Case Study: Odor Control Evaluation and Corrective Action at the Stamford WPCF

> How Successful Partnering Resulted in Benefits for SWPCA Ratepayers

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The Problem: Pervasive Odors make WPCF a Bad Neighbor

- The WPCF was plagued by nearly constant and pervasive odors
- WPCF surrounded by development with residential neighborhoods close by
- Odor complaints from residents and businesses created much bad press focused on the SWPCA
- Complaints from public and City-elected representatives were mounting

#### SWCPA Plant and Environs



### Bad Press

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### Local News

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### WPCA working to clear the air

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The Internal Investigation

- Mayor Michael Pavia appointed two new board members with wastewater treatment and odor control experience
- An internal investigative committee was formed to determine the source of the problem



 Board of directors and plant management made reduction of odors a priority

# SWPCA's Odor Control Systems

Four wet scrubber systems:

- Headworks
- Primaries / Gravity Thickeners
- Solids Processing Building (SPB)



- BFP dewatering of primary and secondary sludge
- SPB Drying
- Sludge Drying/Pelletizing Facility:
  - RTO: Regenerative Thermal Oxidizer
    - RTO Bypass

# Results of the Internal Investigation: Sludge Pelletizing OCS

- During normal operation, the sludge dryer was ventilated directly to atmosphere twice a day – RTO Bypass
- This blanketed the plant and surrounding area with a "burnt hair" odor
- Source most directly linked to odor complaints

## RTO Bypass Discharges at Ground Level



#### Results of the Internal Investigation: Wet Scrubbers

- None of the wet scrubbing features were operational – units operated dry for ventilation only
- Wet scrubbing features had been run only for acceptance testing
- Pipes were leaking / broken and heattrace/insulation damaged
- Chemical pump and control system problems
- Chemical lines clogged
- Particulate in packing pelletizing facility

#### Wet Scrubbers



#### Packed-Bed Scrubbers

![](_page_10_Picture_1.jpeg)

#### Staff Immediately Began Remediation

- SWPCA staff began repairs immediately after the committee report was issued
- The primary / GT OCS was placed into service quickly
- Sludge dryer OCS was cleaned and placed into operation
- Excessive misting and frothing was noted
- Further, in-depth evaluation was deemed appropriate

![](_page_11_Picture_6.jpeg)

# Plant Odors Were Significantly Reduced in a Short Time

- By simply remediating the existing odor control systems and making some small adjustments, odors were markedly reduced
- There were still odors being occasionally emitted from the plant
- Odor complaints from the public were significantly reduced
- SWPCA's press coverage was also reduced considerably

Professional Evaluation Was Required to Complete the Task

- The board of directors and plant management elected to retain a consultant to perform in-depth evaluations of all systems
- Wright-Pierce was selected as SWPCA's consultant for this task.
- Wright Pierce proposed a comprehensive program of inspection and evaluation
- This effort resulted in additional system improvements and further reductions in odor emissions

#### Part 2: Wright Pierce Evaluation

- Packed-bed scrubber issues
  - high mist carry over
  - pH/ORP control issues
  - chemical pump failures
  - cleaning of packing
  - piping system leaks
- RTO bypass
- Additional odor sources
- Dispersion modeling

![](_page_14_Figure_10.jpeg)

# 2005 WWTF Upgrade

Scrubbers	Flowrate, cfm	Design H2S, ppm
Headworks	2,750	200
Primary / GT	14,000 / 25,000	200
SPB – Dewatering	25,000	100

- Three, 2-stage systems w/ 10' deep packing in each stage
- Primary / GT initially launder covers on primaries with future capacity for full covers on primaries

![](_page_15_Picture_4.jpeg)

![](_page_15_Picture_5.jpeg)

## 2007 Drying/Pelletizing Facility

- SPB Dewatering modified by converting second stage to separate system for drying area exhaust
- SPB Drying 25,000 cfm
  - □ drying area 10,500 cfm
  - add'l dewatering area in warm weather – 14,500 cfm
- RTO for dryer exhaust
  - Bypass during start-up / shutdown cycle

![](_page_16_Picture_7.jpeg)

![](_page_16_Picture_8.jpeg)

#### Additional Odor Sources

![](_page_17_Picture_1.jpeg)

