1.

1.)

P_{pump} , P_{fan} . $C_{elec} = \$0.12/kW \cdot hr$

$\dot{V}_{evap}$ $C_{water} = \$10 / 1000\ gal$

$$Power = P_{pump} + P_{fan}$$

$$\underset{\text{Per hr}}{\text{Cost of Power}} = \underset{[kW]}{(Power)}\ \underset{[0.12\$/kW \cdot hr]}{(C_{elec})}$$

$$\underset{\text{Per hr}}{\text{Cost of Water}} = \underset{[L/s]}{(\dot{V}_{evap})}\ \underset{[\$10/1000\ gal]}{(C_{water})} \left[\frac{3600 s}{1 hr}\right]\left[\frac{1 gal}{3.78541 L}\right]$$

$$\text{Cost per hr} = (P_{pump} + P_{fan})(C_{elec}) + (\dot{V}_{evap})(C_{water})$$

$$\text{Cost per hr} = \underset{[\cancel{kW}]}{(P_{pump} + P_{fan})}\underset{\left[\frac{1}{\cancel{kW}}\right]}{\left(\frac{\$0.12}{kW \cdot hr}\right)} + \underset{[\cancel{L}/\cancel{s}]}{(\dot{V}_{evap})}\underset{\left[\frac{\cancel{s}}{\cancel{L} \cdot hr}\right]}{\left(\frac{\$9.51 \cdot s}{hr}\right)}$$

$$\boxed{\text{Cost Per hr} = (P_{pump} + P_{fan})\,0.12 + 9.51\,\dot{V}_{evap}}$$

2. The minimum outlet temperature of the liquid water is equal to the wet-bulb temperature of the air entering when there is no heat to be exchanged between the fluids. Once the temperature is the same it will reach equilibrium. The equilibrium will indicate that the temperature of both fluids will be the same, therefore it is not possible for there to be any heat transferred.

3.

steady state　　adiabatic　　no work

$$\cancel{\frac{dE_{cv}}{dt}} = \cancel{\sum \dot{Q}} + \cancel{\sum \dot{W}} + \sum \dot{m}\,\theta$$

Steady-state

$$\cancel{\frac{dm_{cv}}{dt}} = \sum_{in} \dot{m} - \sum_{out} \dot{m}$$

$$0 = \sum_{in} \dot{m}_i \theta_i - \sum \dot{m}_o \theta_o$$

$$\dot{m}_{tot} = \dot{m}_v + \dot{m}_l$$

$$\dot{m}_l = \dot{m}_{tot} - \dot{m}_v$$

$$\theta = h + ke + pe$$

$$h = c_p T$$

$$0 = \dot{m}_{tot} h_{tot} - (\dot{m}_v h_v + \dot{m}_l h_l)$$

$$0 = \dot{m}_{tot} h_{tot} - \dot{m}_v h_v - (\dot{m}_{tot} - \dot{m}_v) h_l$$

$$0 = \dot{m}_{tot} h_{tot} - \dot{m}_v h_v - \dot{m}_{tot} h_l - \dot{m}_v h_l$$

$$0 = \dot{m}_{tot}(h_{tot} - h_l) - \dot{m}_v (h_v - h_l)$$

$$\boxed{\dot{m}_{tot}(h_{tot} - h_l) = \dot{m}_v (h_v - h_l)}$$

$$h_{tot} - h_l = \frac{\dot{m}_v (h_v - h_l)}{\dot{m}_{tot}}$$

$$c_p T_{tot} - c_p T_l$$

$$\underbrace{c_p (T_{tot} - T_l)}_{\Delta t_{evap}} = \frac{\dot{m}_v (h_v - h_l)}{\dot{m}_{tot}}$$

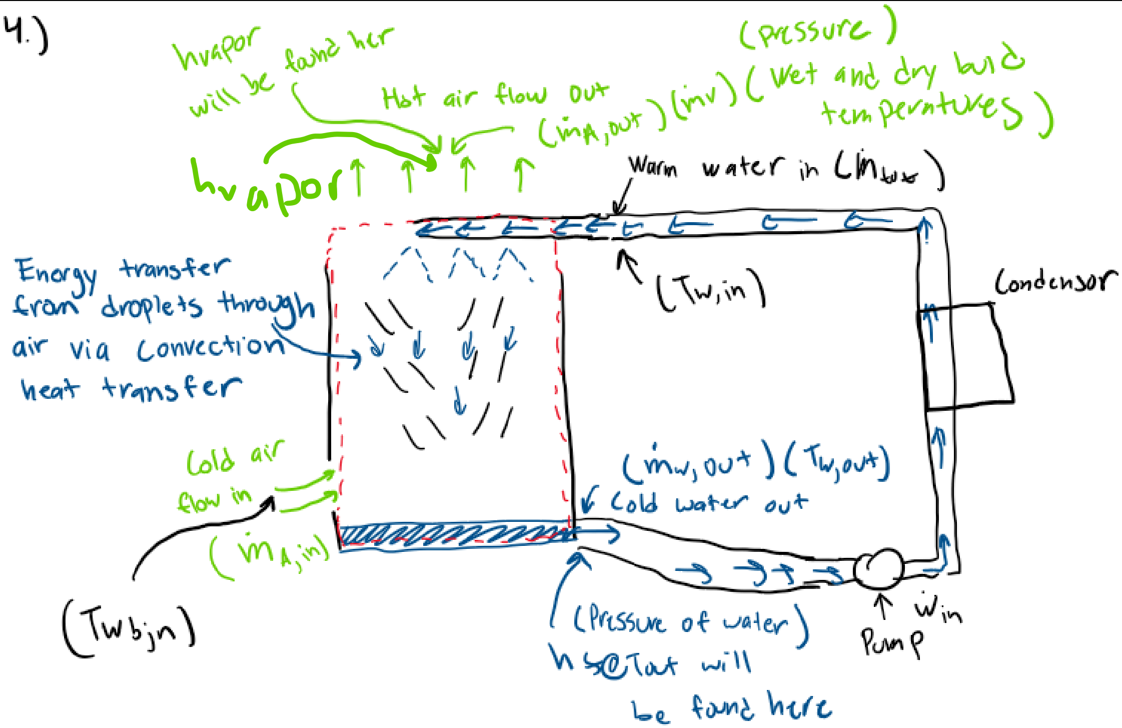
$$\boxed{\Delta T_{evap} \approx \Delta T_l = \frac{\dot{m}_v (h_v - h_l)}{\dot{m}_{total}\, c_p}}$$

4.

$T_{w,\,in}$ (K)	This is the water temperature going in the cooling tower. A thermostat can be used right before the water goes into the cooling tower.
$T_{w,\,out}$ (K)	This is the water temperature going out the cooling water. A thermostat can be used right before the water goes out of the cooling tower.
$T_{wb,\,in}$ (K)	This is the wet bulb temperature of the air. This will be right before it enters the cooling tower process,
m_v (kg/s)	The mass flow rate of water vapor out. A mass flow rate meter can measure this mass flow in the air when the water vapor is going out of the cooling tower.

c_p (J/kg * K)	This is heat capacity at liquid average temperature. This can be found in tables and the liquid average is $T_{w, in} + T_{w, out}$ divided by two.
M_{tot} (kg/s)	Total mass flow rate of fluid falling down the cooling water. This can be measured through a mass flow rate for water right before it goes into the nozzles.
$h_{vapor@P, T, RH}$ (kJ/kg)	This value can be found by finding the pressure and temperature of vapor that is leaving the cooling tower. Pressure can be found with a pressure sensor and temperature can be found with a thermostat. The thermodynamics table will help you find the value
$h_{f@Tout}$ (kJ/kg)	By finding the temperature of the water going out of the cooling tower and finding the pressure of the outlet using a pressure sensor, the steam tables can give you the enthalpy with these two properties.

4.)



5.)

Efficient Instruments	
Thermistor	This will be able to measure the outlet and inlet water temperature. As resistance changes the temperature will also change. With a multimeter you can measure the resistance and by knowing the resistance the temperature can be found by using the Steinhart- Hart equation. These multimeter values can be sent to a computer to give the temperature and the values can be stored there
Wet bulb using a thermometer	The wet bulb measurement will measure the $T_{wb, in}$, which is the wet bulb temperature of the air entering. This measurement uses a wet cloth on a thermometer where the airflow will pass through the cloth. This will allow

	for water to evaporate, measuring the temperature. This can connect to a digital output as well as a computer to store the values.
Effectiveness Instruments	
Thermistor	This applies the same as the efficient instrument. This will measure (ΔTtotal) which is just the cooling range.
Dry bulb using a thermometer	This will measure the outlet air temperature without using a wet cloth. The temperature of the air should end up at a higher temperature compared to the wet bulb temperature. By using wet bulb and dry bulb measurements enthalpy can be found using a psychrometric chart. This can connect to a digital output as well as a computer to store the values.
Wet bulb using a thermometer	This applies the same as the efficient instrument.
Rotameter	This measures the mass flow rate of the water such as Mtot and m_v. In this process, there is a tube that has a float and the fluid will flow through. The float will move depending on the forces acting on it. The measurements can be read by looking at the rotameter but can also be displayed on a computer that is connected to it.
Manometer	This measures pressure of the mass air flow rate that is going out of the cooling tower. This is measured through a U-shaped tube filled with liquid and there will be 2 points that will have a pressure difference and are connected to the system that is measured.
Orifice meter using a manometer	This measures the air flow rate where the air will flow through a duct where the air will be restricted to a small opening. A manometer will connected to find the pressure difference and this will allow us to calculate the mass flow rate by also using the dry and wet bulb temperature to find the specific volume.

6.)

High Impact Factors	**Reason**
Fan speed	The fan speed will affect the air circulation within the tower which can affect the cooling process of the water. The higher the air circulation the more efficient it will be.
Packing or fill	The packaging or fill will have a high impact due to how much contact surface there is for heat exchange. Therefore, the more surface area there is the more heat transfer will occur affecting the cooling tower efficiency.
Ambient air temperature	When the ambient air is higher it will make it more difficult for the water in the cooling water to reject the heat. If the ambient temperature is low then it will be much easier to cool down the water. Therefore, this is critical for efficiency.
Inlet water temperature	This temperature will be critical because it will affect how much heat will be transferred once the water is in the cooling tower.
Outlet water temperature	This temperature will determine how much heat transferred there was in the process leading to the effect of the efficiency.

M_{tot}	This is the total mass flow rate which will have an effect on the effectiveness due to how fast the water will be in the process of the heat transfer in the cooling tower.
M_v	This is the mass flow rate of the water vapor out which will have an effect on the effectiveness
Air inlet temperature	The temperature that goes in the outlet will have an effect on the rate of heat transferred from the water to the air and affect the evaporation.
Wet bulb temperature	This temperature will determine the enthalpy values which affect the effectiveness
Dry bulb temperature	This temperature will determine the enthalpy values which affect the effectiveness
Low Impact Factors	**Reason**
Local pressure	The local pressure will not affect the cooling tower because it does not depend on any effective or efficiency values.
Drift or Carry-over	The factor is just the loss of water droplets from the cooling tower. It will not have an effect because the amount of water is not significant and will not have much effect on the overall efficiency.
Pressure of air outlet	The pressure of the air outlet will much an effect on the cooling tower it will help determine the enthalpy at that pressure and temperature which leads to effectiveness
Blown down	This is just water that is removed from the water circuit. It will not have much effect as it will not affect the heat transfer process.

7.)

