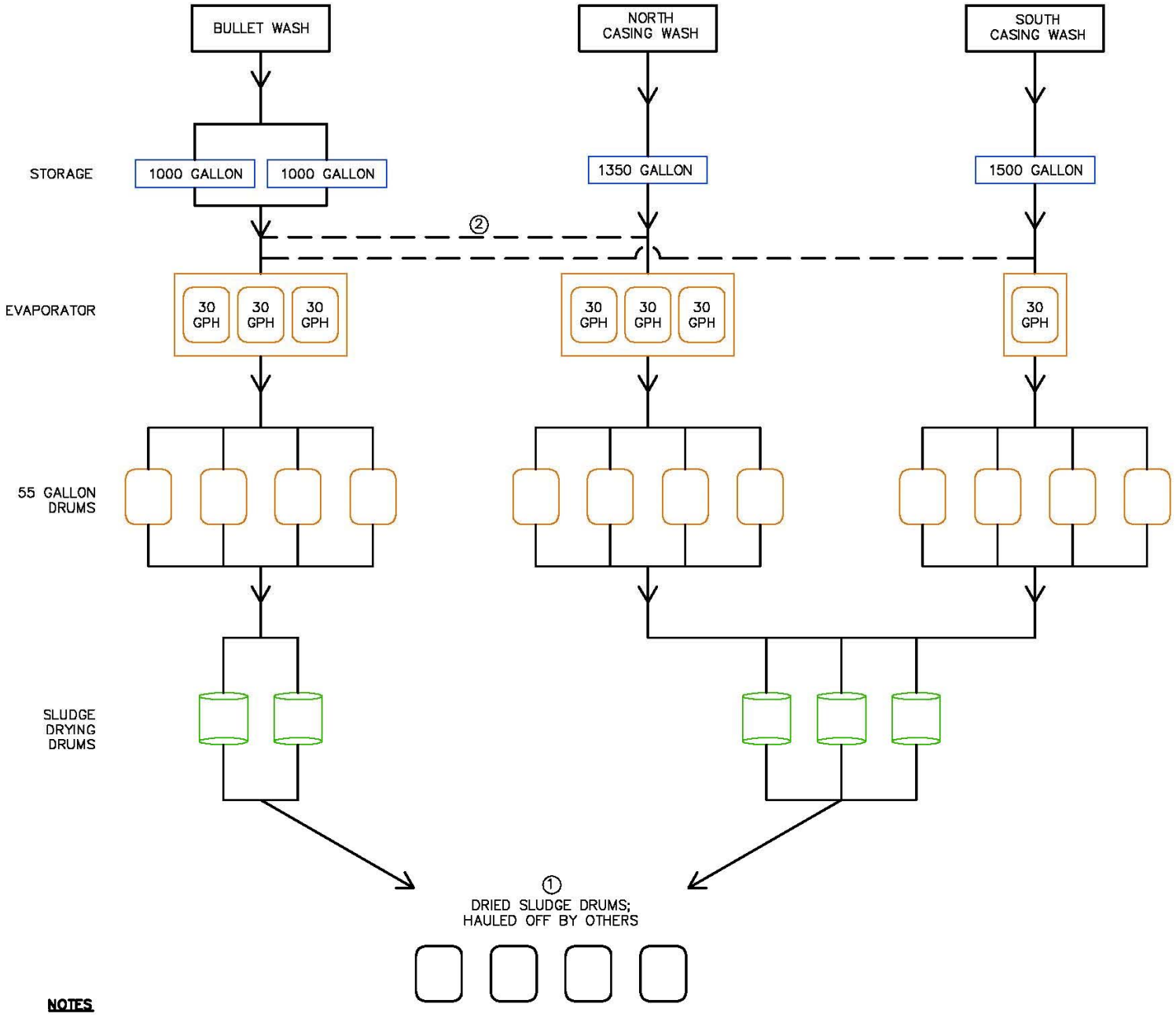
- Heavy Metals
  - Reverse Osmosis
  - Ion exchange
  - Chem precip and filtration
- O&G
  - DAF
  - GAC
  - Organo-clay



Bench Testing

- Aries Chemical

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



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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’

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**	Raw – Untreated	0.415	164	15	0.22	332	201 22 non-polar
A		Treatment # 3 (low chloride) Supernatant clarity only fair.	0.147	7.8 (3.2 sol)	0.26	< 0.1	1.2 (0.48 sol)	101 <8.0 non-polar
B	**JAN 14-15 RESULTS**	Treatment # 4 (low chloride, higher conc.) Supernatant clarity good, better than #3		1.3 (0.25 sol)	< 0.2	< 0.1	0.25 (0.2 sol)	
C		Organo-clay filtration of Test A effluent		6.7	0.25	< 0.1	0.78	78 27 non-polar
D		GAC filtration of Test C filtrate		3.5	< 0.2	< 0.1	0.32	14 <8.0 non-polar
GAC X2	**Jan 27 samples**	2 x GAC filtration of Test C filtration		0.22			0.034	<12 <12 non-polar

