



Process Water Heat Exchanger Evaluation

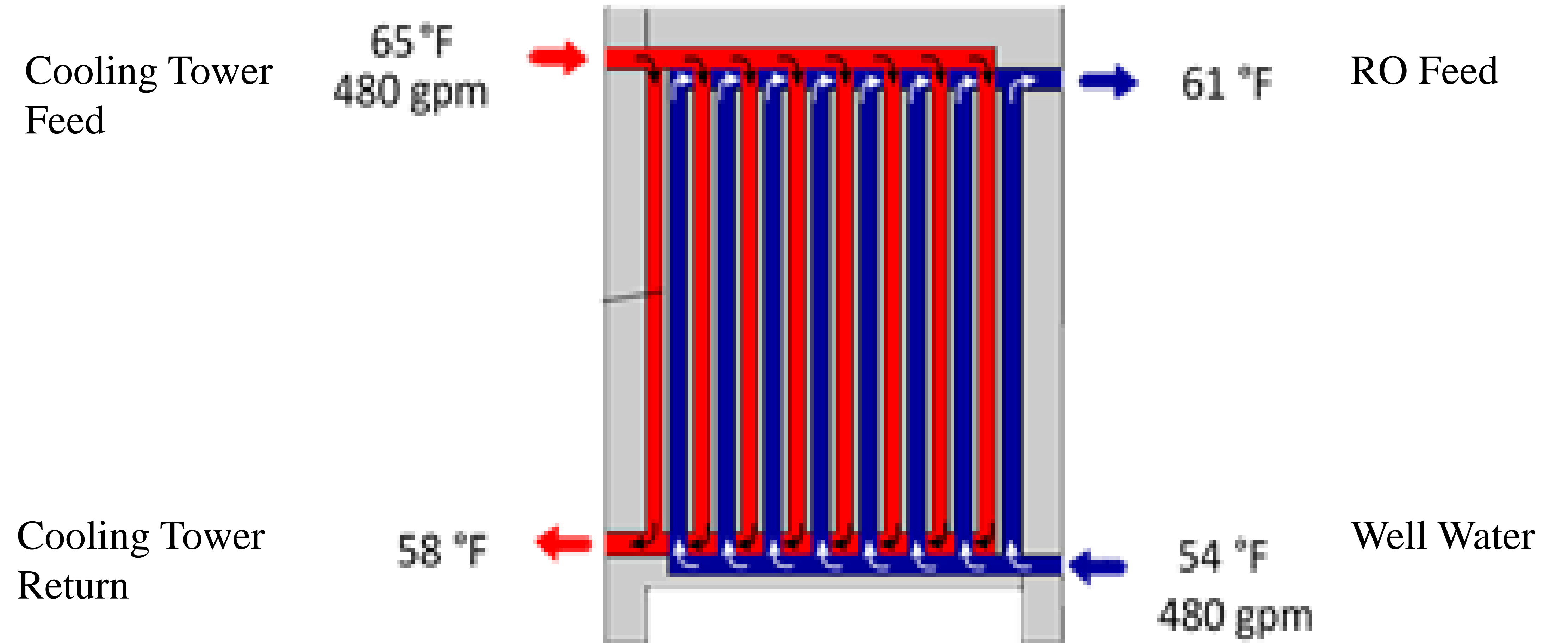
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Abstract

POET Bioprocessing - The state-of-the art ethanol production facility will consume approximately 28 million bushels of locally-grown corn to produce 80 million gallons of ethanol annually. Tasked with evaluating the effectiveness of the current placement of a plate and frame heat exchanger. The heat exchanger is meant to aid the cooling water tower in the summer months when it is unable to meet cooling requirements.