Initial Value of Factor	**Reason**
Inlet water Temperature = 40 ℃	The inlet water temperature is going to be higher since that water is going to get cooled down and this water is coming from the water that was heated. This is also common in water towers.
Outlet water temperature = 30 ℃	The outlet water temperature will be lower than the inlet water because this water has already had some cooling and should be lower.
Mass flow rate of water = 5kg/s	This will be an easy-going rate that will not be fast or slow. It will allow us to see the effect easily as the range can go higher. This value is also common from cooling towers.
wet bulb temperature of air inlet = 20 ℃	The temperature should be cooler because it is the air ambient temperature that is flowing through the air inlet of the cooling tower.
Ambient air temperature = 22 ℃	This is just the ambient air temperature and the room temperature should be an average for a cooling tower.
Fill surface area = 100 ft^2	There should be enough contact area for the water to go through to maximize the efficiency and effectiveness of the cooling tower. The more surface area the more heat transfer will occur
Fan speed/ air flow = Medium	The fan speed will initially be set to medium. Although the higher it is the more efficient it will be.

Local pressure = 1atm	The local pressure will be at 1 atm because cooling towers are usually operated at atmospheric pressure.
Pressure of air outlet = 1atm	The temperature should be close to the local pressure so it should be the same as that.

8.)

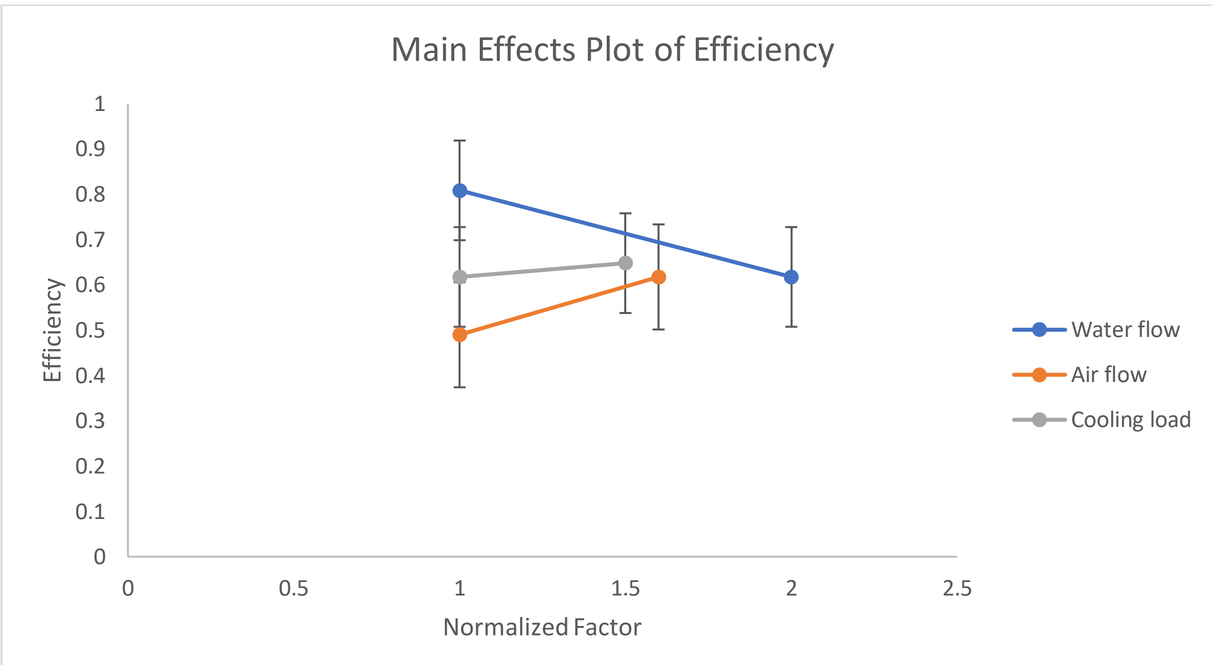
			Level	
			1	2
Factor	A	Water Mass Flow rate (kg/s)	5	10
	B	Ambient Ait Temp. (C)	22	30
	C	Fill surface area (ft^2)	100	150
	D	Fan Speed (Pa)	100	150
	E	Local pressure (atm)	1	5
	F	Inlet water temp (C)	40	50
	G	wet bulb temp of air (C)	20	25

These factors were chosen due to there being the most critical and the ones that are controllable. The green squares are experiments that are not conducted while the white boxes experiment will be conducted. This method will reduce the number of experiments but optimize experiment design which helps with time and cost. This is known as the ¼ fractional factorial experiment.

			A1								A2							
			B1				B2				B1				B2			
			C1		C2		C1		C2		C1		C2		C1		C2	
			D1	D2	D1	D2	D1	D2	D1	D2	D1	D2	D1	D2	D1	D2	D1	D2
E1	F1	G1																
		G2																
	F2	G1																
		G2																
E2	F1	G1																
		G2																
	F2	G1																
		G2																

1.

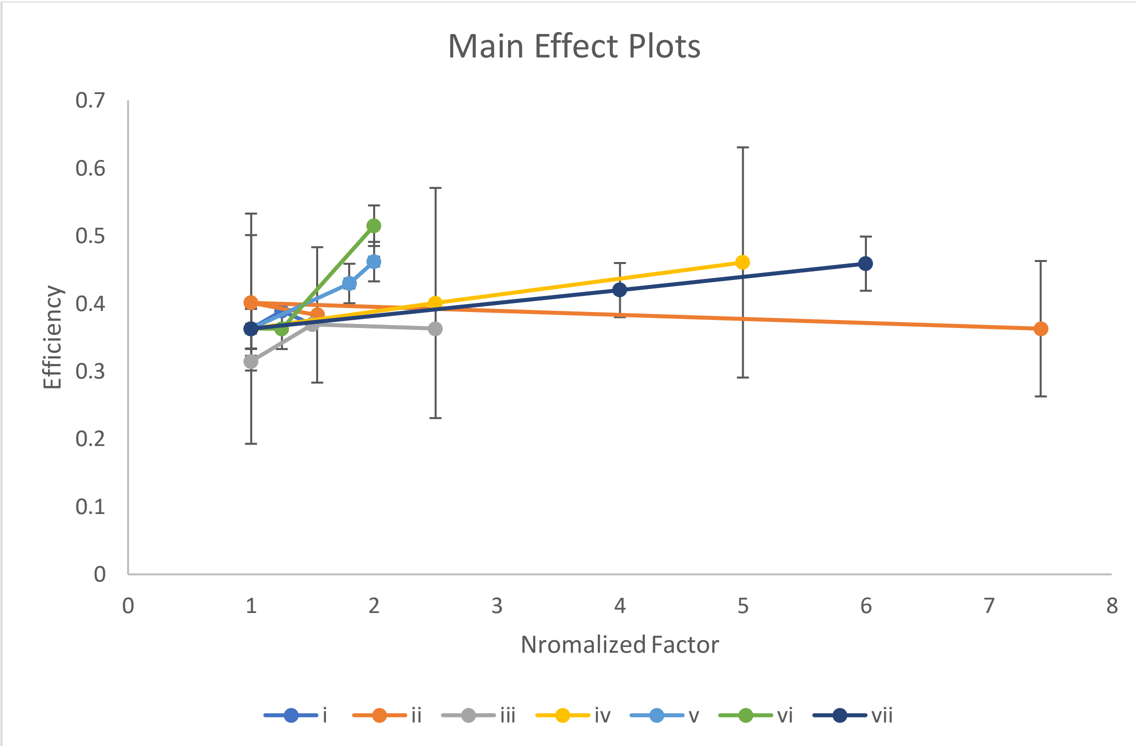
	Efficiency	
Expt #	Value	± Uncert
1	0.61757381	0.158106
2	0.80866548	0.116108
3	0.4900307	0.117605
4	0.64800456	0.118912



The 2 strongest factors that influence this lab are the water flow rate and air flow rate parameters. This can be concluded due to the change in efficiency once the levels are changed. The biggest factors here can be found through this chart by looking at the slope and seeing that it had a bigger change in efficiency than the cooling load factor efficiency. The cooling load factor has the weakest influence since it has the smallest slope and smallest efficiency change. In this experiment, we can conclude that decreasing the water flow rate will increase the efficiency but increasing the air flow will increase the efficiency. By having a higher air flow rate there will be more air entering the cooling tower which will increase the amount of heat transferred to the air and will cause to decrease in the water temperature; therefore making it more efficient. By decreasing the water flow rate, the water will have more time to be in the water tower which will have more time for heat to transfer to air; making it more efficient. As you can see here the uncertainty value ranges are similar.

2.

	Efficiency	
Expt #	Value	± Uncert
1	0.362825331	**0.143864**
2	0.386622543	**0.07528**
3	0.597713089	**0.063169**
4	0.785770164	**0.171328**
5	0.386055172	**0.038526**
6	0.177178727	**0.085003**
7	0.383547929	**0.181958**
8	0.23763662	**0.045671**
9	0.508358333	**0.052588**
10	0.333744916	**0.327913**
11	0.681564448	**0.054189**
12	0.271880118	**0.048384**
13	0.468565223	**0.116286**
14	0.244766713	**0.080899**
15	0.425910748	**0.05855**
16	0.29665104	**0.049395**
17	0.469570938	**0.130551**
18	0.318148048	**0.130551**



The 3 most important factors that were identified were the height tower, packing density, and the outside temperature. These factors were identified by looking at the main effect plots. In this plot, you can see that these factors made the highest efficiency change and this was found by finding the slopes of each factor to ensure what factors had the largest efficiency change. The factor packing density had a high impact due to the water having more area to conduct more heat transfer. The tower height was also a high influence due to making the water have more time in the cooling tower. The higher it is the more time the water will take for it to reach the bottom which will result in more heat being transferred as it stays there longer. The outside temperature has a large influence due to the air temperature that will go inside the cooling tower for heat exchange. If the temperature is warmer then there will not be much heat being transferred which will decrease the efficiency of the cooling tower. Uncertainty analysis can tell us that if it has a low uncertainty then it can be concluded that it is more stable and that the efficiency will not have much of an effect and will stay at a certain range.

3.

In both experiments, the heating load was not considered one of the major factors that had a high influence. Therefore this can be concluded that the heating load will not be the most important factor in cooling towers. In this case, they had similar conclusions. The reason for this is due to the heating load not having a direct impact on the cooling tower heat exchange. The cooling load may change the temperature of the inlet but will not have a large impact on the cooling tower where the temperature of the water is being decreased. Therefore, it will not affect the efficiency making it a low factor. This will occur on any scale of a cooling tower.

4.

	Factor/Level			Efficiency		Relative Cost	
Expt #	A – Tower Heights	B – Packing Density	C – Outside Temp.	Value	± Uncert	Value	± Uncert
1	1	1	1	0.558705	0.111466	0.124078	0.067894
2	1	2	1	0.719048	0.149438	0.131662	0.062065
3	1	3	1	0.744141	0.155654	0.132814	0.06126
4	1	1	2	0.436868	0.085956	0.11385	0.077784
5	1	2	2	0.577467	0.11519	0.120317	0.071252
6	1	3	2	0.600013	0.119991	0.121063	0.070558
7	1	1	3	0.629125	0.128257	0.128462	0.064384
8	1	2	3	0.806519	0.172282	0.137607	0.058132
9	1	3	3	0.836335	0.180037	0.139354	0.057074
10	2	1	1	0.253069	0.050506	0.078541	0.093604
11	2	2	1	0.34326	0.067244	0.085574	0.083576
12	2	3	1	0.361566	0.070574	0.092907	0.075261
13	2	1	2	0.282843	0.056157	0.092902	0.078244
14	2	2	2	0.386915	0.075834	0.088463	0.080037
15	2	3	2	0.36635	0.12978	0.089335	0.079028
16	2	1	3	0.396247	0.078526	0.095747	0.072326
17	2	2	3	0.546323	0.110976	0.110772	0.060394
18	2	3	3	0.580431	0.118785	0.104979	0.064468

19	3	1	1	0.206867	0.041863	0.072772	0.093487
20	3	2	1	0.281147	0.055518	0.083409	0.079226
21	3	3	1	0.297664	0.058374	0.077474	0.086558
22	3	1	2	0.228175	0.045921	0.078849	0.084712
23	3	2	2	0.315573	0.061902	0.081928	0.080848
24	3	3	2	0.465869	0.165067	0.079722	0.08356
25	3	1	3	0.316073	0.062748	0.089019	0.073201
26	3	2	3	0.438419	0.087087	0.089674	0.072535
27	3	3	3	0.464295	0.092748	0.094319	0.068341

Experiment 9 will have the highest efficiency. The reason is due to it having a high tower height and high packing density. These levels are critical because they are what will determine how much heat transfer is occurring in the cooling tower.