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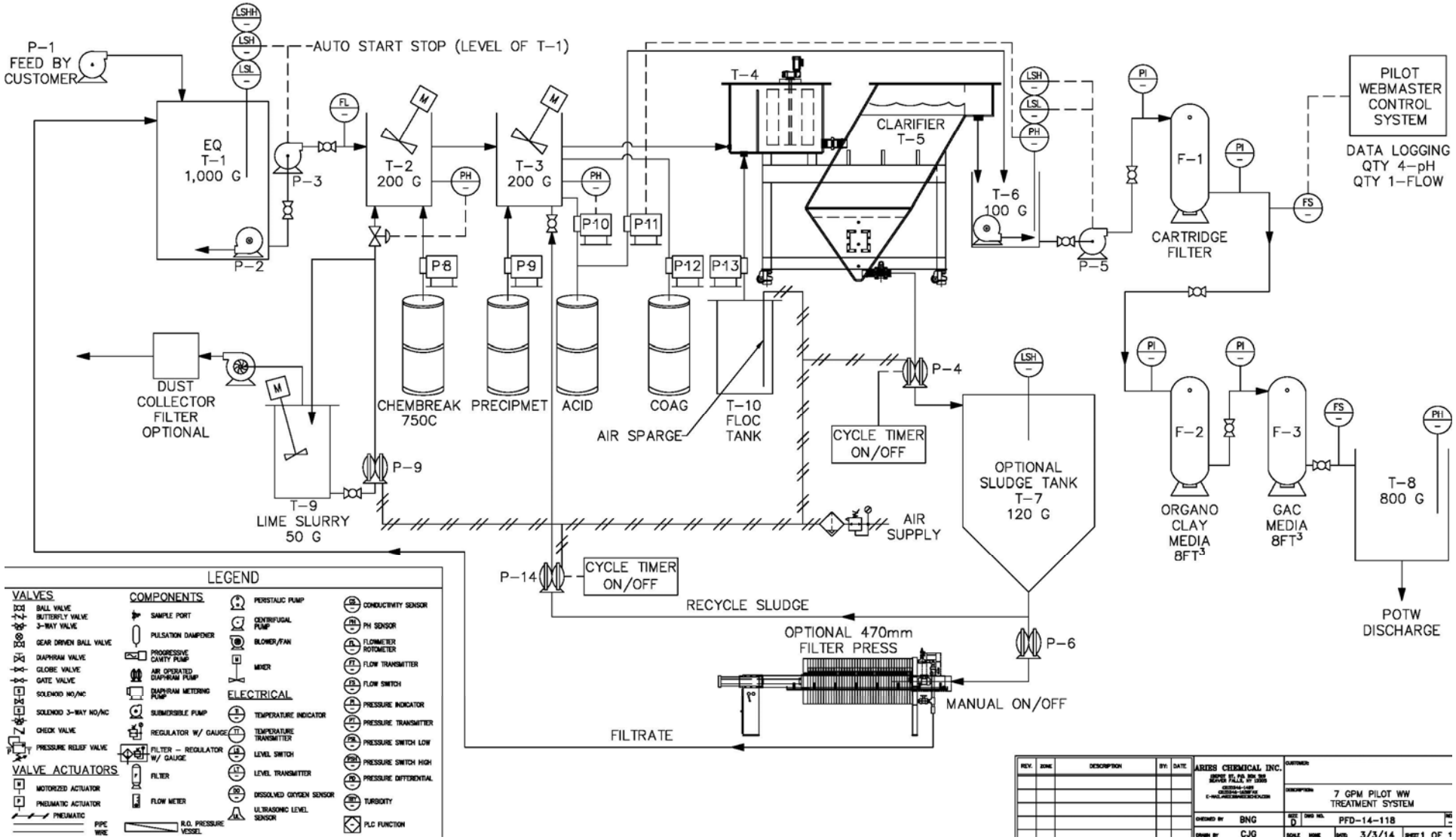
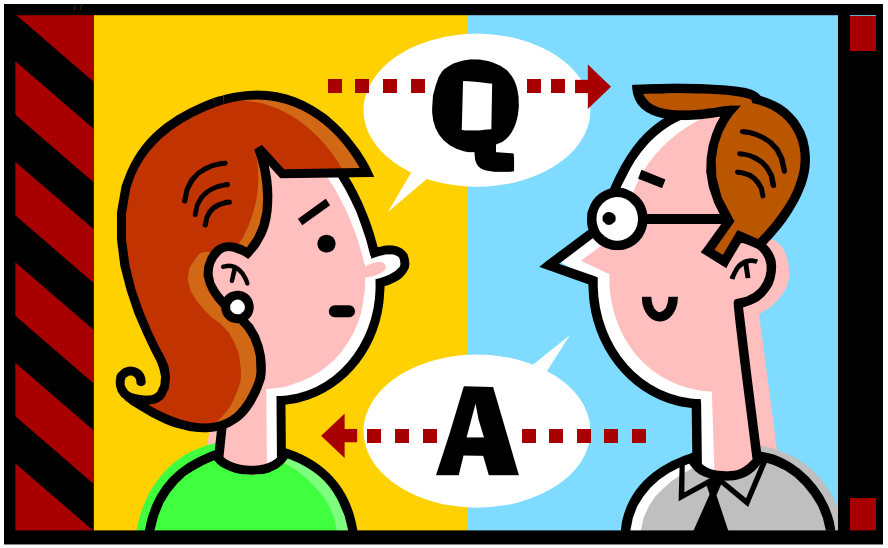
Pilot Plant

- Prove Bench Testing
- Optimize Operations
- Develop Costs
  - Chemical costs
  - Sludge production

Pilot Plant Layout



Q&A



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