Confidential Client Bulk Oil Storage Facility-Oily Water Treatment for Reduced Effluent Standards

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Agenda

- Background
- Objectives
- Existing System Performance
- Waste Water Treatment Plant (WWTP) Condition Assessment
- Recommended Upgrades
- Lessons Learned

Background

- WWTPs at Two Fuel Farm Facilities
- Very Large Distribution and Storage Capacity (> 2 Million Gallons)
- Includes Loading Racks with Frequent Releases
- Discharge to Sensitive Marine Environment
- NGOs Engaged-Deterioration of Marine Environment

Background (Continued)

- Influent Consists of:
  - First-Flush Stormwater
  - Fuel Tank Sumping
  - Secondary Containment Water.
  - Groundwater Remediation and Cleanup from Releases
  - And Whatever Else from Operations?????
- Treatment System Online in 1996
- Poor Energy Efficiency
- Operator Intensive
- Design life 10 – 15 years?????

Objectives of Engineering Assignment

- Evaluate Existing System Operation
  - Poor Performance
  - Broken and Outdated Controls
  - Design Q of 200 gpm
  - Operator Intensive/Operator Bypasses
  - Sensitive Marine Environment
- New Lower Discharge Levels
- Critical Facility-Must Remain Operational
- Improve Energy Efficiency
- Provide Recommendations
- Oversee Bid and Implementation

Changes in Discharge Limits

Compound	Original Limits (ppb)	New Limits (ppb)
Benzene	100	7
Ethylbenzene	100	5
Toluene	100	5
Xylene	100	5
MTBE*	-	50

Evaluation Challenges

- Intermittent Oily Water Flows to System
- Stormwater Intermittent Flows
- High Variability of Influent Concentrations
- Heavy Stormwater Loading of Solids
- Potential for I & I
- Groundwater Impacts (Light Non Aqueous Phase Liquids-LNAPL)
- Conveyance Systems Not Closed
- Parts of Facility Not Classified (Class I, Division 1)
- Underground Storage Addition Difficult

System Photos

Step 1: Understand Existing System

- Review As-Built Drawings
- Half the Drawings/Specs Missing
- Half Drawings/Specs Incomplete
- Drawings don't Reflect Actual System
- Spent Extensive Labor Hours Inspecting System, Cataloging Existing Components, and Comparing Against Drawings and Specifications

Lesson Learned-As-Builts Do Not Always Represent Actual Conditions

Step 2: Spend Quality Time with the Operators

- How is the System Actually Being Run?
- What are the Complications?
- How Much Time is Being Spent on Maintenance? Will that Realistically Change?
- What are the Implications of an Upset?
  - Exceeding Dissolved Limits/Groundwater Influent
  - Oil/Fuel direct Discharge to Marine Environments
- Review of Maintenance Logs/Sludge Disposal/Oil Recovery Rates

