EXHIBIT E

Interim Report
December 21, 2011

Sanitary District of Decatur
501 DIPPER LANE • DECATUR, ILLINOIS 62522 • 217/422-6931 • FAX: 217/423-8171

December 21, 2011

Illinois Environmental Protection Agency
Bureau of Water Compliance Assurance Section, MC #19
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Re: NPDES Permit IL0028321
IPCB Order PCB 09-125
Interim Report

Dear Sir or Madam:

Enclosed is the Interim Report regarding compliance with nickel and zinc limits required by Special Condition 18 of the Sanitary District of Decatur's NPDES Permit and the Pollution Control Board Order in PCB 09-125.

Please contact me at 422-6931 ext. 214 or at timk@sdd.dst.il.us if you have any questions regarding this report.

Sincerely,

Timothy R. Kluge, P.E.
Technical Director

cc: Rick Pinneo, IEPA (via email)
Bob Mosher, IEPA (via email)
SDD File

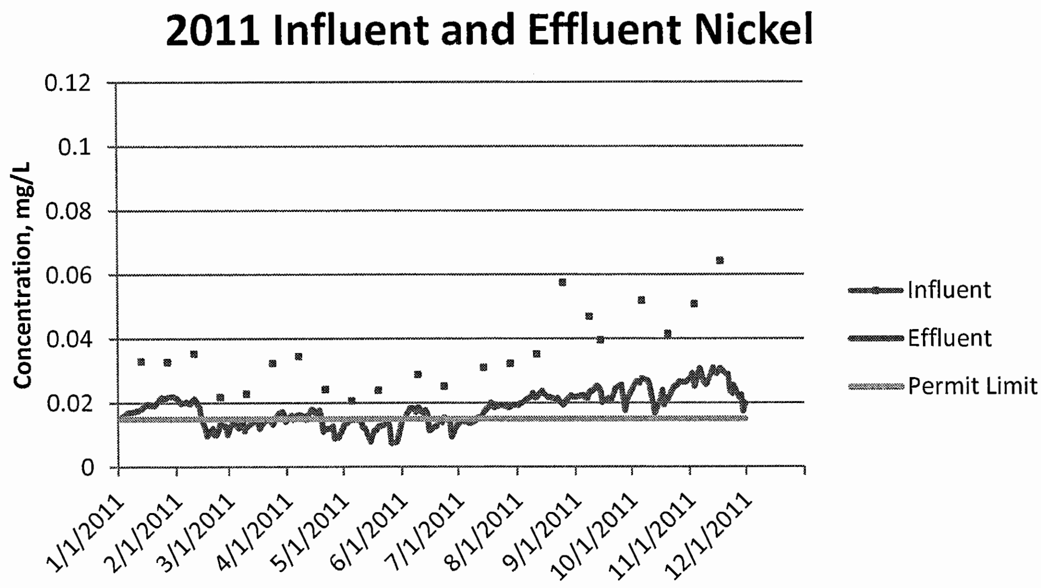
Sanitary District of Decatur
Nickel and Zinc Limits
December 2011 Interim Report

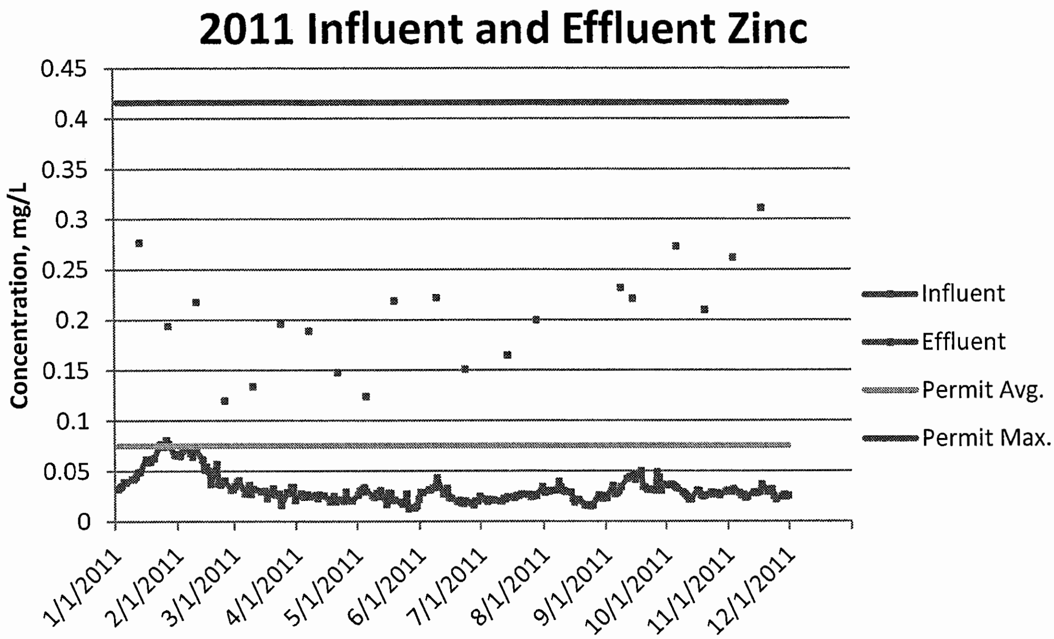
The modified NPDES permit for the Sanitary District of Decatur that became effective July 1, 2009 contains limits for nickel and zinc and a one-year compliance schedule extension for meeting the limits. Special Condition 17 requires that an interim progress report be submitted to Illinois EPA by January 1, 2012.

On January 7, 2010 the Illinois Pollution Control Board granted a variance to the District allowing additional time to comply with final permit limits (PCB 09-125). The final compliance date contained in the Board Order is July 1, 2014. The District's NPDES Permit has not yet been modified to incorporate the variance although Illinois EPA issued a Public Notice and draft modified permit on May 26, 2011. The Board Order also requires that an interim progress report be submitted by January 1, 2012 and lists a number of other activities and investigations that are to be completed. This report is submitted to meet both the permit and variance requirements.

Plant Influent and Effluent Sampling

Ongoing influent sampling for nickel and zinc continues at a frequency of twice monthly, and effluent sampling is done five days per week according to NPDES monitoring requirements. A summary of influent and effluent values during 2011 is shown below. Data shows that the plant effluent is not able to consistently meet the current nickel permit limit. Zinc concentrations remain below the permit limit.





Receiving Stream Sampling

Upstream and downstream sampling continues at a twice monthly frequency to provide a more complete picture of nickel and zinc in the Sangamon River. One upstream and four downstream sampling sites are being monitored. A summary of 2010-2011 river monitoring data is attached. Downstream nickel results remain high during times of low upstream river flow. All upstream and downstream zinc results during 2011 have been below the Illinois water quality standard.

Pretreatment Ordinance Limits

The District's pretreatment ordinance was amended in October 2009 as noted in previous reports.

Stream Flow-Based Compliance Options

The District continues investigation of flow-based permit limits, to take advantage of upstream flow for mixing when it is available. This concept could potentially allow a savings in treatment facility operating costs when the upstream flow is sufficient to meet water quality standards after mixing with treatment plant effluent. A USGS flow gauging station is located about two miles upstream of the District's discharge point, and provides near- real time flow information. Informal discussions with Illinois EPA personnel have indicated a preference for flow-based limits to be a part of relief requested from the Pollution Control Board.

Water Quality Standard Investigations

The District is continuing to investigate approaches to a water quality standard adjustment including a limit based on a bioavailability approach. SDD staff and personnel from Hydro-Qual have discussed aspects of the proposal with Illinois EPA staff during the past few months. The District is in the final stages of preparing a petition for a site-specific nickel standard, which should be filed with the Pollution Control Board in early 2012.

We are also following the Pollution Control Board rulemaking currently underway to correct an error found in the existing zinc water quality standard.

Industrial Source Sampling and Investigations

Sampling at Archer Danield Midland Company for metals continues at a frequency of twice monthly and other industries discharging metals are sampled quarterly. Sample results obtained from ADM within the past year are attached.

The District's operating permit issued to ADM was modified on November 18, 2009 and again on June 17, 2010 to reflect the new limits and provide a compliance schedule for meeting the limits. Final local limits will be effective upon expiration of the District's variance.

Both ADM and Tate & Lyle formerly utilized zinc as part of their cooling tower treatment programs, and both have eliminated or greatly reduced zinc in their towers. At this time, both industries are meeting the zinc pretreatment limit. ADM is continuing to investigate the possible impact of the zinc limit on their planned wasting of solids from their pretreatment system to the District's collection system.

The discharge from ADM is by far the most significant industrial source of nickel. ADM has been very active in seeking treatment technology for nickel removal, involving plant management and research department personnel in addition to environmental compliance and legal staff. District staff met with ADM personnel several times during the second half of 2011, most recently on December 12. The District's pretreatment permit requires semi-annual reports of ADM's investigations, and the most recent report is attached. Work during the past six months has included pilot testing for several nickel removal technologies, toxicity testing to determine potential impacts of the District's nitrification process, and ongoing research into alternative technologies.

Additional Pretreatment Limit Investigations

Pretreatment ordinance limits adopted in 2009 were adopted as total (rather than soluble) limits based on review of soluble/insoluble data. Refinement of pretreatment limits is an ongoing process and will depend on final permit limits as well as treatment technologies that might be employed by industrial users. The required determination of soluble/insoluble vs. total limits will be updated as part of the final compliance plan submitted to the Agency.

Compliance Plan

In summary, the District's proposed compliance plan includes ongoing work as required by the Board Order granting the District's variance. The District will continue to proceed in accordance with the schedule in the Order with efforts in three areas:

1. Continuing to work with ADM to investigate nickel removal technologies, and to determine a sludge wasting plan that will minimize zinc discharges. The Order lists ten technologies that were to be investigated by December 31, 2010; the investigations were done as required. Additional investigations and pilot studies continue and a summary is attached.

2. Completion and filing a petition for a site-specific water quality standard for nickel, based on bioavailability. Work on the petition is proceeding with a goal of filing early in 2012.

3. Conducting additional discussions with Illinois EPA permit personnel regarding variable permit limits based on the amount of flow available in the Sangamon River. At this time, the District intends to include flow variable limits in its request for a site-specific water quality standard.

Sanitary District of Decatur
Nickel and Zinc River Data 2010-2011

Sample Date	Plant Final Effluent Nickel mg/L	River Up-stream Nickel mg/L	River 100 yds Down stream Nickel mg/L	River 600 yds Down-stream Nickel mg/L	Steven's Creek Nickel mg/L	River Rock Springs Bridge Nickel mg/L	River Wyckle's Road Nickel mg/L	River Lincoln H'stead Nickel mg/L	Plant Final Effluent Zinc mg/L	River Up-stream Zinc mg/L	River 100 yds Down stream Zinc mg/L	River 600 yds Down-stream Zinc mg/L	Steven's Creek Zinc mg/L	River Rock Springs Bridge Zinc mg/L	River Wyckle's Road Zinc mg/L	River Lincoln H'stead Nickel mg/L	Plant Final Effluent Flow mgd	River Up-stream Flow ft³/sec
1/14/10	0.0202	<0.00131	0.00374	0.00407	<0.00131	0.00331		0.00318	0.0393	<0.00660	0.0102	0.0108	<0.00660	0.00839		0.0112	30.29	208
1/28/10	0.0160	0.00205	0.00253	0.00240	<0.00131	0.00209		0.00237	0.0399	0.0129	0.0130	0.0121	0.00773	0.0135		0.0138	42.87	3470
2/11/10	0.0204	<0.00131	0.00462	0.00357	<0.00131	0.00277		0.00253	0.0344	<0.00660	0.0119	0.00980	0.00789	0.0108		0.00710	31.39	517
2/18/10	0.0304	<0.00131	0.00527	0.00468	<0.00131	0.00398		0.00351	0.0377	0.00696	0.0103	0.0103	0.00790	0.00777		0.00819	33.12	436
3/4/10	0.0235	<0.00131	0.00376	0.00332	<0.00131	0.00242		0.00240	0.0304	0.00667	0.00918	0.00851	<0.00660	0.00746		0.00895	37.82	755
3/18/10	0.0194	0.00133	0.00232	0.00199	<0.00131	0.00165		0.00200	0.0260	0.00781	0.00966	0.00953	0.00739	0.00801		0.0107	39.45	2160
4/15/10	0.0208	<0.00131	0.00290	0.00279	<0.00131	0.00237		0.00281	0.0204	<0.00660	0.00758	0.00867	<0.00660	<0.00660		0.00761	35.89	482
4/29/10	0.0173	<0.00131	0.00186	0.00201	<0.00131	0.00175		0.00222	0.0290	0.00776	0.00676	0.00833	0.0136	<0.00660		0.00902	31.86	728
5/13/10	0.0127	0.00137	0.00195	0.00244	0.00176	0.00174		0.00229	0.0244	0.00762	0.00767	0.00791	0.0121	0.00821		0.0112	38.27	1440
5/27/10	0.0211	<0.00131	0.00388	0.00284	0.00158	0.00226		0.00259	0.0293	0.00765	0.00875	0.00763	0.00872	0.00697		0.00982	37.01	948
6/10/10	0.0229	0.00205	0.00298	0.00241	0.00325	0.00217		0.00291	0.0328	0.0108	0.0106	0.00988	0.0183	0.0105		0.0145	38.57	1820
6/24/10	0.0205	0.00262	0.00620	0.00386	0.00332	0.00311		0.00345	0.0212	0.0144	0.0137	0.0125	0.0174	0.0142		0.0148	72.13	6120
7/8/10	0.0458	<0.00131	0.00637	0.00713	<0.00131	0.00540		0.00571	0.0662	<0.00660	0.0148	0.0175	<0.00660	0.0155		0.0121	34.86	348
7/29/10	0.0433	0.00190	0.00744	0.00600	0.00151	0.00580		0.00600	0.0564	0.00909	0.0132	0.0122	<0.00660	0.0123		0.0248	38.86	285
8/12/10	0.0493	0.00157	0.0367	0.0353	<0.00131	0.0327		0.0338	0.0681	0.0130	0.0578	0.0529	<0.00660	0.0480		0.0601	31.89	24
8/26/10	0.0370	0.0025	0.0319	0.0320	0.00177	0.0294		0.0211	0.0253	0.0130	0.0255	0.0246	<0.00660	0.0221		0.0121	30.59	4.7
9/9/10	0.0269	<0.00131	0.0203	0.0197	0.00135	0.0166		0.0119	0.0314	<0.00660	0.0219	0.0209	0.0113	0.0257		0.0218	32.10	11
9/23/10	0.0192	0.00186	0.0136	0.0132	0.00188	0.00915		0.0108	0.0309	0.0119	0.0590	0.0249	0.0105	0.0188		0.0162	34.19	2.0
10/14/10	0.0182	0.00251	0.0176	0.0182	0.00143	0.0149	0.0152		0.0335	0.00827	0.0335	0.0317	0.00893	0.0259	0.0303		25.66	1.9
10/28/10	0.0238	0.00135	0.0209	0.0212	<0.00131	0.0158	0.0157		0.0261	<0.00660	0.0316	0.0232	<0.00660	0.0179	0.0190		28.28	1.9
11/04/10	0.0227	0.00146	0.0222	0.0223	<0.00131	0.0193	0.0193		0.0474	<0.00660	0.0440	0.0421	<0.00660	0.0367	0.0354		31.01	2.7
11/18/10	0.0207	0.00131	0.0191	0.0189	<0.00131	0.0164	0.0170		0.0287	<0.00660	0.0271	0.0274	<0.00660	0.0245	0.0238		29.94	4.5
12/02/10	0.0203	0.00180	0.00269	0.00217	<0.00131	0.00217	0.00186		0.0396	<0.00660	0.00702	0.00745	<0.00660	0.00779	<0.00660		33.60	1480
12/16/10	0.0199	<0.00131	0.00311	0.00210	<0.00131	0.0017	0.00156		0.0356	<0.00660	0.00672	0.00859	<0.00660	<0.00660	<0.00660		28.51	694
01/13/11	0.0181	<0.00131	0.00519	0.00495	<0.00131	0.00426	0.00504		0.0503	<0.00660	0.0157	0.0152	<0.00660	0.0133	0.0149		29.48	121
01/27/11	0.0218	<0.00131	0.0144	0.0138	<0.00131	0.0113	0.0102		0.0773	<0.00660	0.0504	0.0481	<0.00660	0.0394	0.0350		30.71	3.9
02/10/11	0.0214	<0.00131	0.0141	0.0128	<0.00131	0.0112	0.00971		0.0701	<0.00660	0.0460	0.0413	0.00761	0.0364	0.0313		27.94	5.4
02/24/11	0.0132	0.00160	0.00242	0.00252	0.00150	0.00214	0.00205		0.0406	0.00841	0.0106	0.0108	0.0138	0.0114	0.00992		44.38	1970
3/10/11	0.0123	0.00169	0.00194	0.00198	0.00153	0.00184	0.00208		0.0321	0.00972	0.00978	0.00992	0.0103	0.00974	0.0100		47.51	2900
3/24/11	0.0132	<0.00131	0.00133	0.00133	<0.00131	<0.00131	<0.00131		0.0161	<0.00660	<0.00660	<0.00660	<0.00660	<0.00660	<0.00660		33.28	667
4/7/11	0.0163	<0.00131	0.00343	0.00252	<0.00131	0.00241	0.00237		0.0246	<0.00660	0.00884	0.00689	<0.00660	0.00732	0.00691		30.62	326
4/21/11	0.0118	<0.00131	0.00236	0.00195	0.00254	0.00157	0.00188		0.0215	0.00729	0.00878	0.00822	0.0170	0.00939	0.00934		52.22	2540
5/5/11	0.0147	0.00177	0.00279	0.00238	0.00137	0.00218	0.00223		0.0295	<0.00660	0.00932	0.00862	<0.00660	0.00760	0.00898		41.88	1670
5/19/11	0.0125	<0.00131	0.00211	0.00186	<0.00131	0.00153	0.00150		0.0213	<0.00660	<0.00660	<0.00660	<0.00660	<0.00660	0.00777		32.29	1290
6/9/11	0.0187	<0.00131	0.00143	0.00194	0.00183	0.00162	0.00177		0.0434	<0.00660	<0.00660	0.00672	<0.00660	<0.00660	0.0124		29.12	1540
6/23/11	0.0154	0.00210	0.00335	0.00307	0.00154	0.00280	0.00329		0.0203	0.0131	0.0134	0.0138	0.0112	0.0129	0.0155		36.23	800
7/14/11	0.0170	<0.00131	0.0118	0.0116	<0.00131	0.00886	0.00890		0.0242	0.00519	0.0162	0.0171	<0.00660	0.0136	0.0130		27.12	200
7/28/11	0.0188	<0.00131	0.0187	0.0168	<0.00131	0.0158	0.0159		0.0255	<0.00660	0.0279	0.0219	<0.00660	0.0205	0.0207		27.85	2.1
8/11/11	0.0218	0.00143	0.0255	0.0212	<0.00131	0.0204	0.0199		0.0294	<0.00660	0.0576	0.0292	<0.00660	0.0266	0.0271		24.82	1.6
8/25/11	0.0193	<0.00131	0.0187	0.0190	<0.00131	0.0183	0.0189		0.0161	<0.00660	0.0153	0.0158	<0.00660	0.0142	0.0137		24.19	1.1
9/8/11	0.0233	0.00142	0.0208	0.0222	<0.00131	0.0207	0.0196		0.0341	<0.00660	0.0294	0.0303	<0.00660	0.0279	0.0254		27.07	0.15
9/14/11	0.0237	0.00132	0.0231	0.0235	<0.00131	0.0228	0.0231		0.0460	<0.00660	0.0425	0.0438	<0.00660	0.0413	0.0385		28.62	1.9
10/6/11	0.0276	0.00140	0.0263	0.0265	<0.00131	0.0255	0.0259		0.0329	<0.00660	0.0318	0.0314	<0.00660	0.0296	0.0288		23.96	0.75
10/20/11	0.0211	<0.00131	0.0189	0.0195	<0.00131	0.0159	0.0181		0.0260	0.0107	0.0235	0.0238	<0.00660	0.0193	0.0199		23.28	2.8
11/3/11	0.0250	0.00197	0.0277	0.0304	0.00175	0.0260	0.0275		0.0322	0.0115	0.0314	0.0354	<0.00660	0.0281	0.0271		42.99	18
11/17/11	0.0307	<0.00131	0.0281	0.0283	0.00178	0.0273	0.0277		0.0368	<0.00660	0.0285	0.0304	<0.00660	0.0275	0.0247		25.80	1.1
12/1/11	0.0221	<0.00131	0.0177	0.0173	<0.00131	0.0149	0.0149		0.0349	0.00728	0.0245	0.0230	0.00824	0.0207	0.0190		27.64	2.1

Indicates that effluent or river/creek sample concentration exceeds chronic water quality value

SDD Major Industrial Nickel and Zinc Results				
	ADM Point A	ADM Point A	ADM Point D	ADM Point D
Sample	Nickel, Tot	Zinc, Tot	Nickel, Tot	Zinc, Tot
Date	mg/L	mg/L	mg/L	mg/L
6/1/2010	0.0813	0.488	0.12	0.441
6/14/2010	0.0826	0.453	0.104	0.345
7/8/2010	0.148	0.54	0.283	1.07
7/12/2010	0.144	0.528	0.193	0.514
8/2/2010	0.125	0.457	0.172	0.446
8/9/2010	0.126	0.44	0.184	0.474
9/1/2010	0.0766	0.465	0.122	0.469
9/20/2010	0.0744	0.442	0.121	0.649
10/4/2010	0.0781	0.461	0.0938	0.369
10/14/2010	0.162	1.18	0.179	1.18
11/8/2010	0.0524	0.24	0.0646	0.208
11/23/2010	0.13	0.665	0.122	0.413
12/6/2010	0.0715	0.53	0.131	0.581
12/13/2010	0.0649	0.498	0.0774	0.219
1/5/2011	0.0629	0.53	0.0669	0.204
1/10/2011	0.0577	0.495	0.0666	0.188
2/7/2011	0.0836	0.756	0.0892	0.329
2/14/2011	0.0589	0.472	0.0598	0.18
3/7/2011	0.0773	0.447	0.0627	0.128
3/14/2011	0.086	0.51	0.1	0.449
4/4/2011	0.07	0.428	0.0841	0.387
4/20/2011	0.0687	0.33	0.0861	0.347
5/2/2011	0.0712	0.304	0.0809	0.302
5/9/2011	0.06	0.301	0.0712	0.3
6/6/2011	0.0648	0.285	0.0786	0.276
6/13/2011	0.0692	0.293	0.0809	0.314
7/11/2011	0.0542	0.226	0.0625	0.209
8/1/2011	0.0491	0.165	0.0621	0.172
8/8/2011	0.0567	0.215	0.074	0.242
9/1/2011	0.0662	0.285	0.0842	0.327
9/7/2011	0.0684	0.311	0.0884	0.344
10/3/2011	0.094	0.518	0.114	0.515
10/10/2011	0.0643	0.191	0.073	0.189
SDD Ordinance Limit (Avg.)	0.0365	0.45		
SDD Ordinance Limit (Max.)	0.15	1.7		

To:	Illinois Environmental Protection Agency Decatur Sanitary District
From:	ADM Decatur WWTP
CC:	ADM Corn Processing, ADM Oilseeds Processing, ADM JRRRC
Date:	December 12, 2011
Re:	Status Report Compliance Strategy for 2011 for Decatur Sanitary District and ADM Decatur WWTP for waste treatment. (Covers updates post July 6, 2011- date)

Table of Contents

ADM Research and Decatur Corn Processing have been actively pursuing technologies to remove Nickel (Ni) from its effluent stream released to the SDD treatment plant. Enclosed is a report on the progress ADM has made since the last update issued on July 6, 2011.

1 Background

Nickel and Zinc are present in effluent leaving the ADM Decatur Complex Waste Water plant. New effluent limits are proposed which will reduce the discharge limits to 0.0365 ppm for Nickel and 0.35 ppm for Zinc. Of the two metals, nickel is more difficult to remove from the effluent. ADM has conducted 5 plant material balances to understand the sources of Nickel in its internal streams. ADM's Decatur Complex consists of multiple, separate processing plants, which send their wastewater to the on-site wastewater treatment plant ("WWTP") operated by Corn Plant personnel. These processing plants consist of the Corn Wet Mill, BioProducts Plant, Cogeneration Plant, East Soybean Processing Plant, West Soybean Processing Plant, Vitamin E Plant, Corn Germ Processing Plant, Glycols Plant and the Polyols Plant. Each of these unique plants produces multiple products, using both batch and continuous processes, and creates water streams which generally are reused multiple times prior to being discharged to the WWTP. The WWTP treats approximately 11 MGD through a newer anaerobic treatment system followed by aerobic treatment prior to discharge to the District.

