“Considerations for Treating Wet Waste”

Presented by Nidal Samad

Farm Pilot Project Coordination, Inc.

March 24, 2011

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Applicability

- To realize value from wet waste – requires solids separation
  - Capture nutrients
  - Reclaiming water
  - Energy use
- Solid separation is also needed after Anaerobic Digester treatment
- FPPC embarked on an incremental, multi-step approach
  - Minimize cost of chemical and polymer additions
  - Maximize conventional methods already available
  - System tolerant of waste stream variability
  - Deployment – mobile platform

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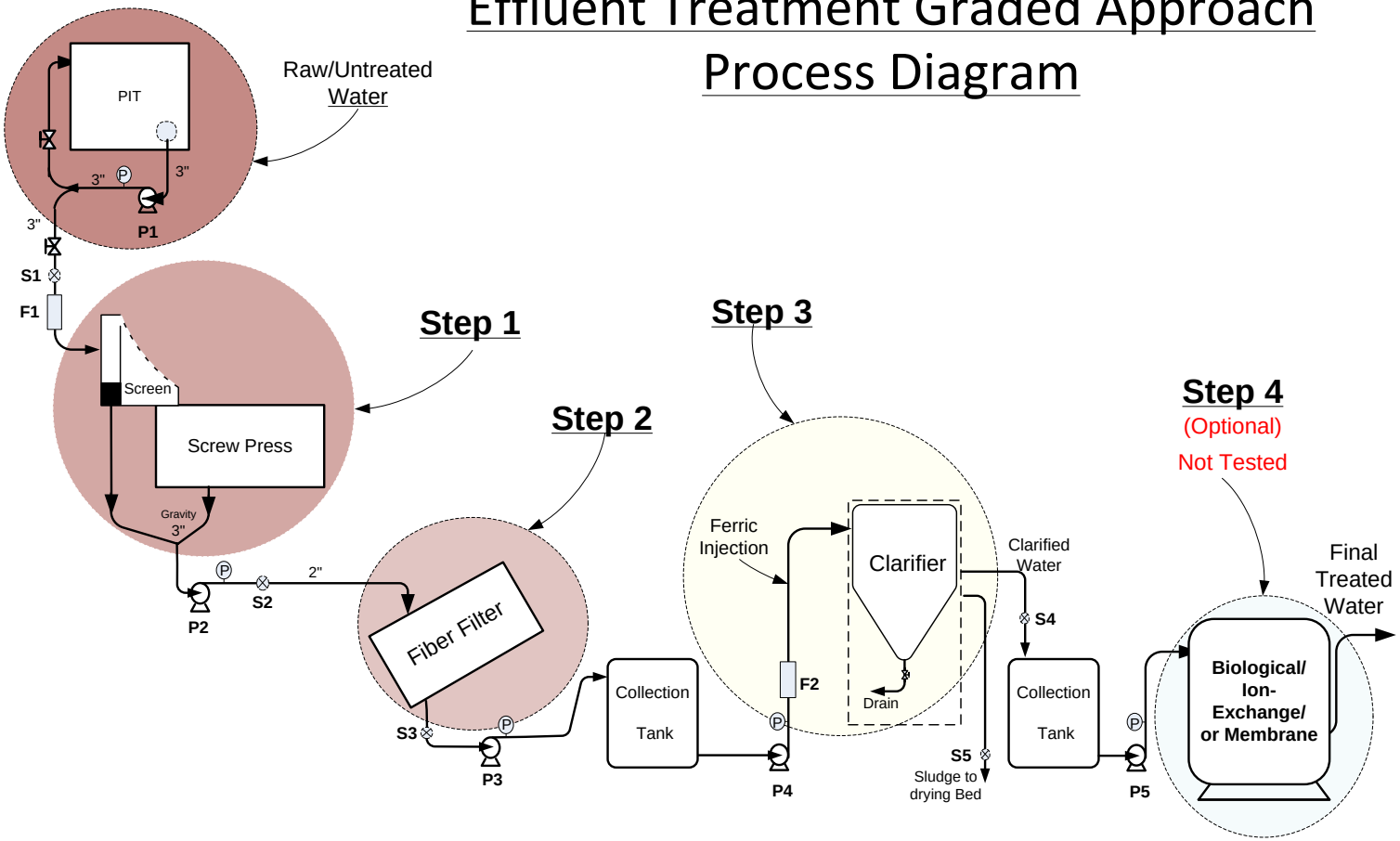
Effluent Treatment Graded Approach Process Diagram



