

AQUATIC CENTER OPERATIONAL and MECHANICAL SYSTEMS

The City/ARC 2020 Study did not explore or discuss any detail of mechanical systems, new technology, or resource saving opportunities. The mechanical and operational systems used in the SF/ISG Study operational, budget, and project cost calculations for new aquatic facilities and upgrades/replacement of equipment in the existing BAC/Odle include state of the art technology and efficiency. Several of these technology systems will become even more prevalent in the post COVID “New Normal” (see COVID Impact Section of this Report). The state of the art equipment and systems considerations are based on the following criteria:

- Energy efficiency
- Low annual operation costs
 - Savings on electric, natural gas, chemicals, and water
 - Less staff operational time
- Low long term maintenance
- Short payback period for premium equipment costs
- Extended lifespan
- Minimal water usage
- Minimize environmental impact
- Minimal impact on programming and pool down time due to regular maintenance

This technology includes:

- Regenerative Media Filters:
 - Reducing water consumption and waste water by significantly reducing the need to backwash filters and add replacement water.
 - Approximately a 80% to 90% savings in water use related to traditional backwashing with high rate sand filters
 - Reducing electrical, natural gas, and chemical use through 80% to 90% less replacement water to heat and treat.
 - Filters down to particles one micron in size compared to 15 to 30 microns in traditional high rate sand filters in the existing pool facilities
 - Reduces space needed in pool pump room for filter systems by approximately 30%
 - Reduces time needed by staff to operate and maintain
- UV water purification system
 - Secondary disinfectant system complementing the chlorine disinfectant system
 - Kills cryptosporidium bacteria which chlorine does not kill (major cause of pool related infections)
 - Reduces consumption of chlorine and pool chemicals by approximately 15%
 - Sometime in the future pool using UV systems may be able to operate at lower residual chlorine levels
 - Helps improve air quality through the reduction of chloramines off gassed from the water
- Variable Frequency Drives (VFDs)
 - Controls the pump output power and electrical draw based on filter and circulation needs and demand
 - Reduces pump electrical use by 20% to 25%

- NOTE: Some Utility companies are providing grants or incentive credits for installing VFDs, especially in adding to existing facilities such as the BAC/Odle
- State of the art chemical and pool controllers (linked via web access for off-site monitoring and smart control)
 - Provides more consistent and accurate control of pool systems, chemical levels, water levels, and temperatures
 - Provides direct alerts to pool operators and management of any problems in order to identify and address problems in a more timely fashion
- High efficiency heaters
- Source capture exhaust system (capture and exhaust bad air at water surface level)
 - Pull the “bad” pool air filled with Chloramines (bi-product of chlorine disinfectant process) sitting within 18 inches above the water surface.
 - Exhausts this air directly
 - Significantly improves air quality
 - Reduces the overall amount of replacement air exchange needed to maintain air quality
 - Reduced amount of replacement air needed in the overall natatorium HVAC System reduces the heating, cooling and de-humidification costs of replacement air treatment and circulation.
 - Theoretically limits amount of corrosive chemical filled air recirculating through overall HVAC system therefore extending the life expectancy of the natatorium HVAC system
 - NOTE: This is theoretical since the source capture exhaust systems are relatively new in the last six to seven years and there is no actual track record yet of the impact on HVAC lifespan, although inspection of HVAC systems indicate some reduction in corrosion.
 - Can be retro-fitted to the existing natatorium spaces
- HVAC Technology
 - SF/ISG anticipate additional air purification systems to be included in new facilities as part of the New Normal. These additional systems are not included in this report but are referenced in the COVID Impact Section of this Report.
- LED lighting
 - Including zone and intensity controls to manage light levels based on time of day, usage, and specific event needs
 - NOTE: Grants sometimes are available for converting buildings to LED lights.
- Myrtha Pool Tank Technology
 - PVC coated stainless steel pool structures that are increasingly used in major aquatic facilities world wide
 - Reduces construction time
 - Reduces thickness needed in the concrete foundation slab
 - Pool tank walls never need painting or resurfacing
 - Improved water tightness: No absorption compared to concrete/gunnite
 - Long Warranty protection
 - 25 year warranty on structural systems and walls
 - 10 year warranty on PVC floor membranes
 - Provides added options
 - Soft safety floor for program and leisure pools

- Non-skid surfaces for ramps, access points, and Wellness/Therapy Pools
- Reduces annual maintenance on pool wall and bottom surfaces and related pool down time or closures

As this project moves forward the energy cost savings analysis can be rolled into the existing City of Bellevue efforts to explore energy savings throughout City buildings, facilities, and operations. Energy saving grants or incentives are currently not factored into the project cost projections. One of the important analytic elements of the Next Steps, either prior to or as part of the next design development stage, will be to analyze the impact of these technology options, including:

- Any premium cost of the state of the art technology
- Analysis of annual and long term operations and maintenance cost impact of this technology (mostly savings)
- Based on initial cost and annual/long term operational savings analyze payback periods, return on investment, and total life cycle costs
- Explore any grants or incentives for use of energy or water saving technology
 - Driven by the City of Bellevue and coordinated with existing City efforts in energy and water conservation

Alternate Energy Systems

Alternate energy systems may also be explored, but an engineering and cost analysis of alternate energy systems were outside the scope of this study. This analysis would be part of the next design stage of the project development.

Examples of State of the Art Pool Mechanical Systems



*Regenerative Media Filters
(Neptune Benson Defenders)*



UV Purification System



Variable Frequency Drives



Web-based Chemical/Pool Controller

ENVIRONMENTAL IMPACT

Although it is very difficult to gain LEED Gold levels for aquatic centers, many of these factors do provide LEED certification credit for energy efficiency and minimization of water usage. The use of Myrtha Pool technology also provides LEED credits from savings of approximately 45-50% in embodied energy during the building process. Use or switching to VFDs, LED Lighting, high efficiency heaters, and updated control systems also generate LEED credits.

Based on analysis by the architect and mechanical engineers during the next design phase, additional environmentally friendly technology and alternate energy sources can be evaluated for their impact, benefit, and return on investment.

NEXT STEPS

- The time between now and the next design phase is a good time for Bellevue City Parks, Operations, and Maintenance Staff to research system options and learn more about these technology options to become educated consumers prior to the next phase of project design and development.
- This research will also be important if replacement of existing systems at the BAC/Odle becomes an issue either due to end of lifespan of existing systems, new post COVID New Normal best practices, or overall City of Bellevue energy/water conservation efforts.
- Coordinate with other ongoing City energy and water conservation initiatives