

10.0 Conclusions

The analysis of the Straumann USA facility provided some very interesting results. When comparing the airside systems, a VAV system definitely has a lower first cost, but the DOAS system saves on annual energy costs and results in a lower twenty year life cycle cost. When comparing the direct-fire absorption and electric centrifugal chillers with the same airside system, the absorption chiller resulted in a higher annual energy cost. However, an absorption/DOAS system did result in a lower annual energy cost than an electric/VAV system. When considering using the absorption chiller to both simultaneously produce hot and chilled water it is found that the heating load for Straumann USA would only be met 16% of the time. Since boilers are already present, there would be no reduction boiler size for the facility so no initial cost savings would be a factor. If a new construction project considered a similar option, it may be beneficial depending on the reduction in boiler size as well as the additional cost for the second heat exchanger in the chiller. An analysis of the waterside free cooling capabilities of Straumann USA also provided some interesting results. While a few additional hours of free cooling can be obtained by using a series free cooling arrangement, it must be carefully controlled to prevent the cooling costs from actually increasing if condenser water is supplied above between 51°F and 55°F

The changes to the mechanicals systems did have impacts on some of the other systems in the building. When using a DOAS system, electrical wiring and associated item for variable air volume, and fan powered boxes could be removed. This resulted in changes for four electric panels and wiring from two motor control centers. Since the chillers would be replaced, wiring is already in place, and no additional costs would be incurred. However if a new construction project considered electric and absorption chillers, additional electrical savings may be possible.

A detailed analysis of the first cost differences between the requirements for the mechanical system show that a DOAS system does have a larger initial cost when compared with a VAV system. On the chiller side, absorption chillers cost two times more than an electric centrifugal chiller. A life cycle cost analysis determined that a DOAS system would pay itself back in approximately 3.7 years, while changing the chiller plant from to absorption cooling, regardless of the airside system would not have a payback after 20 years.