TAKE IT OFF! – ODOR STRIPPING SOLVES ODOR ISSUES IN RED DEER'S COLLECTION SYSTEM

Stantec

Presenter: Michael Headd, PE Date: Januarý 26, 2016

Agenda South Red Deer Regional Wastewater System **2** Background – How we Got Where we Got **3** Goals, Objectives and Constraints **4** Treatment Methodology and Results **5** The Dark Days Conclusion



South Red Deer Regional Wastewater System (SRDRWS)

- Four pump stations in series
- Total distance is approx.
 55 miles
- Design System flows:
 - 2.6 MGD (2015)
 - 12.35 MGD(2035)
- Breaks to gravity, crosses under the Red Deer River and enters the CRD WWTP



Innisfail LS

Bowden LS

Dian

2A

Bowden

Olds LS

Olds

Mayton

What to Expect?...

Sulfide Model to Predict Sulfide Generation

- Proprietary model based on known equations
 - Subroutines for sulfide stripping
- Set up based on actual wastewater conditions

Scenario	Wastewater Flow (MGD)	Wastewater Temperature (°C)	BOD (mg/l)	рН	Predicted Sulfide Concentration (mg/l)
Cool Weather	2.6	11	198	7.8	27.5
Warm Weather	2.6	18	243	7.8	53.5

Typical background Sulfide concentrations ~ 1-3 mg/l



OK, So What Now?

Needed to Understand Project Constraints

- Little to no impact on the operation of the WWTP i.e. background concentrations for;
 - Odors No Sulfide;
 - DO;
 - Nitrate
- Minimize negative public perception and maximize aesthetics
- Minimize impact on future developed area



The Right Method?

- No chemical addition.
 - Cost prohibitive;
 - Iron would interfere with UV;
 - Adding nitrate interfere with nitrification (and wouldn't work anyway);
- Can't rely on natural odor stripping not forceful enough
 - Not enough sulfide removed
- Need to 'strip' off the odor compounds from the liquid stream



Sulfide Stripping



- Sulfide Stripping Chamber with serpentine flow arrangement
- Course bubble diffusers to strip off the sulfides
- Dissolved oxygen monitor
- >90% dissolved sulfide removal from the liquid phase
 - This would translate to ~250-300 ppm H_2 S on average...



How do we Treat the Odor?...

- 250-300 ppm Average H₂S Concentrations
 - Peaks over 450 ppm
- Two-Stage Biological Vapor Phase Odor Control System
 - Stage 1: Inorganic media biofilter
 - Stage 2: Organic media biofilter
- Combine with the Stripping Chamber to Create the South Red Deer Odor Management Facility



SRD Odor Management Facility

- Two (2) 1,950 cfm Air Stripping Blowers (full redundancy)
- Two (2) 4,600 cfm FRP Exhaust Fans (full redundancy)
- City of Red Deer regional line bypass



HDPE **Baffle Curtains** help provide a meandering flow through the stripping chamber which provides increased DO contact time and diffuser efficiency





Course Bubble Diffusers are used to strip dissolved sulfide from wastewater



HDPE Liner was used to prevent corrosion of concrete surfaces





 HDPE Liner was used for OMF Stripping Chamber and East Entrance Chamber



Inorganic Biofilter (Vapor Phase) – 1st Stage

- Initial stage of vapor (air) treatment
- Sized for Media Contact Time (EBRT) of 30 seconds
- Designed to treat an average of 250 ppm of H₂S at 95% removal efficiency as an H₂S roughing filter



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Organic Biofilter (Vapor Phase) – 2nd Stage

- Second and final stage of vapor (air) treatment
- Sized for an Empty Bed Contact Time (EBCT) of 60 seconds
- Designed to polish the remaining H₂S while also removing VOC's and other additional odor compounds in the foul air stream





Organic Biofilter Progression

 Smoke test for each stage of installation to test for short circuiting

Media



Inorganic Biofilter Media

- Expanded clay with nutrient coating
- Sizing between 0.25 1 in.



Organic Biofilter Media

- Blend of wood chips and composted yard waste
- Sizing between 2 6 in



Drip and Spray Irrigation used for both organic and inorganic biofilters

- Need to keep media moist to keep the bacteria alive
- Irrigation washes biofilm from the media







Results?...



- >99% odor removal;
- No Impact on WWTP operations



And Then This Happened...



- Reduced airflow
- Reduced treatment
- Odor complaints...



The Perfect Storm

- Operators changed operation procedures at all pump stations to maximize pump cycles;
 - Increased residence time in the pipe
 - Accounted for the increase in hydrogen sulfide
- The Irrigation sequence/timing was not changed to account for the increase in loading
 - Not washing/sloughing off the accumulated biomass
- Short-circuiting and admitting outside air into the process (ambient temperature -20°F) which impacted the biology
 - Faulty check valve on a makeup air gooseneck;
 - CRD 108-inch gravity pipe fitted with grated MH cover just upstream of the OMF



Back to Normal



- >99% odor removal;
- No Impact on WWTP operations



SCADA Monitoring and Reporting

Supervisory Control and Data Acquisition Records and Reporting (SCADARR) provides remote operation and monitoring of the SRD system via a secure web based site.

	Odour Manageme	ent Facility 15-47-22 15:54
GIORAL WARTENATER COMMITTEER	Alarms Trends Temp B Set	tings Building Home
		TO ATMOSPH
PSV CHAMBER	INORGANIC BIOFILTER	ORGANIC BIOFILTER
PIT-102 PIT-101	Cell #1 Moisture Cell #2 Moisture	Incoming H25 Discharge H25
PIT-104	39.88 % 27.38 %	15.2 ppm 0.1 ppm
421 kPa 15	21 1	EF-301
		REM. AUTO 57.7 h
BL-201 REM. AUTO Dissol	ved Oxygen	
	9 mg/L	-1 0
LAG 57	6.4 ppm 0.84 m	PIT-301 (kPa) PIT-303 (kPa)
41 % REAL AUTO STRIP	ING CHWER EAST ENTRANCE	TIT-301 (*C)
3.1 h Slower P	TO WWTP	EF-302
LEAD		REM AUTO 148.5 h
REM. AUTO 157.5 h REM. AU	np Pump P-401	
PIT-501 (kPa)		PIT-302 (kPa) LEAD PIT-304 (kPa)
655		20.1
		TIT-302 (*C)





QUESTIONS?



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