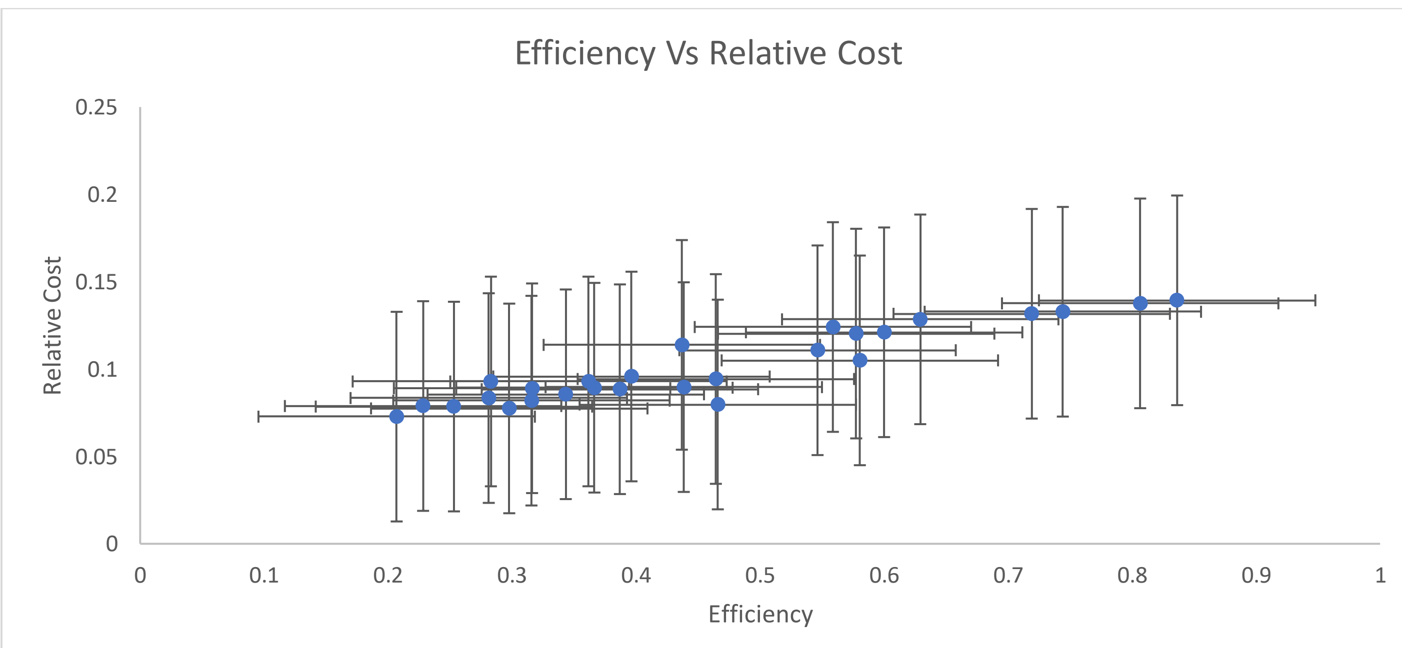
5.

The full factorial results and the Taguchi subset did not give me the same answers. It appears that the subset seems to appear more in the mid-range of efficiency. The full factorial appeared to have higher efficiencies through the experiments as well as some lower efficiency than the subset experiment. This does appear to be good enough as in the full factorial method, the highest efficiency values were found and this is due to looking at the most important factors. We can also conclude which level of the factors will be critical enough to where the efficiency will be low and will conclude that these levels will not be good for the cooling tower efficiency. The advantage of the full factorial is that there will be more experiments conducted which will result in more information but the disadvantage is that it will cost more time and money. The advantage of the subset is that it will save more time and money but will not be able to check which combination might have the highest or lowest efficiency.

6.

Ex	**efficiency**	**Ctower ($/hr)**	**Profit ($/hr)**	**Relative Cost**	**Bx (±)**	**Px (±)**	**Ux (±)**
1	0.558705	15.952932	128.5714	0.124078	0.06789	0.000715	0.067894
2	0.719048	16.927908	128.5714	0.131662	0.06206	0.000791	0.062065
3	0.744141	17.076024	128.5714	0.132814	0.061258	0.000422	0.06126
4	0.436868	14.637798	128.5714	0.11385	0.07778	0.000747	0.077784
5	0.577467	15.469278	128.5714	0.120317	0.07125	0.000535	0.071252
6	0.600013	15.565296	128.5714	0.121063	0.070557	0.000465	0.070558
7	0.629125	16.516602	128.5714	0.128462	0.064381	0.000519	0.064384
8	0.806519	17.692326	128.5714	0.137607	0.05813	0.000402	0.058132
9	0.836335	17.91693	128.5714	0.139354	0.057072	0.000487	0.057074
10	0.253069	10.098174	128.5714	0.078541	0.0936	0.000937	0.093604
11	0.34326	11.002368	128.5714	0.085574	0.083559	0.001695	0.083576

12	0.361566	11.945208	128.5714	0.092907	0.075142	0.004225	0.075261
13	0.282843	11.944512	128.5714	0.092902	0.078191	0.002878	0.078244
14	0.386915	11.37381	128.5714	0.088463	0.080035	0.000646	0.080037
15	0.36635	11.485908	128.5714	0.089335	0.079026	0.000553	0.079028
16	0.396247	12.310296	128.5714	0.095747	0.072322	0.000717	0.072326
17	0.546323	14.242056	128.5714	0.110772	0.060339	0.002572	0.060394
18	0.580431	13.497336	128.5714	0.104979	0.06446	0.001013	0.064468
19	0.206867	9.356412	128.5714	0.072772	0.093482	0.001042	0.093487
20	0.281147	10.724022	128.5714	0.083409	0.079111	0.004284	0.079226
21	0.297664	9.960888	128.5714	0.077474	0.086529	0.002224	0.086558
22	0.228175	10.137774	128.5714	0.078849	0.084688	0.002042	0.084712
23	0.315573	10.5336576	128.5714	0.081928	0.080843	0.000906	0.080848
24	0.465869	10.24992	128.5714	0.079722	0.083559	0.000308	0.08356
25	0.316073	11.44524	128.5714	0.089019	0.07318	0.001752	0.073201
26	0.438419	11.529558	128.5714	0.089674	0.072535	0.000295	0.072535
27	0.464295	12.126786	128.5714	0.094319	0.068329	0.001273	0.068341



Factoring the cost to run the cooling tower does alter the "best choice." This graph shows that just because an experiment is high, that does not mean that it will be affordable. Having high efficiency might result in more cost and sometimes that will not be the best option if you are on a budget. You will have to alter between the efficiency and the cost to see what the best option is and some outside factors will need to be considered. This plot shows that as the efficiency increases the relative cost will also increase.

7. **Part 2 Data**

All temperatures are in Celsius.

Time (s)	T1 – Inlet Dry	T2 – Inlet Wet Bulb	T3 – Outlet Dry Bulb	T4 – Outlet Wet	T5 – Water Inlet	T6 – Water Outlet	Pressure Drop – Orifice(Pa	Water Flow Rate (g/s)	Heater Output (kW)	Range	Approach	Efficiency	Vair_ideal	Vair_actual	air flow rate (g/s)
852	24.841	18.205	23.026	21.855	27.573	21.829	121.042	40	1	5.744	3.624	0.6132	8.036E-05	4.95E-05	49.351
864	24.885	18.256	23.068	21.895	27.538	21.867	121.15	40	1	5.671	3.611	0.611	8.039E-05	4.952E-05	49.373
876	24.902	18.297	23.075	21.929	27.581	21.904	120.896	40	1	5.677	3.607	0.6115	8.031E-05	4.947E-05	49.322
888	24.939	18.335	23.098	21.948	27.602	21.922	120.947	40	1	5.68	3.587	0.6129	8.033E-05	4.948E-05	49.332
900	24.972	18.353	23.109	21.96	27.613	21.953	121.017	40	1	5.66	3.6	0.6112	8.035E-05	4.949E-05	49.346
910	24.999	18.371	23.136	21.966	27.651	21.969	120.865	40	1	5.682	3.598	0.6123	8.03E-05	4.946E-05	49.315
922	25.024	18.381	23.158	21.998	27.675	21.965	120.982	40	1	5.71	3.584	0.6144	8.034E-05	4.949E-05	49.339
932	25.056	18.412	23.177	22.013	27.618	21.98	121.016	40	1	5.638	3.568	0.6124	8.035E-05	4.949E-05	49.346
942	25.06	18.419	23.183	22.022	27.765	21.989	120.888	40	1	5.776	3.57	0.618	8.031E-05	4.947E-05	49.32
952	25.091	18.439	23.207	22.019	27.69	21.99	120.605	40	1	5.7	3.551	0.6161	8.021E-05	4.941E-05	49.262
962	25.121	18.456	23.219	22.032	27.641	22.008	120.771	40	1	5.633	3.552	0.6133	8.027E-05	4.944E-05	49.296
972	25.139	18.456	23.217	22.045	27.754	22.022	120.698	40	1	5.732	3.566	0.6165	8.024E-05	4.943E-05	49.281
982	25.17	18.475	23.234	22.056	27.745	22.017	120.735	40	1	5.728	3.542	0.6179	8.025E-05	4.944E-05	49.289
992	25.194	18.499	23.252	22.084	27.689	22.045	120.605	40	1	5.644	3.546	0.6141	8.021E-05	4.941E-05	49.262
1002	25.215	18.509	23.259	22.082	27.728	22.053	120.87	40	1	5.675	3.544	0.6156	8.03E-05	4.946E-05	49.316
1012	25.236	18.519	23.275	22.099	27.78	22.065	120.787	40	1	5.715	3.546	0.6171	8.027E-05	4.945E-05	49.299
1022	25.245	18.524	23.261	22.087	27.828	22.056	120.677	40	1	5.772	3.532	0.6204	8.024E-05	4.943E-05	49.277
1032	25.28	18.549	23.29	22.11	27.85	22.096	120.732	40	1	5.754	3.547	0.6186	8.025E-05	4.944E-05	49.288
1042	25.298	18.568	23.296	22.124	27.843	22.119	120.682	40	1	5.724	3.551	0.6171	8.024E-05	4.943E-05	49.278
1052	25.304	18.572	23.298	22.133	27.826	22.118	120.794	40	1	5.708	3.546	0.6168	8.027E-05	4.945E-05	49.301
1062	25.332	18.59	23.322	22.155	27.859	22.129	120.521	40	1	5.73	3.539	0.6182	8.018E-05	4.939E-05	49.245
1072	25.341	18.605	23.331	22.151	27.926	22.135	120.45	40	1	5.791	3.53	0.6213	8.016E-05	4.938E-05	49.23
1082	25.345	18.607	23.332	22.162	27.838	22.112	120.548	40	1	5.726	3.505	0.6203	8.019E-05	4.94E-05	49.25
1092	25.377	18.627	23.352	22.186	27.832	22.126	120.464	40	1	5.706	3.499	0.6199	8.016E-05	4.938E-05	49.233
1102	25.399	18.625	23.36	22.186	27.893	22.15	120.684	40	1	5.743	3.525	0.6197	8.024E-05	4.943E-05	49.278
1112	25.4	18.626	23.357	22.181	27.932	22.156	120.56	40	1	5.776	3.53	0.6207	8.02E-05	4.94E-05	49.253
1122	25.408	18.626	23.368	22.187	27.912	22.124	120.674	40	1	5.788	3.498	0.6233	8.023E-05	4.942E-05	49.276
1132	25.428	18.645	23.382	22.208	27.913	22.131	120.465	40	1	5.782	3.486	0.6239	8.017E-05	4.938E-05	49.234
1142	25.435	18.647	23.383	22.217	27.878	22.144	120.403	40	1	5.734	3.497	0.6212	8.014E-05	4.937E-05	49.221
1152	25.432	18.668	23.383	22.211	27.916	22.153	120.903	40	1	5.763	3.485	0.6232	8.031E-05	4.947E-05	49.323
1172	25.461	18.691	23.417	22.243	28.003	22.168	120.611	40	1	5.835	3.477	0.6266	8.021E-05	4.941E-05	49.263
1182	25.486	18.689	23.434	22.264	27.976	22.183	120.21	40	1	5.793	3.494	0.6238	8.008E-05	4.933E-05	49.181
Avg	25.213	18.50753	23.25809	22.0878	27.777	22.052									
Std	0.1871	0.129721	0.108684	0.10507	0.1286	0.0932									
Bx	1.1	1.1	1.1	1.1	1.1	1.1		0.1	0.1576						
Px	0.0676	0.1083	0.090737	0.08772	0.1073	0.0778			0.0132						
Ux	1.1021	1.105318	1.103736	1.10349	1.1052	1.1027			0.1581						