The incoming soybeans contain approximately 4.1 parts per million ("ppm") nickel, while incoming corn contains approximately 0.53 ppm nickel. Given that ADM's Decatur Complex processes approximately 600,000 bushels of corn and 200,000 bushels of soybeans per day, our incoming Nickel load is about 49.2 lbs from the Soybeans and 19.1 lbs from the corn. A small portion of the incoming nickel is discharged in the effluent.

The concentration and total quantity coming from the various waste water treatment plant influents from our five plant balances are shown in Table 1 (Total Nickel) and 2 (Soluble Nickel).

Table 1: Average Total Nickel to HIGH SALT in ppm

	Summer 09 balance	Jan-Feb/2010 30 days	Fall 2010 1 day a week for 7 weeks	Jun-Jul/2011 39 days	Fall 2011 5 weeks
Corn Plt		0.104	0.088	0.09	0.13
East Plt		0.195	0.250	0.18	0.24
Bio Prod		0.028	0.028	0.037	0.242
Glycol		0.150	0.106	0.255	0.112
Polyol		0.505	2.5	7.7	9.2
Co-gen		0.011	0.019		
Truck Wash					
Weighted Average		0.121	0.139	0.140	0.154
HS EQ Tank		0.210	0.170	0.137	0.132
(HS EQ Tank is the combined stream of all plants high salt streams)					

Table 2: Average Soluble Nickel to HIGH SALT in ppm					
	Summer 09 balance	Jan-Feb/2010 30 days	Fall 2010 1 day a week for 7 weeks	Jun-Jul/2011 39 days	Fall 2011 5 weeks
Corn Plt	0.105	0.104	0.092	0.091	0.030
East Plt	0.240	0.161	0.200	0.164	0.180
Bio Prod	0.048	0.028	0.028	0.040	0.030
Glycol		0.150	0.107	0.285	0.110
Polyol		0.476	2.6	8.1	11.1
Co-gen	0.000	0.011	0.017		
Truck Wash					
Weighted Average	0.142	0.107	0.125	0.135	0.110
HS EQ Tank (HS EQ Tank is the combined stream of all plants high salt streams)		0.170	0.140	0.090	0.151

The majority of nickel found in ADM effluent water originates in the corn and soybeans being processed at the facility. During the processing, the metals are released and enter the processing water some of which eventually ends up at the wastewater treatment plant.

ADM has monitored soluble Nickel at the Damon and Front stations continuously (see Figures 3 & 4) and made a number of observations:

1) In the past 9 months there has been a decline in Nickel from about 120 ppb to about 60 ppb. However we have experienced severe spikes in effluent nickel in September-November, 2011 each lasting 2-3 days.
2) There has been a significant reduction in Soluble Nickel using Diatomaceous Earth (~0.2µ) vs. 5µ filtering (see Figure 1). This suggests the insoluble nickel is very small and may not be removed by metal precipitants.
3) ADM sees a large level of carryover from the anaerobic digesters to the aerobic Dissolve Air Floatation units (DAF). (Figure 2)

As discussed below, ADM is investigating other opportunities for processing the Soy Molasses stream from the East Plant. This will reduce the nickel load from the WWTP.

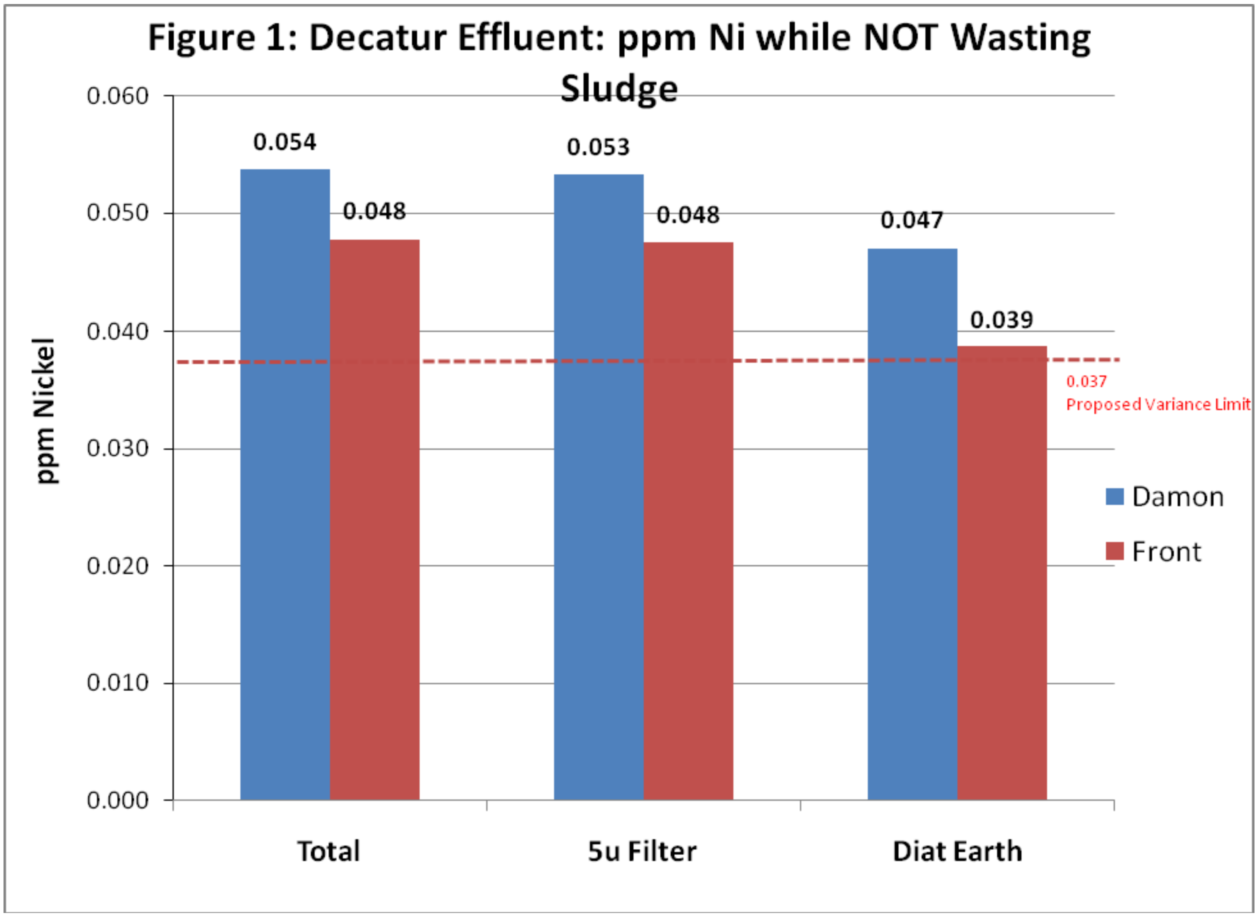
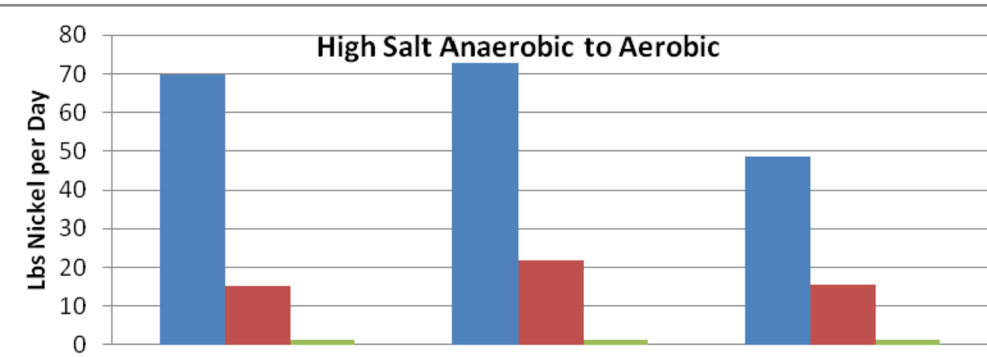


Figure 1: Reduction in DAF Nickel using 0.25 micron DE



	9/27/11	9/28/11	9/29/11
Total	70	73	49
5u Soluble	15	22	16
0.45u Filtered	1.4	1.5	1.4

Figure 2: Nickel carryover from Anaerobic digesters

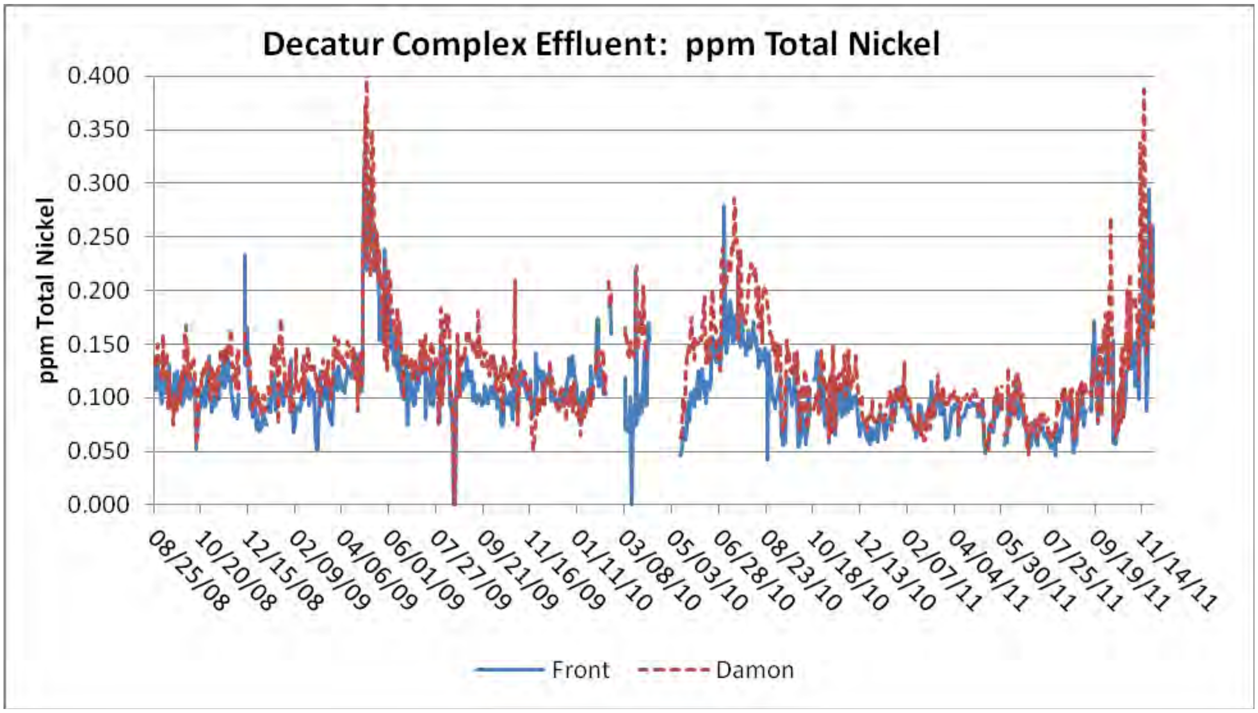


Figure 3: Decatur Complex Effluent- Total Nickel

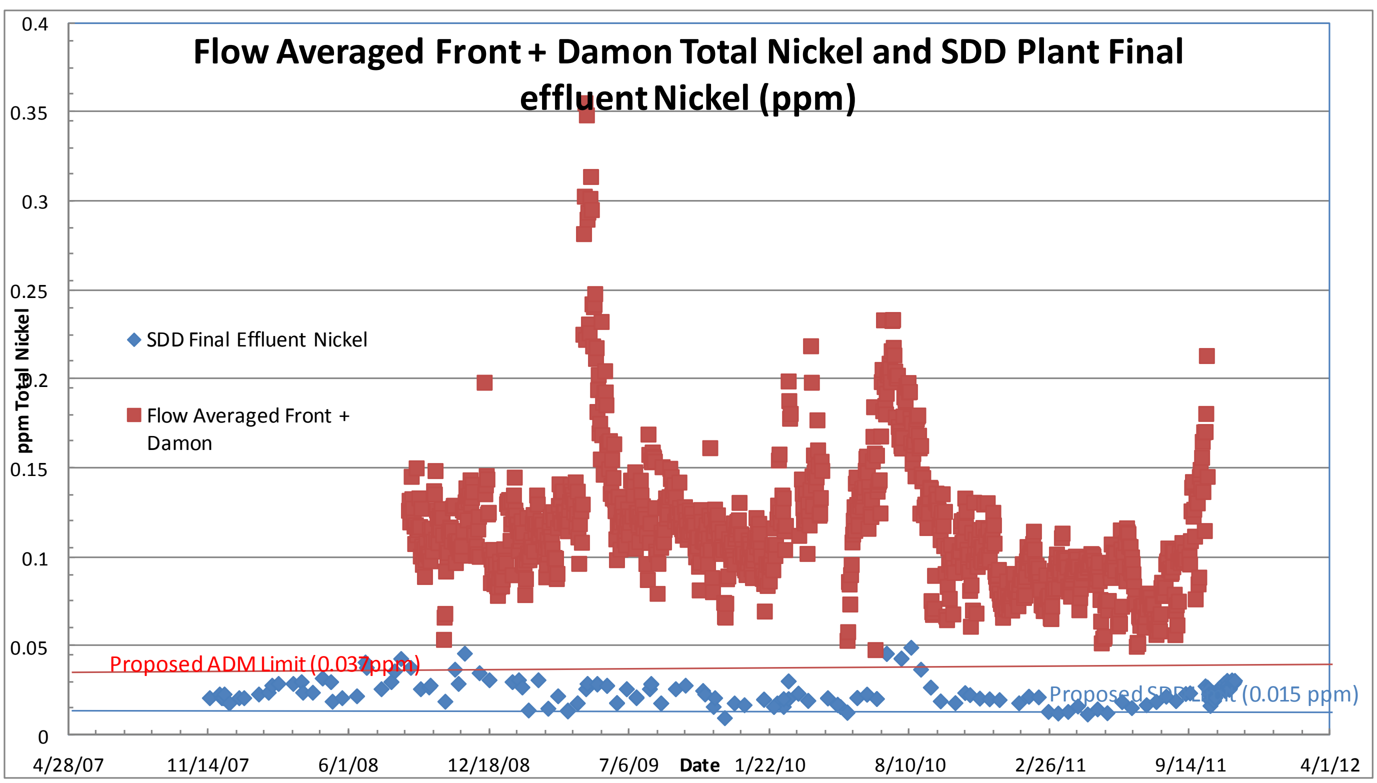


Figure 4: Decatur Complex Effluent- Flow-weighted total Nickel vs. SDD plant effluent total nickel.

As reported in the 2010 and July 2011 updates, ADM has, thus far, investigated 29 technologies that had the potential to control nickel at the Decatur Complex WWTP. (This was in addition to the work ADM has undertaken to reduce nickel within the individual wastewater streams.) As indicated in Table 3, these technologies can be segregated into six broad categories:

1. Nickel Proprietary Precipitation Process;
2. Nickel Chemical Precipitation;
3. Ion Exchange Resin;
4. Filtration;
5. pH Modification
6. Noncommercial, Experimental Technologies.

Table 3: Summary of Technologies Reviewed by ADM Research (12/1/11)

	Chemistry	Dosage	Nickel Reduction (%)	Current Status	Nitratox / Respirometer Testing*
Nickel Proprietary Precipitation Process					
1. Ecovu	Activated Clay	1%-3% w/w	40-60% (from 200ppb)	Shelved. Unable to scale up	Not tested
2. EP minerals	Acidic Clay	4-8% w/w	40 % (from 90ppb)	Shelved. High dosage	Not tested
3. Crystal Clear Technologies	Chitosan Based	5% w/w	90%	Shelved. High dosage	Not tested
4. Siemens / Plymouth Technologies	Proprietary	2% w/w/	82% (from 100ppb)	Shelved. Company went out of business	Not tested
5. GE Water	Metclear	200 ppm	64%	Shelved. Strong pH swing (acidification to pH 2, alkalination to 10 and neutralization)	Not tested
6. KML	Not disclosed	Not disclosed	58%	Shelved. Company not sharing samples.	Not tested
Nickel Chemical Precipitation					
1. Chemtreat	Polymeric Di methyl Dithiocarbamate	100 ppm + 50 ppm CaCl2	30%	Piloted. Nickel reduction seen to 60ppb.	Passed
2. Hydrite	Polymeric Di methyl Dithiocarbamate	20-50ppm	60%	Piloted. Nickel reduction seen to 54 ppb	Passed
3. Kroff	Polymeric Di methyl Dithiocarbamate	100ppm	41%	Piloted. Nickel reduction seen to 32 ppb	Passed
4. Hychem DP4	Di methyl Dithiocarbamate	50ppm + pH 6.0	24%	Piloted. Nickel reduction seen to 40ppb	Passed
5. Nalmet	Polymeric Di methyl Dithiocarbamate	300ppm + pH swing	30%	Shelved. Strong pH swing needed	Not tested
6. Nalmet (Modified)	Polymeric Di methyl Dithiocarbamate	100ppm	48%	Piloted. Nickel reduction seen to 20ppb	Passed
7. Hychem Poly DP	Polymeric Di methyl Dithiocarbamate	200ppm	52%	Piloted. Nickel reduction seen to 39 ppb	Failed.

8. GE Betz DTC	Polymeric Di methyl Dithiocarbamate	100 ppm	40-60%	Not piloted. GE does not have commercial quantities available	Not tested
9. Nalco DTC	Di methyl Dithiocarbamate	100ppm	60%	Piloted. Nickel reduction seen to 24ppb	Passed
Ion Exchange Resin					
1. Purolite	Styrene Di vinyl benzene	2% w/w	20%	Not scaled. High regeneration costs	Not tested
2. Dow	Styrene Di vinyl benzene	4% w/w	60%	Not scaled. Very high resin use. Caustic/ ethanol based regeneration.	Not tested
3. Vivenano	Immobilized Ion Exchange beads	5%	Not significant	Shelved.	Not tested
Filtration					
1. Nalco-RO	Phosphate ppt+ Reverse Osmosis	80% recovery	95+% reduction	Shelved. Uncertainty about treating RO concentrate stream. Capex [redacted]	Not tested
2. Filtration Energy Solutions	Low pressure Reverse Osmosis	30% recovery	95% reduction	Shelved. Uncertainty about treating RO concentrate stream. Capex [redacted]	Not tested
3. Sand filtration (Procorp)	Sand filter	Not disclosed	20% reduction	Shelved. Insufficient efficacy	Not tested
Other Approaches					
Captive Deionization	Carbon Aerogels	Not tested	Not tested	Company went out of business. Also technology picks up all ions	Not tested
Electrocoagulation	Electrochemical	Not disclosed	Higher Ni seen	Shelved.	Not tested
Salt Precipitation	Ferric Chloride	100ppm	40%	Unscalable due to higher chloride in our wastewater	Not tested
Bioactive Peptides	Protein based	---	Not significant	Lab scale technique only.	Not tested
Advanced Oxidation	Hydrogen Peroxide and Ozone	5% w/w + pH adjustmen t	20%	High pH required. Chemical usage significant	Not tested
Metallothionein	Protein based	Bench scale	Not tested	Nickel competes for binding with other divalent	Not tested
Acidification/ Alkalination based precipitation	pH Swing	Bench Scale	30%	pH swing to 10 followed by to 2.0 and back to 7 is required. Very high chemical usage	Not tested
High pH precitpitation	pH >11.0	Bench Scale	100% for Polyol waste	High pH precipitation for inorganic nickel from polyol waste stream.	Not required

*ADM has been working with Riverbend Laboratories in St. Charles, Missouri, to perform respirometer and nitratox testing on various chemistries using MLSS from the District. Such testing is necessary to determine whether the treated effluent is compatible with the District's treatment processes.

ADM continues to operate its pilot plant for chemical sequestration of nickel as needed. We are also planning to start a new pilot reactor at the High Salt equalization tank (HS EQ Tank) to test polymeric treatment of nickel ahead of the anaerobic digesters. Figures 5&6 are pictures of the pilot plant. There are 4 separate mixing tanks of 100 gallons each, using the Decatur plant DAF effluent as feed, with the respective chemistries at various dosages (10-200ppm) and a combination of residence times (1-4 hrs). HS EQ Tank is running a single 100 gallon reactor with one chemistry. One of the setups was modified to allow for a change in pH and testing of the chemistry at a different pH is scheduled for December 2011. The results from the pilot plant were previously reported on. Since Fall 2011, the chemicals being investigated at the pilot plant have been narrowed to those from Nalco and Hydrite.

Figure 5: ADM Decatur Nickel Removal pilot plant (5/13/2011). Four 100 gal reactors.

Figure 6: High Salt EQ Tank pilot plant. One 100 gallon reactor.

Pilot testing protocol:

- 4 mixing tanks; initially 100 gallons liquid level in each in pilot plant
- 1 mixing tank; 100 gallons liquid level
- Two different products to be tested in each tank (currently, Nalmet, Hydrite) at the pilot plant. One chemistry at the HS EQ Tank.
- Feed flows, chemical dosages and agitation can be optimized independently in each tank.
- Ability to adjust residence time in each tank to 0.5 to 8 hrs, through the adjustment of feed flow and tank liquid level
- Ni Precipitant is added in-line in the influent flow and further mixed/reacted in tank.
- Precipitant dosages planned: 10-200 ppm
- Piloting will continue as needed.
- Treated samples from each tank will be filtered through diatomaceous earth (DE) in the lab and submitted to ADM's lab for ICP analysis.
- We expect to use flocculants and coagulants after treatment with metal precipitant.
- pH is monitored in the feed tank but will not be adjusted initially. One tank has been modified for pH adjustment.
- The toxicity studies (by Riverbend Laboratories) on treated wastewater provided the desired Ni removal at current and peak Influent Ni levels.
- Secondary treatment such as DE/Clarifier/Sand filter will be implemented next month.

As required by the variance, a summary of the various control strategies is presented in Appendix B.

"By July 1, 2011 the District must complete the following tasks:

i. Compile various control strategies based on one or more of the feasible technologies. Develop flow diagrams depicting removal options, pros and cons, capital expenditures, and operating costs.

ii. Present findings to ADM division managers"

- **ADM / SDD Variance, p. 41**.

ADM met with the SDD and IEPA on July 8, 2011 and provided them with a copy of the report detailing the progress and ADM's compliance efforts.

2 Deliverables

2.1 Nickel- Proprietary Precipitation Process

As reported previously ADM is no longer pursuing the eight technologies we investigated in this area.

2.2 Nickel- Chemical Precipitation Process Using Carbamates or Organic Sulfides

2.2.1 Chemtreat

A 33% reduction resulted with P8007L from Chemtreat. No any additional work beyond what was reported in July 2011.

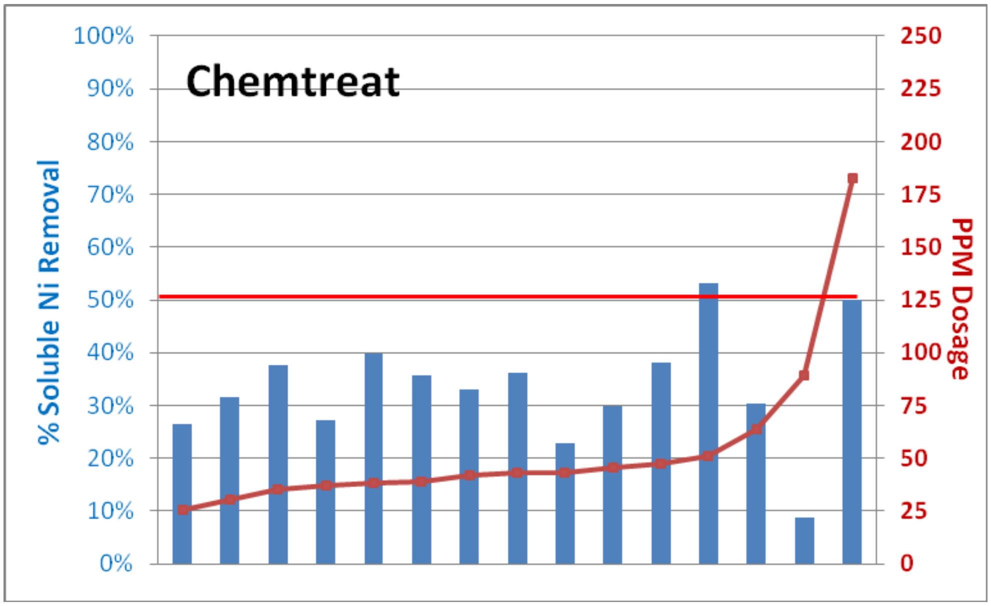


Figure 7: Nickel reduction using Chemtreat P8007L

2.2.1.1 Technical Feasibility

Commercially available product. No problems are expected.