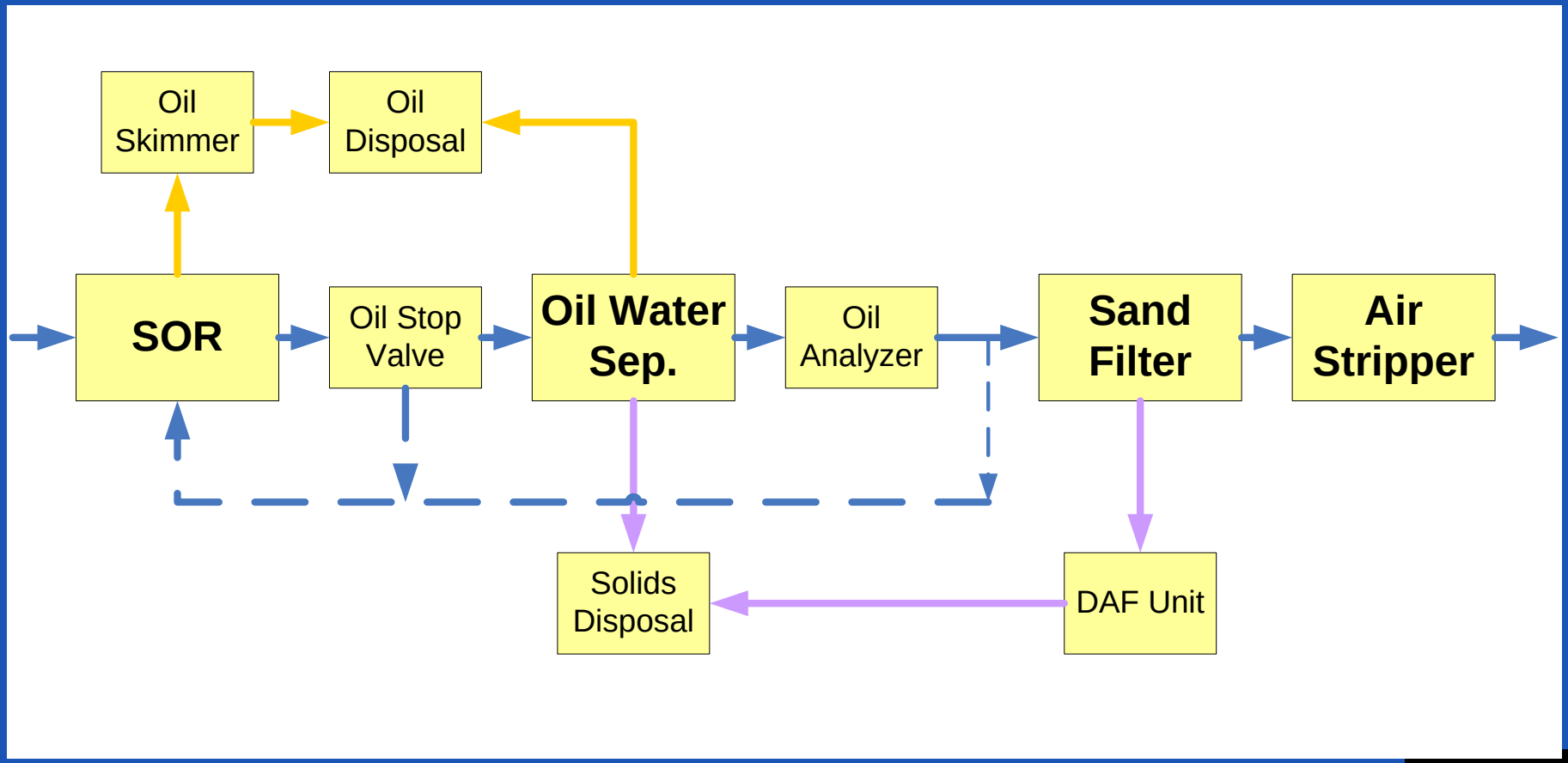
Lesson Learned-Communication Difficult Management Knowledge Low

Results of Step 1 and 2

- Original System Design-Two Fail Safes for Oil Discharge (None Operational)
- Surface Oil Recovery (SOR) Tanks-Below Ground-Difficult to Remove Solids so Not Done (Solids Loading Big Problem)
  - Intake Pipe Raised
  - Skimmers/Level Controls Don't Work
  - Frequent Pumping of Oil into Treatment System
  - Manual Operation of Pump for SORs
- Continuous Backwash Filters (CBF) Fouled
- DAF Not Working
- Class I or 2? Hazard Classification Areas???