1618	25.747	18.815	22.97	22.347	33.076	21.554	121.301	20	1	11.522	2.739	0.8079	8.044E-05	4.955E-05	49.404
1628	25.75	18.795	22.98	22.346	33.127	21.575	121.426	20	1	11.552	2.78	0.806	8.048E-05	4.958E-05	49.43
1638	25.76	18.802	22.985	22.358	33.2	21.56	121.639	20	1	11.64	2.758	0.8084	8.055E-05	4.962E-05	49.473
1648	25.759	18.82	23.003	22.366	33.271	21.569	121.484	20	1	11.702	2.749	0.8098	8.05E-05	4.959E-05	49.441
1658	25.772	18.838	23.02	22.396	33.326	21.587	121.399	20	1	11.739	2.749	0.8103	8.048E-05	4.957E-05	49.424
1668	25.778	18.854	23.033	22.414	33.362	21.617	121.435	20	1	11.745	2.763	0.8096	8.049E-05	4.958E-05	49.431
Avg	25.761	18.82067	22.9985	22.3712	33.227	21.577									
Std	0.011	0.020213	0.022396	0.02539	0.1029	0.0208									
Bx	1.1	1.1	1.1	1.1	1.1	1.1		0.1	0.116						
Px	0.0092	0.016875	0.018698	0.0212	0.0859	0.0173			0.0051						
Ux	1.1	1.100129	1.100159	1.1002	1.1033	1.1001			0.1161						
2140	25.562	18.704	25.501	24.526	30.186	24.551	48.872	40	1	5.635	5.847	0.4908	5.106E-05	3.145E-05	31.359
2150	25.557	18.736	25.514	24.534	30.148	24.561	48.527	40	1	5.587	5.825	0.4896	5.088E-05	3.134E-05	31.248
2160	25.569	18.762	25.517	24.555	30.177	24.579	48.563	40	1	5.598	5.817	0.4904	5.09E-05	3.135E-05	31.26
2170	25.603	18.8	25.548	24.589	30.18	24.583	48.926	40	1	5.597	5.783	0.4918	5.109E-05	3.147E-05	31.376
2180	25.603	18.808	25.548	24.579	30.083	24.586	48.748	40	1	5.497	5.778	0.4875	5.1E-05	3.141E-05	31.319
2190	25.62	18.826	25.556	24.581	30.155	24.603	48.946	40	1	5.552	5.777	0.4901	5.11E-05	3.148E-05	31.383
Avg	25.586	18.77267	25.53067	24.5607	30.155	24.577									
Std	0.0239	0.042843	0.020766	0.02414	0.0349	0.017									
Bx	1.1	1.1	1.1	1.1	1.1	1.1		0.1	0.1176						
Px	0.02	0.035769	0.017337	0.02016	0.0291	0.0142			0.0023						
Ux	1.1002	1.100581	1.100137	1.10018	1.1004	1.1001			0.1176						
2774	25.785	19.317	24.878	23.95	31.956	23.757	119.121	40	1.5	8.199	4.44	0.6487	7.972E-05	4.911E-05	48.958
2784	25.81	19.332	24.897	23.965	31.89	23.751	118.846	40	1.5	8.139	4.419	0.6481	7.962E-05	4.905E-05	48.902
2794	25.835	19.351	24.905	23.973	31.796	23.748	118.899	40	1.5	8.048	4.397	0.6467	7.964E-05	4.906E-05	48.912
2804	25.852	19.367	24.901	23.98	31.968	23.797	118.83	40	1.5	8.171	4.43	0.6484	7.962E-05	4.905E-05	48.898
2814	25.87	19.393	24.927	23.996	31.91	23.804	118.878	40	1.5	8.106	4.411	0.6476	7.964E-05	4.906E-05	48.908
2824	25.881	19.407	24.926	23.992	31.964	23.821	119.016	40	1.5	8.143	4.414	0.6485	7.968E-05	4.908E-05	48.937
Avg	25.839	19.36117	24.90567	23.976	31.914	23.78									
Std	0.0333	0.031762	0.016987	0.0157	0.0601	0.0287									
Bx	1.1	1.1	1.1	1.1	1.1	1.1		0.1	0.1189						
Px	0.0278	0.026517	0.014182	0.0131	0.0502	0.024			0.0035						
Ux	1.1004	1.10032	1.100091	1.10008	1.1011	1.1003			0.1189						
s1 (m)	0.15		t	2.045											
D2 (m)	0.08		n1	32											
A1 (m^2)	0.0225		n2,3,4	6											
A2 (m^2)	0.005														
CD	0.616														
rho (g/m^;	997000														

Water flow	**Air flow**	**Coolin g load**	**efficenic ny avg**		**std**
2	1.6	1	0.617574	**Default**	0.0042
1			0.808665	**B**	0.0014
	1		0.490031	**C**	0.0013
		1.5	0.648005	**D**	0.0007

Part 3 data

Exp #	Water In Temp	Water Out Tem	DB In T [	WB In T [C	DB out T [(	WB out T	Water Flowrate	Water Makeup (n	Pump Power (	efficiency
1	23.52	20.65	35.01	15.54	27.57	20.16	0.891	1.179	49607	0.35964912
1	23.51	20.64	35	15.63	27.58	20.14	0.8	2.9308	49615	0.3642132
1	23.53	20.64	34.98	15.43	27.56	20.12	0.799	2.9236	49596	0.35679012
1	23.53	20.63	35.01	15.72	27.59	20.15	0.809	2.9168	49625	0.37131882
1	23.52	20.63	34.99	15.54	27.57	20.13	0.791	2.9092	49607	0.36215539
Avg	**23.522**	**20.638**	**34.998**	**15.572**	**27.574**	**20.14**	**0.818**		**49610**	**0.362825**
Std	**0.00748331**	**0.007483315**	**0.0117**	**0.09745**	**0.0102**	**0.01414**	**0.0369432**	**0.696476821**	**9.63327566**	**0.00492**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.143753**
Px	**0.00929027**	**0.009290273**	**0.0145**	**0.12098**	**0.01266**	**0.01756**	**0.045863687**	**0.864651555**	**11.959374**	**0.005659**
Ux	**0.30014381**	**1.100039231**	**0.8001**	**0.8091**	**0.8001**	**0.80019**				**0.143864**
2	31.66	25.75	25.01	16.44	27.4	23.68	0.916	0.7197	23162	0.38830486
2	31.67	25.75	25	16.43	27.4	23.68	0.915	0.6288	23161	0.38845144
2	31.65	25.76	25.01	16.24	27.4	23.66	0.896	0.6184	23165	0.38221934
2	31.63	25.74	25	16.36	27.39	23.67	0.908	0.6079	23154	0.38572364
2	31.65	25.75	24.99	16.46	27.38	23.68	0.918	0.5956	23144	0.38841343
Avg	**31.652**	**25.75**	**25.002**	**16.386**	**27.394**	**23.674**	**0.9106**		**23157.2**	**0.386623**
Std	**0.0132665**	**0.006324555**	**0.0075**	**0.0804**	**0.008**	**0.**[illegible]	[illegible]	**0.044205493**	**7.52063827**	**0.002432**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	[illegible]	[illegible]		**10**	**0.075234**
Px	**0.01646989**	**0.007851714**	**0.0093**	**0.09981**	**0.00993**	**0.00993**	**0.009981255**	**0.05487957**	**9.33660875**	**0.002613**
Ux	**0.30045176**	**1.100028022**	**0.8001**	**0.8062**	**0.80006**	**0.80006**				**0.07528**
3	52.22	40.76	40	33.01	43.07	40.12	1.858	1.3663	16566	0.59656429
3	52.24	40.76	40	32.96	43.07	40.11	1.853	1.3227	16561	0.59543568
3	52.23	40.75	40.01	33.06	43.08	40.12	1.864	1.2735	16572	0.59885237
3	52.26	40.77	40.01	33.11	43.08	40.13	1.869	1.2215	16577	0.6
3	52.24	40.74	40	33	43.07	40.12	1.857	1.1315	16565	0.5977131
Avg	**52.238**	**40.756**	**40.004**	**33.028**	**43.074**	**40.12**	**1.8602**		**16568.2**	**0.597713**
Std	**0.0132665**	**0.010198039**	**0.0049**	**0.05192**	**0.0049**	**0.00632**	**0.005635601**	**0.08168192**	**5.63560112**	**0.001615**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.063132**
Px	**0.01646989**	**0.012660508**	**0.0061**	**0.06446**	**0.00608**	**0.00785**	**0.006996401**	**0.10140524**	**6.99640121**	**0.002172**
Ux	**0.30045176**	**1.100072856**	**0.8**	**0.80259**	**0.80002**	**0.80004**				**0.063169**
4	40.57	34.65	40.01	33.06	38.65	36.9	1.09	3.4619	32539	0.78828229
4	40.61	34.69	40.01	33.1	38.65	36.9	1.094	3.5198	32543	0.78828229
4	40.59	34.67	40	32.93	38.63	36.89	1.078	3.5616	32527	0.77284595
4	40.6	34.68	40.01	33.1	38.65	36.9	1.094	3.6412	32543	0.78933333
4	40.58	34.67	40.01	33.1	38.65	36.9	1.094	3.7188	32543	0.79010695
Avg	**40.59**	**34.672**	**40.008**	**33.058**	**38.646**	**36.898**	**1.09**		**32539**	**0.78577**
Std	**0.01414214**	**0.013266499**	**0.004**	**0.06585**	**0.008**	**0.004**	**0.006196773**	**0.09046426**	**6.19677335**	**0.006499**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.171092**
Px	**0.01755697**	**0.016469894**	**0.005**	**0.08175**	**0.00993**	**0.00497**	**0.007693077**	**0.112308208**	**7.69307687**	**0.008992**
Ux	**0.30051331**	**1.100123292**	**0.8**	**0.80417**	**0.80006**	**0.80002**				**0.171328**
5	36.79	25.27	20	7.01	27.25	24.27	1.673	4.3231	19976	0.3868368
5	36.81	25.29	19.99	6.89	27.24	24.26	1.661	4.6763	19965	0.38502674
5	36.81	25.28	20.02	7.16	27.27	24.28	1.687	4.7919	19991	0.38887015
5	36.81	25.29	19.99	6.81	27.24	24.25	1.653	4.8911	19957	0.384
5	36.81	25.29	20	6.93	27.25	24.26	1.665	5.0629	19969	0.38554217
Avg	**36.806**	**25.284**	**20**	**6.96**	**27.25**	**24.264**	**1.6678**		**19971.6**	**0.386055**
Std	**0.008**	**0.008**	**0.011**	**0.119**	**0.01095**	**0.0102**	**0.011565466**	**0.247887923**	**11.4821601**	**0.001678**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.038477**
Px	**0.00993172**	**0.00993172**	**0.0136**	**0.14773**	**0.0136**	**0.01266**	**0.01435812**	**0.307744166**	**14.2546992**	**0.001944**
Ux	**0.30016435**	**1.100044835**	**0.8001**	**0.81353**	**0.80012**	**0.8001**				**0.038526**