Measured values



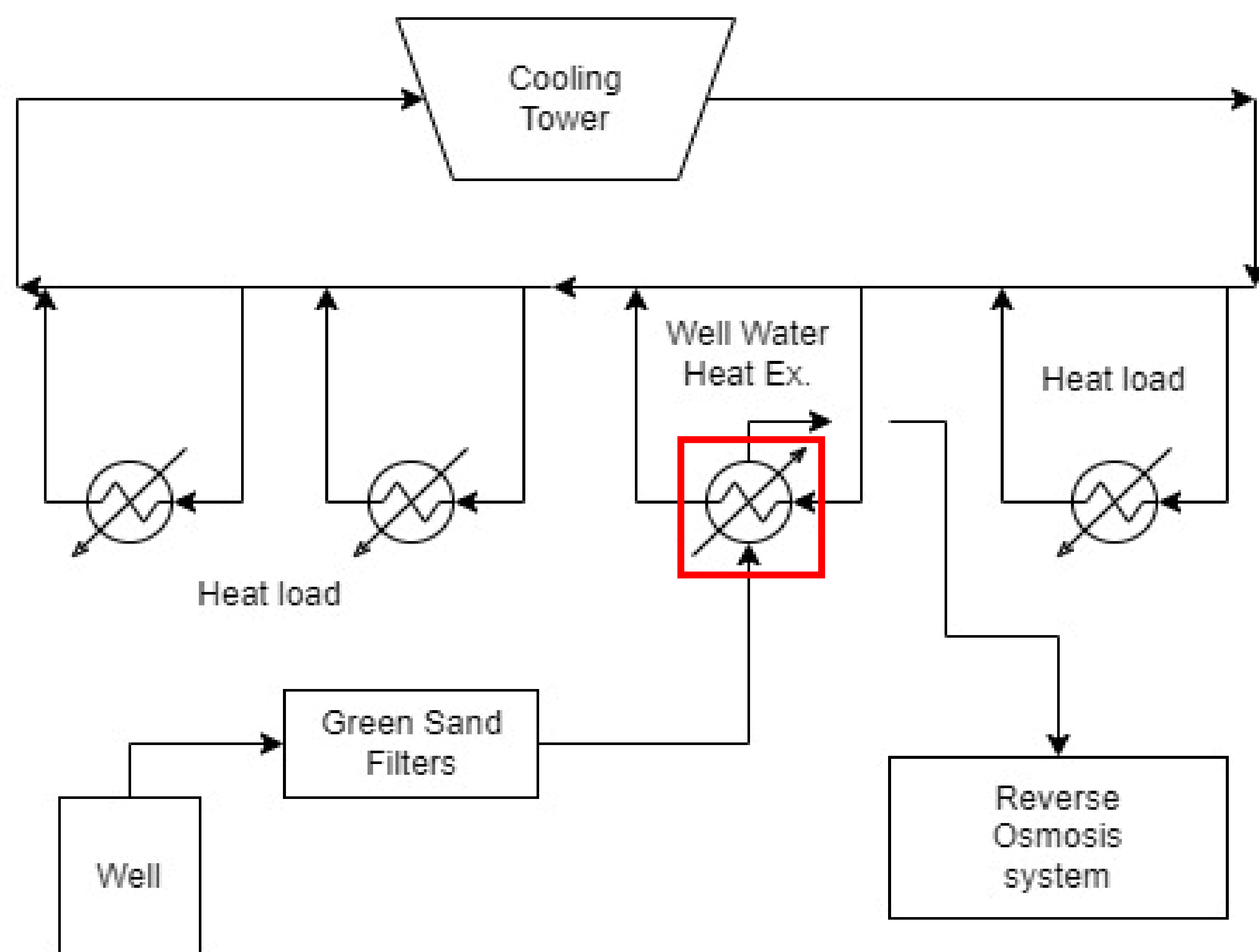
Calculated Values for Summer months			
	Current values	Expected Values after cleaning	Unit
U	547	747	$\frac{Btu}{hr ft^2 \text{ } ^\circ F}$
Q	3.07	3.36	$\frac{MBtu}{hr}$
Effectiveness	64	70	%
% total cooling	2.0	2.2	%

Geothermal viability

One alternative source of cooling that we evaluated was a vertical closed loop geothermal system. Some heuristics were used to find rough estimates to the size of a geothermal system required to deliver equivalent performance.

Wells	280
Area	1.6 acres
cost	\$ 980,000

Due to the high cost and large area required this does not seem like a viable solution to alleviate the cooling issues at the scale that is need.



Water hardness

The water hardness was tested to determine the likelihood of fouling. The hardness was found to be 313 PPM of $CaCO_3$. This is high enough to justify concern of fouling, however our effectiveness measurements show that the fouling is having minimal effect.

Conclusion

If the heat exchanger is cleaned the expected increase in duty is 9.4%. Even with cleaning this heat exchanger would only lower the cooling tower outlet temperature by less than 0.5 °F. No solution was found for the issue a chiller or heat pump may be required to assist the cooling tower.