FPPC, Inc

101 E. Kennedy Blvd. # 3220
Tampa, FL 33602-5178

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Designed/Drawn/Checked By: Nidal Samad

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The objective for capturing solids from wet waste, used as a feedstock for Thermochemical conversion must also consider moisture content

Typical specification and operating performance of solid separation methods			
	Mass Removal Efficiency1, %	Cake TS1, %	Solid Capture2, %
Settling	up to 75	1 to 3	40-65
Incline screen	up to 45	8-22	10-20
Vibrating Screen		5-22	15-30
Rotating Screen		5-16	20-40
Belt Press		15-25	30-40
Screw Press		30-40	15-20
Decanting centrifuge	up to 70	25 to 40	20-45
Liquid Cyclone	up to 40	Less than 10	
Geotexile Bag			50-98

[1] Alan Newport, Sep 1, 2004, "Separating fact from fiction"

[2] Dr. Robert Burns, "Selection and performance of mechanical solids-liquid separators", Iowa State University

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Variability of Dairy Waste (Total Solids Data)

Date	Pit Slurry		Screw Press (Step 1)		Fiber filter (Step 2)	
	%	mg/Liter	%	mg/Liter	%	mg/Liter
1/20/2011	1.03	10,300	0.92	9,200	**n/a**	**n/a**
2/1/2011	n/a	n/a	n/a	n/a	0.4	4,000
2/3/2011	**n/a**	**n/a**	**n/a**	**n/a**	0.41	4,100
2/10/2011	0.79	7,900	0.6	6,000	0.36	3,600
2/10/2011	0.67	6,700	0.67	6,700	0.44	4,400
2/15/2011	1.19	11,900	0.71	7,100	0.5	5,000
2/16/2011	0.46	4,600	0.71	7,100	0.51	5,100
2/16/2011	0.76	7,600	0.55	5,500	0.44	4,400
2/16/2011	**n/a**	**n/a**	**n/a**	**n/a**	0.46	4,600
2/17/2011	1.2	12,000	0.82	8,200	0.52	5,200
2/17/2011	**n/a**	**n/a**	**n/a**	**n/a**	0.53	5,300
2/17/2011	0.69	6,900	0.61	6,100	0.39	3,900
Mean	0.85	8,488	0.7	6,987	0.45	4,509
Standard Deviation	0.27	2,652	0.12	1,222	0.06	579
Variability in Percent	**31**		**17**		**13**	