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
6	29.28	26.98	25	16.39	25.88	19.44	0.351	5.3869	13761	0.17843289
6	29.49	27.16	24.99	16.31	25.93	19.49	0.351	5.4091	13752	0.176783
6	29.55	27.21	24.99	16.32	25.94	19.51	0.354	5.4257	13753	0.17687075
6	29.59	27.25	24.98	16.18	25.94	19.51	0.342	5.4515	13740	0.17449664
6	29.59	27.25	25.02	16.54	25.98	19.55	0.377	5.471	13775	0.17931034
Avg	**29.5**	**27.17**	**24.996**	**16.348**	**25.934**	**19.5**	**0.355**		**13756.2**	**0.177179**
Std	**0.11593101**	**0.100598211**	**0.0136**	**0.11754**	**0.032**	**0.03578**	**0.01171324**	**0.029830964**	**11.54816**	**0.001647**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.084426**
Px	**0.14392429**	**0.124889152**	**0.0168**	**0.14592**	**0.03973**	**0.04442**	**0.014541577**	**0.037034096**	**14.3366358**	**0.009889**
Ux	**0.33273744**	**1.107066981**	**0.8002**	**0.8132**	**0.80099**	**0.80123**				**0.085003**
7	25.76	23.34	25	19.53	24.92	22.45	0.421	0.7509	19089	0.38844302
7	25.75	23.33	24.99	19.37	24.9	22.43	0.405	0.7849	19074	0.37931034
7	25.77	23.35	24.99	19.41	24.91	22.44	0.409	0.8119	19078	0.38050314
7	25.77	23.35	25	19.5	24.92	22.45	0.419	0.839	19087	0.38596491
7	25.77	23.35	25	19.46	22.91	22.44	0.414	0.8645	19082	0.38351823
Avg	**25.764**	**23.344**	**24.996**	**19.454**	**24.512**	**22.442**	**0.4136**		**19082**	**0.383548**
Std	**0.008**	**0.008**	**0.0049**	**0.05817**	**0.80103**	**0.00748**	**0.005986652**	**0.039843173**	**5.54977477**	**0.003377**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.181897**
Px	**0.00993172**	**0.00993172**	**0.0061**	**0.07222**	**0.99446**	**0.00929**	**0.007432218**	**0.049463902**	**6.88985081**	**0.004702**
Ux	**0.30016435**	**1.100044835**	**0.8**	**0.80325**	**1.2763**	**0.80005**				**0.181958**
8	42.97	37.15	40.01	18.57	40.12	26.1	1.01	1.2195	12885	0.23852459
8	42.97	37.14	40.01	18.56	40.12	26.1	1.009	1.2968	12884	0.23883654
8	42.98	37.16	39.98	18.33	40.09	26.07	0.986	1.3562	12861	0.23610548
8	42.97	37.15	39.99	18.4	40.1	26.08	0.993	1.5287	12868	0.23687424
8	42.97	37.15	40	18.5	40.11	26.09	1.003	1.6187	12878	0.23784226
Avg	**42.972**	**37.15**	**39.998**	**18.472**	**40.108**	**26.088**	**1.0002**		**12875.2**	**0.237637**
Std	**0.004**	**0.006324555**	**0.0117**	**0.09325**	**0.01166**	**0.01166**	**0.009325235**	**0.147961554**	**9.32523458**	**0.001019**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.045656**
Px	**0.00496586**	**0.007851714**	**0.0145**	**0.11577**	**0.01448**	**0.01448**	**0.011576952**	**0.183689083**	**11.5769518**	**0.00**[illegible]
Ux	**0.3000411**	**1.100028022**	**0.8001**	**0.80833**	**0.80013**	**0.80013**				**0.045671**
9	34.79	23.35	20.01	12.39	27.5	26.24	1.53	2.2172	31354	0.51071429
9	34.78	23.34	19.99	12.25	27.49	26.22	1.515	2.3072	31340	0.50776742
9	34.79	23.35	20	12.27	27.49	26.23	1.518	2.3815	31342	0.5079929
9	34.81	23.37	20	12.3	27.49	26.23	1.521	2.4564	31345	0.50821857
9	34.78	23.35	19.99	12.24	27.49	26.22	1.515	2.5492	31339	0.50709849
Avg	**34.79**	**23.352**	**19.998**	**12.29**	**27.492**	**26.228**	**1.5198**		**31344**	**0.508358**
Std	**0.01095445**	**0.009797959**	**0.0075**	**0.05404**	**0.004**	**0.00748**	**0.005564171**	**0.11510437**	**5.40370243**	**0.001236**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.052562**
Px	**0.01359957**	**0.012163823**	**0.0093**	**0.06709**	**0.00497**	**0.00929**	**0.006907723**	**0.14289804**	**6.70850712**	**0.001638**
Ux	**0.30030809**	**1.100067252**	**0.8001**	**0.80281**	**0.80002**	**0.80005**				**0.052588**
10	44.2	32.73	25.02	10.02	31.23	25.96	1.736	3.5328	16561	0.33557636
10	44.21	32.74	24.98	9.7	31.2	25.93	1.703	3.7348	16529	0.33236743
10	44.2	32.74	25.01	9.94	31.22	25.95	1.728	3.81	16553	0.33450088
10	44.21	32.74	24.99	9.75	31.2	25.93	1.709	3.9249	16534	0.33284968
10	44.2	32.73	25	9.8	31.21	25.94	1.714	4.0088	16539	0.33343023

11	32.33	29.74	40.01	28.66	33.43	30.4	0.738	5.5282	36408	0.70572207
11	32.33	29.74	39.99	28.44	33.41	30.38	0.716	7.5602	36386	0.66580977
11	32.33	29.74	40	28.55	33.42	30.39	0.727	5.5957	36397	0.68518519
11	32.33	29.74	39.99	28.43	33.41	30.38	0.716	5.6685	36385	0.66410256
11	32.35	29.76	40	28.58	33.42	30.39	0.731	5.7005	36400	0.68700265
Avg	**32.334**	**29.744**	**39.998**	**28.532**	**33.418**	**30.388**	**0.7256**		**36395.2**	**0.681564**
Std	**0.008**	**0.008**	**0.0075**	**0.08704**	**0.00748**	**0.00748**	**0.00859302**	**0.777085111**	**8.70402206**	**0.015358**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.327326**
Px	**0.00993172**	**0.00993172**	**0.0093**	**0.10806**	**0.00929**	**0.00929**	**0.010667934**	**0.964723921**	**10.8057382**	**0.019617**
Ux	**0.30016435**	**1.100044835**	**0.8001**	**0.80726**	**0.80005**	**0.80005**				**0.327913**
12	35.77	30.13	20.01	15.08	24.7	22.77	0.782	6.1014	23167	0.27259546
12	35.77	30.13	19.99	14.95	24.69	22.76	0.769	6.1407	23154	0.27089337
12	35.78	30.14	20	15.03	24.7	22.76	0.778	6.1832	23162	0.27180723
12	35.77	30.12	19.99	14.93	24.69	22.75	0.767	6.2332	23151	0.27111324
12	35.77	30.13	20.01	15.11	24.71	22.77	0.786	6.287	23170	0.27299129
Avg	**35.772**	**30.13**	**20**	**15.02**	**24.698**	**22.762**	**0.7764**		**23160.8**	**0.27188**
Std	**0.004**	**0.006324555**	**0.0089**	**0.07043**	**0.00748**	**0.00748**	**0.007337575**	**0.065723481**	**7.30479295**	**0.000814**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.054176**
Px	**0.00496586**	**0.007851714**	**0.0111**	**0.08743**	**0.00929**	**0.00929**	**0.009109342**	**0.081593398**	**9.06864435**	**0.001208**
Ux	**0.3000411**	**1.100028022**	**0.8001**	**0.80476**	**0.80005**	**0.80005**				**0.054189**
13	52.75	41.38	20.02	28.74	42.57	36.81	1.882	7.1045	19983	0.47355269
13	52.78	41.42	40	28.59	42.56	36.79	1.867	7.2335	19968	0.46961554
13	52.78	41.42	39.97	28.32	42.53	36.77	1.839	7.391	19941	0.46443173
13	52.77	41.4	39.99	28.48	42.55	36.78	1.855	7.4769	19957	0.46809387
13	52.77	41.4	39.99	28.43	42.54	36.78	1.851	7.8484	19952	0.46713229
Avg	**52.77**	**41.404**	**35.994**	**28.512**	**42.55**	**36.786**	**1.8588**		**19960.2**	**0.468565**
Std	**0.01095445**	**0.01496663**	**7.987**	**0.1433**	**0.01414**	**0.01356**	**0.014647867**	**0.253578379**	**14.3303873**	**0.003011**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.048255**
Px	**0.01359957**	**0.018580546**	**9.9156**	**0.17791**	**0.01756**	**0.01684**	**0.018184813**	**0.314808668**	**17.7906734**	**0.00353**
Ux	**0.30030809**	**1.100156915**	**9.9478**	**0.81954**	**0.80019**	**0.80018**				**0.048384**
14	24.6	22.23	20	15	21.59	18.4	0.339	8.3384	13758	0.246875
14	24.53	22.18	19.99	14.9	21.56	18.36	0.327	8.3644	13748	0.24402908
14	24.53	22.17	19.98	14.83	21.55	18.35	0.32	8.4259	13741	0.24329897
14	24.53	22.17	20	14.97	21.56	18.37	0.335	8.4518	13756	0.24686192
14	24.52	22.17	19.98	14.84	21.55	18.35	0.321	8.477	13742	0.2427686
Avg	**24.542**	**22.184**	**19.99**	**14.908**	**21.562**	**18.366**	**0.3284**		**13749**	**0.244767**
Std	**0.02925748**	**0.023323808**	**0.0089**	**0.06794**	**0.0147**	**0.01855**	**0.007525955**	**0.052313899**	**6.98569968**	**0.001762**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.116224**
Px	**0.03632213**	**0.028955689**	**0.0111**	**0.08435**	**0.01825**	**0.02303**	**0.009343209**	**0.064945871**	**8.67250124**	**0.003805**
Ux	**0.30219083**	**1.100381039**	**0.8001**	**0.80443**	**0.80021**	**0.80033**				**0.116286**
15	24.25	18.15	24.99	9.79	22.91	19.52	1.119	4.559	32557	0.42185339
15	24.27	18.16	25.01	9.99	22.93	19.54	1.14	4.6486	32578	0.42787115
15	24.27	18.16	25.01	9.91	22.92	19.53	1.131	4.7092	32569	0.42548747
15	24.26	18.16	25.01	9.98	22.93	19.54	1.139	4.8044	32576	0.42717087
15	24.28	18.18	25.02	10	22.93	19.54	1.141	4.8592	32578	0.42717087

