RVA

NWWC 2023

MANAGING RISK IS NO CAKEWALK LESSONS LEARNED FROM THE ROPEC SLUDGE THICKENING AND DEWATERING BUILDING UPGRADES







November 2023



- > Project and Facility & Overview
- > Project Structure Arrangement to Meet a Common Goal
- > Project Upgrades
 - Truck Bay Reconfiguration & Hopper System Reconstruction
 - Odour Control
 - HVAC Renewal





ROBERT O. PICKARD ENVIRONNEMENTAL CENTRE (ROPEC)

Population	~1 Million
Size	67 Hectares
Average Daily Flow - 2019	436 MLD
Peak Capacity	1362 MLD

Biosolids Production ~ 50,000 Wet Tonnes per Year

End result of 1400- 1800 trucks per year







THICKENING AND DEWATERING BUILDING





PROJECT ISSUES



- Reconfiguration of the truck loading system, to allow full length truck trailers to use the existing cake loading bays;
- Hopper modifications and new distribution conveyors to increase system redundancy and maximize the effective storage capacity by allowing a single centrifuge to feed multiple points along the hoppers;
- Capture and treatment of the foul air generated during the truck loading process;
- HVAC Upgrades part of a lifecycle renewal process and to eliminate recirculation of foul odorous air into the 4 story office areas connected to the biosolids facility;
- Modernizing HVAC controls and instrumentation

After 25 years of operation, components of the facility were either due for lifecycle replacement, or, merited updating to meet changing loading demands



PROJECT OVERVIEW





TRUCK LOADING IMPROVEMENTS.

THF



ODOUR CONTROL



HVAC LIFECYLE RENEWAL



MULTIPLE PROJECTS IN SAME LOCATION





UNFORSEEN EXTERNAL FACTOR

- ✓ Good for project budget. Might get to build everything you require for the project scope.
- ✓ Objectively; a good news story for the project
- X Project timelines and schedules to be reworked
- X Greater financial risk due to project delays (Lost Funding).
- X Things 'get busier' for the entire project team (City, Contractor, Consultant)



EXTERNAL FUNDING SOURCE





RESOLVING ROAD BLOCKS





- Project would be spread out throughout the entire four stories (plus a basement level), while working around many operating plant processes
- The upgrades would be required within a facility which is staffed 24/7 as it houses both the SCADA control room and office space overseeing the solids treatment train.
- Existing Building with potential facility 'unknowns'
- Approximately 100 new pieces of major process and mechanical equipment to supply, install and commission

Now faced with a reduced design & construction schedule

REVIEW OF THE PROJECT SCHEDULE



- Need to be Honest. "Strategic" but not "Optimistic". Is an extension feasible?
- Detailed schedule allows for incremental gains, High Level Overview allows for the big 'wins'
- Evaluate implications of alternative procurement approaches (Equipment pre-purchase, preselection, contractor pre-qualification). Be Honest with Procurement timelines.
- City Engineering and Operating staff undertook strategic review to 'make it happen'



MANAGING RISK WHEN FLOW CAN'T STOP



- > Planning centrifuge maintenance works to ensure service periods would not disrupt construction
- Schedule for loadings to start earlier in the morning to allow enough truck filling times during the heaviest loading season from a single truck bay;
- > Digester levels were adjusted (lowered) for built in emergency storage
- > Provisions for emergency dewatering equipment as a failsafe measure against catastrophic disruption to plant operations.



RESULT:

ENABLED TRUCK BAY TO BE OUT OF SERVICE DURING PEAK SEASON

METHODS FOR EXPEDITING SCHEDULE



- > Construction meetings were increased to weekly
- Physical Barriers (1800 sq ft) wall to separate construction staff from loading process
- Priorities schedule by allowing window equipment removal





CONSOLIDATE THE PROJECT STRUCTURE





CONSOLIDATE THE PROJECT STRUCTURE











HOPPER DISTRIBUTION & TRUCK LOADING SYSTEM



PROJECT OVERVIEW





RISK MITIGATION DURING DESIGN

3D Laser scans

 comprises of millions of 3D points (X,Y,Z coordinates) and High resolution imaging

3D CAD Material Modelling

- Modelling allows for rapid interpretation of more complex shapes and configurations
- > Efficient way to run trial runs on multiple design scenarios

Lot's of time spent on developing the design options and design basis















INLINE DROP POINTS (PLUS DIVERTER CHUTE DROP POINT)

RISK MITIGATION FOR LOADING

- > Decision on truck size had to be made during design phase
- > Thermal camera's for 'remote loading of truck bays'
- > All controls were upgraded; however similar push button controls were re-used for truck drivers. OIT was provide to provide additional information; but is not mission critical for loading.
- > Training for both operators and truck drivers.
- > Better 'Air-lock' between control area and process area
- > Allow for recirculation of cake







EXISTING



HOPPER RECONSTRUCTION









REDUCE UN-CONTROLLED DISCHARGE





LIVE BOTTOM INSTALLATION







TRUCK BAY





FLOOR REINFORCEMENTS FOR OPENINGS AND LIVE BOTTOM MOTOR MOMENT













PRE-CONSTRUCTION LOADING CONDITIONS



MODIFIED LOADING CONDITIONS







ODOUR CONTROL



APPROACH

Treatment of the foul air from the truck bay would be difficult. Peak level contaminants (hydrogen sulfide, methyl mercaptans, VOC's and ammonia) within the foul air stream truck bay were near the technical removal limits of many technologies

- > Contaminant sampling
- > ARMOD was combined with CFD Modelling to better understand the local affects of the stack
- Target removal concentrations (99.9%) to allow for future odour sources
- Multi-Media approach to target specific contaminants
- Independent testing to confirm treatment capabilities









ARMOD VS CFD





APPROACH



- > Pure H2S Required. Safety and Evacuation Plan becomes critical
- Agree on Pass /Fail criteria before testing program based on lower detection limits and standard deviations.Dry run / extra samples worthwhile







HVAC UPGRADES



HVAC UPGRADES



- > Replacement of the HVAC system would require 12 new air handling units, 3 supply fans, 20 new pumps, 17 exhaust fans, and three (3) new odour control units.
- > Ventilation rates to the process areas (centrifuges, thickening and dewatering facilities, truck loading) would be increased to 6 Air Changes per Hour (6 ACH) for NFPA 820 Compliance
- > 48 sets of horn/strobes relaying from 15 gas detection systems were installed. Thirteen (13) control panels were installed at the entrances to the process areas to control and monitor either the gas levels or ventilation activity within each room. Ventilation proving (air flow monitoring) would also be added to the supply air ducts.
- > Use Effluent Water for Building Cooling
- > Heat Recovery systems updated
- > Pressure Zones Increased / Modified

REVISED CONDITIONS





SYSTEM WIDE HYDRONIC UPGRADES





HVAC UPGRADES





COOLING VIA EFFLUENT WATER SYSTEM

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ALL PROGRAMMING COMPLETE BY CITY 'IN-HOUSE' RVA

TAKE AWAY'S

- Trade off's to be made between energy efficiency, local occupancy comfort and ease of operation
- Allow for extended commissioning and testing period of HVAC BAS system
- Allow for multiple stages of air balancing through the commissioning process to test for air flows under multiple operating conditions.

QUESTIONS & DISCUSSION