n/a: Data Not Collected or Rejected

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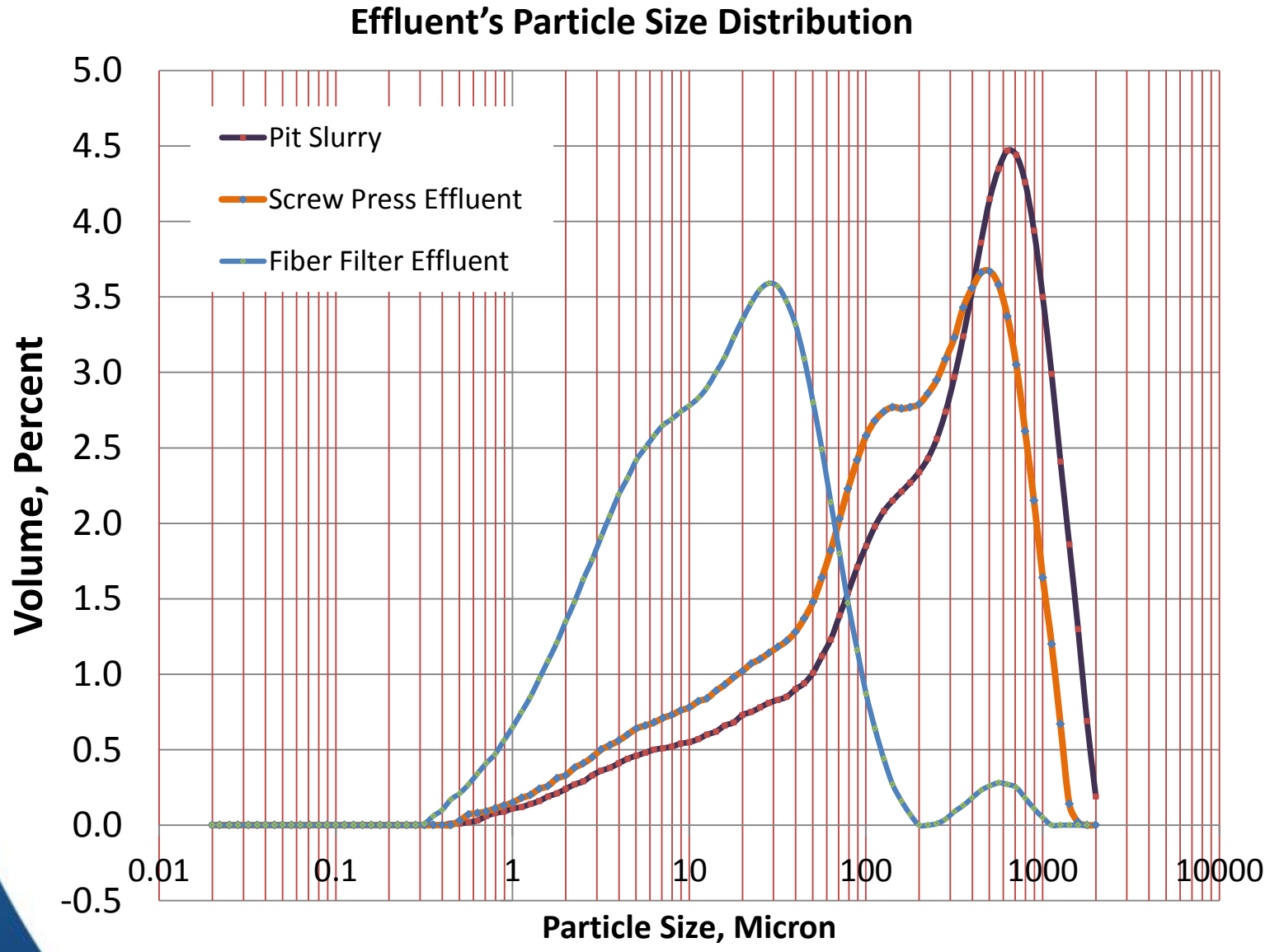
Effluent's Particle Size Distribution
Pit Slurry
Screw Press Effluent
Fiber Filter Effluent
Volume, Percent
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0.01
0.1
1
10
100
1000
10000
Particle Size, Micron

