A Long-Term Performance Review of Industrial Stormwater Active Treatment at Facilities Discharging to San Francisco Bay, Galveston Bay, Puget Sound, and Columbia River Watersheds

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Introduction

Stormwater treatment at industrial facilities can be especially challenging due to high levels of solids, metals, and oils present on many sites. These problems are further exacerbated by truck traffic which grinds up contaminants into smaller particles, significantly reducing the size of contaminants that get blended with stormwater during rain events. Industrial stormwater permits are administered both by the EPA and by individual state environmental authorities. Approximately 35 out of 50 states have permits strict enough to potentially require implementation of advanced stormwater treatment controls. Advanced stormwater treatment controls include controls above and beyond structural controls, ponds, and other settling/clarification methods. While there are common themes, many states end up developing slightly different permit variations – as appropriate to their own local ecology, historical contamination, and economic and social goals.

Picture 1. Industrial Facility Discharging to San Francisco Bay

Picture 2. Industrial Facility Discharging to Puget Sound

Picture 3. Industrial Facility Discharging to the Columbia River

Picture 4. Industrial Facility Discharging to Galveston Bay

Methods & Data

This poster presents findings from installations of advanced stormwater treatment systems at facilities discharging to San Francisco Bay, Galveston Bay, Puget Sound, and Columbia River watersheds installed between 2007 and 2015. This data set includes hundreds of water quality data points from full-scale operating facilities, including effluent data for: Total Suspended Solids (TSS), Turbidity, Oil & Grease, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Phosphorus, Polychlorinated Biphenyls (PCBs), Escherichia coli (E. coli), Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, and Zinc.

Data sets were collected from facilities in the following industries: metal recycling, ship building, wood treatment, metal processing, and marine services. All influent and effluent data points represent instantaneous grab samples. Most samples were collected during qualifying storm events.

Purpose

The purpose of this data set is to demonstrate average effluent water quality values being achieved today by various facilities across the country that have active stormwater treatment systems installed. This is a valuable data set for regulators, engineers, consultants, and end users who are attempting to assess what is technically achievable using best available technologies in the marketplace. Most stakeholders assert that the technologies must be technically proven, commercially available, and economically feasible relative to the size and nature of the end user's business.

Table 1. Effluent Water Quality Results from Active Treatment System Projects

Parameter	Units	n*	Median	Average
TSS	mg/L	194	11	16
Turbidity	NTU	128	2.3	10.6
Oil & Grease	mg/L	288	4.7	3.4
COD	mg/L	20	42	88
BOD	mg/L	24	7	12
Phosphorus	mg/L	22	0.042	0.048
Total PCBs	mg/L	105	0.000037	0.013
E. Coli	#/100mL	22	23	33
Aluminum	mg/L	35	0.31	0.68
Arsenic	mg/L	81	0.012	0.016
Cadmium	mg/L	12	0.001	0.0007
Chromium	mg/L	90	0.0074	0.0096
Copper	mg/L	277	0.019	0.037
Iron	mg/L	35	0.67	0.90
Lead	mg/L	172	0.0056	0.020
Zinc	mg/L	302	0.041	0.130

**n=Total number of third-party data points collected at full-scale operations*

Results Analysis

This data set is not intended to represent the expected performance of a specific technology or group of technologies. Facilities represented in the data set have widely varying influent water quality and effluent goals. Treatment systems are purpose-built to achieve site-specific goals. Individuals should compare results from similar facilities with similar pollutant loadings whenever possible.

Case Study: Scrap Metal Recycling

The below data shown in Chart 1 showcases stormwater influent and effluent data for a scrap metal recycler that operates a treatment system equipped with pH adjustment (utilized for optimizing metals solubility), electrocoagulation (utilized to coagulate particulates and heavy metals), clarification (utilized to settle coagulated flocs), media filtration (utilized to filter residual flocs), and carbon filtration (utilized to reduce COD).

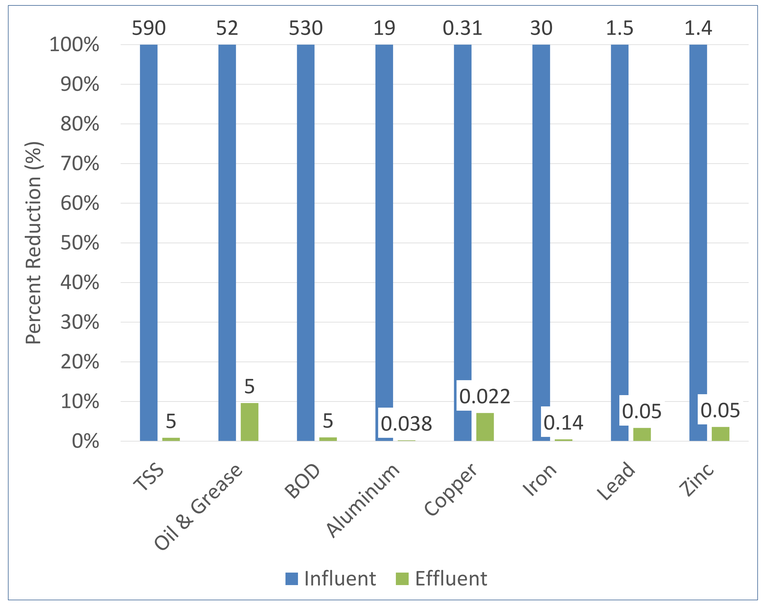

Chart 1. Performance Data from a Scrap Metal Recycling Facility

Picture 5. Water Quality at Various Phases of an Active Treatment Process

Conclusions

Industrial stormwater treatment projects are complex in nature and often involve significant technical, commercial, and legal risk for end users. Selection and installation of effective treatment systems can be improved by comprehensively reviewing historical & site data, conducting bench-scale treatability studies, utilizing PSD (Particle Size Distribution) analysis, and analyzing for total and dissolved metals. Active treatment systems have been shown to be effective in multiple states across a wide range of industries as demonstrated by the data presented in this poster.

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