16	31.62	25.91	20	12.31	24.4	20.68	0.796	4.0005	12884	0.29570171
16	31.61	25.89	20	12.33	24.4	20.68	0.799	4.0663	12887	0.2966805
16	31.62	25.9	20	12.29	24.2	20.68	0.795	4.1334	12883	0.29591309
16	31.61	25.88	20.01	12.37	24.4	20.68	0.803	4.1843	12891	0.29781705
16	31.62	25.9	20	12.37	24.4	20.68	0.802	4.2272	12890	0.29714286
Avg	**31.616**	**25.896**	**20.002**	**12.334**	**24.36**	**20.68**	**0.799**		**12887**	**0.296651**
Std	**0.00489898**	**0.010198039**	**0.004**	**0.032**	**0.08**	**0**	**0.003162278**	**0.081169516**	**3.16227766**	**0.000781**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.058543**
Px	**0.00608191**	**0.012660508**	**0.005**	**0.03973**	**0.09932**	**0**	**0.003925857**	**0.100769109**	**3.92585685**	**0.000902**
Ux	**0.30006164**	**1.100072856**	**0.8**	**0.80099**	**0.80614**	**0.8**				**0.05855**
17	43.21	32.07	25.01	19.55	31.41	30.21	1.514	5.0226	31327	0.47083686
17	43.2	32.06	25	19.51	31.41	30.21	1.51	5.128	31323	0.47024061
17	43.18	32.04	24.99	19.37	31.39	30.19	1.496	5.235	31309	0.46787064
17	43.2	32.06	25.01	19.55	31.41	30.21	1.514	5.3566	31327	0.47103594
17	43.2	32.06	24.99	19.39	31.4	30.19	1.498	5.4731	31311	0.46787064
Avg	**43.198**	**32.058**	**25**	**19.474**	**31.404**	**30.202**	**1.5064**		**31319.4**	**0.469571**
Std	**0.00979796**	**0.009797959**	**0.0089**	**0.07838**	**0.008**	**0.0098**	**0.007838367**	**0.159822472**	**7.83836718**	**0.001413**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.049354**
Px	**0.01216382**	**0.012163823**	**0.0111**	**0.09731**	**0.00993**	**0.01216**	**0.009731058**	**0.198413995**	**9.73105805**	**0.002008**
Ux	**0.3002465**	**1.100067252**	**0.8001**	**0.8059**	**0.80006**	**0.80009**				**0.049395**
18	27.13	24.36	39.99	18.46	32.23	22.46	0.793	5.9497	19083	0.3194925
18	27.11	24.35	39.99	18.38	32.22	22.45	0.785	6.0146	19076	0.3161512
18	27.12	24.36	40.01	18.56	32.23	22.46	0.803	6.0839	19094	0.32242991
18	27.11	24.35	39.99	18.4	32.22	22.45	0.787	6.1594	19078	0.31687715
18	27.11	24.35	39.99	18.37	32.21	22.45	0.783	6.2079	19074	0.31578947
Avg	**27.116**	**24.354**	**39.994**	**18.434**	**32.222**	**22.454**	**0.7902**		**19081**	**0.318148**
Std	**0.008**	**0.004898979**	**0.008**	**0.07031**	**0.00748**	**0.0049**	**0.007222188**	**0.093685837**	**7.15541753**	**0.002502**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.13051**
Px	**0.00993172**	**0.006081911**	**0.0099**	**0.08729**	**0.00929**	**0.00608**	**0.008966093**	**0.116307682**	**8.8832**	**0.003295**

	i	**ii**	**iii**	**iv**	**v**	**vi**	**vii**	**efficiency**
1	1	7.4231	2.5	1	1	1	1	0.36282533
2		1	1.5	2.5	1.8	1.25	4	0.38662254
3		1.5385	1	5	2	2	6	0.59771309
4	1.25			2.5	1.8	2	6	0.78577016
5	1.25	1	1.5	5	2			0.38605517
6	1.25	1.5385	1			1.25	4	0.17717873
7	1.5		1.5		2	1.25	6	0.38354793
8	1.5	1	1	2.5		2		0.23763662
9	1.5	1.5385		5	1.8		4	0.50835833
10			1	5	1.8	1.25		0.33374492
11		1			2	2	4	0.68156445
12		1.5385	1.5	2.5			6	0.27188012
13	1.25		1.5	5		2	4	0.46856522
14	1.25	1	1		1.8		6	0.24476671
15	1.25	1.5385		2.5	2	1.25		0.42591075
16	1.5		1	2.5	2		4	0.29665104
17	1.5	1		5		1.25	6	0.46957094
18	1.5	1.5385	1.5		1.8	2		0.31814805

Exp #	Water In Temp [C]	Water Out Temp [C]	DB In T [C]	WB In T [C]	DB out T [C]	WB out T [C]	Water Flowrate (L/s	Water Makeup (m^3)	Pump Power (W)	efficiency
1	35.32	29.32	35.01	24.57	33.76	29.88	1.091	0.8865	45070	0.55814
1	35.33	29.3	34.99	24.4	33.74	29.86	1.075	0.9099	45053	0.551693
1	35.33	29.31	35.01	24.63	33.76	29.89	1.097	0.9332	45076	0.562617
1	35.33	29.31	35.01	24.65	33.76	29.89	1.099	0.9565	45077	0.56367
1	35.34	29.32	35	24.54	33.75	29.88	1.088	0.9766	45067	0.557407
Avg	**35.33**	**29.312**	**35.004**	**24.558**	**33.754**	**29.88**	**1.09**		**45068.6**	**0.558705**
Std	**0.006324555**	**0.007483315**	**0.008**	**0.0884081**	**0.008**	**0.01095445**	**0.008485281**	**0.032087543**	**8.639444427**	**0.004269**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.111316**
Px	**0.007851714**	**0.009290273**	**0.009932**	**0.1097556**	**0.00993172**	**0.01359957**	**0.010534179**	**0.039835559**	**10.72556737**	**0.005772**
Ux	**0.300102731**	**1.100039231**	**0.800062**	**0.8074938**	**0.80006165**	**0.80011558**				**0.111466**
2	33.01	26.93	35.01	24.63	31.56	30.03	1.201	0.7247	45087	0.725537
2	32.98	26.9	35	24.47	31.54	30.01	1.185	0.7407	45071	0.714454
2	33	26.92	35.02	24.69	31.57	30.04	1.207	0.7597	45093	0.731649
2	33	26.92	34.99	24.41	31.54	30.01	1.179	0.7758	45065	0.7078
2	32.99	26.92	35	24.51	31.55	30.02	1.19	0.7907	45075	0.715802
Avg	**32.996**	**26.918**	**35.004**	**24.542**	**31.552**	**30.022**	**1.1924**		**45078.2**	**0.719048**
Std	**0.010198039**	**0.009797959**	**0.010198**	**0.1032279**	**0.0116619**	**0.0116619**	**0.010268398**	**0.023650319**	**10.32279032**	**0.008474**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.149029**
Px	**0.012660508**	**0.012163823**	**0.012661**	**0.1281538**	**0.01447784**	**0.01447784**	**0.012747856**	**0.029361042**	**12.81538228**	**0.011046**
Ux	**0.300267029**	**1.100067252**	**0.8001**	**0.8101996**	**0.80013099**	**0.80013099**				**0.149438**
3	32.68	26.58	34.99	24.46	31.17	30.08	1.202	0.5338	45071	0.742092
3	32.67	26.61	35	24.55	31.18	30.09	1.215	0.5567	45080	0.746305
3	32.69	26.62	35	24.56	31.18	30.09	1.212	0.5779	45081	0.746617
3	32.68	26.6	34.99	24.45	31.17	30.08	1.201	0.6002	45070	0.738761
3	32.68	26.6	35	24.54	31.18	30.09	1.21	0.6331	45079	0.746929
Avg	**32.68**	**26.602**	**34.996**	**24.512**	**31.176**	**30.086**	**1.208**		**45076.2**	**0.744141**
Std	**0.006324555**	**0.013266499**	**0.004899**	**0.0470744**	**0.00489898**	**0.00489898**	**0.005549775**	**0.034376771**	**4.707440918**	**0.003217**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.155548**
Px	**0.007851714**	**0.016469894**	**0.006082**	**0.0584412**	**0.00608191**	**0.00608191**	**0.006889851**	**0.042677556**	**5.844122863**	**0.005738**
Ux	**0.300102731**	**1.100123292**	**0.800023**	**0.8021318**	**0.80002312**	**0.80002312**				**0.155654**
4	29.96	24.07	25	16.34	26.59	23.68	0.942	2.0881	45084	0.432452
4	29.95	24.04	25.01	16.48	26.6	23.69	0.956	2.1041	45098	0.438753
4	29.97	24.06	25.02	16.56	26.61	23.7	0.964	2.1188	45106	0.440716
4	29.96	24.04	25	16.4	26.59	23.69	0.948	2.132	45089	0.436578
4	29.95	24.04	25	16.39	26.59	23.69	0.947	2.1462	45089	0.435841
Avg	**29.958**	**24.05**	**25.006**	**16.434**	**26.596**	**23.69**	**0.9514**		**45093.2**	**0.436868**
Std	**0.007483315**	**0.012649111**	**0.008**	**0.0773563**	**0.008**	**0.00632456**	**0.007735632**	**0.020391037**	**7.833262411**	**0.002793**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.085892**
Px	**0.009290273**	**0.015703427**	**0.009932**	**0.0960352**	**0.00993172**	**0.00785171**	**0.009603516**	**0.025314758**	**9.724720658**	**0.003326**
Ux	**0.300143814**	**1.100112084**	**0.800062**	**0.8057436**	**0.80006165**	**0.80003853**				**0.085956**