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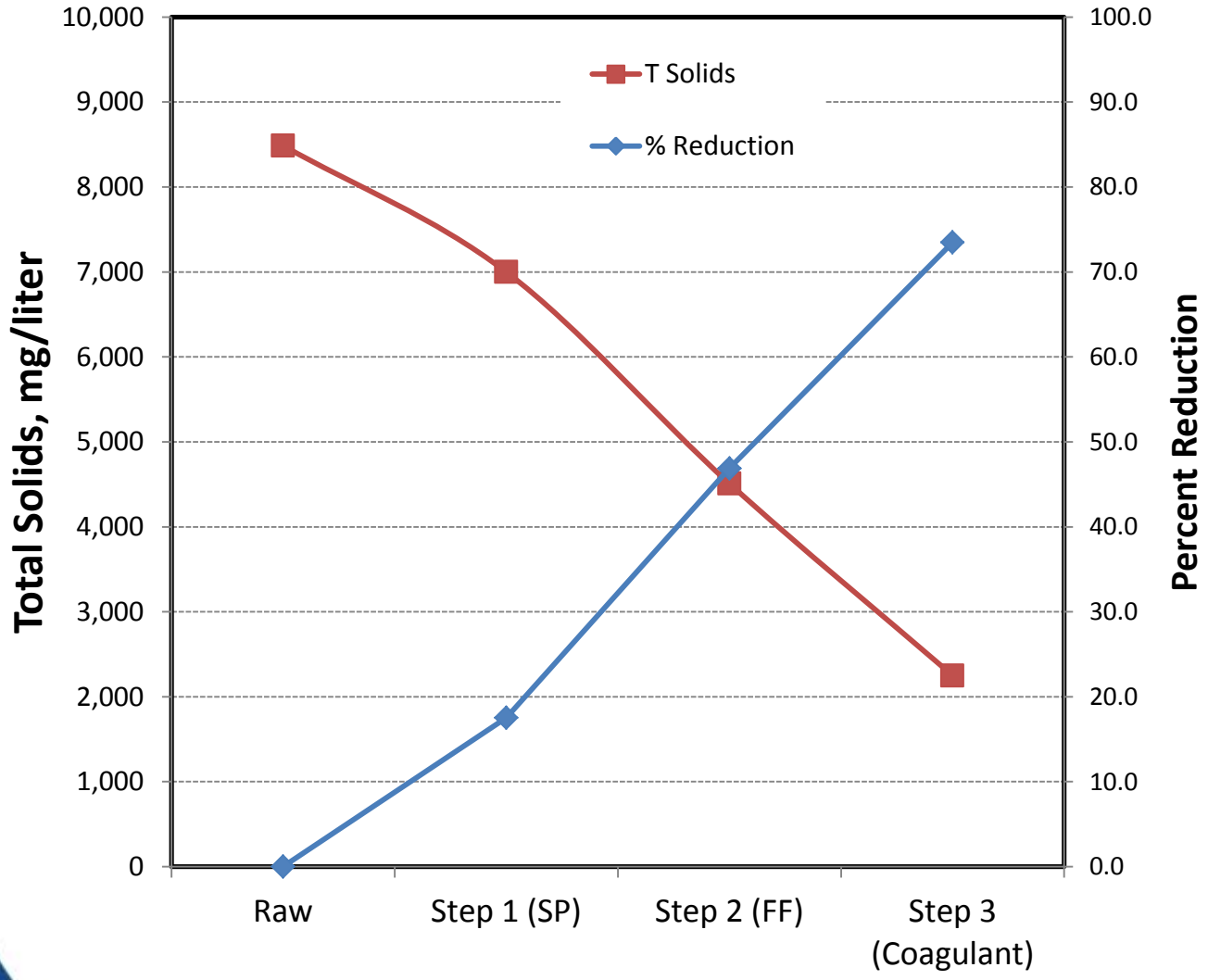
Change in Total Solids After Treatment (Total Solids)