2.2.1.2 Capital and Operation Costs

Chemtreat estimates costs for P8007L at about [redacted] $/lb.

2.2.1.3 Reliability

ADM has reproduced some of Chemtreat's work internally and plan to conduct a pilot trial with their material. To date, Chemtreat P8007L has not been piloted.

2.2.2 Hydrite

Hydrite 1740 is currently being tested in the Pilot plant. A 41% average reduction in soluble nickel has been seen using the 1740 as seen in Figures 8 and 9.

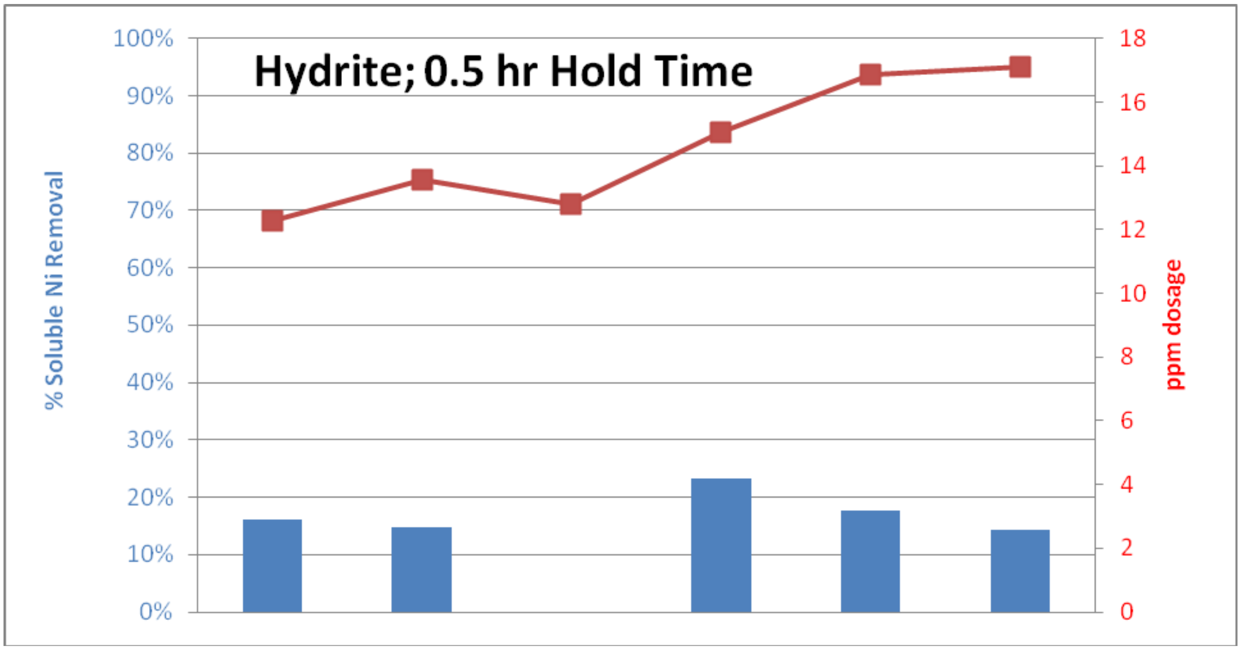


Figure 8: Nickel reduction with 0.5 hr hold time at DAF Pilot plant using Poly DTC from Hydrite.

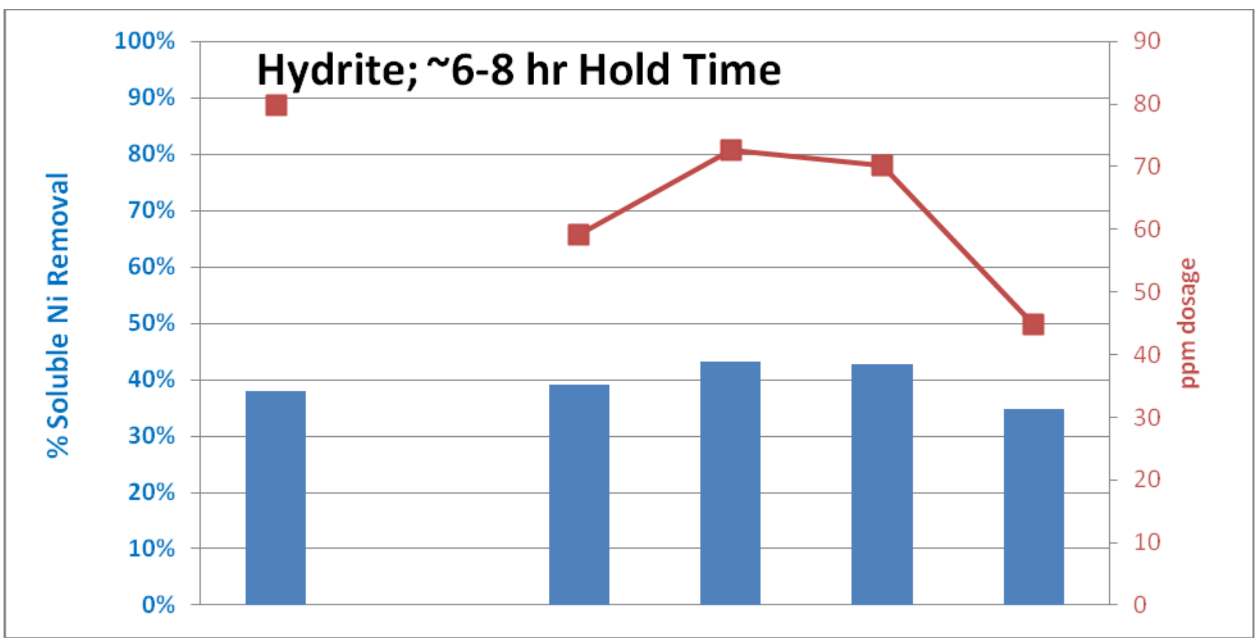


Figure 9: Nickel reduction with 8 hr hold time at DAF Pilot plant using Poly DTC from Hydrite.

2.2.2.1 Technical Feasibility

The product is approved for use in waste water systems. Nitratox and Respirometer testing were performed on the waste water at two different dosages of Hydrite (20ppm and 200ppm) and no adverse effects were seen at either dosage.

2.2.2.2 Capital and Operation Costs

Hydrite estimates costs at about $[redacted] per lb.

2.2.2.3 Reliability
Good reproducibility was seen with different feed samples.

2.2.3 Kroff 9011
Kroff 9011 is being trialed at the Pilot plant. About a 41% average reduction in soluble nickel was seen using the Kroff 9011 as seen in Figure 10 and 11.

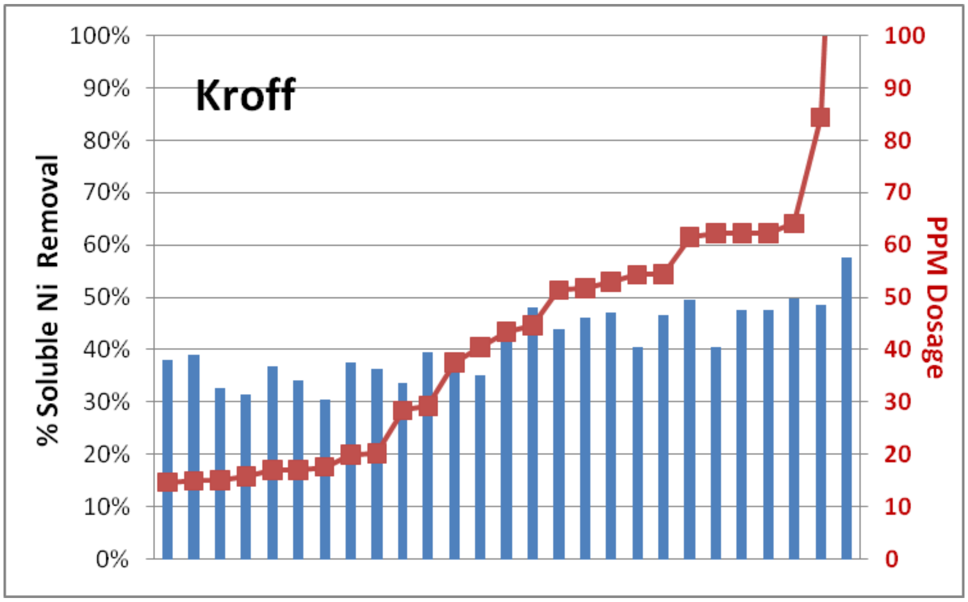


Figure 10: Nickel removal (left scale) and ppm soluble nickel (right scale) with Kroff 9011

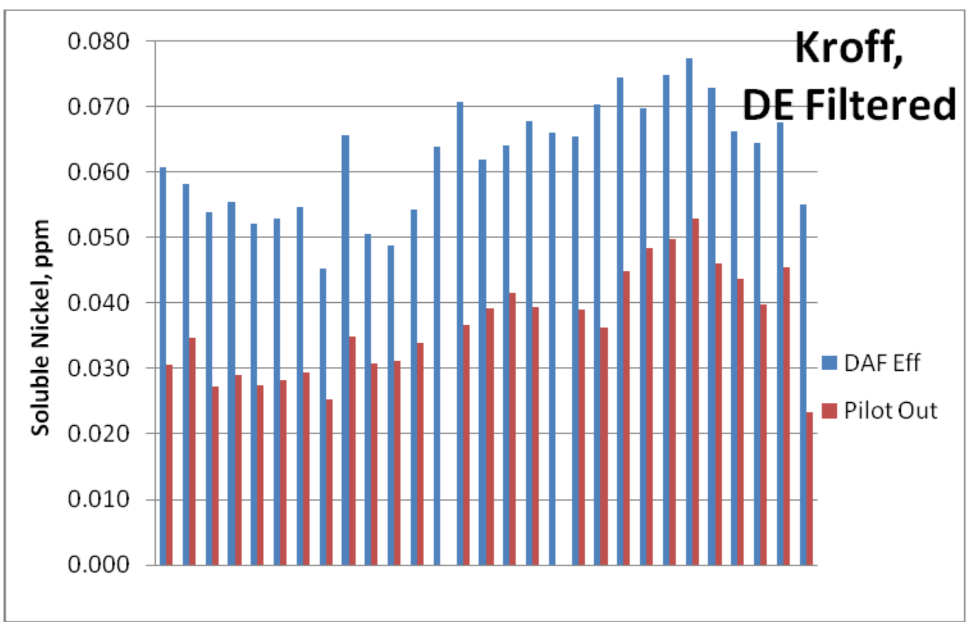


Figure 11: Effect of DE filtration on reduction in soluble nickel after application of 9011

2.2.3.1 Technical Feasibility
No pH adjustment is required. Product is approved for use in waste water systems.

2.2.3.2 Capital and Operation Costs
Kroff estimates costs at about $[redacted] per lb.

2.2.3.3 Reliability
There has been good reproducibility with different feed samples. Nitratox and Respirometer testing were performed on the waste water samples at two different dosages (20ppm and 200ppm) and no adverse effects were seen at either dosage.

2.2.4 Hychem Polymeric DP4
Hychem Poly DP4 is a polymeric dimethyl dithiocarbamate and was one the first chemistries found that resulted in a nickel reduction. Hychem DP4 is currently being run in the pilot plant. Since the tests are running at "as-is" pH (~8.0) and about a 38% reduction in soluble nickel is being achieved.

2.2.4.1 Technical Feasibility
ADM is not further investigating Hychem poly DP4 at present, as the levels of nickel reduction seen were not significant. Also when we performend respirometer and nitratox studies on the Hychem Poly DP4 treated waste water samples using the SDD MLSS , the samples exhibited nitratox toxicity and less reduction in soluble ammonia levels.

2.2.4.2 Capital and Operation Costs
Hychem poly DP4 is estimated to cost about $[redacted] per lb.

2.2.4.3 Reliability
There has been good reproducibility with different feed samples, and ADM has tested this chemical in-house the longest. In addition to the "as-is" testing, this chemistry will be tested at pH 6.0 in the pilot trials. Nitratox and Respirometer testing were performed on the treated waste water at two different dosages of DP4 (20ppm and 200ppm) and no adverse effects were seen at either dosage.

2.2.5 Nalmet (Nalco)
As reported in December 23, 2010, work has been done with a new chemistry from NALCO. This chemistry has been piloted at the pilot plant and has resulted in a 48% reduction in soluble Nickel as found in Figures 12 and 13. We also tested Alum and Ferric based coagulants from Hychem following addition of the Nalmet polymer to the waste water and binding of nickel to remove the flocs with a 0.2um filter. We found that Alum based flocculants performed better than Ferric based flocculants (Table 4). This approach will be scaled up when we run pilot equipment using the Nalmet chemistry.

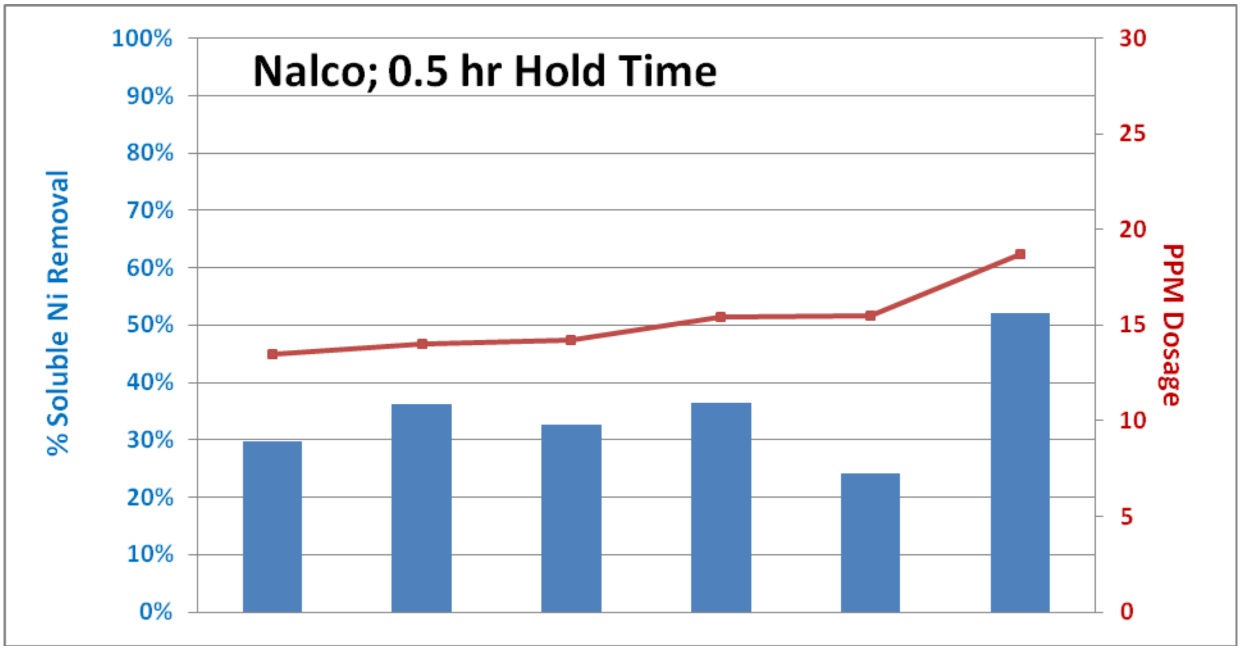


Figure 12: Nickel reduction with 0.5 hr hold time at DAF Pilot plant using Poly DTC from Nalco.

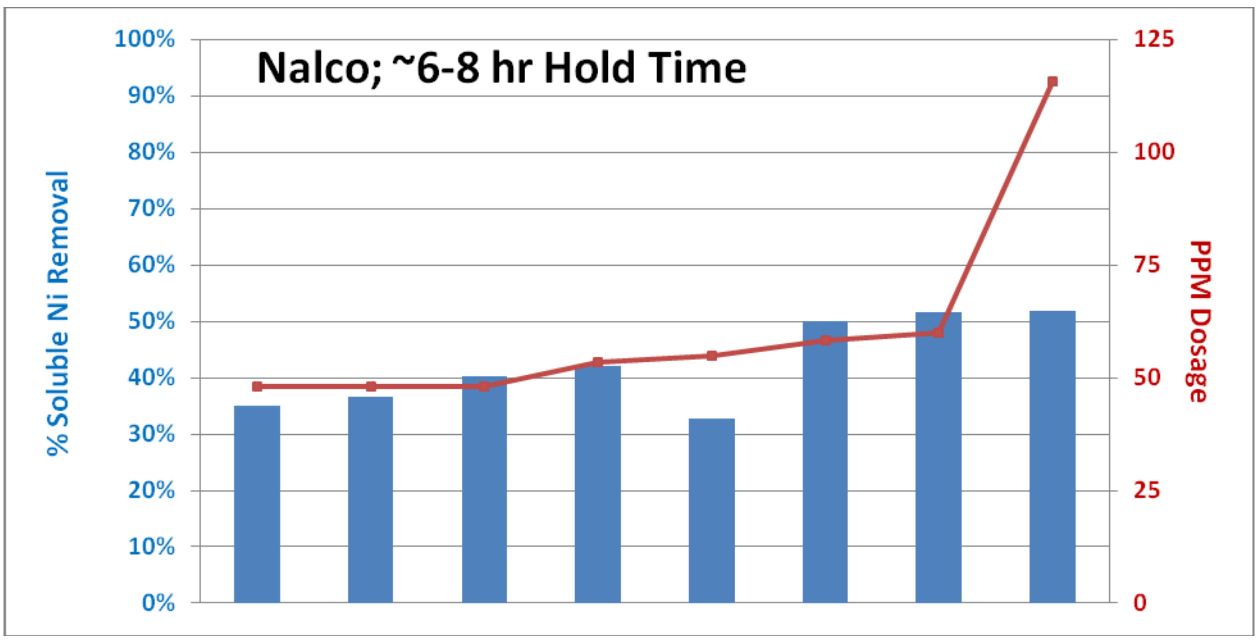


Figure 13: Nickel reduction with 0.5 hr hold time at DAF Pilot plant using Poly DTC from Nalco.

Table 4. Ni removal with Nalmet followed by Hychem 420 Coagulant & 308 Flocculent

	Total Ni (mg/kg)	Soluble Ni (mg/kg)	Total Ni Reduction (%)
DAF Effluent Feed	0.083	0.071	- - -
Effluent 0.2 micron	0.051	0.051	38.6
HN-18 Test	0.062	0.054	25.3

2.2.5.1 Technical Feasibility
Nalmet is not a commercial product, and Nalco's plans to manufacture it commercially are uncertain. No pH adjustment is needed and a very short mixing time is possible. The chemistry does produce a very small size floc, and it is expected to be challenging to remove the floc subsequent to nickel binding.

2.2.5.2 Capital and Operation Costs
Costs are estimated at $[redacted] per lb (N1689/N7768).

2.2.5.3 Reliability
There has been good reproducibility with different feed samples. Nitratox and Respirometer testing were performed on the treated waste water samples at two different dosages of Nalmet (20ppm and 200ppm) and no adverse affects were seen at either dosages.

2.3 Nickel- Ion Exchange Resin

2.3.1 Purolite Resin
As reported in the July 2011, ADM is discontinuing further investigation of a brand new resin system for the entire complex. The efforts on ion exchange will focus on small used resin systems located at strategic inorganic nickel sites (such as the Corn Plant or the Polyols plant).

2.3.2 Corn Plant Used IX system
As previously disclosed, ADM has been working to install a used ion exchange resin bed system to capture nickel leaching from the sorbitol process catalyst. This system has been running manually for the past 6 weeks. Thus far, about 5 lbs of nickel have been removed from the treated stream and no nickel has been detected in the efluent. This is shown in Figure 14. We are using 105 cu ft of resin and expect a nickel binding capacity of about 3.4 lbs per cubic ft.

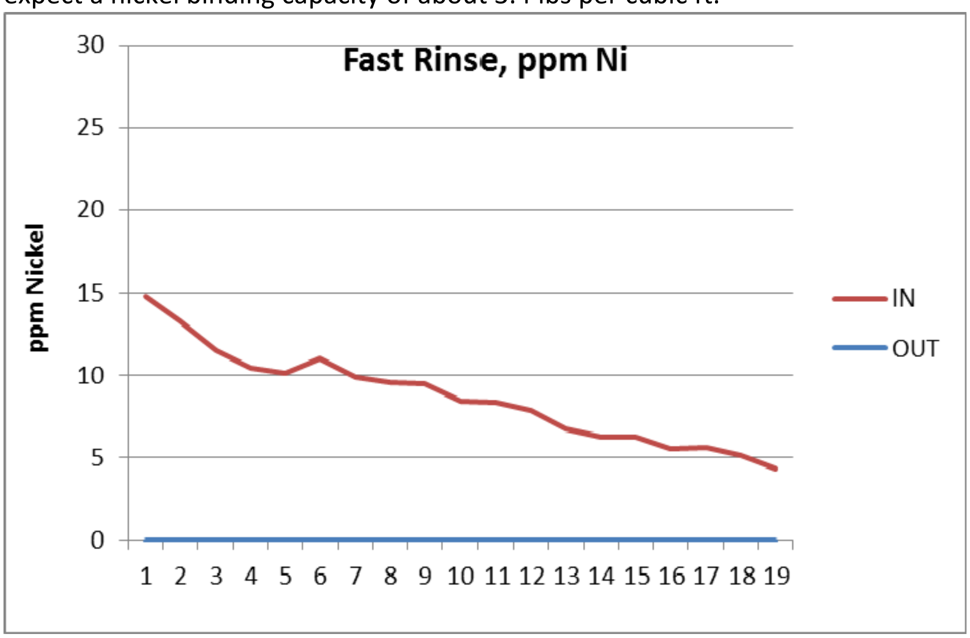


Figure 14: Used ion exchange resin treating material leaving the sorbitol process

2.3.2.1 Technical Feasibility

A full scale system has been installed to capture bulk of the leaching nickel from the sorbitol catalyst.

2.3.2.2 Capital and Operating costs.

About $[redacted] was spent to install the system and ongoing maintenance and operation costs are expected.

2.4 Nickel and Zinc- Soybean Process Stream Alternative.

Alternatives will be continued to be evaluated for this stream. There has been interest in several companies for purchasing this particular stream for a de-nitrfication application in municipal waste treatment plants in the Eastern United States.

2.5 Nickel and Zinc- BioProducts Process Stream Alternative

There have no updates from the report of December 23, 2010.

2.6 Nickel and Zinc- WWTP Sludge Removal System

This process has been investigated and there are no updates from the report of December 23, 2010.

2.7 Nickel and Zinc- Reverse Osmosis

There have been no updates from the report of July 8, 2011.

2.7.1 Technical Feasibility

We have seen very poor recovery and do not expect this process to be scaled up.

2.7.2 Capital and Operating costs.

The estimated capital for a UF/RO/Thermal evaporation based on a ADM's 6 million gallon per day stream is [redacted]. However, this capital expense was estimated based on 85% recovery in UF and 75% recovery in RO. As discussed here, the best cases of UF recovery achieved are 60-70% and RO only about 30% due to scaling.

2.8 Nickel and Zinc- Sludge (WWTP organism cell wall rupture)

There are no updates from the report of December 23, 2010.

2.9 Nickel and Zinc- Sludge Sales

There are no updates from the report of December 23, 2010.

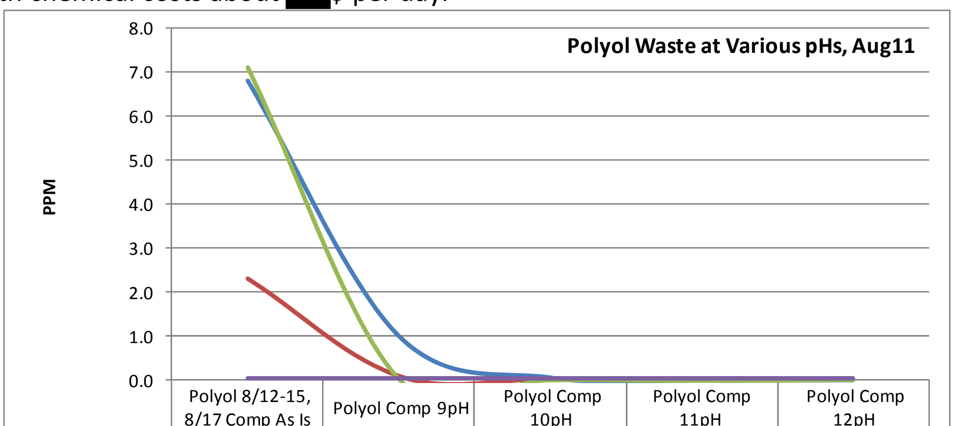
3 Review Ceased for Technologies

Since the July 2011 update, we have ceased trials with polymeric DTC from Kroff 9011 and Hychem DP4. We continue to evaluate the options for scale and will be reporting as progress is made on the same.