5	26.9	20.85	25	16.36	25.02	23.95	1.03	0.3942	45104	0.574
5	26.9	20.84	25.01	16.43	25.03	23.95	1.037	0.4097	45111	0.5788
5	26.91	20.87	25.02	16.47	25.03	23.96	1.048	0.4231	45115	0.5785
5	26.9	20.86	25	16.42	25.02	23.95	1.036	0.4365	45111	0.5763
5	26.9	20.86	25.01	16.48	25.03	23.96	1.042	0.4494	45117	0.5797
Avg	**26.902**	**20.856**	**25.01**	**16.432**	**25.026**	**23.954**	**1.0386**		**45111.6**	**0.577**
Std	**0.004**	**0.010198039**	**0.007**	**0.0426**	**0.0049**	**0.0049**	**0.006053098**	**0.019414778**	**4.4542115**	**0.002**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.115**
Px	**0.00496586**	**0.012660508**	**0.009**	**0.0529**	**0.0061**	**0.00608**	**0.007514709**	**0.024102766**	**5.5297474**	**0.003**
Ux	**0.3000411**	**1.100072856**	**0.8**	**0.8017**	**0.8**	**0.80002**				**0.115**
6	26.48	20.4	25	16.42	24.76	23.95	1.051	0.2638	45102	0.6044
6	26.49	20.43	25	16.35	24.75	23.95	1.05	0.2785	45103	0.5976
6	26.47	20.43	25	16.41	24.76	23.95	1.055	0.2922	45110	0.6004
6	26.49	20.4	25	16.36	24.75	23.95	1.049	0.3048	45105	0.6012
6	26.49	20.4	24.99	16.28	24.75	23.94	1.039	0.3216	45097	0.5965
Avg	**26.484**	**20.412**	**25**	**16.364**	**24.754**	**23.948**	**1.0488**		**45103.4**	**0.6**
Std	**0.008**	**0.014696938**	**0.004**	**0.05**	**0.0049**	**0.004**	**0.0053066**	**0.020086652**	**4.2237424**	**0.003**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.12**
Px	**0.00993172**	**0.018245734**	**0.005**	**0.0621**	**0.0061**	**0.00497**	**0.006587957**	**0.024936875**	**5.2436281**	**0.004**
Ux	**0.30016435**	**1.100151311**	**0.8**	**0.8024**	**0.8**	**0.80002**				**0.12**
7	38.08	32.09	40.01	28.65	37.43	33.05	1.164	0.2916	45068	0.6352
7	38.11	32.09	39.99	28.48	37.41	33.04	1.147	0.3043	45052	0.6251
7	38.09	32.06	39.99	28.43	37.41	33.03	1.139	0.317	45056	0.6242
7	38.09	32.08	39.99	28.49	37.41	33.04	1.143	0.3302	45052	0.626
7	38.09	32.07	40	28.61	37.43	33.05	1.154	0.3441	45064	0.635
Avg	**38.092**	**32.078**	**40**	**28.532**	**37.418**	**33.042**	**1.1494**		**45058.4**	**0.629**
Std	**0.00979796**	**0.011661904**	**0.008**	**0.0835**	**0.0098**	**0.00748**	**0.008822698**	**0.018515572**	**6.4992307**	**0.005**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.128**
Px	**0.01216382**	**0.014477845**	**0.01**	**0.1037**	**0.0122**	**0.00929**	**0.01095307**	**0.022986433**	**8.0685671**	**0.007**
Ux	**0.3002465**	**1.100095272**	**0.8**	**0.8067**	**0.8001**	**0.80005**				**0.128**
8	36.09	30.01	39.99	28.47	34.84	33.17	1.266	0.355	45052	0.7979
8	36.11	30.04	39.99	28.48	34.84	33.17	1.265	0.3735	45052	0.7955
8	36.11	30.01	40	28.59	34.85	33.18	1.275	0.3901	45063	0.8112
8	36.11	30.02	40.01	28.71	34.86	33.19	1.286	0.4077	45075	0.823
8	36.12	30.01	40	28.53	34.85	33.18	1.273	0.4239	45062	0.805
Avg	**36.108**	**30.018**	**40**	**28.556**	**34.848**	**33.178**	**1.273**		**45060.8**	**0.807**
Std	**0.00979796**	**0.011661904**	**0.007**	**0.088**	**0.0075**	**0.00748**	**0.007563068**	**0.024330031**	**8.5182158**	**0.01**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.172**
Px	**0.01216382**	**0.014477845**	**0.009**	**0.1092**	**0.0093**	**0.00929**	**0.009389284**	**0.03020488**	**10.575066**	**0.012**
Ux	**0.3002465**	**1.100095272**	**0.8**	**0.8074**	**0.8001**	**0.80005**				**0.172**
9	35.88	29.76	40.01	28.68	34.44	33.19	1.31	0.3313	45073	0.85
9	35.87	29.77	40	28.6	34.43	33.18	1.301	0.3482	45065	0.8391
9	35.88	29.79	39.99	28.43	34.41	33.17	1.282	0.3638	45048	0.8174
9	35.87	29.76	40	28.54	34.42	33.18	1.292	0.378	45059	0.8336
9	35.87	29.76	40	28.61	34.41	33.18	1.298	0.3949	45066	0.8416

10	34.53	28.91	19.99	12.2	24.27	20.55	0.781	0.2352	19995	0.2517
10	34.51	28.9	20	12.28	24.28	20.56	0.788	0.247	20003	0.2524
10	34.53	28.91	20	12.38	24.28	20.57	0.794	0.2569	20010	0.2537
10	34.54	28.91	20.02	12.51	24.3	20.58	0.81	0.2672	20027	0.2556
10	34.52	28.9	19.99	12.22	24.27	20.55	0.78	0.2779	19997	0.252
Avg	**34.526**	**28.906**	**20**	**12.318**	**24.28**	**20.562**	**0.7906**		**20006.4**	**0.253**
Std	**0.01019804**	**0.004898979**	**0.011**	**0.1146**	**0.011**	**0.01166**	**0.010947146**	**0.014939692**	**11.551623**	**0.001**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.05**
Px	**0.01266051**	**0.006081911**	**0.014**	**0.1423**	**0.0136**	**0.01448**	**0.013590498**	**0.018547104**	**14.340935**	**0.002**
Ux	**0.30026703**	**1.100016813**	**0.8**	**0.8126**	**0.8001**	**0.80013**				**0.051**
11	29.23	23.42	20	12.31	23.87	20.72	0.862	0.1736	20014	0.3434
11	29.22	23.41	19.99	12.22	23.86	20.71	0.91	0.1279	20006	0.3418
11	29.23	23.41	20.01	12.43	23.88	20.73	0.912	0.1393	20027	0.3464
11	29.24	23.42	20	12.3	23.87	20.72	0.883	0.15	20013	0.3436
11	29.23	23.42	19.99	12.2	23.86	20.71	0.861	0.1614	20003	0.3412
Avg	**29.23**	**23.416**	**20**	**12.292**	**23.868**	**20.718**	**0.8856**		**20012.6**	**0.343**
Std	**0.00632456**	**0.004898979**	**0.007**	**0.0813**	**0.0075**	**0.00748**	**0.022186482**	**0.01605523**	**8.3090312**	**0.002**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.067**
Px	**0.00785171**	**0.006081911**	**0.009**	**0.101**	**0.0093**	**0.00929**	**0.02754374**	**0.019932005**	**10.315371**	**0.002**
Ux	**0.30010273**	**1.100016813**	**0.8**	**0.8063**	**0.8001**	**0.80005**				**0.067**
12	28.49	22.59	20	12.29	23.72	20.75	1.084	0.0804	20014	0.3642
12	28.44	22.58	20	12.28	23.71	20.74	1.022	0.0952	20013	0.3626
12	28.42	22.57	19.97	12.03	23.68	20.71	0.955	0.1082	19988	0.3569
12	28.42	22.58	20.01	12.37	23.71	20.74	0.955	0.123	20022	0.3639
12	28.42	22.57	19.99	12.18	23.69	20.72	0.908	0.1353	20003	0.3602
Avg	**28.438**	**22.578**	**19.99**	**12.23**	**23.702**	**20.732**	**0.9848**		**20008**	**0.362**
Std	**0.02712932**	**0.007483315**	**0.014**	**0.1168**	**0.0147**	**0.0147**	**0.061479753**	**0.019468169**	**11.679041**	**0.003**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.07**
Px	**0.0336801**	**0.009290273**	**0.017**	**0.145**	**0.0182**	**0.01825**	**0.076324958**	**0.024169049**	**14.49912**	**0.003**
Ux	**0.30188466**	**1.100039231**	**0.8**	**0.813**	**0.8002**	**0.80021**				**0.071**
13	36.36	30.71	25	16.39	28.15	23.48	1.006	0.0929	20006	0.2829
13	36.39	30.72	25.01	16.44	28.16	23.5	0.978	0.1043	20011	0.2842
13	36.42	30.74	25	16.37	28.16	23.51	0.932	0.1162	20005	0.2833
13	36.44	30.74	24.99	16.27	28.16	23.5	0.922	0.1279	19995	0.2826
13	36.46	30.78	24.99	16.26	28.16	23.51	0.894	0.1398	19994	0.2812
Avg	**36.414**	**30.738**	**25**	**16.346**	**28.158**	**23.5**	**0.9464**		**20002.2**	**0.283**
Std	**0.03555278**	**0.024**	**0.007**	**0.07**	**0.004**	**0.01095**	**0.040247236**	**0.016603301**	**6.6151342**	**1E-03**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.056**
Px	**0.04413753**	**0.029795159**	**0.009**	**0.0869**	**0.005**	**0.0136**	**0.049965532**	**0.020612416**	**8.2124571**	**0.002**
Ux	**0.30322949**	**1.100403449**	**0.8**	**0.8047**	**0.8**	**0.80012**				**0.056**
14	31.61	25.7	25	16.36	27.37	23.64	0.925	0.2015	20010	0.3875
14	31.59	25.74	25.02	16.57	27.39	23.66	0.941	0.2144	20030	0.3895
14	31.59	25.74	25	16.41	27.37	23.64	0.92	0.2278	20014	0.3854
14	31.59	25.72	25.01	16.45	27.38	23.65	0.922	0.2402	20019	0.3877
14	31.59	25.75	25	16.4	27.37	23.64	0.915	0.252	20013	0.3845

15	30.84	24.97	25.01	16.47	27.15	23.66	0.949	0.2065	20021	0.4085
15	30.86	24.99	25	16.39	27.14	23.66	0.936	0.2158	20013	0.4057
15	30.87	24.99	25.01	16.46	27.15	23.66	0.939	0.2288	20020	0.408
15	30.86	24.97	25	16.41	27.13	23.66	0.932	0.2409	20015	0.4076
15	30.9	27.97	25	16.39	27.14	23.66	0.926	0.253	20012	0.2019
Avg	**30.866**	**25.578**	**25**	**16.424**	**27.142**	**23.66**	**0.9364**		**20016.2**	**0.366**
Std	**0.01959592**	**1.196033444**	**0.005**	**0.0344**	**0.0075**	**0**	**0.007657676**	**0.016722081**	**3.6551334**	**0.082**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.079**
Px	**0.02432765**	**1.48483359**	**0.006**	**0.0427**	**0.0093**	**0**	**0.009506736**	**0.020759878**	**4.5377199**	**0.103**
Ux	**0.30098477**	**1.84789902**	**0.8**	**0.8011**	**0.8001**	**0.8**				**0.13**
16	43.24	37.43	39.99	28.48	40.22	33.14	1.027	0.1819	19998	0.3936
16	43.25	37.43	40.01	28.63	40.24	33.16	1.034	0.1948	20013	0.3981
16	43.24	37.43	40	28.58	40.23	33.15	1.022	0.2076	20008	0.3963
16	43.23	37.45	40.01	28.71	40.25	33.17	1.03	0.2199	20020	0.3981
16	43.26	37.42	39.99	28.48	40.22	33.14	1.003	0.2321	19997	0.3951
Avg	**43.244**	**37.432**	**40**	**28.576**	**40.232**	**33.152**	**1.0232**		**20007.2**	**0.396**
Std	**0.01019804**	**0.009797959**	**0.009**	**0.0887**	**0.0117**	**0.01166**	**0.010833282**	**0.017749885**	**8.7954534**	**0.002**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.078**
Px	**0.01266051**	**0.012163823**	**0.011**	**0.1101**	**0.0145**	**0.01448**	**0.01344914**	**0.022035859**	**10.919247**	**0.003**
Ux	**0.30026703**	**1.100067252**	**0.8**	**0.8075**	**0.8001**	**0.80013**				**0.079**
17	39.29	33.42	40	28.54	38.26	32.99	1.298	0.1012	20002	0.546
17	39.3	33.42	40	28.62	38.27	33.01	1.263	0.1159	20010	0.5506
17	39.3	33.42	39.98	28.43	38.26	33	1.208	0.1308	19991	0.5409
17	39.34	33.44	39.99	28.48	38.26	33.01	1.185	0.1453	19996	0.5433
17	39.34	33.43	40	28.61	38.28	33.02	1.178	0.1583	20009	0.5508
Avg	**39.314**	**33.426**	**39.99**	**28.536**	**38.266**	**33.006**	**1.2264**		**20001.6**	**0.546**
Std	**0.02154066**	**0.008**	**0.008**	**0.0734**	**0.008**	**0.0102**	**0.046607296**	**0.020314625**	**7.3375745**	**0.004**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.111**
Px	**0.02674197**	**0.00993172**	**0.01**	**0.0911**	**0.0099**	**0.01266**	**0.057861323**	**0.025219895**	**9.1093415**	**0.005**
Ux	**0.30118953**	**1.100044835**	**0.8**	**0.8052**	**0.8001**	**0.8001**				**0.111**
18	38.78	32.86	40.01	28.7	37.85	33.01	1.175	0.1908	20018	0.5873
18	38.81	32.89	39.99	28.51	37.83	32.99	1.144	0.2067	19999	0.5748
18	38.8	32.88	40.02	28.73	37.86	33.02	1.159	0.2202	20022	0.5879
18	38.81	32.88	40	28.56	37.84	33	1.135	0.2339	20004	0.5785
18	38.71	32.87	39.92	28.53	37.84	33	1.127	0.2481	20001	0.5737
Avg	**38.782**	**32.876**	**39.99**	**28.606**	**37.844**	**33.004**	**1.148**		**20008.8**	**0.58**
Std	**0.03762978**	**0.010198039**	**0.035**	**0.0909**	**0.0102**	**0.0102**	**0.017181385**	**0.020061765**	**9.3680307**	**0.006**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.119**
Px	**0.04671605**	**0.012660508**	**0.044**	**0.1129**	**0.0127**	**0.01266**	**0.021330087**	**0.024905977**	**11.630082**	**0.007**
Ux	**0.30361553**	**1.100072856**	**0.801**	**0.8079**	**0.8001**	**0.8001**				**0.119**
19	38.97	33.47	20.02	12.47	24.46	20.47	0.815	0.1455	13758	0.2075
19	38.97	33.43	20	12.3	24.44	20.46	0.79	0.1547	13740	0.2077
19	38.96	33.49	19.99	12.26	24.44	20.46	0.781	0.1638	13737	0.2049
19	39	33.49	20	12.32	24.45	20.47	0.783	0.1732	13742	0.2065
19	39	33.48	20	12.42	24.45	20.49	0.789	0.1845	13752	0.2077

