

# SULFUR and COLLECTION SYSTEMS: A COMMON BUT OVERLOOKED CHALLENGE

Wisconsin Wastewater Operators Association  
2015 Annual Conference

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## OVERVIEW

- BACKGROUND
- CHALLENGES
- STRATEGIC SOLUTIONS

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# OVERVIEW

- **BACKGROUND**
  - SULFUR
  - CASE STUDY EXAMPLES
- **CHALLENGES**
  - SOURCES
  - FACTORS and RELATIONSHIPS
  - BIO / CHEMISTRY
  - EFFECTS
- **STRATEGIC SOLUTIONS**
  - SOURCE PREVENTION
  - PRETREATMENT
  - MITIGATION
  - REHABILITATION and REPAIR

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# BACKGROUND

- **SULFUR**
  - REQUIRED for WASTEWATER PROTEIN SYNTHESIS
- **CASE STUDY EXAMPLES**
  - ADELL
  - CASCADE
  - HEART of the VALLEY METROPOLITAN SEWERAGE DISTRICT

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# CHALLENGES

- SOURCES
- FACTORS and RELATIONSHIPS
- BIO / CHEMISTRY
- EFFECTS / CONCERNS

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# CHALLENGES

- **SOURCES**
  - GROUNDWATER
  - INDUSTRIAL SULFUR BASED ACIDS
  - $\text{SO}_4^{2-}$  SULFATE ION
- **FACTORS and RELATIONSHIPS**
  - CONCENTRATION
  - DIURNAL FLOWS
  - TURBULENCE → ++ $\text{O}_2$  →  $\text{H}_2\text{S}$  ↑
  - pH ↓ for BACTERIA

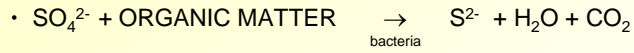


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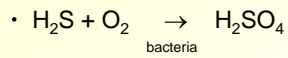
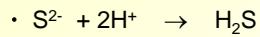
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# CHALLENGES

## • Bio / CHEMISTRY

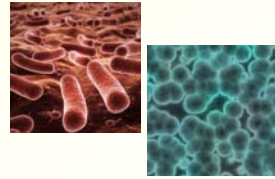


ANAEROBIC BIOLOGIC REDUCTION



AEROBIC BIOLOGIC OXIDATION

Thiobacillus thiooxidans (concretivorous) - Latin for "concrete-eating"  
common sulfur-oxidizing bacteria



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# CHALLENGES

## • EFFECTS / CONCERNS

- **H<sub>2</sub>S**
  - HAZMAT / SAFETY
  - ODOR f<sup>n</sup> (H<sub>2</sub>S + IRON)
  - GAS is CORROSIVE
  - BURNED GAS CAN DAMAGE EQUIPMENT
  - HEAVIER than AIR GAS
  - RELATIONSHIP to DIURNAL FLOW CYCLE



- **S<sup>2-</sup> SULFIDES**
  - > 200 ppm CAN AFFECT DIGESTOR BIOLOGY

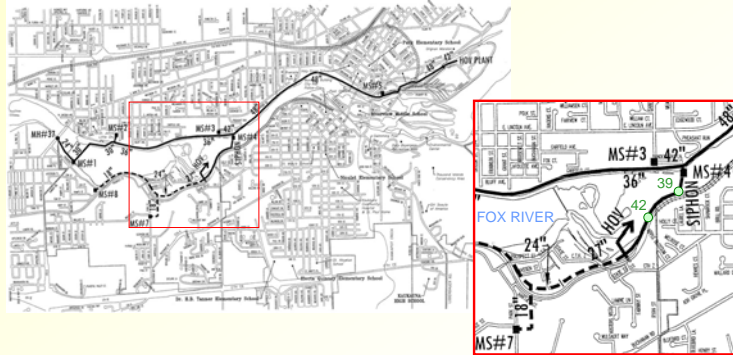
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# CHALLENGES

