



# Process Water Heat Exchanger Evaluation

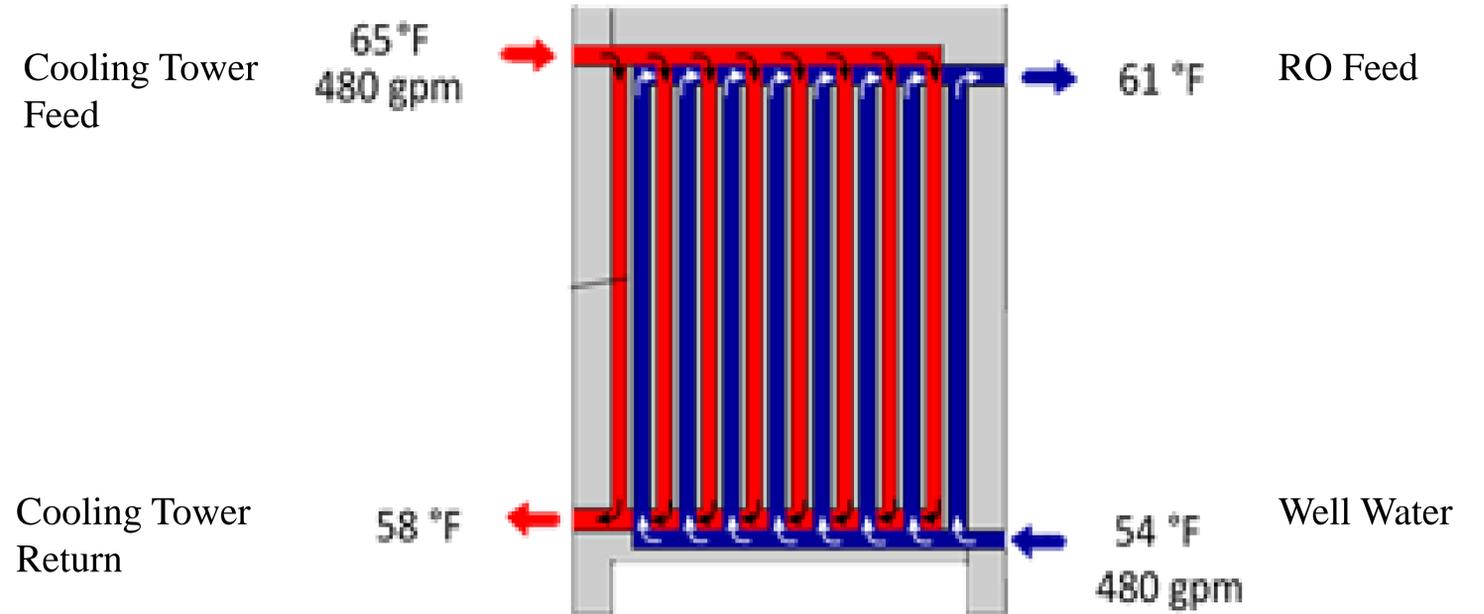
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## Abstract

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



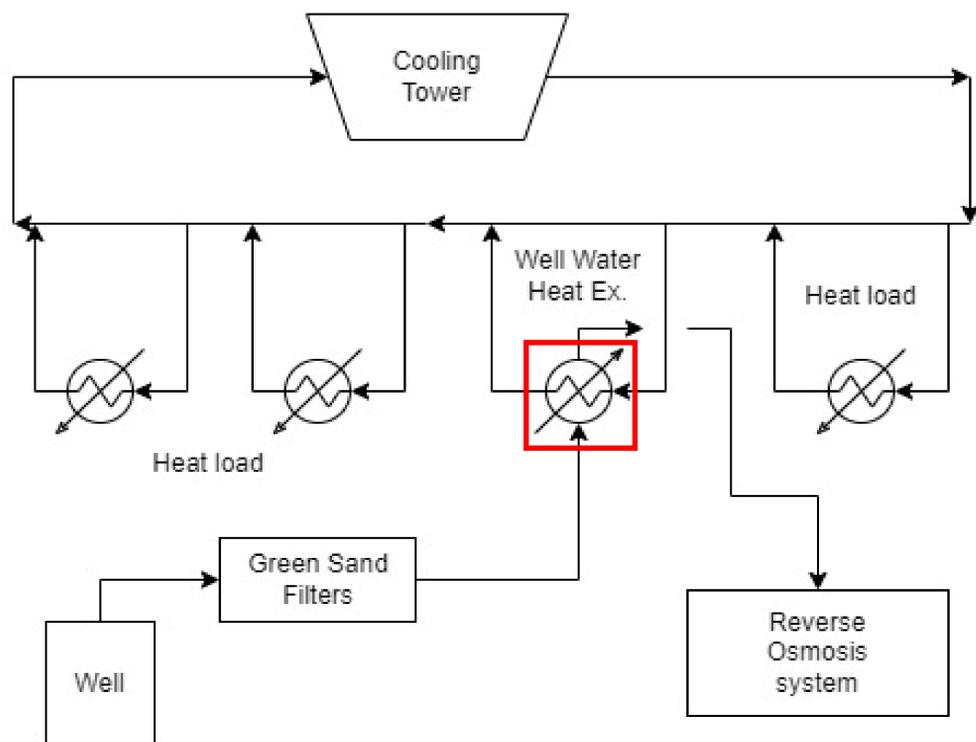
Calculated Values for Summer months			
	Current values	Expected Values after cleaning	Unit
U	547	747	$\frac{Btu}{hr ft^2 \text{ } ^\circ F}$
Q	3.07	3.36	$\frac{MBtu}{hr}$
Effectiveness	64	70	%
% total cooling	2.0	2.2	%

## 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 needed.



## 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.