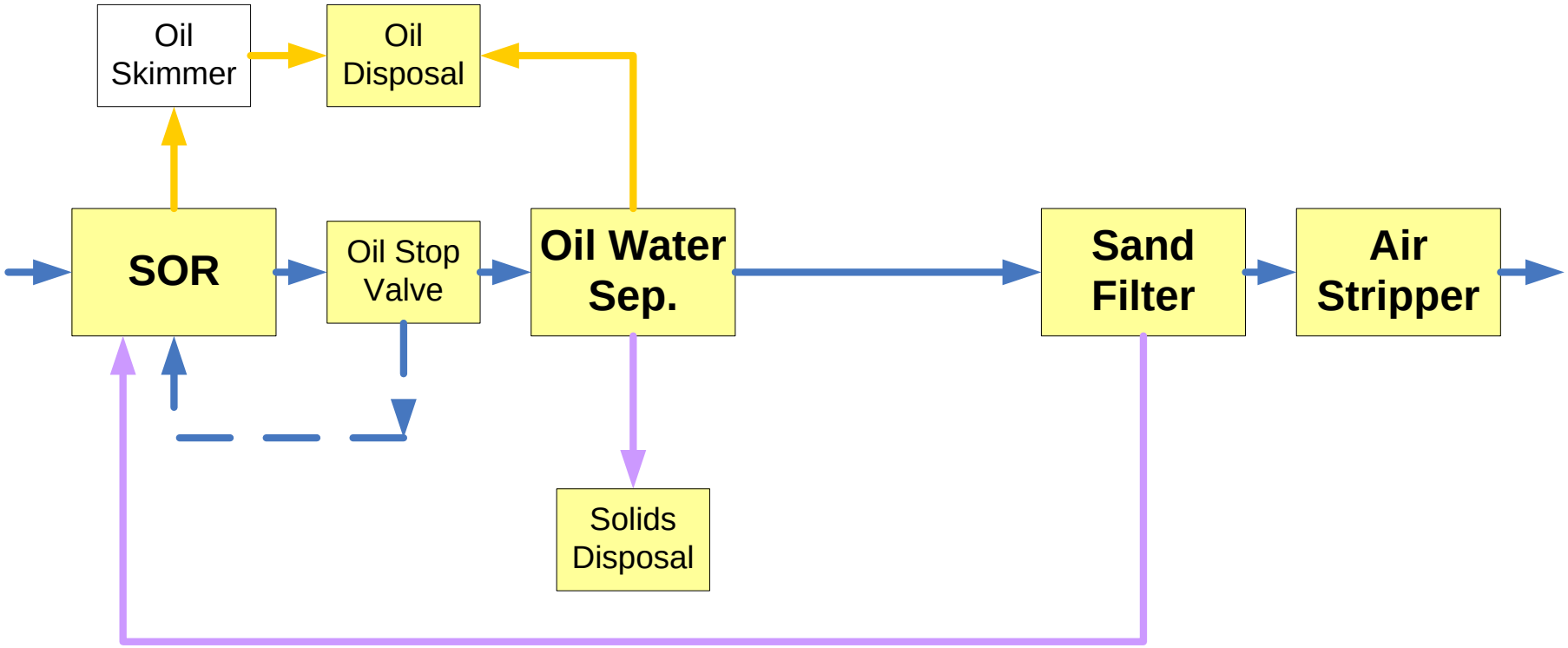
WWTP Condition Assessment

Original System Design:



WWTP Condition Assessment

System Current Condition:



Step 3: Preliminary Review of Information To Date

- How System Should Work
- Current State of Operations
- Operator Knowledge and Skill
- Understanding of NFPA Flammable Classifications and NEC Classifications
- Energy Inefficiencies
- What Should the New Design Life Be?
- Scrap Existing and Bring in New (Down time and risk) versus Modifications

Step 4: Discuss Options

- Design Meeting with Client
- Possibility for Downtime
- Capital Costs/Schedule
- Procurement Issues
- Energy Pluses
- Certainty of Meeting Limits
- Improvement in Operator Maintenance
- Client Institutional Responsibility

  (Who “Owns” the Previous Design?)

Lesson Learned-Upgrade Option is Easy to Choose-Hard to Execute

Step 5-Bring in the Vendors/Contractors for Upgrades

- Develop Performance Design Standards
- Bring in Vendors-PAY FOR THEIR TIME
- Interview Vendors with Operators to Pose Implementation and System Compatibility Questions
- Request Component Specs and Drawings
- REQUEST REFERENCES and CALL THEM
- Interview Installation Contractors-Get Input

Lesson Learned-Use Vendors to Avoid Potential Compatibility/Constructability Issues

Step 6: Prioritize Options

- Air Stripper Minimum to Meet Dissolved Levels
- Eliminate Groundwater Influent-High Iron Fouls Stripper (Separate System Design)
- Replace Stripper-Gains in Energy Efficiency
- Oil Recovery Problem-New Controls and SOR Pump
- New Level Controls
- Efficient Solids Removal
  - Eliminate DAF-Go to Bag Filters
  - SOR Replacement
  - New Oil/Water Separator

Priority 1-Focus on Air Stripper Performance

- Air stripper key component for removing volatiles.
- Effluent xylenes often >10 ppb
- Influent Xylenes up to 700 ppb: > 250 ppb will violate permit with existing striper.
- High xylenes likely related to contaminated groundwater
- Based on model projections, the existing air stripper cannot meet the changed limits at 200 gpm
- Air strippers are in poor condition and are approaching the end of their design life

Lesson Learned-What is the Real Design Life?

Priority 1: Air Stripper Upgrade

- Replace existing air stripper-five tray system.
- New instrumentation and controls (air flow, differential pressure)
- Locking valve to prevent manual bypass
- Fail Safe for Required Blower Operation
- Reduce Energy Loading

Secondary WWTP Upgrades

- Overall System Controls
  - Replace Broken / Missing Instruments.
  - New controls for remote operation and monitoring of SORs.
  - Replace control panel with modern PLC.
  - Update telemetry.
- Vendor Input and Compatibility

Secondary WWTP Upgrades

- SOR
  - New Level Instruments and Controls
  - New Oil Skimmers
  - New Influent Pumps
- Oil Stop Valve Tank
  - Repair or replace tank / replace valve
- Oil Water Separators
  - New controls to prevent flooding of oil baffle
  - Or, replace existing OWS with better design (for solids removal)
- New SORs?