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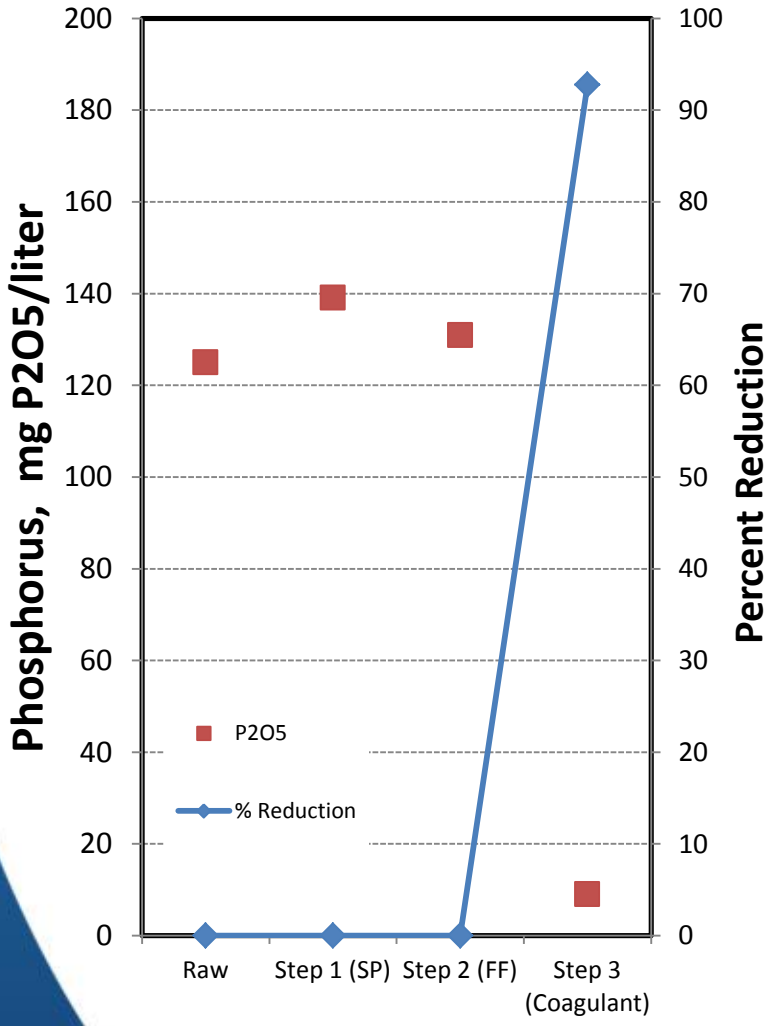
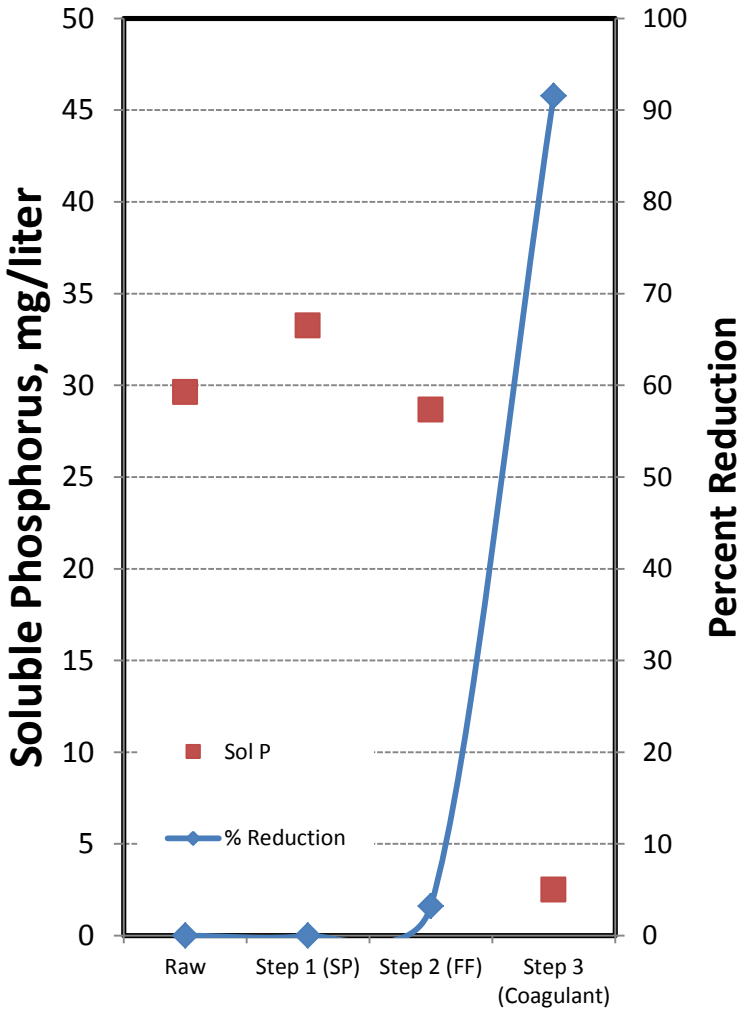
Total Phosphorus Summary