4 Polyol waste stream treatment

We have identified our polyol ix waste stream (between 16-22% of total nickel load) as a significant contributor of inorganic nickel due to corrosion of our distillation columns. Initial work using high pH precipitation has shown almost a complete removal of soluble nickel.

Initial work suggests a pH modification would eliminate all soluble nickel from the IX regen streams with chemical costs about [redacted]$ per day.



	Polyol 8/12-15, 8/17 Comp As Is	Polyol Comp 9pH	Polyol Comp 10pH	Polyol Comp 11pH	Polyol Comp 12pH
Nickel	6.81	1.01	0.063	0.000	0.007
Chromium	2.31	0.083	0.025	0.006	0.014
Iron	7.10	0.034	0.012	0.000	0.014
Moly	0.052	0.049	0.047	0.047	0.052

Figure 15: Effect of pH on precipitation on Polyol ion exchange regeneration streams.

Table 5: High pH precipitation of Polyol ion exchange regeneration streams

					Adjust to 10pH:	
2.5	%NaOH, w/w	Polyol Flows:	lbs / day		lbs 50% NaOH / day	$ / day
90	sample, ml	8/12/11	61,400		3,014	[redacted]
10.45	g NaOH to 9pH	8/13/11	65,400		3,210	[redacted]
10.6	g NaOH to 10pH	8/14/11	60,730		2,981	[redacted]
10.8	g NaOH to 11pH	8/15/11	119,800		5,880	[redacted]
16.4	g NaOH to 12.2pH	8/17/11	27,940		1,371	[redacted]

$[redacted]	50% Caust / lb						
1.6	**Starting pH**						

The Process Development group at ADM Bioproducts has investigated using gypsum (Table 7) as a filter media and seen nickel reductions over using a 0.1um Filter (Table 6).

Table 6: 0.1 micron Buchner Filtration of Polyol IX regeneration stream			
Sample (ppm)	Ni	Zn	P
Waste Water Feed	860.32	3.76	0.818
Waste water/NaOH solution	658.897	2.90	0.856
Treated and filtered waste water	0.300	0.015	0.639

Note: Feed was a composite of the discharge from the acid-in and slow rinse cycle in a proportion that is representative of the volume of water used in each cycle. Precipitate was passed through a Buchner filter with a 0.1um filter.

Table 7: Gypsum Filtration of Polyol IX regeneration stream				
Sample Name	Ni	Zn	P	Cr
	mg/kg	mg/kg	mg/kg	mg/kg
Waste water/NaOH solution	689.0	2.66	2.18	245.1
Treated and filtered waste water	81.94	0.705	18.40	23.32

Note: Feed was a composite of the discharge from the acid-in and slow rinse cycle in a proportion that is representative of the volume of water used in each cycle. Precipitated feed was fed to a Buchner funnel with CaSO4 as filter media.

5 Appendix A Pilot Plant Trials Update

ADM is piloting equipment identified in our July 2011 update. A summary of the present status of the trials is included below.

1. **Alar Corp**. – Removal using diatomaceous earth and RVF.
2. **FRC Systems International, LLC** – Removal of Ni precipitate using DAF pilot.
3. **GE Power & Water** – Removal using Entrapped Air Flotation (EAF) Pilot.
4. **Kroff Engineering** – Removal using One Pass Microfiltration.
5. **Krofta Chemical Company, Inc**. – Removal using Dissolved Air Floatation (DAF) and Sandfloat Pilot.
6. **Nalco** – Removal using Lamella Gravity Settler and Dynasand.

In early November 2011, tests were completed at ALAR Engineering (Mokena, IL), to screen use of Rotary Vacuum Filter (RVF) as separation method. During a two-day test, Hychem and the following day, Nalco, separately tested coagulant and flocculent chemistry for removing precipitated Nickel from ADM DAF effluent. Results are presented in Tables 8 & 9 and Figures 16 & 17.

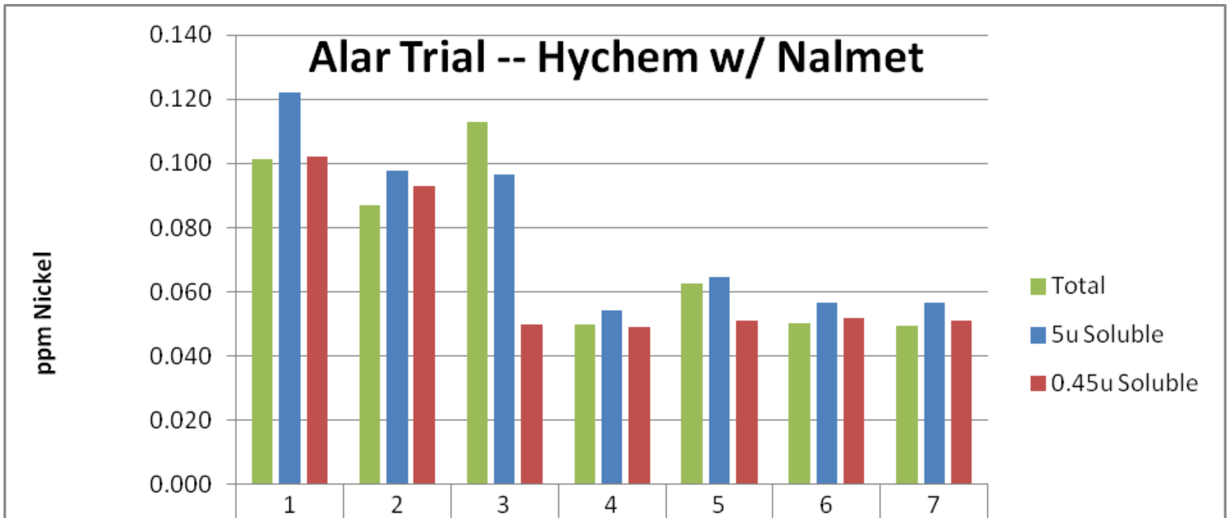
TABLE 8: Test Results of 100-gallon batch, RVF Filtration at ALAR Engineering. Starting Feed 0.129 ppm Nickel. Metal precipitant: Nalco TX15029SQ, 50ppm, 30 minute residence time.

	Nickel Reduction (%)	Filtrate Ni (ppm)	Coag (ppm)	Floc1 (ppm)	Floc2 (ppm)	Flux (Gal/Hr/ft2)	D.E.
Hychem, Test 1	55.0	.058	300	0.125	0	36	FW-20
Hychem, Test 2	55.8	.057	200	0.125	0	43	FW-20
Nalco, Test 1	50.4	.064	0	0.5	1.0	50	FW-20
Nalco, Test 2	51.2	.063	0	0.5	1.0	65	FW-40

	Table 9: Bench scale testing of Nalmet with RVF at Alar Engineering using Nalco Flocculants (8133/8131).			
	Sample Volume : 1L			
Sample #	Treatment	DE Filtrate	Ni	
		Turbidity	Soluble	Total
		NTU	mg/kg	mg/kg
0			0.092	0.091
1	50 ppm TX15029SQ (30 min) + 130 ppm Nalco 2 (1 min)+Filtration through 0.9 um (FW20) DE filter	0.5	0.049	0.061
2	50 ppm TX15029SQ (30 min) + 120 ppm 8133 (1 min)+Filtration through 0.9 um (FW20) DE filter	0.3	0.042	0.052
3	50 ppm TX15029SQ (30 min) + 120 ppm 8131 (1 min)+Filtration through 0.9 um (FW20) DE filter	0.2	0.042	0.053
4	50 ppm TX15029SQ (30 min) + 130 ppm Nalco 2 (1 min)+Filtration through 0.5 um (FA 06) DE filter	0.3	0.035	0.053
5	50 ppm TX15029SQ (30 min) + 120 ppm 8133 (1 min)+Filtration through 0.5 um (FA 06) DE filter	0.3	0.050	0.041

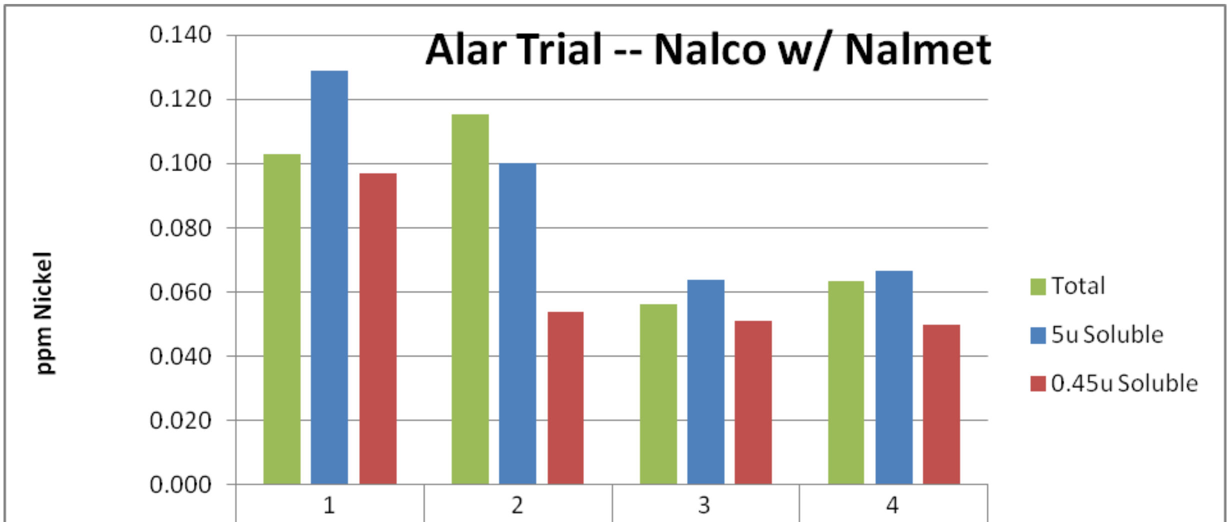
1	50 ppm TX15029SQ (30 min) + 120 ppm 8131 (1 min)+Filtration through 0.5 um (FA 06) DE filter	0.3	0.040	0.046
7	120 ppm 8133 (1 min)+50 ppm TX15029SQ (30 min) + Filtration through 0.5 um (FA 06) DE filter	0.3	0.041	0.048
8	120 ppm 8131 (1 min)+50 ppm TX15029SQ (30 min) + Filtration through 0.5 um (FA 06) DE filter	0.3	0.047	0.050

Nickel reductions with RVF equipment have potential as full-scale option and planned testing at Decatur are scheduled of January 2012.



	1	2	3	4	5	6	7
Total	0.102	0.087	0.113	0.050	0.063	0.050	0.050
5u Soluble	0.122	0.098	0.097	0.054	0.065	0.057	0.057
0.45u Soluble	0.102	0.093	0.050	0.049	0.051	0.052	0.051

Figure 16: Rotary Vacuum Filtration of Polymeric DTC (Nalco) with Flocculant (Hychem)



	1	2	3	4
Total	0.103	0.115	0.056	0.064
5u Soluble	0.129	0.100	0.064	0.066
0.45u Soluble	0.097	0.054	0.051	0.050

Figure 17: Rotary Vacuum Filtration of Polymeric DTC (Nalco) with Flocculant (Nalco)

Equipment currently at ADM Decatur Pilot plant:

1. Krofta/Ecolab DAF and Sandfloat pilot.
2. Kroff one-pass microfiltration.

Krofta/Ecolab equipment is ready to begin testing. We have successfully operated equipment at 25 GPM and everything appears to be functional.

Kroff equipment has been tested and filtration rate dramatically slows, filtration flux estimate: 3.2-3.8 Gal/Hr/ft2. We have been experiencing technical problems with filtration and are working with the vendor to address them.

FRC Systems International, LLC will be shipping unit to Decatur the week of 05-Dec.

Figure 18: Krofta Sand Filter at ADM pilot plat

Figure 19: Kroff One pass MF at ADM Pilot plant

Figure 20: Alar RVF Filtration with FW40 precoat filteraid

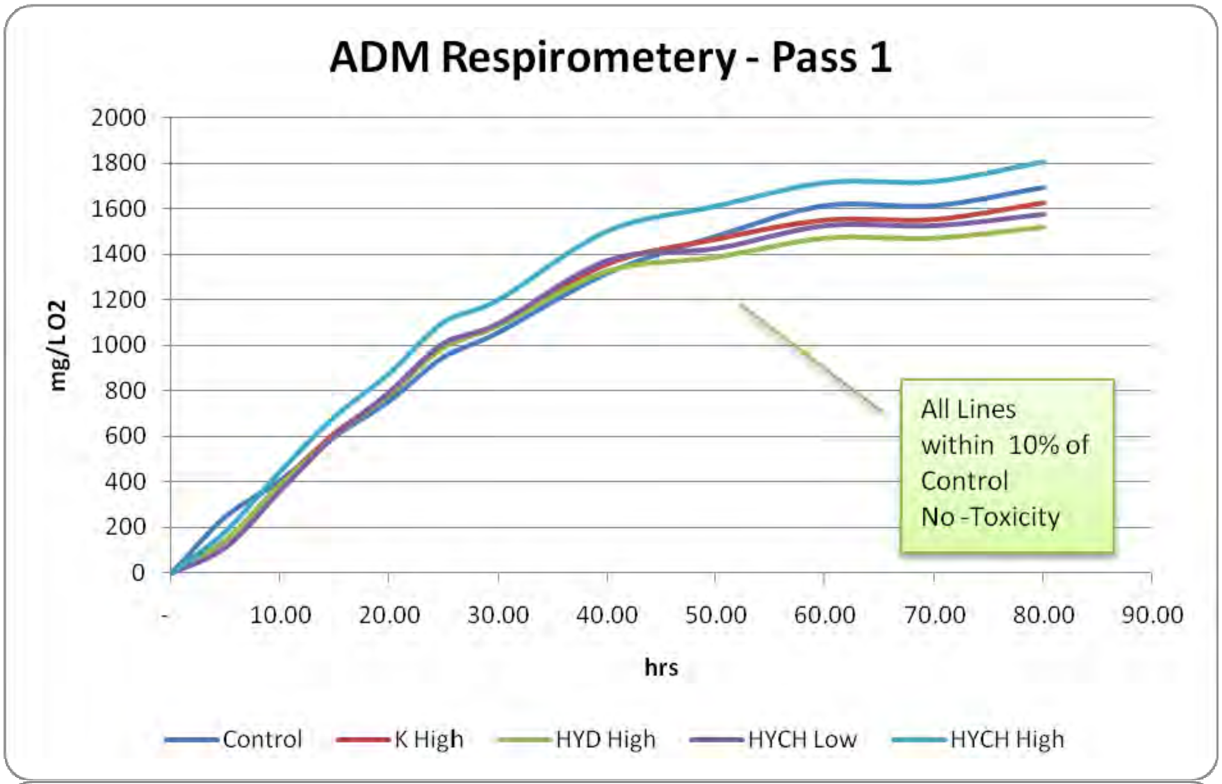
6 Appendix B Respirometer and Nitratox Testing

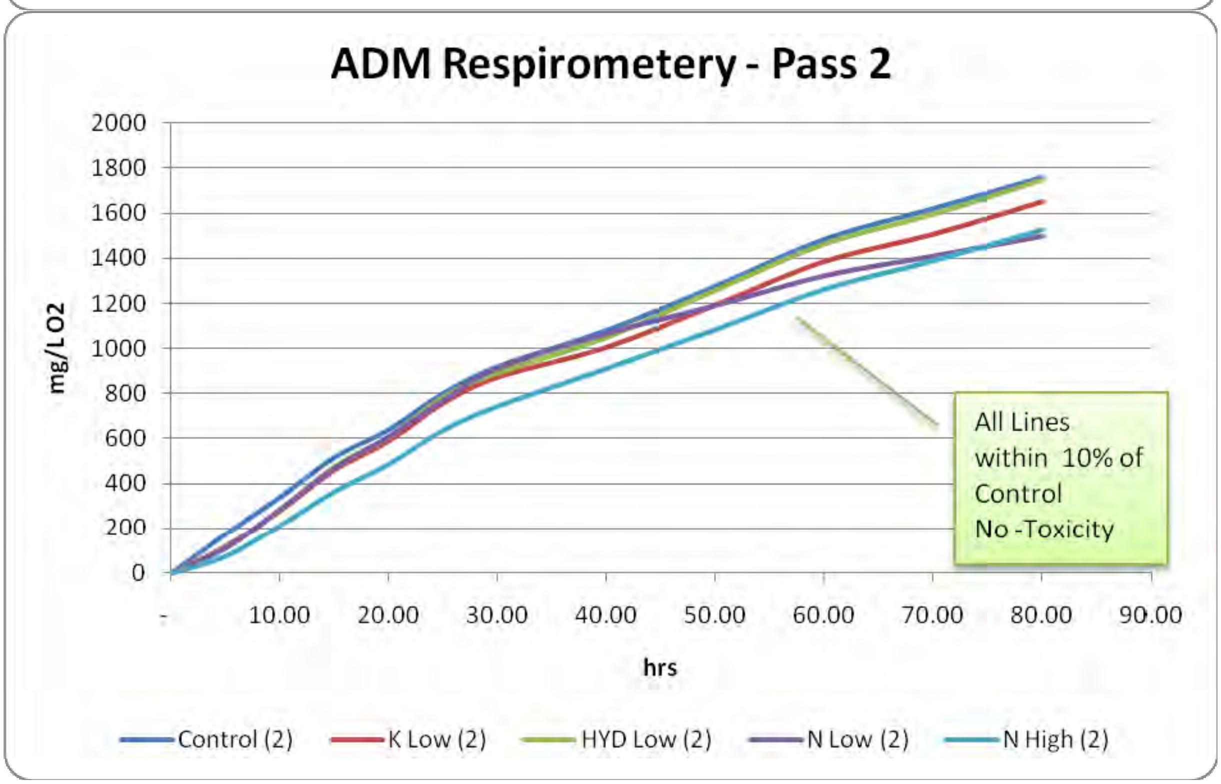
Results from Respirometer and Nitratox testing of Decatur Sanitary Districts MLSS using nickel reduction chemistries piloted at ADM.

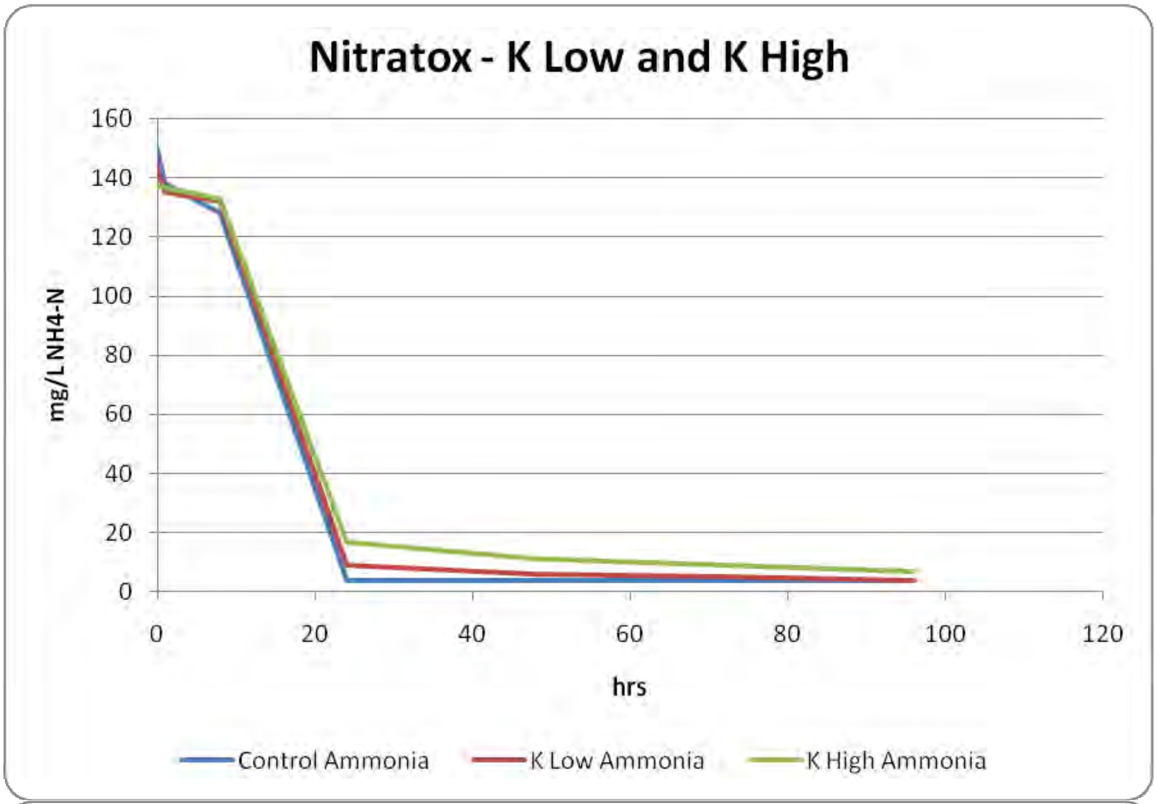
Riverbend Laboratories performed respirometer and Nitratox testing of the four chemistries currently being testing using SDD's MLSS. The chemistries were dosed at ~20ppm and ~200ppm and diluted 50:50 with fresh DAF to simulate a scenario envisioned by the Decatur Sanitary District.

