WASTEWATER BEST PRACTICES

IMPROVING WASTEWATER SYSTEMS

2018 NAMI ENVIRONMENTAL CONFERENCE
TYPICAL BEST PRACTICES

• O & M MANUAL
  • DESIGN CRITERIA – BACKGROUND - TREATMENT PROCESSES – TYPICAL LOADING RATES FOR EACH PROCESS
  • EQUIPMENT LIST – CRITICAL EQUIPMENT & SPARE PARTS LIST
  • SAMPLING/MONITORING PLAN & QC FOR TESTING – WHO, WHAT, WHERE, WHEN, & HOW
    • TYPICAL/IDEAL RANGES FOR EACH TEST
    • PERMIT REQUIREMENTS
  • OPERATIONAL STRATEGY – HOW TO ACHIEVE DESIRED RESULTS & ADJUSTMENTS
  • NOTIFICATIONS – NON-COMPLIANCE/SPILLS/LEAKS/BY-PASS/DEVIATIONS FROM SAMPLING PLAN
  • PREVENTATIVE MAINTENANCE
  • TROUBLESHOOTING
  • UPDATE- LIVING DOCUMENT – SYSTEM CHANGES/ADDITIONS, OPERATIONAL STRATEGIES
TYPICAL BEST PRACTICES

• OPERATOR TRAINING
  • MAINTENANCE, TESTING/MONITORING, PROCESS OPERATIONS, OBSERVATIONS, CALCULATIONS

• COMMUNICATION, COMMUNICATION, COMMUNICATION
  • DON’T SET YOUR PLANT ON AN ISLAND
  • BE PRO-ACTIVE, GET INVOLVED WITH PLANT OPERATIONS WHICH DIRECTLY EFFECT THE LIVELIHOOD OF THE WWTP – WATER USAGE, LOADINGS, SPILLS. SELF ADVOCATE.
  • IF YOU AREN’T PART OF THE SOLUTION……..GUESS WHAT???
  • DON’T BE PROUD WHEN ISSUES SURFACE - REACH OUT – OTHERS MOST LIKELY HAVE BEEN THROUGH IT.

• OPERATORS LOG
  • DEAR DIARY… TODAY MY FRIEND NOCARDIA DECIDED TO PAY US A VISIT… WHAT A GLORIOUS SURPRISE!
IMPROVING WASTEWATER SYSTEMS

• WHAT ARE OUR GOALS?
  • MEET PERMIT LIMITS
  • PRODUCE THE BEST EFFLUENT QUALITY AT THE LOWEST OPERATING COST
  • AVOID UPSET CONDITIONS/PERMIT VIOLATIONS/PRODUCTION LOSSES

• HOW DO WE ACHIEVE THESE?
  • KNOW YOUR SYSTEM & ITS CAPABILITIES
  • DON’T BE AFRAID OF CHANGE - #1 CAUSE OF RESISTANCE
    “WE’VE NEVER DONE THAT” “WE CAN’T DO THAT”
    “IF YOU ALWAYS DO WHAT YOU’VE ALWAYS DONE,
     YOU’LL ALWAYS GET WHAT YOU’VE ALWAYS GOTTEN”
  • MONITORING DATA
    • TYPICALLY NOT ENOUGH DATA, LACK OF RELEVANT & CURRENT DATA, OR NOT UNDERSTANDING THE STORY
    • YOU’LL NEVER HEAR SOMEONE TROUBLESHOOTING A SYSTEM SAY, “I WISH YOU DIDN’T HAVE SO MUCH MONITORING DATA”
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*Data for troubleshooting*

"Give me all you have on current data"

*Houston we have a problem*
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IMPROVING WASTEWATER SYSTEMS

• MONITORING DATA & COMPREHENSION OF THE STORY IT’S TELLING
  • NITRIFICATION
    • WHAT INFORMATION DO YOU THINK WE SHOULD HAVE?
      • pH, ALKALINITY, MLSS, MLVSS, NH3, NO3, NO2, TEMPERATURE, DO, FLOWS, FOG
      • VISUAL OBSERVATIONS – MIXING, FOAM, SET TESTS, MICROSCOPIC EVALUATION
    • ONE ADDITIONAL TEST SHOULD BE ON THIS LIST, ONE GLORIOUS TEST WORTH ITS WEIGHT IN GOLD?

S.O.U.R. - NOT LIKE SOUR SKITTLES, LEMONHEAD, ETC. OR SOUR DRINK MIX FOR YOUR EVENING COCKTAIL

SPECIFIC OXYGEN UPTAKE RATE – mg O2/hr/g MLVSS
IMPROVING WASTEWATER SYSTEMS

S.O.U.R.

• RUN AN OXYGEN UPTAKE RATE TEST AND CONVERT TO SOUR - END OF AERATION
  • ACCOUNTS FOR CHANGES IN VOLATILE CONCENTRATIONS
  • OUR(mg O2/L/min) x 60 (min/hr) x 1000 (mg/g) / MLVSS (mg/L)
  • PROVIDES OPERATOR WITH BUG ACTIVITY LEAVING THE A-TANK
    • ARE THE BUGS HUNGRY & READY TO DUE BATTLE AT THE BUFFET LINE OR ARE THEY LOOSENING UP THEIR BELTS AFTER THANKSGIVING DINNER, HITTING THE LAZY BOY, AND SNOOZING.