Total Soluble Phosphorus Summary



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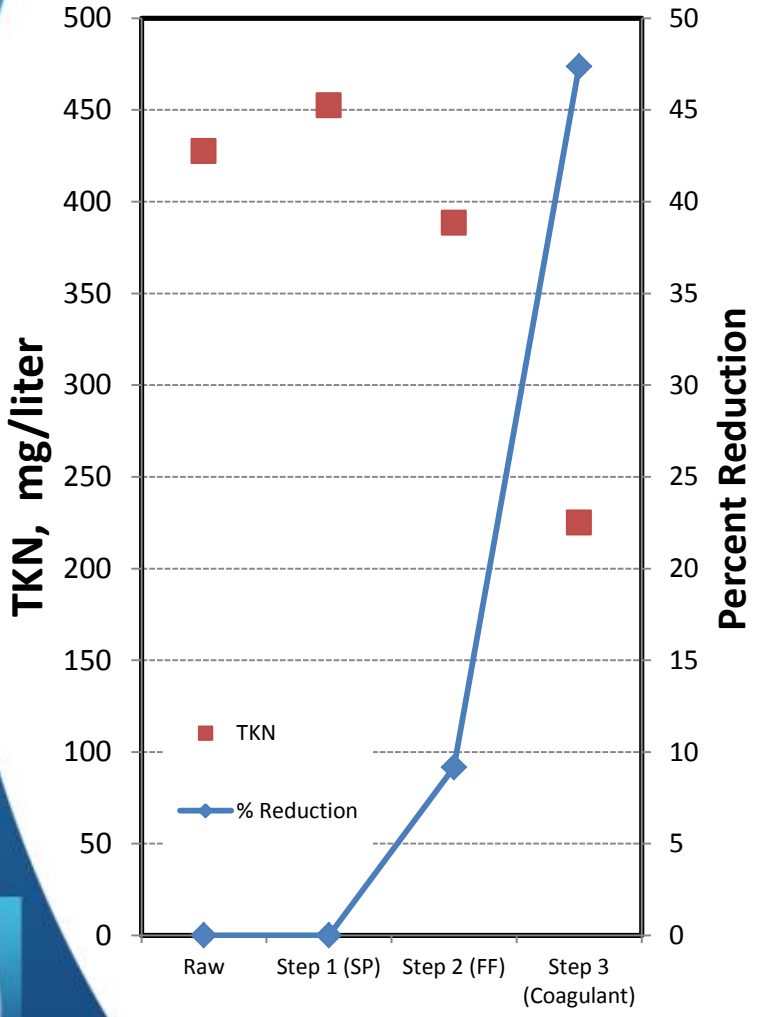
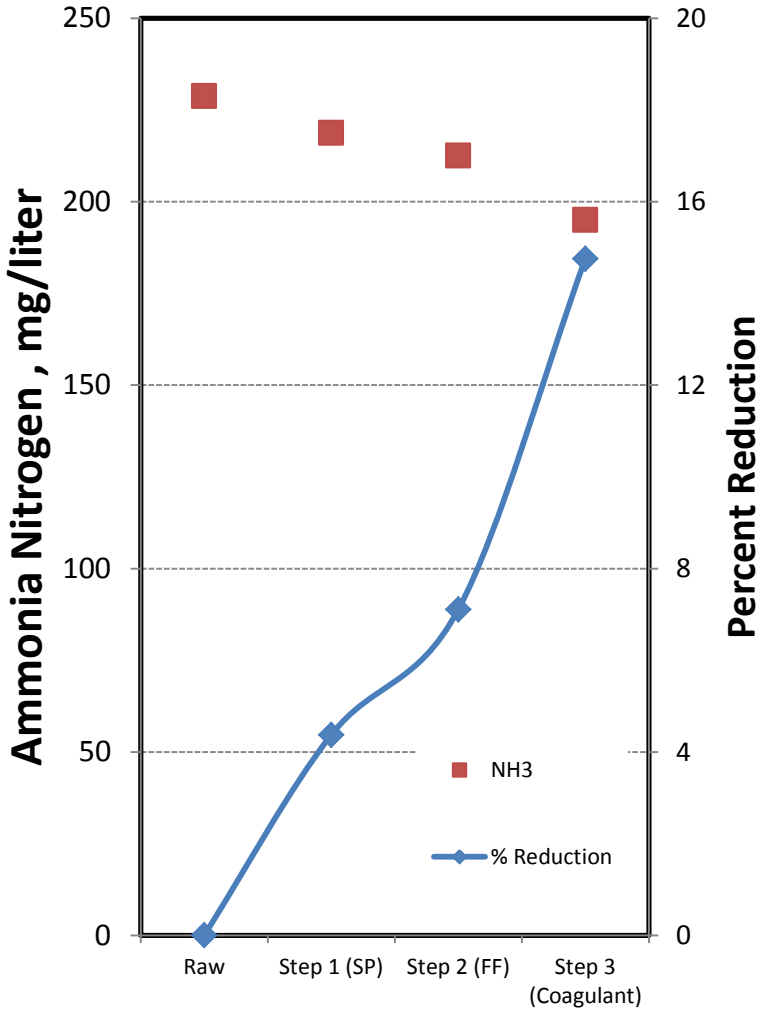
TKN Summary