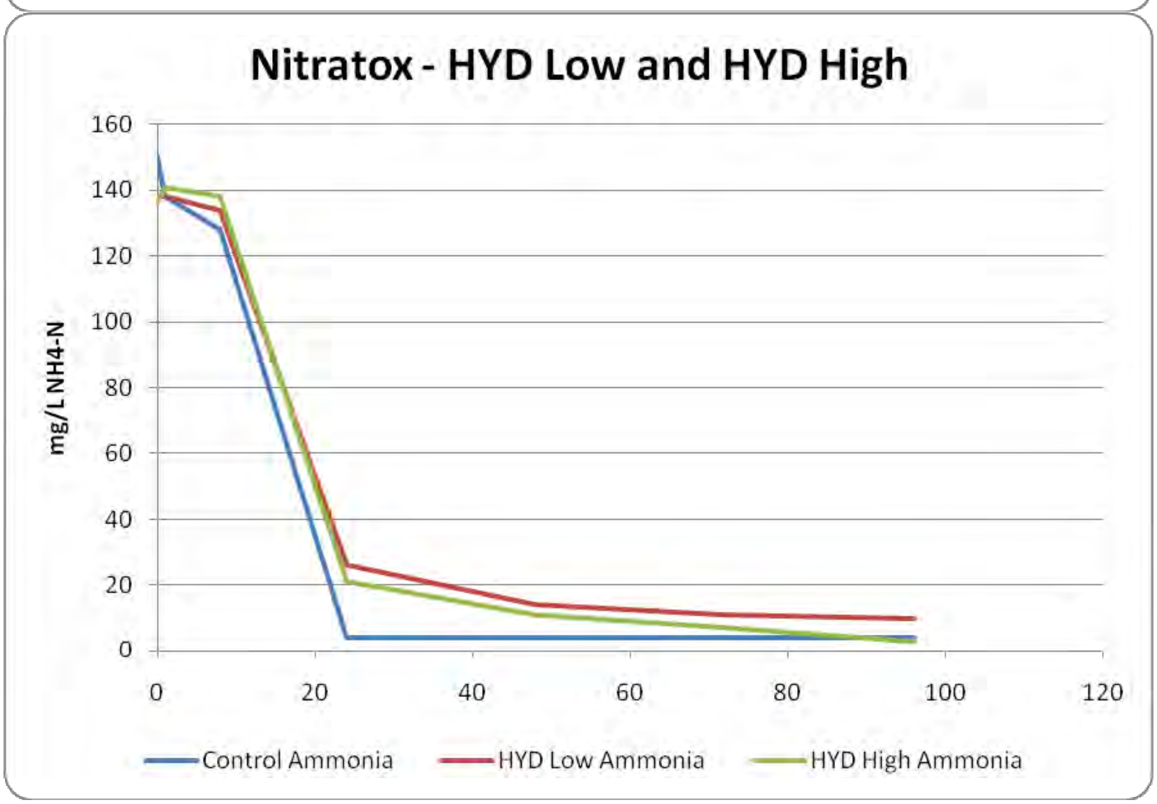
Table 7: Pilot plant results for Samples used for Nitratox and Respirometer testing

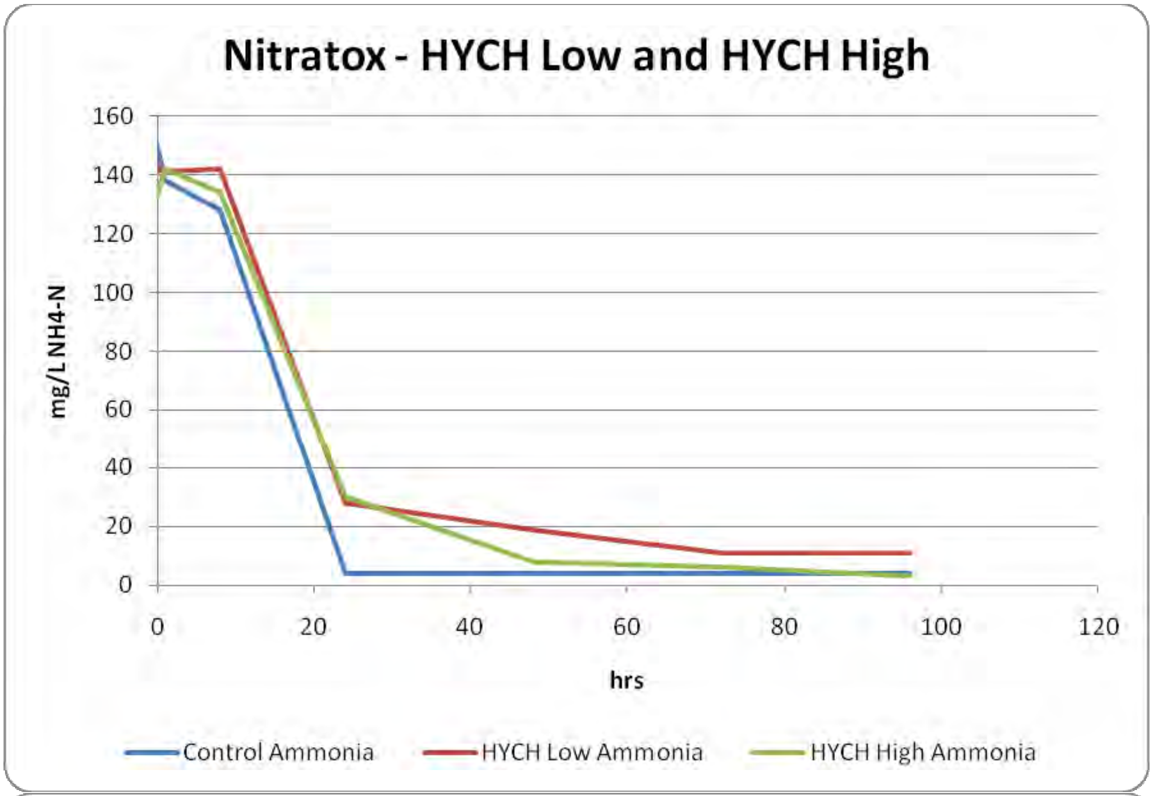
	ppm Nickel	HOLD Time, Hrs	ppm, by wt	% Reduction
LOW SAMPLES TO RIVERBEND			added	
Feed	0.07			
Kroff	0.05	3.75	15.11	0.33
Hydrite	0.04	3.87	18.41	0.34
Hychem	0.06	3.63	18.68	0.18
Nalmet	0.04	3.87	20.39	0.47
HIGH SAMPLES TO RIVERBEND				
02441 5-10 DAF to Pilot DE	0.06			
Kroff	0.02	3.63	190.18	0.58
Hydrite	0.02	3.87	194.07	0.58
Hychem	0.03	3.75	207.83	0.37
Nalmet	0.02	4.23	254.95	0.60

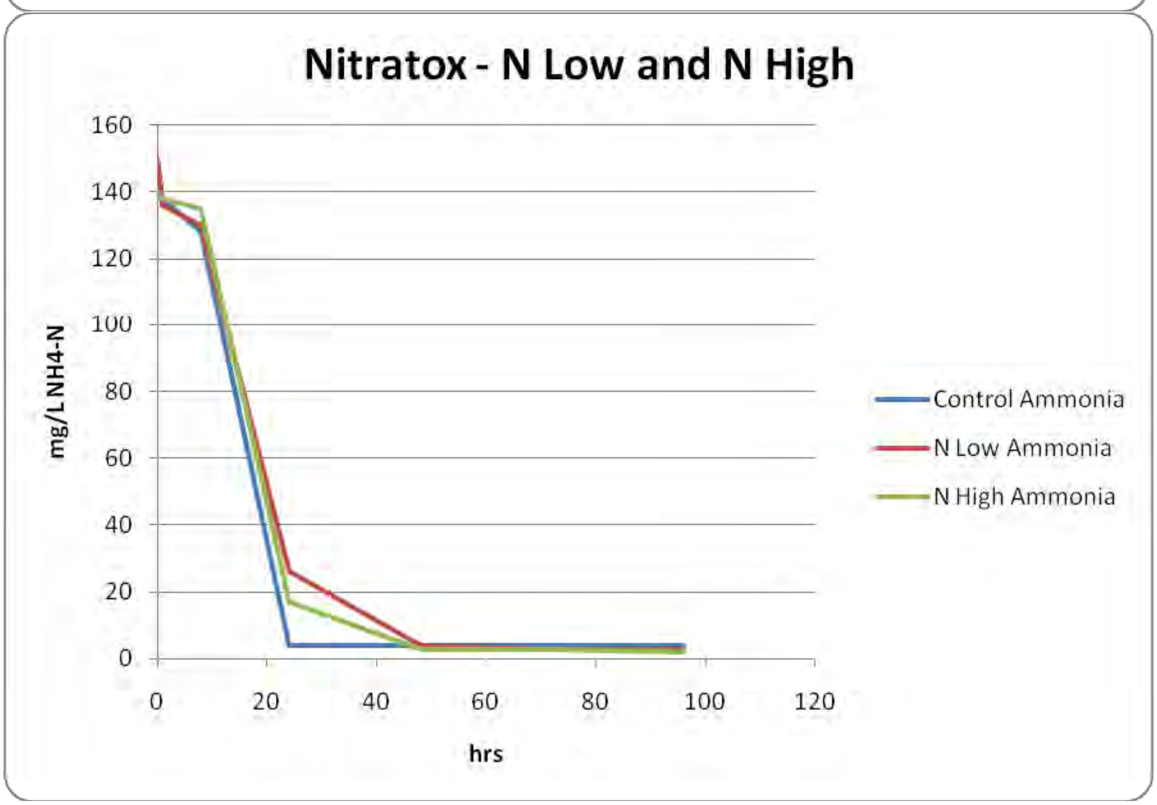

ADM Respirometery - Pass 1
2000
1800
1600
1400
1200
1000
800
600
400
200
0
mg/L O2
-
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
hrs
All Lines within 10% of Control No -Toxicity
Control
K High
HYD High
HYCH Low
HYCH High

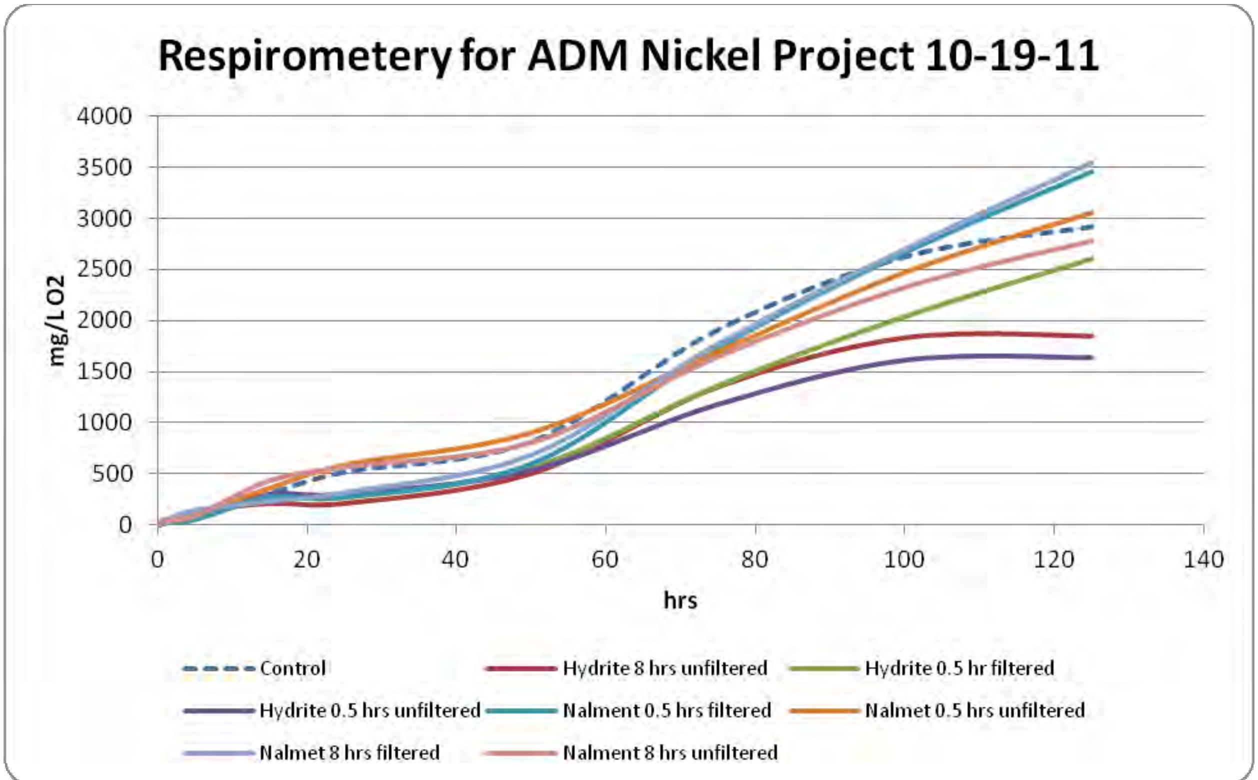

ADM Respirometery - Pass 2
2000
1800
1600
1400
1200
1000
800
600
400
200
0
mg/L O2
-
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
hrs
All Lines within 10% of Control No -Toxicity
Control (2)
K Low (2)
HYD Low (2)
N Low (2)
N High (2)


Nitratox - K Low and K High
mg/L NH4-N
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
hrs
Control Ammonia
K Low Ammonia
K High Ammonia


Nitratox - HYD Low and HYD High
mg/L NH4-N
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
Control Ammonia
HYD Low Ammonia
HYD High Ammonia


Nitratox - HYCH Low and HYCH High
mg/L NH4-N
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
hrs
Control Ammonia
HYCH Low Ammonia
HYCH High Ammonia


Nitratox - N Low and N High
mg/L NH4-N
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
hrs
Control Ammonia
N Low Ammonia
N High Ammonia


Respirometery for ADM Nickel Project 10-19-11
4000
3500
3000
2500
2000
1500
1000
500
0
mg/L O2
0
20
40
60
80
100
120
140
hrs
Control
Hydrite 8 hrs unfiltered
Hydrite 0.5 hr filtered
Hydrite 0.5 hrs unfiltered
Nalment 0.5 hrs filtered
Nalmet 0.5 hrs unfiltered
Nalmet 8 hrs filtered
Nalment 8 hrs unfiltered

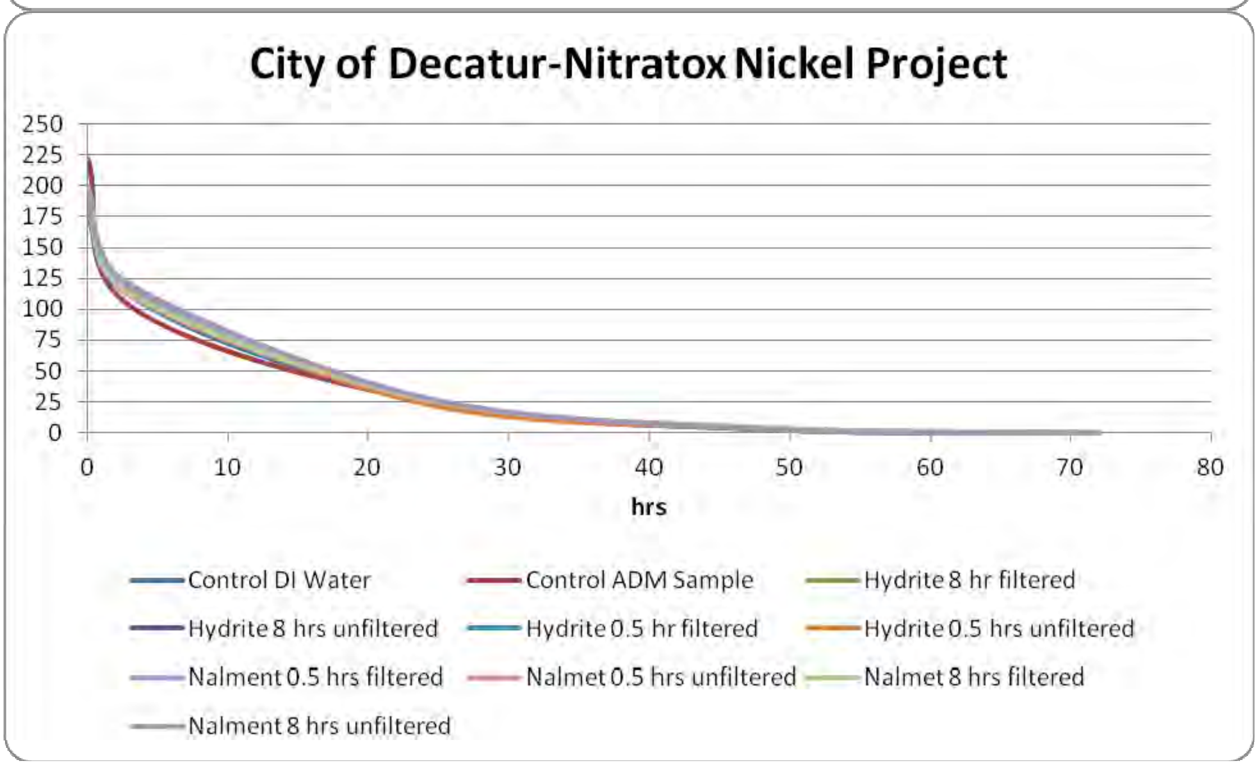

City of Decatur-Nitratox Nickel Project
250
225
200
175
150
125
100
75
50
25
0
0
10
20
30
40
50
60
70
80
hrs
Control DI Water
Control ADM Sample
Hydrite 8 hr filtered
Hydrite 8 hrs unfiltered
Hydrite 0.5 hr filtered
Hydrite 0.5 hrs unfiltered
Nalment 0.5 hrs filtered
Nalmet 0.5 hrs unfiltered
Nalmet 8 hrs filtered
Nalment 8 hrs unfiltered

EXHIBIT F

Interim Report
June 25, 2012

Sanitary District of Decatur
501 DIPPER LANE • DECATUR, ILLINOIS 62522 • 217/422-6931 • FAX: 217/423-8171

June 25, 2012

Illinois Environmental Protection Agency
Bureau of Water Compliance Assurance Section, MC #19
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Re: NPDES Permit IL0028321
IPCB Order PCB 09-125
Interim Report

Dear Sir or Madam:

Enclosed is the Interim Report regarding compliance with nickel and zinc limits required by Special Condition 18 of the Sanitary District of Decatur's NPDES Permit and the Pollution Control Board Order in PCB 09-125.

Please contact me at 422-6931 ext. 214 or at timk@sdd.dst.il.us if you have any questions regarding this report.

Sincerely,

Timothy R. Kluge, P.E.
Technical Director

cc: Rick Pinneo, IEPA (via email)
Bob Mosher, IEPA (via email)
SDD File

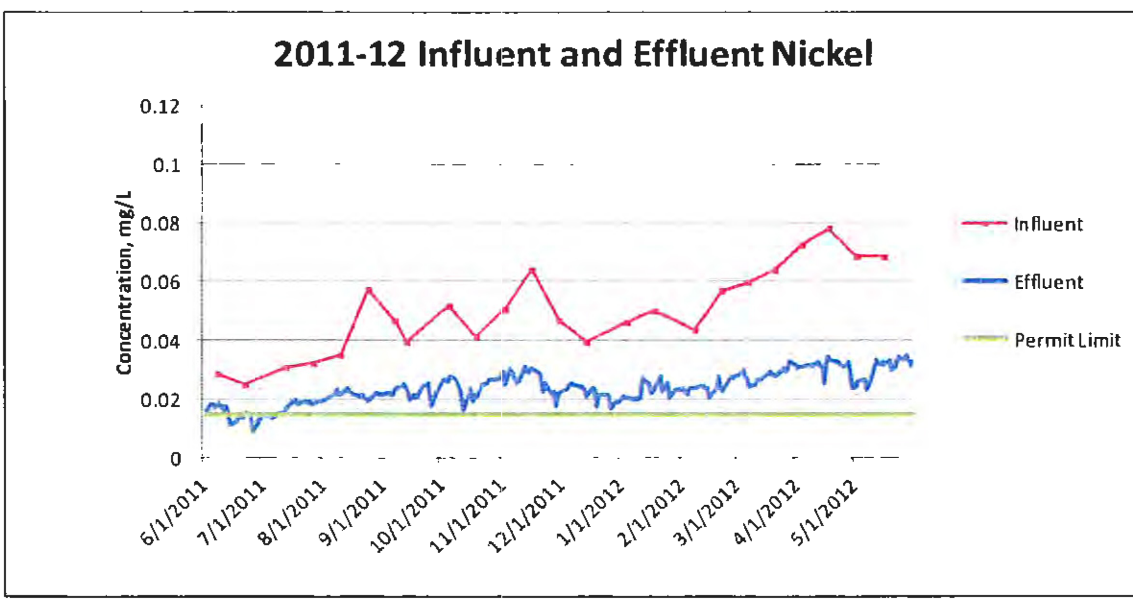
Sanitary District of Decatur
Nickel and Zinc Limits
June 2012 Final Compliance Plan

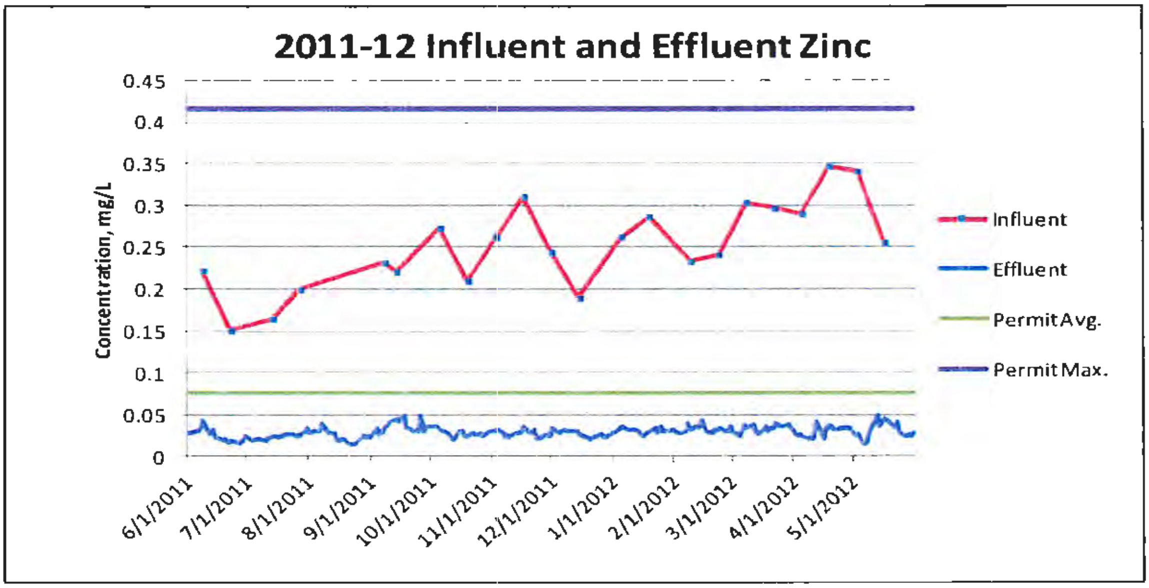
The modified NPDES permit for the Sanitary District of Decatur that became effective July 1, 2009 contains limits for nickel and zinc and a one-year compliance schedule extension for meeting the limits. Special Condition 17 requires the District to achieve compliance with final nickel and zinc effluent limitations by July 1, 2010. This Special Condition also notes that the permit may be modified to include revised compliance dates in Pollution Control Board orders, and that prior to such permit modification, the revised dates in the appropriate orders shall govern the Permittee's compliance.

On January 7, 2010 the Illinois Pollution Control Board granted a variance to the District allowing additional time to comply with final permit limits (PCB 09-125). The final compliance date contained in the Board Order is July 1, 2014. The District's NPDES Permit has not yet been modified to incorporate the variance although Illinois EPA issued a Public Notice and draft modified permit on May 26, 2011. The Board Order also requires that a final compliance plan be submitted to Illinois EPA by July 1, 2012 "containing nickel and zinc controls, treatment technologies, proposed permit modifications, or proposed site-specific water quality standards that will achieve compliance with the District's NPDES permit effluent limits for nickel and zinc." This report is submitted to meet both the permit and variance requirements.

Plant Influent and Effluent Sampling

Ongoing influent sampling for nickel and zinc continues at a frequency of twice monthly, and effluent sampling is done five days per week according to NPDES monitoring requirements. A summary of influent and effluent values during the past twelve months is shown below.





Data shows that the plant effluent is not able to consistently meet the current nickel permit limit. Effluent zinc concentrations remain below the permit limit.

Receiving Stream Sampling

Upstream and downstream sampling continues at a twice monthly frequency to provide a more complete picture of nickel and zinc in the Sangamon River. One upstream and four downstream sampling sites are being monitored. A summary of 2011-2012 river monitoring data is attached. Downstream nickel results remain high during times of low upstream river flow; low flows have prevailed during most of the past year. All upstream and downstream zinc results during 2011 and 2012 have been below the Illinois water quality standard.

Pretreatment Ordinance Limits

The District's pretreatment ordinance was amended in October 2009 as noted in previous interim reports.

Stream Flow-Based Compliance Options

The District continues investigation of flow-based permit limits, to take advantage of upstream flow for mixing when it is available. This concept could potentially allow a savings in treatment facility operating costs when the upstream flow is sufficient to meet water quality standards after mixing with treatment plant effluent. A USGS flow gauging station is located about two miles upstream of the District's discharge point, and provides near- real time flow information. A proposal for flow-based limits will be a part of relief requested from the Pollution Control Board.

Water Quality Standard Investigations

The District is in the final stages of preparing a petition for a site-specific nickel standard, which we expect to file with the Pollution Control Board in in early July 2012.

We are also following the Pollution Control Board rulemaking currently underway to correct an error found in the existing zinc water quality standard. If the Board adopts the corrected standard, utilizing the corrected number to determine our permit limit should provide further assurance of compliance.

Industrial Source Sampling and Investigations

Sampling at Archer Danield Midland Company for metals continues at a frequency of twice monthly and other industries discharging metals are sampled quarterly. Sample results obtained from ADM within the past two years are attached.

The District's operating permit issued to ADM was modified on November 18, 2009 and again on June 17, 2010 to reflect the new limits and provide a compliance schedule for meeting the limits. Final local limits will be determined following Board action on the District's WQS request.

Both ADM and Tate & Lyle formerly utilized zinc as part of their cooling tower treatment programs, and both have eliminated or greatly reduced zinc in their towers. At this time, both industries are meeting the zinc pretreatment limit. ADM is continuing to investigate the possible impact of the zinc limit on their planned wasting of solids from their pretreatment system to the District's collection system.

The discharge from ADM is by far the most significant industrial source of nickel. ADM has been very active in seeking treatment technology for nickel removal, involving plant management and research department personnel in addition to environmental compliance and legal staff. District staff met with ADM personnel several times during the first half of 2012. The District's pretreatment permit requires semi-annual reports of ADM's investigations, and the most recent report is attached. Completed and anticipated modifications made by ADM are listed on pages 3-4 of the report.

Additional Pretreatment Limit Investigations

Pretreatment ordinance limits adopted in 2009 were adopted as total (rather than soluble) limits based on review of soluble/insoluble data. Refinement of pretreatment limits is an ongoing process and will depend on final permit limits as well as treatment technologies that might be employed by industrial users.