Secondary WWTP Upgrades

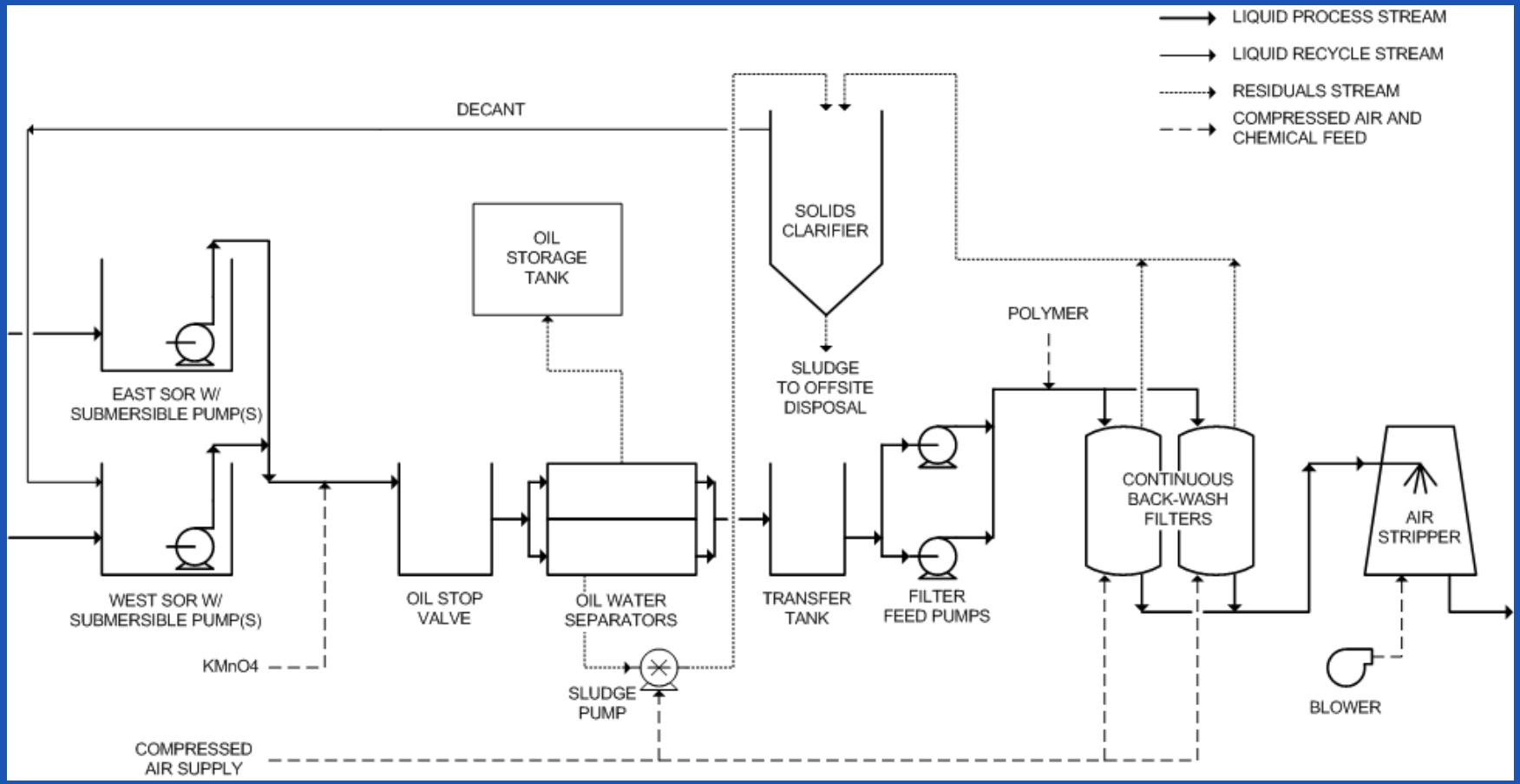
- Consider replacing CBF units w/ bag filtration
  - Dummy proof,
  - More labor to replace bags
- If CBF units are retained:
  - Replace DAF with gravity clarifier / thicker for backwash waste.
  - Easier to operate, lower maintenance.

Other Important Design Issues

- Classification-One System Classified as Hazardous, One Not
- Upgrades Consistent with Previous Classification
- Future Study for Evaluating Classification
- Discharge of Oil into Sewer Conveyance Systems-Reclassification? Or Closed?
- Really Need New or Expanded SOR to Facilitate Solids Removal-Underground and Difficult due to Space

Lesson Learned-Some Issues will Require Additional Study-Must Follow UP!

Upgraded System Flow Diagram (CBF Option)



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Benefits

- Increased Certainty of Permit Compliance
- Increased Factor of Safety (Unanticipated Influent Flows/Concentrations)
- Decreased Maintenance
- Decreased Energy Consumption
- Reduced Labor Costs
- New Controls, Alarm Systems, Remote Operation & Telemetry

Lessons Learned

- As-Builts Do Not Always

  Represent Actual Conditions
- Operator Communication Difficult-Management Knowledge Low
- Upgrade Option is Easy to Choose-Hard to Execute
- Use Vendors to Avoid Potential Compatibility/Constructability Issues
- What is the Real Design Life?
- Some Issues will Require Additional Study-Must Follow UP!