#### Odor Sources – Screening Level Modeling

Source	Flowrate, cfm	Discharge Elevation, ft <sup>b</sup>	Uncontrolled Odor Concentration, Dilutions to Threshold	Treated Odor Concentration, Dilutions to Threshold
Primary / GT Scrubber	14,000	55.5	>12,300ª	100-200
SPB – Dewatering Scrubber	25,000	48.5	>4,700 <sup>a</sup>	100-200
SPB – Drying Scrubber	10,500 / 25,000	48.5	>100ª	100-200
Headworks Scrubber	2,750	35.5	>3,000ª	100-200
Dryer – RTO Discharge	3,200	74.4	11,400 <sup>b</sup>	500-700 <sup>b</sup>
Dryer - RTO Bypass	3,200	~20	11,400 <sup>b</sup>	100
Pellet Silo Baghouse	1,600	~37	300	300

a. Scrubber concentrations based on late Oct. 2010 H2S data

b. RTO data based on OS&E testing in Feb. 2011

# Dispersion Modeling

- Uncontrolled scrubber and RTO sources all have the potential for off-site odor impacts.
- Treated scrubber emissions levels should not cause offsite odor impacts
- RTO discharge and pellet silo baghouse should not cause off-site odor impacts

![](_page_19_Figure_4.jpeg)

#### Wet Scrubbers – High Mist Carry Over

Mist carry over - key issue for staff

- safety and impact on parked automobiles
- 2010 Manufacturer evaluation of issues to get scrubbers operating
  - Revise make-up water
  - Modify blowdown piping
  - Replace isolation dampers
- 2011 City moved forward with first 2 recommendations at cost of \$156,000
- Misting problem was not fixed

![](_page_20_Figure_9.jpeg)

#### Wet Scrubbers – High Mist Carry Over

- Potential causes of high mist carry over:
  - Nozzle type distribution system
  - Excessive recirculation flow rate / pressure
    - High pressure = smaller droplet size easier to convey in air flow
    - Pump system head analysis indicated high pressure
    - Recommended installing pressure gauges and throttling recirculation pumps as necessary
  - Excessive air flow rate:
    - Higher face velocity = convey larger particles in flow
    - Air flow pressure drop analysis indicated high flow
    - Recommended air flow rate testing and adjustment as necessary

![](_page_21_Picture_11.jpeg)

![](_page_21_Picture_12.jpeg)

# Packed Bed Scrubber - Testing

	Design Flow	Actual Flow	Actual Pressure
Location	(cfm)	(cfm)	(In. of H2O)
SPB - Dewatering Scrubber	25,000	37,000	5.40
SPB - Drying Scrubber - Low Speed	10,500	29,600	4.50
Primary / GT Scrubber (Loc. 1)	14,000	21,800	5.40
Primary / GT Scrubber (Loc. 2)	14,000	28,000	5.04
Headworks Scrubber	2,750	4,500	12.80

## Packed Bed Scrubber

- Reduced air flow rates to design criteria
  - New fan sheaves or adjust VFD
- Throttled pumps to achieve intended pressure / flow rate at nozzle

Increased average water droplet size

Mist carry over was eliminated

![](_page_23_Figure_6.jpeg)

# Packed Bed Scrubber

#### Throttling of recirculation pumps:

- also addressed key issue with pH and ORP sensor performance
- has been "finicky" City moved forward with pump replacement
  - reduced pump size power savings
  - magnetically-driven to eliminate pump seal issues
- Other Staff projects:
  - New hypochlorite feed pumps
    - Restored hypochlorite feed

![](_page_24_Picture_9.jpeg)

# RTO Bypass

- Intermittent operation
- 3,200 cfm
- Carbon canister was installed on the bypass discharge
- Norit carbons a VOC carbon followed by Darco H2S that can handle high humidity

![](_page_25_Picture_5.jpeg)

# Additional Odor Sources

![](_page_26_Figure_1.jpeg)

#### Planned improvements

- Headworks / Raw Influent P.S. upgrade
  - enclose septage receiving
  - potentially convert to activated carbon to simplify operation
- New garage for grit / screenings trailer w/ activated carbon
- New pumps for caustic addition to scrubbers
- Move pH and ORP sensors to scrubber sumps

# A Successful Partnership

- Through the partnership between SWPCA and Wright-Pierce, a significant improvement in overall odor control and mitigation was achieved
- There have been no pervasive odors in the surrounding neighborhoods
- Odor complaints are rare
- Instead of complaints, SWPCA is complimented for the improvement in odor control

![](_page_28_Picture_5.jpeg)

# Questions?

![](_page_29_Picture_1.jpeg)

# Thank you

- For more Information, please contact:
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