Compliance Plan

District and ADM staff met with Illinois EPA personnel on May 8, 2012 to discuss the District's compliance plan approach. In summary, the District's compliance plan includes the following:

1. Continue to work with ADM to implement nickel discharge reductions and removal technologies. ADM's May 31, 2012 Interim Report describes the completed and planned reductions.

2. Complete and file a petition for a site-specific water quality standard for nickel, based on bioavailability. We anticipate providing a draft of the petition to Illinois EPA before the end of June and filing the petition with the Pollution Control Board in July.

3. The Board petition will contain a request for variable permit limits based on the amount of flow available in the Sangamon River.

Sanitary District of Decatur

Nickel and Zinc River Data 2010-2011

Sample Date	Plant Final Effluent Nickel mg/L	River Up-stream Nickel mg/L	River 100 yds Down stream Nickel mg/L	River 600 yds Down-stream Nickel mg/L	Steven's Creek Nickel mg/L	River Rock Springs Bridge Nickel mg/L	River Wyckle's Road Nickel mg/L	Plant Final Effluent Zinc mg/L	River Up-stream Zinc mg/L	River 100 yds Down stream Zinc mg/L	River 600 yds Down-stream Zinc mg/L	Steven's Creek Zinc mg/L	River Rock Springs Bridge Zinc mg/L	River Wyckle's Road Zinc mg/L	Plant Final Effluent Flow mgd	River Up-stream Flow ft^3/sec
01/13/11	0.0181	<0.00131	0.00519	0.00495	<0.00131	0.00426	0.00504	0.0503	<0.00660	0.0157	0.0152	<0.00660	0.0133	0.0149	29.48	121
01/27/11	0.0218	<0.00131	0.0144	0.0138	<0.00131	0.0113	0.0102	0.0773	<0.00660	0.0504	0.0481	<0.00660	0.0394	0.0350	30.71	3.9
02/10/11	0.0214	<0.00131	0.0141	0.0128	<0.00131	0.0112	0.00971	0.0701	<0.00660	0.0460	0.0413	0.00761	0.0364	0.0313	27.94	5.4
02/24/11	0.0132	0.00160	0.00242	0.00252	0.00150	0.00214	0.00205	0.0406	0.00841	0.0106	0.0108	0.0138	0.0114	0.00992	44.38	1970
3/10/11	0.0123	0.00169	0.00194	0.00198	0.00153	0.00184	0.00208	0.0321	0.00972	0.00978	0.00992	0.0103	0.00974	0.0100	47.51	2900
3/24/11	0.0132	<0.00131	0.00133	0.00133	<0.00131	<0.00131	<0.00131	0.0161	<0.00660	<0.00660	<0.00660	<0.00660	<0.00660	<0.00660	33.28	667
4/7/11	0.0163	<0.00131	0.00343	0.00252	<0.00131	0.00241	0.00237	0.0246	<0.00660	0.00884	0.00689	<0.00660	0.00732	0.00691	30.62	326
4/21/11	0.0118	<0.00131	0.00236	0.00195	0.00254	0.00157	0.00188	0.0215	0.00729	0.00878	0.00822	0.0170	0.00939	0.00934	52.22	2540
5/5/11	0.0147	0.00177	0.00279	0.00238	0.00137	0.00218	0.00223	0.0295	<0.00660	0.00932	0.00862	<0.00660	0.00760	0.00898	41.88	1670
5/19/11	0.0125	<0.00131	0.00211	0.00186	<0.00131	0.00153	0.00150	0.0213	<0.00660	<0.00660	<0.00660	<0.00660	<0.00660	0.00777	32.29	1290
6/9/11	0.0187	<0.00131	0.00143	0.00194	0.00183	0.00162	0.00177	0.0434	<0.00660	<0.00660	0.00672	<0.00660	<0.00660	0.0124	29.12	1540
6/23/11	0.0154	0.00210	0.00335	0.00307	0.00154	0.00280	0.00329	0.0203	0.0131	0.0134	0.0138	0.0112	0.0129	0.0155	36.23	800
7/14/11	0.0170	<0.00131	0.0118	0.0116	<0.00131	0.00886	0.00890	0.0242	0.00519	0.0162	0.0171	<0.00660	0.0136	0.0130	27.12	200
7/28/11	0.0188	<0.00131	0.0187	0.0168	<0.00131	0.0158	0.0159	0.0255	<0.00660	0.0279	0.0219	<0.00660	0.0205	0.0207	27.85	2.1
8/11/11	0.0218	0.00143	0.0255	0.0212	<0.00131	0.0204	0.0199	0.0294	<0.00660	0.0576	0.0292	<0.00660	0.0266	0.0271	24.82	1.6
8/25/11	0.0193	<0.00131	0.0187	0.0190	<0.00131	0.0183	0.0189	0.0161	<0.00660	0.0153	0.0158	<0.00660	0.0142	0.0137	24.19	1.1
9/8/11	0.0233	0.00142	0.0208	0.0222	<0.00131	0.0207	0.0196	0.0341	<0.00660	0.0294	0.0303	<0.00660	0.0279	0.0254	27.07	0.15
9/14/11	0.0237	0.00132	0.0231	0.0235	<0.00131	0.0228	0.0231	0.0460	<0.00660	0.0425	0.0438	<0.00660	0.0413	0.0385	28.62	1.9
10/6/11	0.0276	0.00140	0.0263	0.0265	<0.00131	0.0255	0.0259	0.0329	<0.00660	0.0318	0.0314	<0.00660	0.0296	0.0288	23.96	0.75
10/20/11	0.0211	<0.00131	0.0189	0.0195	<0.00131	0.0159	0.0181	0.0260	0.0107	0.0235	0.0238	<0.00660	0.0193	0.0199	23.28	2.8
11/3/11	0.0250	0.00197	0.0277	0.0304	0.00175	0.0260	0.0275	0.0322	0.0115	0.0314	0.0354	<0.00660	0.0281	0.0271	42.99	18
11/17/11	0.0307	<0.00131	0.0281	0.0283	0.00178	0.0273	0.0277	0.0368	<0.00660	0.0285	0.0304	<0.00660	0.0275	0.0247	25.80	1.1
12/1/11	0.0221	<0.00131	0.0177	0.0173	<0.00131	0.0149	0.0149	0.0349	0.00728	0.0245	0.0230	0.00824	0.0207	0.0190	27.64	2.1
1/5/12	0.0207	<0.00131	0.0193	0.0206	<0.00131	0.0170	0.0174	0.0355	<0.00660	0.0328	0.0346	<0.00660	0.0298	0.0278	27.19	4.1
1/19/12	0.0245	0.00146	0.0164	0.0166	0.00135	0.0126	0.0127	0.0307	0.0265	0.0229	0.0240	0.00838	0.0203	0.0184	26.24	8.9
2/9/12	0.0241	<0.00131	0.00567	0.00496	<0.00131	0.00480	0.00421	0.0329	<0.00660	0.00944	0.00838	<0.00660	0.00788	0.00782	29.94	228
2/23/12	0.0227	<0.00131	0.0135	0.0147	<0.00131	0.0118	0.0115	0.0343	<0.00660	0.0213	0.0256	<0.00660	0.0182	0.0172	28.01	50
3/8/12	0.0245	<0.00131	0.0111	0.0111	<0.00131	0.00964	0.00941	0.0338	<0.00660	0.0167	0.0161	<0.00660	0.0149	0.0150	27.78	79
3/22/12	0.0277	<0.00131	0.0241	0.0211	<0.00131	0.0180	0.0185	0.0399	<0.00660	0.0501	0.0387	<0.00660	0.0245	0.0227	26.74	2.5
4/5/12	0.0313	<0.00131	0.0226	0.0226	<0.00131	0.0205	0.0207	0.0260	<0.00660	0.0214	0.0227	<0.00660	0.0185	0.0172	26.05	4.6
4/19/12	0.0334	<0.00131	0.0246	0.0238	0.00149	0.0187	0.0199	0.0375	<0.00660	0.0331	0.0308	<0.00660	0.0240	0.0216	26.08	4.2
5/3/12	0.0262	0.00158	0.0120	0.0105	<0.00131	0.00755	0.00770	0.0270	0.00690	0.0231	0.0194	<0.00660	0.0148	0.0142	26.95	8.7
5/17/12	0.0317	0.00156	0.00859	0.00888	0.00141	0.00775	0.00806	0.0450	<0.00660	0.0160	0.0171	<0.00660	0.0139	0.0148	25.37	97

Indicates that effluent or river/creek sample concentration exceeds chronic water quality value

SDD Major Industrial Nickel and Zinc Results				
	ADM Point A	ADM Point A	ADM Point D	ADM Point D
Sample	Nickel, Tot	Zinc, Tot	Nickel, Tot	Zinc, Tot
Date	mg/L	mg/L	mg/L	mg/L
6/1/2010	0.0813	0.488	0.12	0.441
6/14/2010	0.0826	0.453	0.104	0.345
7/8/2010	0.148	0.54	0.283	1.07
7/12/2010	0.144	0.528	0.193	0.514
8/2/2010	0.125	0.457	0.172	0.446
8/9/2010	0.126	0.44	0.184	0.474
9/1/2010	0.0766	0.465	0.122	0.469
9/20/2010	0.0744	0.442	0.121	0.649
10/4/2010	0.0781	0.461	0.0938	0.369
10/14/2010	0.162	1.18	0.179	1.18
11/8/2010	0.0524	0.24	0.0646	0.208
11/23/2010	0.13	0.665	0.122	0.413
12/6/2010	0.0715	0.53	0.131	0.581
12/13/2010	0.0649	0.498	0.0774	0.219
1/5/2011	0.0629	0.53	0.0669	0.204
1/10/2011	0.0577	0.495	0.0666	0.188
2/7/2011	0.0836	0.756	0.0892	0.329
2/14/2011	0.0589	0.472	0.0598	0.18
3/7/2011	0.0773	0.447	0.0627	0.128
3/14/2011	0.086	0.51	0.1	0.449
4/4/2011	0.07	0.428	0.0841	0.387
4/20/2011	0.0687	0.33	0.0861	0.347
5/2/2011	0.0712	0.304	0.0809	0.302
5/9/2011	0.06	0.301	0.0712	0.3
6/6/2011	0.0648	0.285	0.0786	0.276
6/13/2011	0.0692	0.293	0.0809	0.314
7/11/2011	0.0542	0.226	0.0625	0.209
8/1/2011	0.0491	0.165	0.0621	0.172
8/8/2011	0.0567	0.215	0.074	0.242
9/1/2011	0.0662	0.285	0.0842	0.327
9/7/2011	0.0684	0.311	0.0884	0.344
10/3/2011	0.094	0.518	0.114	0.515
10/10/2011	0.0643	0.191	0.073	0.189
11/7/2011	0.0912	0.377	0.116	0.529
11/22/2011	0.221	1.28	0.136	0.623
12/1/2011	0.0917	0.416	0.11	0.492
12/5/2011	0.094	0.423	0.117	0.508
1/5/2012	0.0921	0.451	0.111	0.531
1/9/2012	0.0868	0.424	0.109	0.491
2/6/2012	0.121	0.441	0.134	0.488
2/13/2012	0.127	0.49	0.159	0.601
3/5/2012	0.128	0.431	0.15	0.493
3/12/2012	0.12	0.406	0.141	0.482
4/12/2012	0.169	0.621	0.191	0.705
4/19/2012	0.148	0.516	0.176	0.674
SDD Ordinance Limit (Avg.)	0.0365	0.45		
SDD Ordinance Limit (Max.)	0.15	1.7		

ADM

May 31, 2012

CERTIFIED MAIL
7003 3110 0005 2739 4722

Charles Jarvis
Pretreatment Coordinator
Sanitary District of Decatur
501 Dipper Lane
Decatur, Illinois 62522

Re: Interim Nickel and Zinc Report, 2012-1

Dear Charles,

Per Special Condition E.8. of the ADM Industrial Discharge Permit #200, ADM is enclosing the semi-annual report that summarizes ADM's research efforts to reduce nickel and zinc from effluent during the first half of CY2012. In Tables 1 & 2 of the report you will note that we have struck reference to any vendors associated with technology studies. This is in accordance with confidentiality agreements in place with those vendors.

Please contact our Environmental Manager Mark Atkinson if you have any questions or would like to arrange a meeting to discuss.

Regards,

Mark Burau
Plant Manager
ADM Decatur Corn Processing Plant

Ec: Mark Atkinson – ADM Corn Plant Environmental Manager
Dean Frommelt – ADM Corn Division Environmental Manager
EDMS

To: Illinois Environmental Protection Agency

Decatur Sanitary District

From: ADM Decatur WWTP

CC: ADM Corn Processing, ADM Oilseeds Processing, ADM JRRRC

Date: May 31, 2012

Re: Status Report Compliance Strategy for 2012 for Decatur Sanitary District and ADM Decatur WWTP for waste treatment. (Covers updates post December, 2011- date)

ADM

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ADM Research and Decatur Corn Processing have been actively pursuing technologies to remove Nickel (Ni) from its effluent stream released to the SDD treatment plant. Enclosed is a report on the progress ADM has made since the last update issued on December 2011.

1 Background and Update (post December 2011)

Nickel and Zinc are present in effluent leaving the ADM Decatur Complex Waste Water plant. Of the two metals, nickel is more difficult to remove from the effluent. ADM has conducted 5 plant material balances to understand the sources of Nickel in its internal streams. ADM's Decatur Complex consists of multiple, separate processing plants, which send their wastewater to the on-site wastewater treatment plant ("WWTP") operated by Corn Plant personnel. These processing plants consist of the Corn Wet Mill, BioProducts Plant, Cogeneration Plant, East Soybean Processing Plant, West Soybean Processing Plant, Vitamin E Plant, Corn Germ Processing Plant, Glycols Plant and the Polyols Plant. Each of these unique plants produces multiple products, using both batch and continuous processes, and creates water streams which generally are reused multiple times prior to being discharged to the WWTP. The WWTP treats approximately 11 MGD through a newer anaerobic treatment system followed by aerobic treatment prior to discharge to the District.

The incoming soybeans contain approximately 4.1 parts per million ("ppm") nickels, while incoming corn contains approximately 0.53 ppm nickel. Given that ADM's Decatur Complex processes approximately 600,000 bushels of corn and 200,000 bushels of soybeans per day, our incoming Nickel load are about 49.2 lbs from the Soybeans and 19.1 lbs from the corn. A small portion of the incoming nickel is discharged in the effluent.

In ADM effluent water originates in the corn and soybeans being processed at the facility. During the processing, the metals are released and enter the processing water some of which eventually ends up at the wastewater treatment plant.

ADM has monitored soluble Nickel at the Damon and Front stations continuously (see <u>Figures 1-3</u>) and made a number of modifications in its operations:

1) In the past 9 months there has been a decline in Nickel from about 0.120ppm to about 0.060 ppm. However we have experienced severe spikes in effluent nickel in September-November, 2011 each lasting 2-3 days.

2) Spent catalyst from the West Soybean Processing Plant is collected and sent to a landfill. Spilled catalyst is collected and disposed of as solid waste rather than washed into a sump.
3) Particulate catalyst from the Corn Plant Sorbitol production is captured by filters and physically recovered for recycling or disposal as solid waste. ADM is also installing an ion exchange resin system at the Sorbitol Plant to capture soluble nickel from wastewater.
4) The East Soybean Processing Plant is finalizing its design of a system that will remove the soy molasses stream (containing approximately 2.4 lb/day, approximately 35% of the soluble nickel from the Decatur Complex) from the WWTP. This stream is high in digestible, fermentable sugars but will need to be concentrated for stability. The East Soybean Processing Plant has prepared a cost estimate for this process change. Once the system design is complete and the cost estimate approved, ADM anticipates spending several million dollars to install it.
5) The Polyols Plant accounts for approximately 11% of the soluble nickel from the Decatur Complex. The Polyols Plant has determined that this nickel can be precipitated by pH adjustment. ADM is now determining how to implement this change on its process stream.
6) We have also collected soluble nickel data for the past 8+ yrs. and it shows that our soluble nickel number remain unchanged with the only change in total nickel due to startup of the anaerobic digesters post August 2008.

