BREWBOT

test: TEST-HAR-0049-01

Heat Exchanger Inlet Side Selection

date: 7.7.16 *status:* Done

engineer: Cody Badger

system: Brewbot

part: Heat Exchanger

test: Inlet Selection

brew: N/A

procedure: in Trello

data: https://trello.com/c/LP4cC9lT

history:

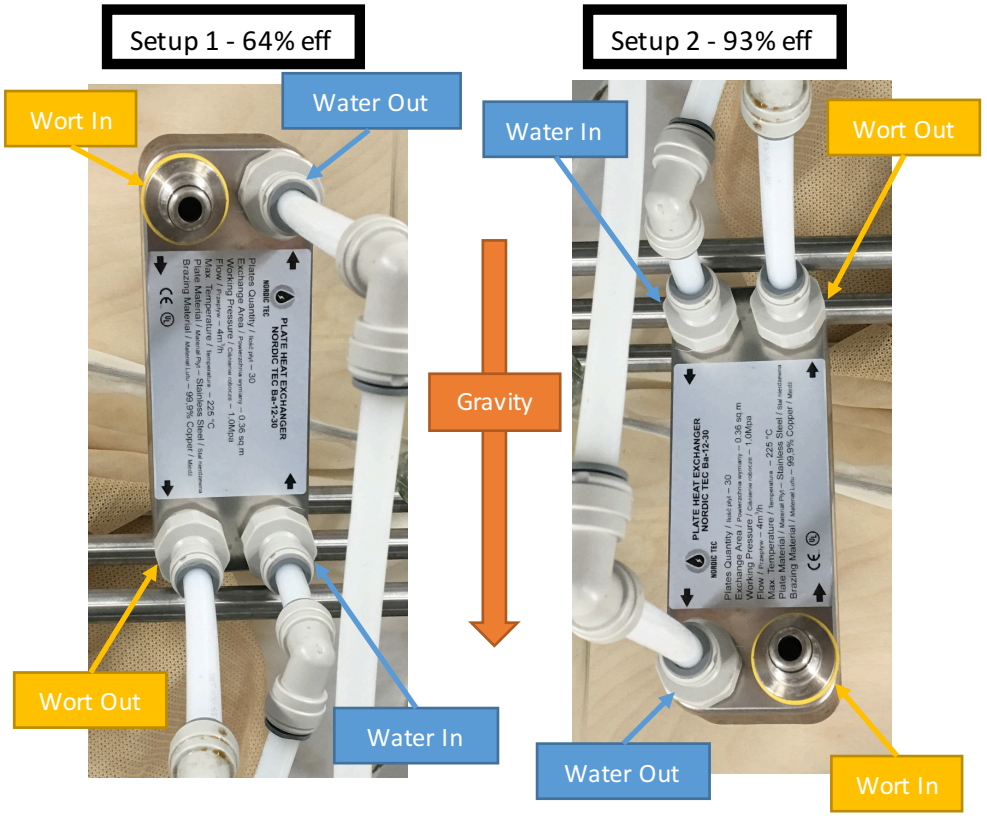
7.7.16 First run

summary:

This initial test is to determine if the wort_in port should enter the heat exchanger on the top or bottom side of the unit.

documentation:

At the test points used in this test, the heat exchanger has an effectiveness of 93% when the wort enters from the bottom side, and 64% when it enters from the top. To fully characterize the HX, we should test a wider range of input parameters (water temp, water flowrate).



observations:

Due to the low flow (resulting in low HX pressure) nature of the cooling system, all of the channels in the heat exchanger do not fill with wort when filled from the top side. I suspect that this issue may be negligible at higher pressures, as the fluid being coold would be forced into all channels.

conclusions:

The wort should enter the HX on the bottom (low) side fo the HX, as in Setup #2 to the left.

Further testing is recommended.

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additional information:

Flow Name	Volume (L)	Time (s)	Temp (°C)	Flowrate (L/s)	Flowrate (kg/s)	Qdot (W)	Effectiveness
Cold Flow	10	53	15	0.189	0.189	-	-
Hot Flow	1	26	57	0.038	0.038	-	-
Cooled Hot Flow - Hot in on bottom	10	275	18.1	0.036	0.036	5913	93%
Heated Cold Flow - Hot in on bottom	-	-	23.2	-	-	6467	-
Cooled Hot Flow - Hot in on top	10	277	30.2	0.036	0.036	4044	64%
Heated Cold Flow - Hot in on top	-	-	20.4	-	-	4259	-

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system:	Brewbot	*brew:*	N/A

Procedure:

Procedure

1. Fix the `Cold_in` flow to the *bottom* of the HX.
2. Measure flowrate on both hot and cold side flows.
3. Measure temperature of both hot and cold side flows.
4. Cool HX with cold flow, attach hot flow, and fill 10L in a bucket while recording the time, final temperature, and average temperature of the cold flow.
5. Repeat `steps 1-4` with the `Cold_in` flow to the *top* of the HX.