Total Ammonia-Nitrogen Summary



TKN = Organic-Nitrogen (Mostly in Solids/Particles) + Ammonia-Nitrogen (Dissolved)

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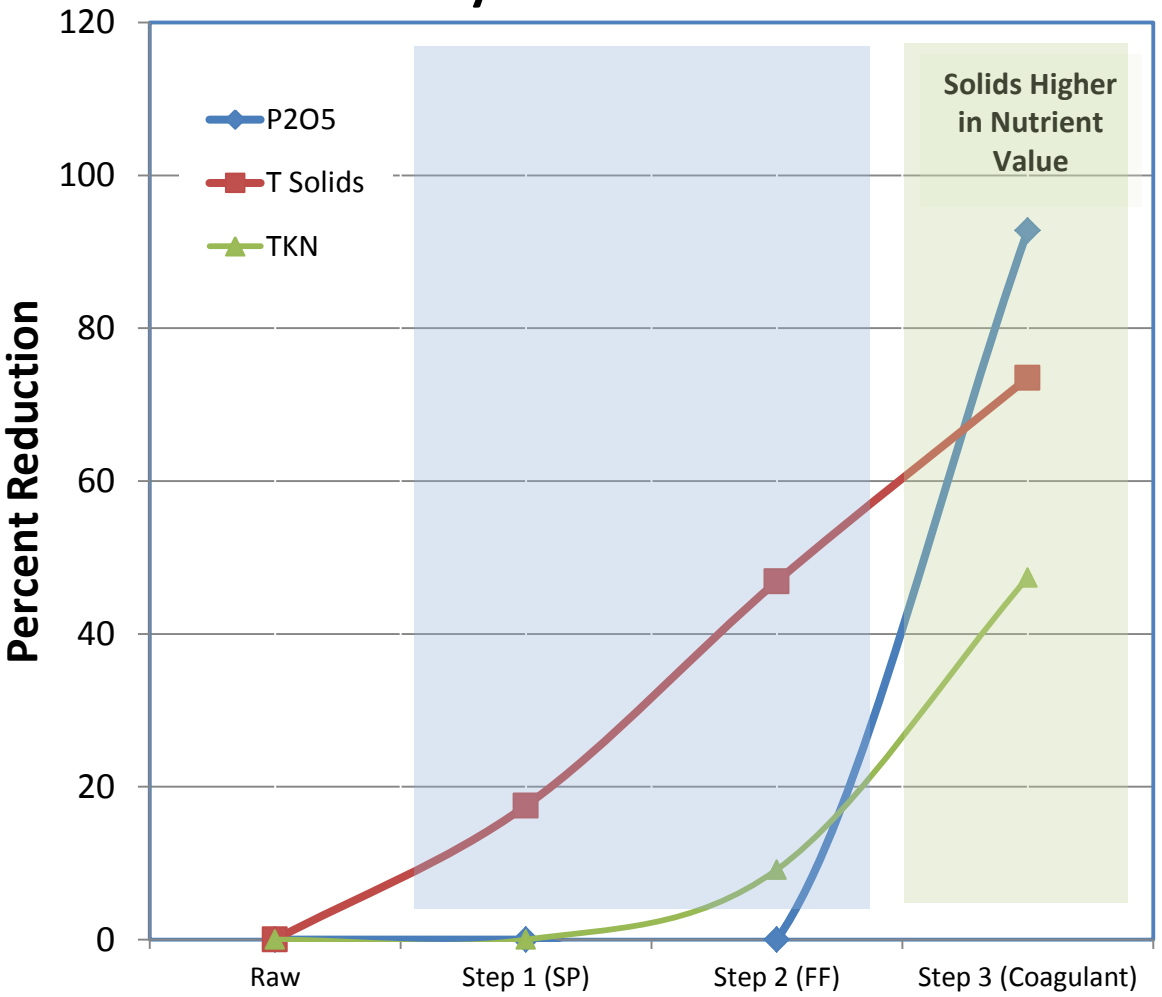
Effluent Graded Approach Treatment System Performance



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Conclusion

- The waste stream variability is better controlled after mechanical separation
- Mechanical separators employed show that particle size is reduced and solid particles are more uniform size
- Chemical treatment was very effective once the waste stream variability was improved
- Confident – can remove 90-95% of P and 50% of Nitrogen

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Thank You , Questions?

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