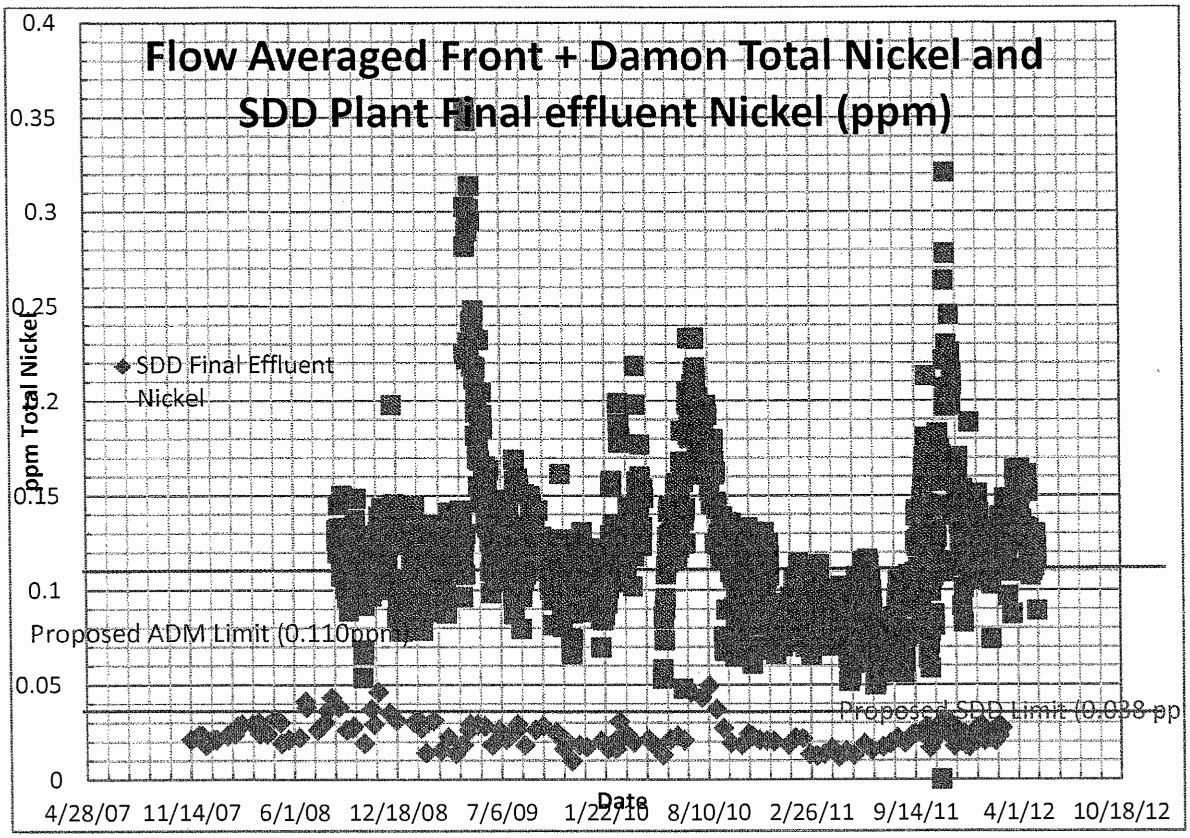


Figure 1 Flow Averaged Front and Damon Nickel

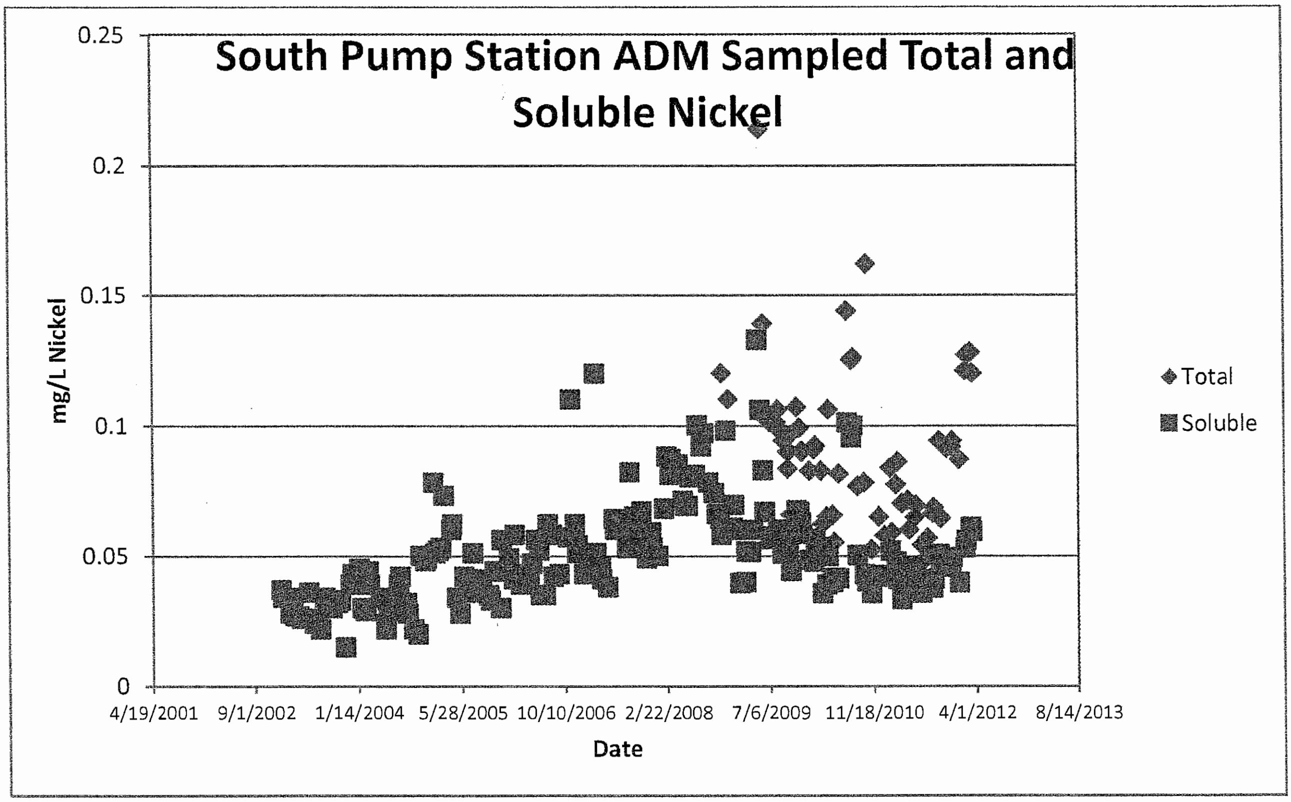


Figure 2 South Pump Station Nickel

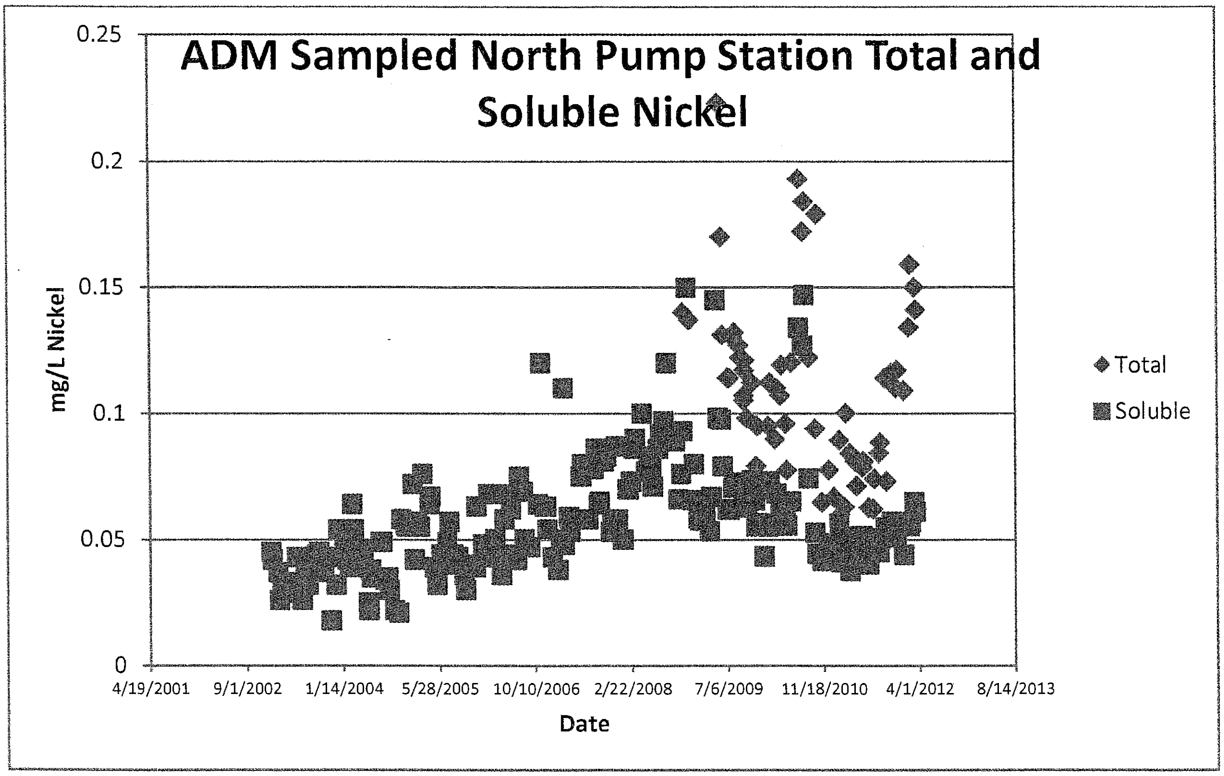


Figure 3 North Pump Station Nickel

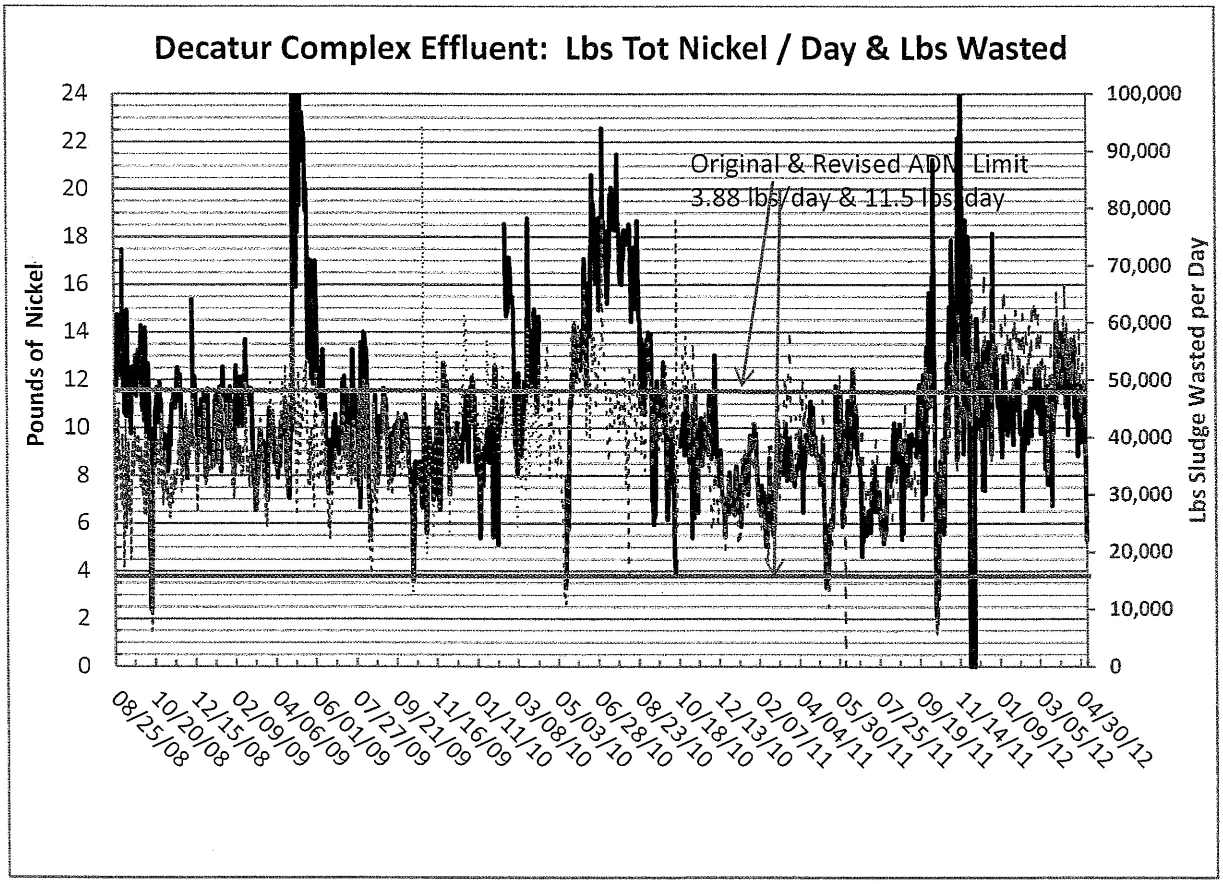


Figure 4 Sludge wasting and Total Nickel ADM WWTP

As reported in the 2010 and 2011 updates, ADM has, thus far, investigated 44 technologies that had the potential to control nickel at the Decatur Complex WWTP. (This was in addition to the work ADM has undertaken to reduce nickel within the individual wastewater streams.) As indicated in Table 1, these technologies can be segregated into six broad categories:

1. Nickel Proprietary Precipitation Process;
2. Nickel Chemical Precipitation;
3. Ion Exchange Resin;
4. Filtration;
5. pH Modification
6. Noncommercial, Experimental Technologies.

Additional details about some of the technologies identified in Table 1 are presented in Table 2, including a general list of reasons why certain of those technologies are not technically feasible and are not currently being pursued.

While most of the technologies evaluated were not found to be technically feasible, ADM identified one technology it had not already actively pursued that it will continue pursuing to reduce nickel at its Polyols Plant. In particular, ADM investigated a technology using pH modification for precipitation of nickel as a hydroxide. During its evaluation, ADM determined that the inorganic nickel present in the effluent leaving the Polyols Plant (which averages about 40,000 gallons per day out of the 11 million gals per day (MGD) Decatur Complex flow) can be precipitated using this technique. However, the majority of nickel present in the bulk of waste streams evaluated appears to be in the form of chelated nickel, which requires a pH swing from 7.0 to 10.0 to 3.0 and back to 7.0. Thus, while pH modification has been determined to be technically feasible to reduce nickel from the Polyols Plant's effluent, the results show that there is still much work to be done to understand and manage the anticipated swings in pH for the entire Decatur Complex. Nevertheless, ADM is committed to determining how to implement this change on the Polyols Plant process stream. It is important to note that, due to the high volume of acid and base that will be required for changing the pH of the waste streams, this approach was not pursued for the dissolved air flotation ("DAF") where the daily volume averages 11.5 MGD effluent, as compared to 0.037 MGD for the Polyols Plant. It is also important to note that, although determined not to be technically feasible, ADM continues to trial polymeric dimethyl dithiocarbamate for use in ADM's final wastewater effluent. This technology would consist of a polymeric dimethyl dithiocarbamate addition to precipitate soluble nickel followed by coagulation and filtration to remove the solid nickel polymer complex. To date, ADM has had reasonable success in some trials with removing 40-60% of the soluble nickel present in DAF effluent water. However, there are still a number of significant technical obstacles to employing this nickel reduction technology, such as scaling, residence time, chemical usage, and nickel reduction percentage and consistency. Further, even if the obstacles inherent in this technology could be overcome, ADM believes that it will continue to be cost prohibitive to employ. Table 3, summarizes the capital, operating and chemical costs for the approaches it is scaling and either installing or continuing to trial.

Thus, of all of the technologies investigated by ADM to date, the only viable option that has not already been fully planned, installed or employed by ADM is the nickel capture process based upon high pH precipitation at the Polyols Plant. Because such technology has been determined to be both technically feasible and economically reasonable for the specific application, ADM will install that system at the Polyols Plant after necessary pilot testing is complete. However, that reduction, even when combined with the other reductions achieved by ADM, will still not reduce nickel to the levels sought by the District under its current permit. Even if ADM could overcome the technical obstacles it faces regarding the use of polymeric dimethyl dithiocarbamate to reduce nickel from the final wastewater effluent, testing indicates that residual soluble nickel concentrations close to 0.050 mg/L will remain irrespective of contact time and incoming nickel levels. ADM's investment to date to identify and implement viable solutions to meet the nickel standard has been approximately $1.02 million in employee costs and $0.45 million in equipment rental and pilot trial costs from 2009 to December 2011. In addition, ADM has spent $0.45 million to install a resin capture system at the Decatur Sorbitol plant. It is also preparing to spend an additional $2.5 million to install a system to allow removal of the soy molasses stream and roughly $0.75 million to install a high pH precipitation and filtration process at the Polyols Plant. ADM has also significantly improved housekeeping in the West Plant to minimize nickel catalyst from entering the wastewater system. Finally, ADM continues to investigate the ability to scale up a potentially viable chemical technology for installation at the Decatur Complex WWTP based on polymeric dimethyl dithiocarbamate to reduce nickel from its effluent. At this point, all reasonably identifiable options have been explored and all technically feasible and economically reasonable solutions are being pursued

Table 1 Summary of Technologies Reviewed by ADM

	Chemistry	*Dosage*	*Nickel Reduction (%)*	*Current Status*	*Nitratox/ Respirometer Testing**	*Technically Feasible (y/n)*	*Economically Reasonable (y/n)*
Category 1 - Nickel Proprietary Precipitation Process							
[redacted]	Activated Clay	1%-3% by weight of clay	40%-60% (from 200ppb influent)	Not Active, High dosages unscalable.	Not tested.	No	No
[redacted]	Acidic Clay	4%-8% w/w	40% (from 90ppb influent)	Stopped. High dosage.	Not tested.	No	No
[redacted]	Chitosan Based	5% w/w	90% from 200 ppb influent	Abandoned. High dosage,	Not	No	No

[redacted]				Concerns with Chitosan Availability	tested.		
[redacted]	Proprietary	2% w/w	82% (from 100ppb)	Abandoned. Company went out of business	Not tested.	No	No
[redacted]	Metclear	200 ppm	64% (from 120ppb)	Shelved. Strong pH swing (acidification to pH 2, alkalination to 10 and neutralization)	Not tested.	No	No
[redacted]	Not disclosed	Not disclosed	40-60% (from 200ppb)	Shelved. Company not sharing samples.	Not tested.	No	No
Category 2 - Nickel Chemical Precipitation Process Using Carbamates or Organic Sulfides							
[redacted]	Polymeric Dimethyl Dithiocarbamate	100ppm with 50ppm of CaCl2	30% from 150ppb	Piloted. Total Nickel reduction to 60ppb.	Passed	No	No
[redacted]	Polymeric Dimethyl Dithiocarbamate	20-50ppm	60% from 150ppb	Piloted. Total Nickel reduction to 54 ppb.	Passed	Yes	No
[redacted]	Polymeric Dimethyl Dithiocarbamate	100ppm	41% from 150ppb	Piloted. Total Nickel reduction to 32ppb	Passed	Yes	No
[redacted]	Dimethyl Dithiocarbamate	50ppm + pH 6.0	76% from 150ppb	Piloted. Nickel reduction seen to 40ppb	Passed	Yes	No
[redacted]	Polymeric Dimethyl Dithiocarbamate	300ppm + pH swing	30%	Not active. Modified chemistry from Nalco being tested	Not tested.	No	No
[redacted]	Polymeric Dimethyl Dithiocarbamate	50ppm	48% from 100ppb	Piloted. Nickel reduction seen to 20ppb	Passed	Yes	No
[redacted]	Polymeric Dimethyl Dithiocarbamate	200ppm	52% from 150ppb	Piloted. Nickel reduction seen to 39 ppb	Passed	No	No
[redacted]	Polymeric Dimethyl Dithiocarbamate	100ppm	40% from 150ppb	Not piloted. GE has not scaled up commercial manufacturing.	Not tested.	No	No
[redacted]	Dimethyl Dithiocarbamate	100ppm	60% from 150ppb	Piloted. Nickel reduction seen to 24 ppb	Passed	No	No
Category 3 - Non Functional Resins							
[redacted]	Styrene Divinyl Benzene	2-5% w/w	20%	Not scaled. High regeneration costs	Not tested	No	No

[redacted]	Styrene Divinyl Benzene	4% w/w	60%	Not scaled. Very high resin use. Caustic /ethanol based regeneration	Not tested	No	No
[redacted]	Immobilized Ion Exchange Beads	5%	Not significant	Shelved	Not tested	No	No
Category 4 - Reuse of Ion Exchange Resin							
[redacted]	Sulfonic	0.1-0.5%	Complete removal of Ionic Nickel from the Sorbitol plant waste	Installed at Sorbitol plant	Not required	Yes	Yes
Category 5 - Filtration							
[redacted]	Phosphate precipitation + Reverse Osmosis	80% recovery of feed	95%+ reduction	Shelved. Brine disposal issues. High capex	Not required	No	No
[redacted]	Low pressure Reverse Osmosis	30% recovery of feed	80% + reduction	Shelved. Brine disposal issues. High capex	Not required	No	No
[redacted]	Sand Filter	Not disclosed	20% reduction	Insufficient efficacy	Not required	No	No
Category 6 - Other Approaches							
[redacted]	Carbon Aerogels	Not tested	Not tested	Company went out of business. CD also binds other ions	Not tested	No	No
[redacted]	Electrochemical	Not disclosed	Higher Nickel due to leaching from electrode plates	Shelved after 4 trials.	Not tested	No	No
[redacted]	Ferric Chloride	100ppm	40%	Unscalable due to chloride limits	Not tested	No	No
[redacted]	Protein	not tested	Not tested	Lab scale only	Not tested	No	No
[redacted]	Hydrogen Peroxide and Ozone	5% w/w + pH adjustmen t	20% from 150ppb	Significant chemical usage	Not tested	No	No
[redacted]	Protein based	Not disclosed	Not tested	Other ions compete with nickel. Not scalable.	Not tested	No	No
[redacted]	pH Swing	1-3% w/w	30% from 150ppb	Very high chemical usage.	Not tested	No	No

[redacted]	pH >11.0	1-2% w/w	Complete for ionic regeneration waste	Being piloted at polyol plant for waste stream	Not tested	Yes	Yes

Table 2: Technical Challenges on Scale Up for Nickel Remediation Chemistries

Technology / Provider	***cooperative with***	***determined not***	***Not commercially available***	***High Dosages required***	***Results not scalable beyond bench scale***	***Low recoveries and brine disposal concerns***	***Technically Feasible (y/n)***	***Comments***
[redacted]	X		X				No	
[redacted]		X		X			No	Would require 5 million pounds of additive per day
[redacted]			X	X			No	
[redacted]	X			X			No	
[redacted]				X			No	Requires a pH to <2 then to pH 5.5 then to pH 10
[redacted]	X						No	
[redacted]					X		No	Plant pilot trial did not achieve required Nickel reduction.
[redacted]		X			X		No	Plant pilot trial did not achieve required Nickel reduction.
[redacted]					X		No	Plant pilot trial did not achieve required Nickel reduction.
[redacted]			X				No	

[redacted]							No	
[redacted]				X			No	
[redacted]				X			No	Decolorization resin needs 3,000 cubic feet of resin at $300/cubic foot. Resin, beds and regeneration equipment estimated at $8 - 10 million and uses Ethanol to regenerate resin.
[redacted]		X		X			No	
[redacted]							Yes*	Installed at Sorbitol plant
[redacted]						X	No	
[redacted]						X	No	
[redacted]						X	No	
[redacted]			X				No	
[redacted]		X	X				No	
[redacted]		X					No	Requires over 30,000 pounds of ferric salts per day
[redacted]			X				No	
[redacted]		X					No	Raise the pH 10 and add ozone and hydrogen

								peroxide. Large amounts of chemicals required.
[redacted]			X				No	
[redacted]							Yes	Suitable for <~50,000 GPD, non-grain based wastewater with non-chelated, salt-form nickel such as Polyols Plant IX regen waste
* The amount of used ion exchange resin is limited and it is most effective on non-chelated nickel. Therefore, it is being used to capture nickel from the sorbitol process.								

Table 3: Capital and Operating Costs for Nickel Removal at ADM Decatur Complex

	Initial Capital Cost	**Annual Operating & Chemical Costs**	**Status**
Active Projects			
1) Soybean Process Stream Alternative	$2.7 million	$400,000	Planned
2) Used IX resin system at Sorbitol Plant	$450,000	$200,000	Installed
3) High pH precipitation at Polyols Plant	$750,000	$600,000	Planned
Further Technical Analysis/Cost Prohibitive			
1) Polymeric DTC addition and nickel removal using different unit operations			Being piloted
a) Settling Clarifier and Sand Filter	$25.58 million	$7.2 million	Being piloted
b) Sand Float Filter	$23.14 million	$7.2 million	Being piloted

c) Sand Filter + precipitation	$24.48 million	$7.2 million	Being piloted
d) DE Filtration + Precipitation	$14.97 million	$7.2 million	Being piloted
e) DE Filtration	$ 7.05 million	$7.2 million	Being piloted
f) Sand Filter	$13.57 million	$7.2 million	Being piloted

2 Reduction in total and soluble nickel between ADM Discharge and SDD effluent

We ran a 5 week trial where in Front and Damon were monitored and compared to corresponding results for SDD Influent and Effluent. While some variability was seen in nickel reduction to SDD influent we are seeing a consistent 80% reduction in total nickel and 59% in soluble nickel to the SDD effluent from the effluent as shown in Table 4.

	Table 4: Reduction in total and soluble Nickel between ADM and SDD											
Date	Front	Damon	Flow Averaged F+D	SDD Influent	SDD Effluent	Front	Damon	Flow Average F+D	SDD Influent	SDD Effluent	% Reduction in flow averaged Total Nickel	% Reduction in Flow averaged soluble nickel
	Total					Soluble						
1/9/2012	0.1195	0.1240	0.1217	0.0562	0.0270	0.0521	0.0563	0.0542.	0.0299	0.0277	78%	49%
1/11/2012	0.1244	0.1172	0.1132	0.0267	0.0254	0.0563	0.0584	0.0537	0.0250	0.0241	78%	55%
1/13/2012	0.1250	0.0904	0.1321	0.0343	0.0286	0.0498	0.0541	0.0637	0.0266	0.0285	78%	55%
1/16/2012	0.1180	0.0933	0.1281	0.0507	0.0255	0.0516	0.0541	0.0641	0.0264	0.0259	80%	60%
1/18/2012	0.1170	0.1078	0.1286	0.0990	0.0242	0.0530	0.0567	0.0628	0.0237	0.0231	81%	63%
1/20/2012	0.0960	0.0703	0.1138	0.0653	0.0274	0.0368	0.0563	0.0637	0.0271	0.0273	76%	57%
1/23/2012	0.1190	0.0930	0.1242	0.0627	0.0285	0.0533	0.0581	0.0652	0.0268	0.0278	77%	57%
1/27/2012	0.1110	0.1017	0.1200	0.0353	0.0149	0.0421	0.0467	0.0501	0.0108	0.0145	88%	71%
1/30/2012	0.1190	0.1034	0.1248	0.0455	0.0161	0.0542	0.0501	0.0585	0.0171	0.0164	87%	72%
2/1/2012	0.1164	0.1413	0.1298	0.0815	0.0216	0.0491	0.0496	0.0497	0.0240	0.0220	83%	56%
2/3/2012	0.1058	0.1304	0.1197	0.2769	0.0245	0.0500	0.0520	0.0517	0.0404	0.0262	80%	49%
										Average	80%	59%

ADM continues to operate its pilot plant for chemical sequestration of nickel as needed. Since fall 2011, the chemicals being investigated at the pilot plant have been narrowed to those from Nalco and Hydrite.

"By July 1, 2012 the District must complete the following tasks:

Submit a final compliance plan to [the Agency] containing nickel and zinc controls, treatment technologies, proposed permit modifications, or proposed site-specific water quality standards that will achieve compliance with permit limits.

- ***ADM / SDD Variance, p. 29.***

ADM met with the SDD and IEPA on May 8, 2012 and provided them with an overview detailing the progress and ADM's compliance efforts. In addition it was agreed that our petition to the PCB would be part of the compliance plan for ADM to meet our July 1, 2012 deadline.

3 Corn Plant used IX system

As previously disclosed, ADM has been working to install a used ion exchange resin bed system to capture nickel leaching from the sorbitol process catalyst. This system has been running manually for the past 6 weeks. Thus far, about 5 lbs of nickel have been removed from the treated stream and no nickel has been detected in the effluent. This is shown in Figure 5. We are using 105 cu ft of resin and expect a nickel binding capacity of about 3.4 lbs per cubic ft.

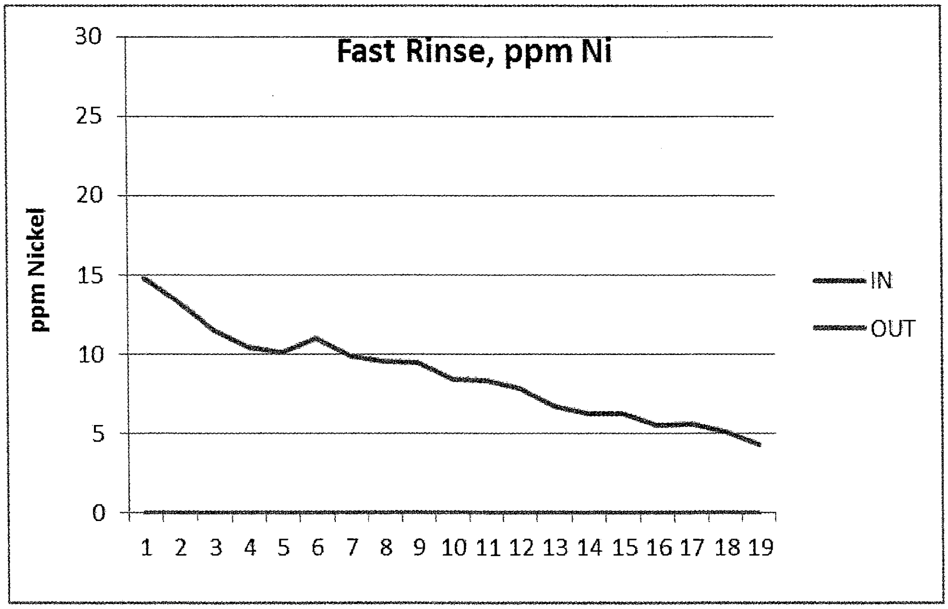


Figure 5: Used ion exchange resin treating material leaving the sorbitol process

In addition we have compiled results for soluble nickel in the refinery waste stream and see a75% reduction in soluble nickel due to better housekeeping and check filters for capturing waste catalyst.

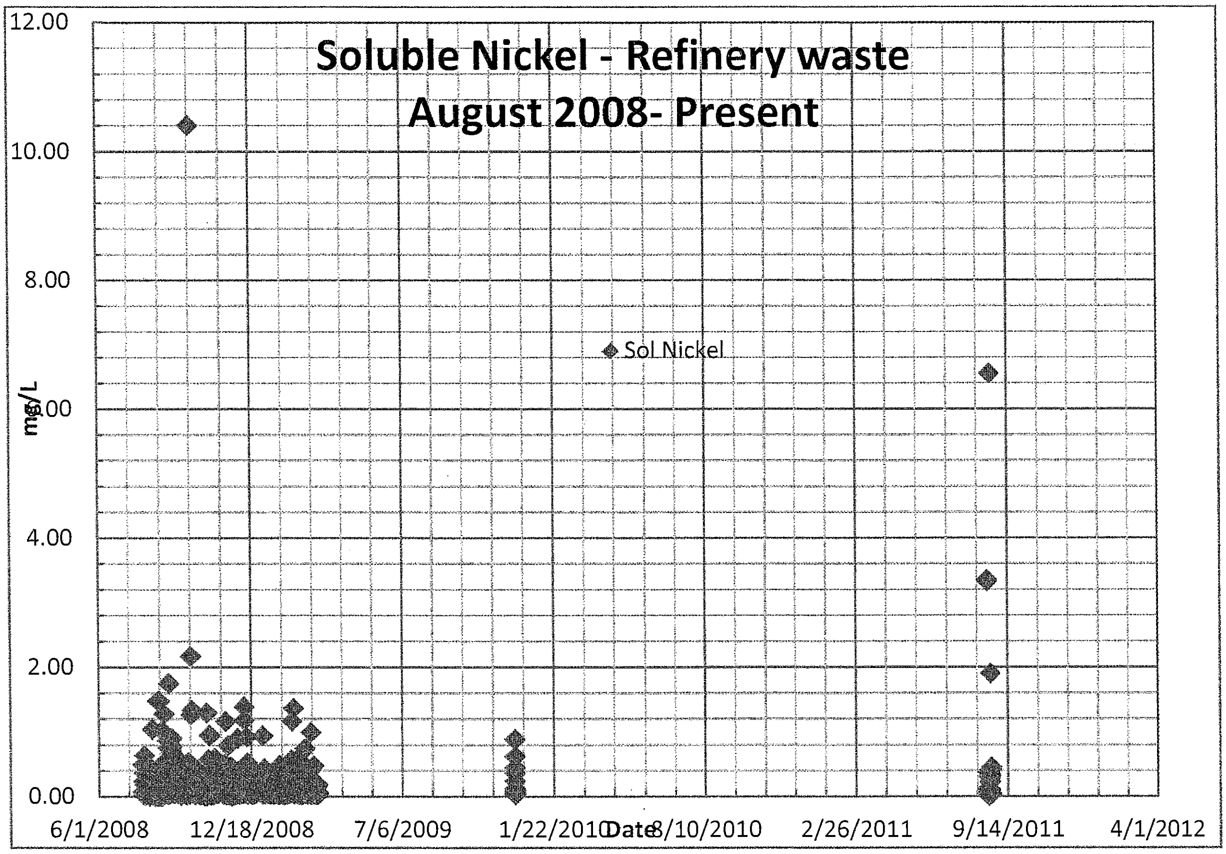


Figure 6 Soluble Nickel reduction on corn plant refinery waste

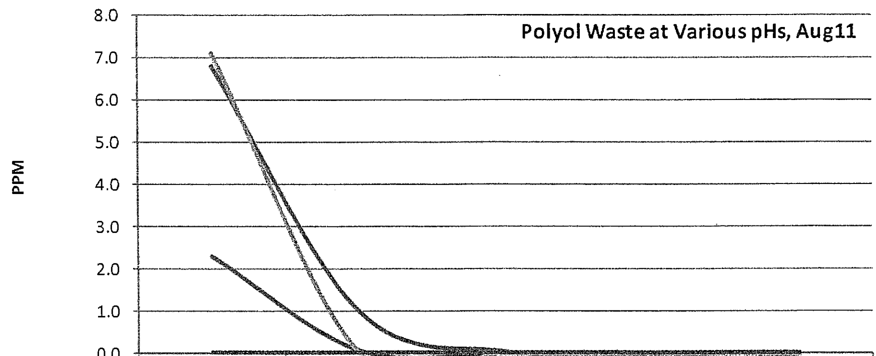
4 Review Ceased for Technologies

Since the 2011 update, we have ceased trials with polymeric DTC from Kroff 9011 and Hychem DP4. We continue to evaluate the options for scale and will be reporting as progress is made on the same.