- **EFFECTS / CONCERNS**

- $H_2SO_4$  f<sup>n</sup> (MICROBIAALLY INDUCED CORROSION - MIC)
- LOW but PERSISTENT CONCENTRATIONS
- CORRODES METALS, MASONRY, CONCRETE



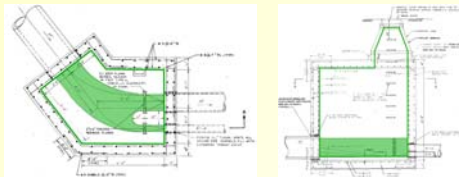
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# CHALLENGES

- **EFFECTS / CONCERNS**

- $H_2SO_4$  and MIC



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# CHALLENGES

- **EFFECTS / CONCERNS**
  - $H_2SO_4$  and MIC



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# STRATEGIC SOLUTIONS

- SOURCE PREVENTION
- PRETREATMENT
- MITIGATION
- REHABILITATION and REPAIR

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# STRATEGIC SOLUTIONS

- **SOURCE PREVENTION**
  - MONITOR and INVENTORY SOURCES
  - INDUSTRIAL USE of SULFUR ACIDS
- **PRETREATMENT**
  - SOURCE REDUCTION
  - POTABLE WATER SYSTEMS

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# STRATEGIC SOLUTIONS

- **MITIGATION**
  - **VENTING** (REMOVE "FOOD" SOURCE)
  - **ODOR / REMOVAL**
    - PRIMARILY H<sub>2</sub>S, REDUCED SULFUR and NITROGEN BASED



- TYPICALLY NOT CONVENTIONAL CARBON BASED FILTERS

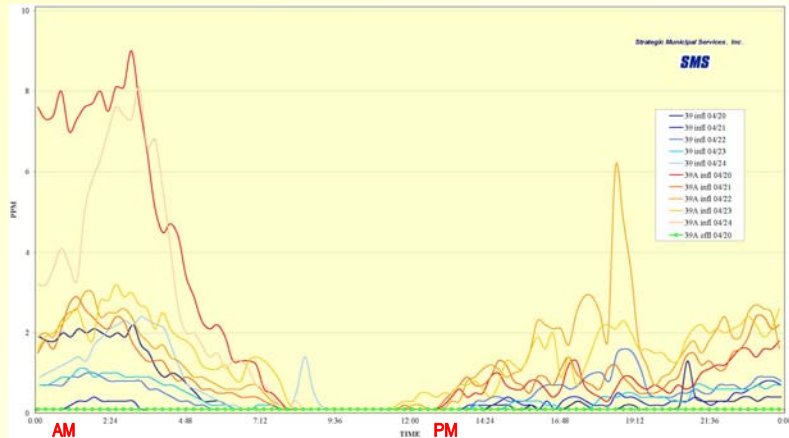
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# STRATEGIC SOLUTIONS

- **MITIGATION**
  - **VENTING and ODOR CONTROL**



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# STRATEGIC SOLUTIONS

- **MITIGATION**
  - **NEW CONSTRUCTION**
    - CRYSTALLINE TECHNOLOGIES
      - e.g. CONSHIELD, XYPEX
    - COATING SYSTEMS
      - EPOXIES
      - CALCIUM ALUMINATE CEMENTS
        - e.g. APS PERMAFORM, RAVEN
    - AVOID TURBULENT FLOW / DROPS / TRANSITIONS



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# STRATEGIC SOLUTIONS

- **REHABILITATION, REPAIR and REPLACEMENT**

- LINERS - PIPE and STRUCTURES
- CRYSTALLINE TECHNOLOGIES
  - eg. CONSHIELD, XYPEX
- COATING SYSTEMS



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# STRATEGIC SOLUTIONS

- **REHABILITATION, REPAIR and REPLACEMENT**

- QUALITY CONTROL – STANDARD TESTS
- CORROSION RESISTANCE
- ADHESION
- UNIFORM and COMPLETE COATING



- "TIPS"
- NOT POLY-UREA / MOISTURE SENSITIVE SYSTEMS

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