CONNECTING THE DOTS

UNINTENDED IMPACTS OF WATER CONSERVATION ON WASTEWATER CONVEYANCE, TREATMENT, REUSE AND ORGANIZATIONS

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NO GOOD DEED GOES UNPUNISHED

WATER CONSERVATION IMPACTS:
• wastewater conveyance
• treatment
• reclamation
• economy
• and behavior of organizations
AGGRESSIVE WATER CONSERVATION IS CHALLENGING...

INFRASTRUCTURE INTEGRITY ▼
• conditions of sewage conveyance, reliability and economy of treatment

DELIVERY OF SERVICES ▼
• more difficulty meeting stringent discharge requirements and reuse water quality needs
OUR INDUSTRY NEEDS...

NEW DESIGN APPROACHES ▲
• integrate more efficient technologies,
  more efficiently

A LEARNING CULTURE ▲
• increased attention to the changes, and
  a willingness to change
Yesterday’s designs are stressed by today’s changing conditions. Equipment is strained under a new paradigm. Increasing pressure in planning for tomorrow’s challenges.
STRESS ON RESOURCE MANAGEMENT

Yesterday’s designs are STRESSED by today’s changing conditions

- Change in source water and influent quality
- Increased demand for energy & chemicals
- Increased energy density – kWh per MGD
- Decreased energy potential – premature digestion and lower gas production
- Challenges operations knowledge and capabilities
- Increased labor attention – process & maintenance
- Increased process monitoring
- Increased laboratory support
STRAIN ON RELIABILITY

- Asset performance, availability and reliability
- Increased wear and tear on equipment
- Loss of redundancy
- Overload equipment design capacity
- Increased rate of failure
- Reduced expected life
- Increased replacement rate
- Increased labor burden – reactive vs. predictive
- Reduced quality and quantity of reuse water

Equipment is STRAINED under a new paradigm
PRESSURE ON INFRASTRUCTURE AND ORGANIZATIONAL PLANNING

PRESSURE to plan for tomorrow’s challenges

- Loss of infrastructure integrity
- Increased community impacts – odor and rates
- Loss of treatment capacity and function
- Change in organizational pressure and culture
- Change in CIP schedule
- Increased engineering load
- Shift in financial plan and resource demand
- Loss of co-gen output
- Increase in energy purchase

PRESSURE
THE WAY IT WAS

FLOW

BOD

NEW SERVICES

AMMONIA
IMPACT OF WATER CONSERVATION

FLOW

NEW SERVICES
EXPECTED CHANGE IN DILUTION

FLOW

BOD

AMMONIA
ACTUAL CHANGE IN COLLECTION SYSTEM BIOLOGY

FLOW

AMMONIA
SOLUBLE BOD
PARTICULATE BOD
BOD
Energy Density = \( \frac{\text{KWH}}{\text{MGD}} \)
CHANGING CONDITIONS REQUIRES AWARENESS & MANAGEMENT OF CHANGE

- COMPLIANCE
- ENERGY
- FAILURES
- TECHNOLOGIES
- DESIGN STANDARDS
WANTED – SITUATIONAL AWARENESS

NEW TECHNOLOGIES ▲

BETTER INFORMATION ▲

SUPPORT FOR NEW STRATEGIES ▲
RELIABILITY IN UNCERTAIN TIMES

MAINTENANCE AND OPERATIONS ▲

- optimize based on new conditions
- take advantage of change to make changes
- anticipate changing concentration loads and hydraulic conditions
- changes design & type of equipment/processes
ASSESSING CONDITIONS

KNOWING HOW AND WHY ENERGY AND PROCESS OBJECTIVES ARE CONNECTED

- What needs to be done? - Functional analysis
- What are we doing now? - Condition assessment
- Can it be done better? - Gap analysis
- Risk and consequence of failure? - Risk assessment and CoFA
CASE STUDY: WWTP #1

OPPORTUNITIES

MODIFIED COLLECTION SYSTEM MANAGEMENT PLAN

- chemical & biological mitigation

HEADWORKS AND PRIMARY SULFIDE CONTROL

MODIFIED BNR PROCESS STRATEGY

- ammonia-based blower & mlr control
- simultaneous nitrification/denitrification
- sequenced large bubble mixing
CASE STUDY: WWTP #1

APPROACH

- root cause analysis
- process operation strategies to meet current conditions
- chemical use optimization to reduce costs
- energy optimization to reduce costs
- reliability centered maintenance to improve asset performance
CASE STUDY: WWTP #1

LESSONS LEARNED

• use current data
• analyze data trends
• design for future conditions
• upgrade awareness of modern technologies
• focus on monitoring and control
• use on-going condition assessment for decision support
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