5 Polyol waste stream treatment

We have identified our polyol ix waste stream (between 16-22% of total nickel load) as a significant contributor of inorganic nickel due to corrosion of our distillation columns. Initial work using high pH precipitation has shown almost a complete removal of soluble nickel.

Initial work suggests a pH modification would eliminate all soluble nickel from the IX regen streams with chemical costs about $300 per day.



	Polyol 8/12-15, 8/17 Comp As Is	Polyol Comp 9pH	Polyol Comp 10pH	Polyol Comp 11pH	Polyol Comp 12pH
Nickel	6.81	1.01	0.063	0.000	0.007
Chromium	2.31	0.083	0.025	0.006	0.014
Iron	7.10	0.034	0.012	0.000	0.014
Moly	0.052	0.049	0.047	0.047	0.052

Figure 7 Effect of pH on precipitation on Polyol ion exchange regeneration streams.

Table 5: High pH precipitation of Polyol ion exchange regeneration streams							
					Adjust to 10pH:		
2.5	%NaOH, w/w	Polyol Flows:	lbs / day		lbs 50% NaOH / day		$ / day
90	sample, ml	8/12/11	61,400		3,014		$301
10.45	g NaOH to 9pH	8/13/11	65,400		3,210		$321
10.6	g NaOH to 10pH	8/14/11	60,730		2,981		$298
10.8	g NaOH to 11pH	8/15/11	119,800		5,880		$588
16.4	g NaOH to 12.2pH	8/17/11	27,940		1,371		$137
$0.10	50% Caust / lb						
1.6	**Starting pH**						

The Process Development group at ADM BioProducts has investigated using gypsum (Table 7) as a filter media and seen nickel reductions over using a 0.1um Filter (Table 6).

Table 6: 0.1 micron Buchner Filtration of Polyol IX regeneration stream			
Sample (ppm)	Ni	Zn	
Waste Water Feed	860.32	3.76	
Waste water/NaOH solution	658.897	2.90	
Treated and filtered waste water	0.300	0.015	

Note: Feed was a composite of the discharge from the acid-in and slow rinse cycle in a proportion that is representative of the volume of water used in each cycle. Precipitate was passed through a Buchner filter with a 0.1um filter.

Table 7: Gypsum Filtration of Polyol IX regeneration stream			
Sample Name	Ni	Zn	
	mg/kg	mg/kg	
Waste water/NaOH solution	689.0	2.66	
Treated and filtered waste water	81.94	0.705	

Note: Feed was a composite of the discharge from the acid-in and slow rinse cycle in a proportion that is representative of the volume of water used in each cycle. Precipitated feed was fed to a Buchner funnel with $CaSO_4$ as filter media.

6 Appendix A Respirometer and Nitratox Testing

Results from Respirometer and Nitratox testing of Decatur Sanitary Districts MLSS using nickel reduction chemistries piloted at ADM.

Riverbend Laboratories performed respirometer and Nitratox testing of the four chemistries currently being testing using SDD's MLSS. The chemistries were dosed at ~20ppm and ~200ppm and diluted 50:50 with fresh DAF to simulate a scenario envisioned by the Decatur Sanitary District.

Toxicity Test ADM Decatur / ALAR Effluent (2) May 2012

Executive Summary:
The following are the results for the ADM Decatur ALAR Effluent for Anaerobic Toxicity

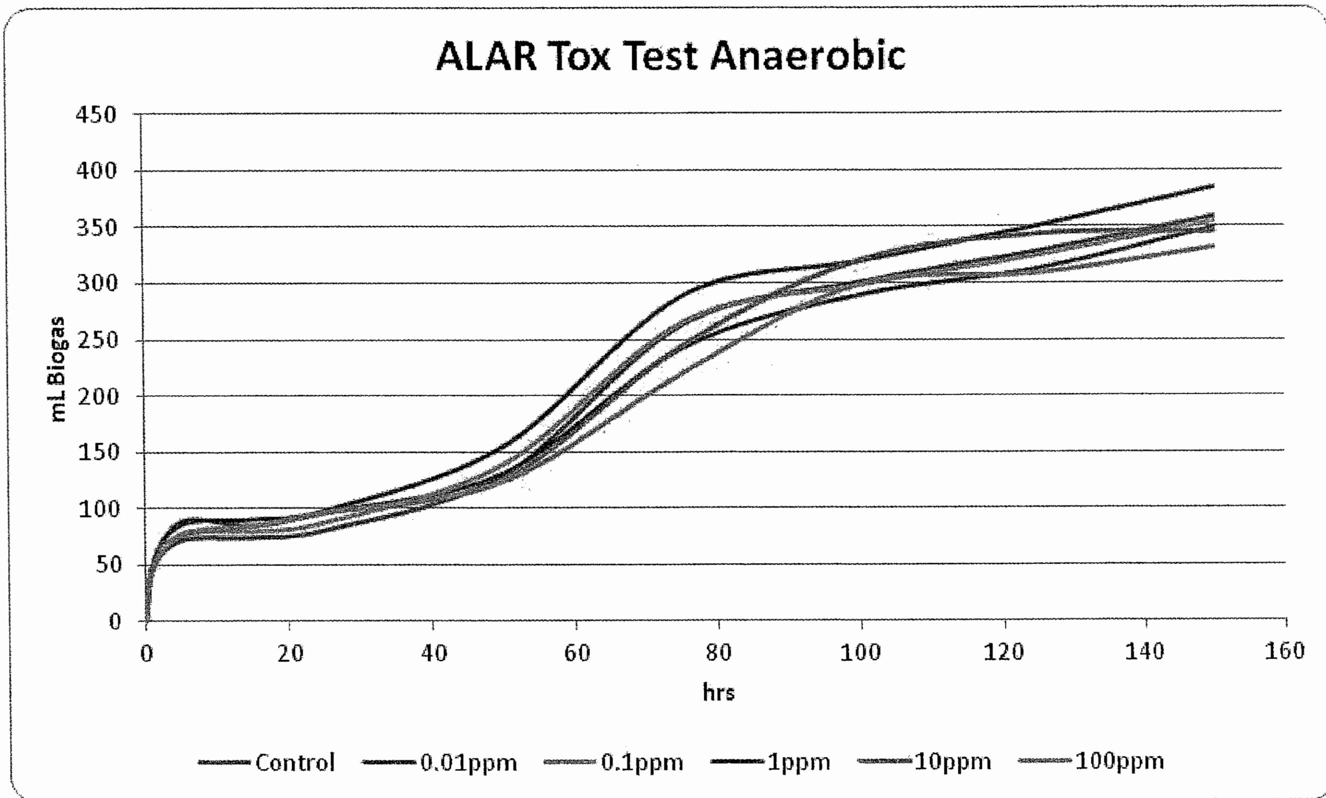
- **The testing showed no definite toxicity at all. There was no trend towards higher concentrations causing more toxicity. This material appears to be safe to use anaerobically.**

Method:
Respirometery measures the biogas generation in mL of the samples. Samples were 200 mL sludge. Each influent was adjusted independently then added to the biomass for each variable the bottles were run at 98deg F and biogas production was recorded. Each bottle had various concentrations of ALAR polymer (raw) added to anaerobic influent and an added concentration of MgOH that was then pH adjusted to 7.5.

- Control – Sludge and normal Influent
- 0.01 ppm – 0.01 ppm ALAR & Sludge and normal Influent
- 0.1 ppm – 0.1 ppm ALAR & Sludge and normal Influent
- 1 ppm – 1 ppm ALAR & Sludge and normal Influent
- 10 ppm - 10 ppm ALAR & Sludge and normal Influent
- 100 ppm - 100 ppm ALAR & Sludge and normal Influent

Results:

This testing showed that, with equally set up bottles, increasing the concentration of the ALAR chemical had no effect at all. The gas production varied across every concentration, but in general they all followed each other and there was not a statistical difference between the samples, nor a trend as concentrations increased.



ADM & City of Decatur / Respirometry Results (2) / 5/14/12

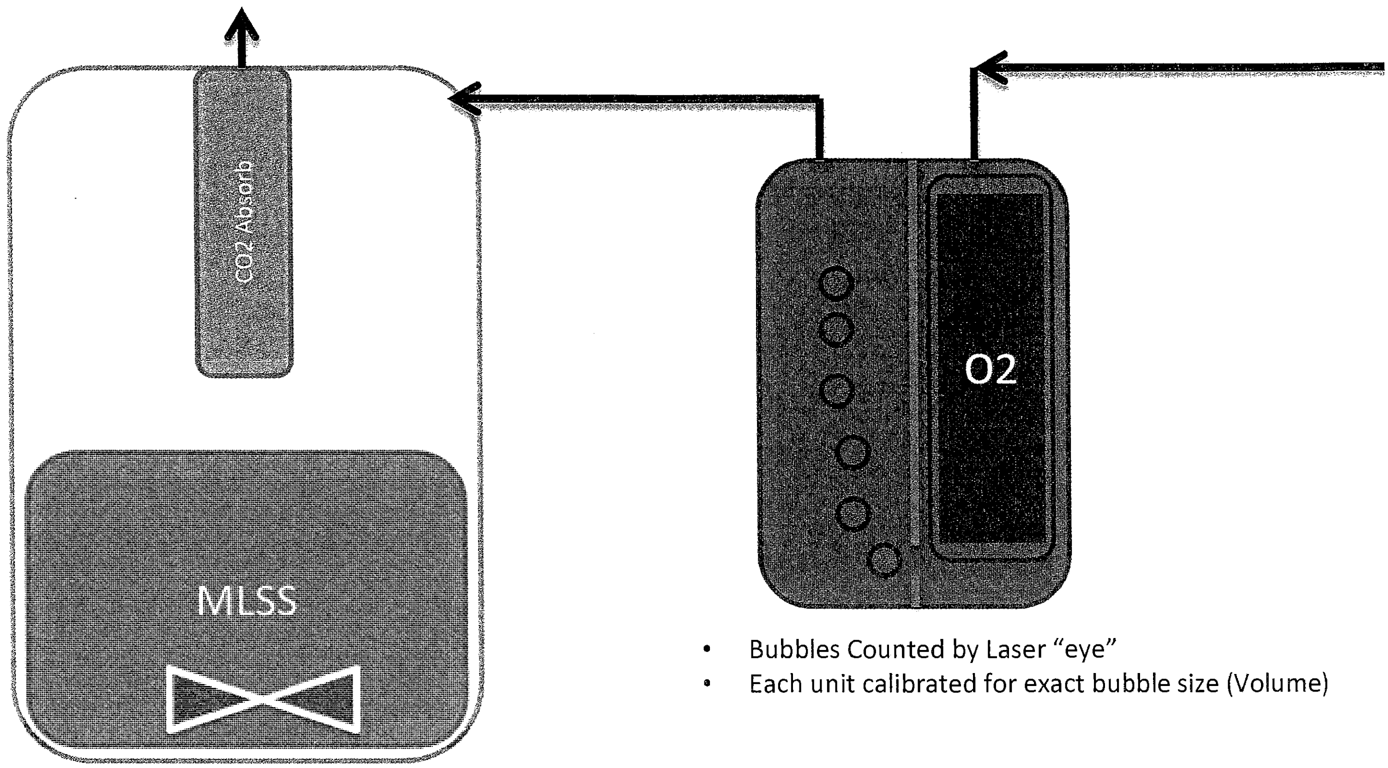
Executive Summary:

In all cases the chemistries showed no toxicity or inhibition. The lines were almost exactly the same.

I do not think any toxicity exists for this concentration of ALAR effluent.

Method:

The method involves setting up several identical bottles on a Challenge Respirometer in aerobic mode. The Challenge Respirometer accurately measures minute changes in oxygen uptake for the bacteria culture in question. This allows us to look at the total possible toxicity to the aeration bacteria (Aerobic Heterotrophs and Nitrifiers combined). By utilizing a control (normal conditions, we can establish a baseline oxygen uptake and then add various amounts of chemicals or suspect waste stream to be tested to see if there are any toxic (lower oxygen uptake) reactions with the biology. In this case all reactors were held at pH 7.5 (+/-0.2) and a temp of 80F (+/- 5.0)



- Bubbles Counted by Laser "eye"
- Each unit calibrated for exact bubble size (Volume)

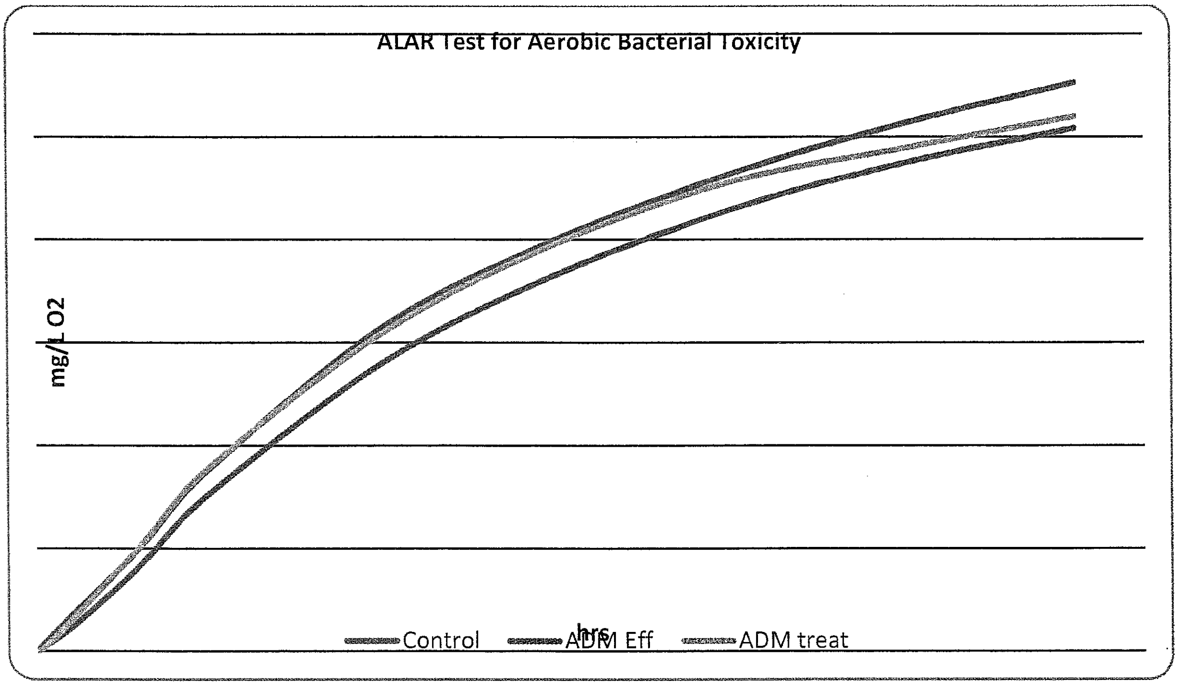
- Bottle in Bath to hold Temp to Field Conditions
- All Bottles same liquid level
- All Bottles Same rotation Speed

In this test we looked at the following.

- **Control** – 200 mL Mixed Liquor (city), 100mL City Influent
- **ADM** – 200 mL Mixed Liquor (city), 40mL City Influent, 60mL ADM Effluent
- **ADMALAR** – 200 mL Mixed Liquor (city), 40mL City Influent, 60mL ADM Effluent after ALAR treatment.

Results:

Every line matched the control almost exactly, or within statistical error. The slopes also correspond with no negative inflections or deviations. This material seems to not be toxic to Heterotrophic bacteria at the City of Decatur.



City Decatur / Nitratox Test Results / 5-10-12

Executive Summary:

We saw inhibition again in all samples containing City Influent. I included a graph of the last test as well as a good test from last year for comparison below.

Method:

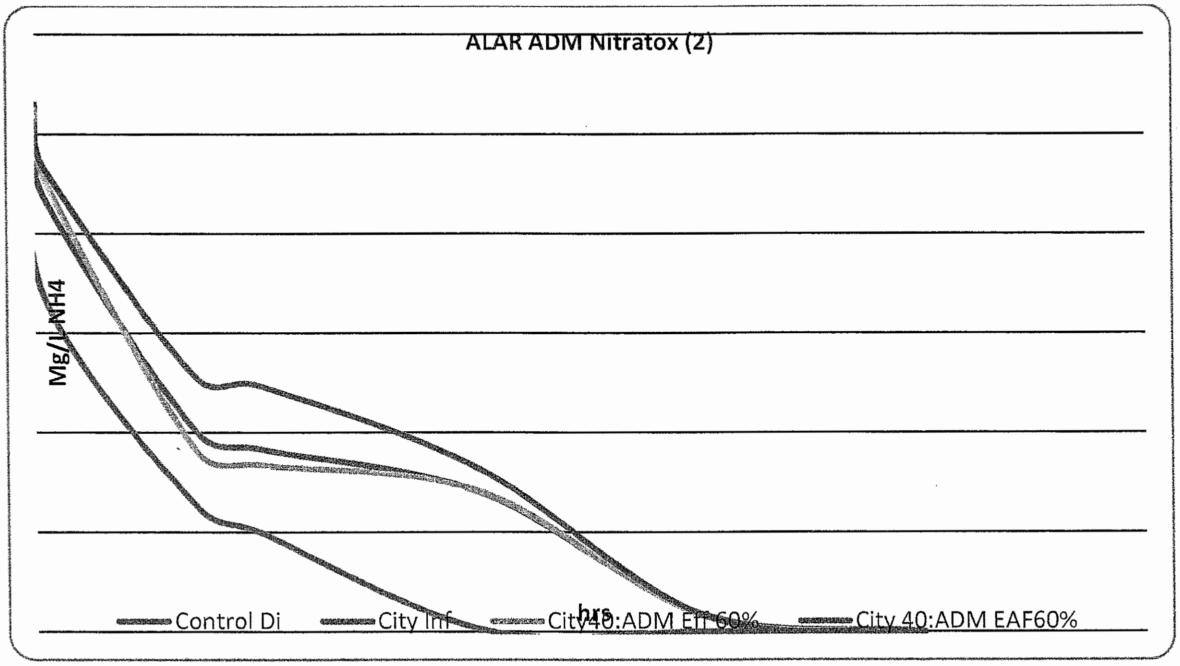
The general method involves setting up each test bottle with a specific volume of pure culture nitrifiers, DI water, and a then a specific concentration of NH4-N (in this case approx. 100 mg/L). Each bottle is aerated with exactly the same air flow through a diffuser. A control is maintained and then various concentrations of a suspect chemical or waste stream are added to each variable bottle. NH4-N is then measured throughout the test (1hr, 8 hrs. 24 hours, 48, hours, 72 hours). All reactors are buffered to 7.5 pH.

In this test we looked at the following.

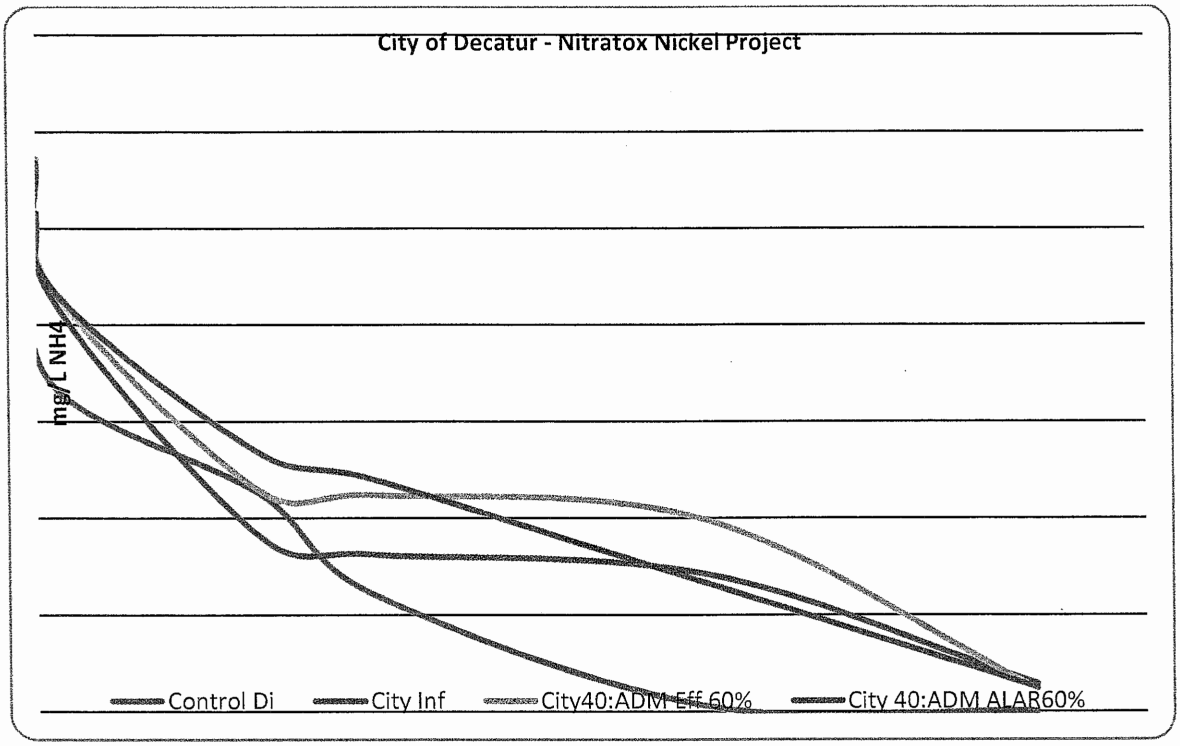
- **Control DI** – DI water, Nitrifiers, Ammonia (110 ppm)
- **City Inf** –Nitrifiers, Ammonia (110 ppm) 100% City Influent
- **City40: ADM Eff 60%** – Nitrifiers, Ammonia (110 ppm) 40% City Influent, 60% ADM Effluent.
- **City 40: ADM ALAR60%** - Nitrifiers, Ammonia (110 ppm) 40% City Influent, 60% ADM Effluent after ALAR treatment.

Results:
We saw some nitrification inhibition on all samples, but the DI water control. Again this points to something inhibiting on the city influent to nitrification. I have included 2 more graphs besides the normal one for this testing. The second graph is the testing from before.

Note the similarity in the curves for the last test and this test. It looks like moderate inhibition to the second step of nitrification, Nitrobacteria. Had the DI water sample responded the same I would have thought it a bad batch of our nitrifiers, but they handled the NH4 fine.



Last Test from last month below



Example of good test back on 10-11-11