• TYPICAL RANGES
  • CONVENTIONAL AS: 12 – 20 mg/hr/g MLVSS
  • EXTENDED AIR: 6 – 12 mg/hr/g MLVSS
    *Typical is relative to your respective system

• KNOWING YOUR TYPICAL RANGE DURING PERIODS OF GOOD SYSTEM PERFORMANCE IS YOUR BEST DEFENSE WHEN YOUR SYSTEM STARTS TRENDING THE WRONG DIRECTION
IMPROVING WASTEWATER SYSTEMS
S.O.U.R.

• SO HOW DO WE USE THIS AS AN OPERATIONAL TOOL WITH OUR OTHER DAILY TESTING
  • INCREASING SOUR
    • HIGHER LOADING
    • INCREASED TEMPERATURE
    • EXCESSIVE WASTING
  • SIGNS
    • LOWER DO
    • POSSIBLE DENITRIFICATION IN CLARIFIERS
    • NH3/NO2 BREAK THROUGH – HETEROTROPHS DOMINATING YOUR AUTOTROPHS
    • SLOWER SETTLING – SET TEST; DISPERSED GROWTH UNDER MICROSCOPE
IMPROVING WASTEWATER SYSTEMS
S.O.U.R.

• DECREASING SOUR
  • LOWER LOADINGS
  • LOWER TEMPS
  • POSSIBLE INHIBITION/TOXICITY
  • INCREASED MCRT – DIDN’T WASTE ENOUGH

• SIGNS
  • INCREASED DO – IS IT LOWER LOADINGS OR TOXICITY?
  • FASTER SETTLING – OLDER SLUDGE
  • FOAM ON AERATION – DARKER COLOR(OLD), GRAY/SLIME LOOKING
  • FOAM ON CLARIFIERS OR IN CONTACT TANK
  • NH3, NO2 BREAKTHROUGH
  • MICROSCOPIC EVALUATION – MAJORITY OF ROTIFERS OR MAYBE NOTHING
IMPROVING WASTEWATER SYSTEMS
S.O.U.R.

• HOW DO WE USE THIS INFO AS AN OPERATIONAL TOOL
  • HIGH SOUR – WHAT CHANGES CAN WE MAKE?
    • ANOXYC ZONE – NO3, NO2 BOTH <, MLR INCREASE
    • STRICTLY NITRIFICATION – RAS DECREASE, WAS DECREASE, HIGHER MCRT
  • LOW SOUR – AGAIN, WHAT CHANGES CAN WE MAKE?
    • TOO MUCH BIOMASS OR INHIBITION?
    • FED/UNFED TEST
      • LOAD FACTOR: 0 TO 1 – TOXICITY/INHIBITION
      • LOAD FACTOR: 1 TO 2 – DILUTE/STABLE LOAD
      • LOAD FACTOR: 2 TO 5 – NORMAL RANGE
      • LOAD FACTOR: > 5 – HIGH ORGANIC LOAD
    • LOWER MCRT OR STAY?
IMPROVING WASTEWATER SYSTEMS

S.O.U.R.

• AGAIN, PERIODICALLY RUN THESE TESTS TO DETERMINE WHAT YOUR NORMAL RANGE IS.
  • IT’S HARD TO KNOW WHERE YOU’RE GOING IF YOU DON’T KNOW WHERE YOU’RE AT OR WHERE
    YOU NEED TO BE.

• SOUR EQUIPMENT — YSI 5100, BOD PROBE FOR 5100, BOD BOTTLES ~ $2,500
  • OUR/SOUR CALCULATIONS PRE-PROGRAMMED
IMPROVING WASTEWATER SYSTEMS
UNDERSTANDING THE STORY

• EXAMPLES
  • EXTENDED PROCESS ISSUES AT MAIN COMPLEX
    • HIGH INFLUENT LOADINGS TO LAGOONS, LOWER TEMPS, PARTIAL NITRIFICATION, NH3 BREAKTHROUGH, HIGH SOUR’S, LOWER DO’S, HIGH LAGOON LEVELS
    • NOW WHAT?
  • HIGH EFFLUENT TSS
    • LOWER, YET FAIRLY NORMAL SOUR’S, DO NORMAL, SET TEST- 300 IN 30 MIN WITH CLEAR SUPERNATANT, ALL OTHER TESTS GOOD.
    • WHAT’S GOING ON? WHAT OTHER INFORMATION DO WE HAVE?
      • CLARIFIER BLANKETS ~1 TO 2 FEET
      • MLSS – 4000; RAS – 5500; RAS Q – 1.2 Q
IMPROVING WASTEWATER SYSTEMS

• KNOW YOUR SYSTEM
• DON’T BE AFRAID TO VENTURE OUTSIDE YOUR COMFORT ZONE
• COMMUNICATE
• DATA – ANALYTICAL AND VISUAL
• UNDERSTAND WHAT DATA IS TELLING YOU & MAKE ADJUSTMENTS
• 10% RULE
• TROUBLESHOOTING – WHAT’S THE ROOT CAUSE AND WHAT CAN I CHANGE TO HELP MYSELF OUT
WASTEWATER BEST PRACTICES
IMPROVING WASTEWATER SYSTEMS

QUESTIONS