20	32.6	26.89	20	12.36	24.48	20.67	1.021	0.0754	13749	0.2821
20	32.63	26.93	20.02	12.52	24.5	20.69	0.985	0.0882	13765	0.2834
20	32.63	26.92	20	12.3	24.48	20.68	0.922	0.101	13743	0.2809
20	32.64	26.94	19.99	12.22	24.48	20.68	0.883	0.1132	13734	0.2791
20	32.66	26.95	20	12.28	24.49	20.69	0.866	0.1251	13741	0.2802
Avg	**32.632**	**26.926**	**20**	**12.336**	**24.486**	**20.682**	**0.9354**		**13746.4**	**0.281**
Std	**0.01939072**	**0.02059126**	**0.01**	**0.1023**	**0.008**	**0.00748**	**0.059210134**	**0.017595272**	**10.461357**	**0.002**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.055**
Px	**0.0240729**	**0.025563328**	**0.012**	**0.127**	**0.0099**	**0.00929**	**0.073507306**	**0.021843913**	**12.987409**	**0.002**
Ux	**0.30096429**	**1.100296998**	**0.8**	**0.81**	**0.8001**	**0.80005**				**0.056**
21	31.7	25.94	20.01	12.39	24.43	20.73	0.889	0.1246	13752	0.2983
21	31.69	25.93	20.01	12.42	24.44	20.73	0.879	0.1363	13749	0.2989
21	31.69	25.94	20.02	12.47	24.44	20.74	0.863	0.1483	13730	0.2992
21	31.71	25.92	19.98	12.13	24.41	20.7	0.818	0.1593	13749	0.2957
21	31.71	25.96	20	12.3	24.43	20.72	0.827	0.1709	13734	0.2962
Avg	**31.7**	**25.938**	**20**	**12.342**	**24.43**	**20.724**	**0.8552**		**13742.8**	**0.298**
Std	**0.00894427**	**0.013266499**	**0.014**	**0.1196**	**0.011**	**0.01356**	**0.028102669**	**0.016349728**	**8.9755223**	**0.001**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.058**
Px	**0.011104**	**0.016469894**	**0.017**	**0.1484**	**0.0136**	**0.01684**	**0.034888478**	**0.020297614**	**11.142796**	**0.002**
Ux	**0.30020543**	**1.100123292**	**0.8**	**0.8137**	**0.8001**	**0.80018**				**0.058**
22	40.62	35.08	25.01	16.47	28.54	23.41	0.92	0.1072	13752	0.2294
22	40.65	35.1	24.99	16.3	28.53	23.41	0.883	0.1176	13735	0.2279
22	40.7	35.14	24.99	16.25	28.54	23.42	0.863	0.1272	13731	0.2274
22	40.71	35.15	25	16.36	28.55	23.44	0.86	0.1386	13741	0.2283
22	40.74	35.17	24.99	16.29	28.55	23.44	0.843	0.1497	13734	0.2278
Avg	**40.684**	**35.128**	**25**	**16.334**	**28.542**	**23.424**	**0.8738**		**13738.6**	**0.228**
Std	**0.04317407**	**0.033105891**	**0.008**	**0.0766**	**0.0075**	**0.01356**	**0.026362094**	**0.014997813**	**7.4458042**	**7E-04**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.046**
Px	**0.05359909**	**0.041099803**	**0.01**	**0.0951**	**0.0093**	**0.01684**	**0.032727615**	**0.018619259**	**9.2437049**	**0.002**
Ux	**0.30475049**	**1.100767548**	**0.8**	**0.8056**	**0.8001**	**0.80018**				**0.046**
23	34.73	28.95	25	16.35	28.19	23.69	0.934	0.1301	13739	0.3145
23	34.76	28.99	25.01	16.49	28.2	23.61	0.9178	0.1413	13739	0.3158
23	34.75	28.97	25.02	16.54	28.21	23.62	0.921	0.1536	13758	0.3174
23	34.76	28.98	24.99	16.31	28.2	23.6	0.9	0.1639	13747	0.3133
23	34.78	29	25.02	16.54	28.21	23.62	0.904	0.1742	13758	0.3169
Avg	**34.756**	**28.978**	**25.01**	**16.446**	**28.202**	**23.628**	**0.91536**		**13748.2**	**0.316**
Std	**0.01624808**	**0.017204651**	**0.012**	**0.0973**	**0.0075**	**0.03187**	**0.012249016**	**0.015679209**	**8.5182158**	**0.002**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.062**
Px	**0.02017142**	**0.02135897**	**0.014**	**0.1208**	**0.0093**	**0.03957**	**0.015206724**	**0.019465188**	**10.575066**	**0.002**
Ux	**0.30067738**	**1.100207347**	**0.8**	**0.8091**	**0.8001**	**0.80098**				**0.062**
24	33.88	28.04	25.01	28.06	23.63	0.91	0.888	13749	13749	1.0034
24	33.87	28.05	24.99	16.28	28.04	23.61	0.885	0.1811	13732	0.3309
24	33.88	28.06	25	16.39	28.05	23.62	0.889	0.194	13743	0.3328
24	33.85	28.08	25	16.42	28.06	23.63	0.888	0.20654	13746	0.331
24	33.87	28.07	25	16.36	28.05	23.62	0.878	0.2201	13741	0.3312

26	41.87	36.04	40	28.56	39.72	33.14	1.023	0.4216	13741	0.438
26	41.88	36.05	40	28.59	39.72	33.15	1.026	0.4348	13744	0.4387
26	41.87	36.02	39.99	28.48	39.71	33.14	1.015	0.4466	13734	0.4369
26	41.89	36.02	40	28.55	39.72	33.14	1.022	0.4594	13741	0.44
26	41.89	36.01	39.99	28.48	39.71	33.14	1.015	0.4727	13734	0.4385
Avg	**41.88**	**36.028**	**40**	**28.532**	**39.716**	**33.142**	**1.0202**		**13738.8**	**0.438**
Std	**0.00894427**	**0.014696938**	**0.005**	**0.0445**	**0.0049**	**0.004**	**0.004445222**	**0.017935484**	**4.069398**	**0.001**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.087**
Px	**0.011104**	**0.018245734**	**0.006**	**0.0552**	**0.0061**	**0.00497**	**0.005518587**	**0.022266275**	**5.0520149**	**0.002**
Ux	**0.30020543**	**1.100151311**	**0.8**	**0.8019**	**0.8**	**0.80002**				**0.087**
27	41.13	35.29	40	28.62	39.39	33.1	1.119	0.1544	13748	0.4668
27	41.13	35.28	39.99	28.45	39.35	33.09	1.084	0.1693	13731	0.4614
27	41.16	35.29	40	28.55	39.36	33.1	1.082	0.1824	13741	0.4655
27	41.17	35.3	39.98	28.39	39.35	33.09	1.057	0.1954	13725	0.4593
27	41.16	35.29	40.01	28.63	39.37	33.11	1.073	0.2088	13749	0.4685
Avg	**41.15**	**35.29**	**40**	**28.528**	**39.364**	**33.098**	**1.083**		**13738.8**	**0.464**
Std	**0.0167332**	**0.006324555**	**0.01**	**0.0943**	**0.015**	**0.00748**	**0.020366639**	**0.019083983**	**9.4318609**	**0.003**
Bx	**0.3**	**1.1**	**0.8**	**0.8**	**0.8**	**0.8**	**1**		**10**	**0.093**
Px	**0.02077368**	**0.007851714**	**0.013**	**0.1171**	**0.0186**	**0.00929**	**0.025284469**	**0.023692096**	**11.709325**	**0.004**
Ux	**0.30071838**	**1.100028022**	**0.8**	**0.8085**	**0.8002**	**0.80005**				**0.093**

	Pipe D.	Pipe M.	Tower Heig	H. Load	Density	Out Te	Humidity
1	0.25	Galvaniz	**25**	2.5	**75**	**20**	40
2	0.25	Galvaniz	**25**	2.5	**135**	**20**	40
3	0.25	Galvaniz	**25**	2.5	**150**	**20**	40
4	0.25	Galvaniz	**25**	2.5	**75**	**25**	40
5	0.25	Galvaniz	**25**	2.5	**135**	**25**	40
6	0.25	Galvaniz	**25**	2.5	**150**	**25**	40
7	0.25	Galvaniz	**25**	2.5	**75**	**40**	40
8	0.25	Galvaniz	**25**	2.5	**135**	**40**	40
9	0.25	Galvaniz	**25**	2.5	**150**	**40**	40
10	0.25	Galvaniz	**15**	2.5	**75**	**20**	40
11	0.25	Galvaniz	**15**	2.5	**135**	**20**	40
12	0.25	Galvaniz	**15**	2.5	**150**	**20**	40
13	0.25	Galvaniz	**15**	2.5	**75**	**25**	40
14	0.25	Galvaniz	**15**	2.5	**135**	**25**	40
15	0.25	Galvaniz	**15**	2.5	**150**	**25**	40
16	0.25	Galvaniz	**15**	2.5	**75**	**40**	40
17	0.25	Galvaniz	**15**	2.5	**135**	**40**	40
18	0.25	Galvaniz	**15**	2.5	**150**	**40**	40
19	0.25	Galvaniz	**10**	2.5	**75**	**20**	40
20	0.25	Galvaniz	**10**	2.5	**135**	**20**	40
21	0.25	Galvaniz	**10**	2.5	**150**	**20**	40
22	0.25	Galvaniz	**10**	2.5	**75**	**25**	40
23	0.25	Galvaniz	**10**	2.5	**135**	**25**	40
24	0.25	Galvaniz	**10**	2.5	**150**	**25**	40
25	0.25	Galvaniz	**10**	2.5	**75**	**40**	40
26	0.25	Galvaniz	**10**	2.5	**135**	**40**	40
27	0.25	Galvaniz	**10**	2.5	**150**	**40**	40

	efficier	ctower	profit	Relativ	Bx	Px	Ux
1	0.5587	15.952932	128.57	0.1241	0.0679	0.0007	0.0679
2	0.719	16.927908	128.57	0.1317	0.0621	0.0008	0.0621
3	0.7441	17.076024	128.57	0.1328	0.0613	0.0004	0.0613
4	0.4369	14.637798	128.57	0.1138	0.0778	0.0007	0.0778
5	0.5775	15.469278	128.57	0.1203	0.0712	0.0005	0.0713
6	0.6	15.565296	128.57	0.1211	0.0706	0.0005	0.0706
7	0.6291	16.516602	128.57	0.1285	0.0644	0.0005	0.0644
8	0.8065	17.692326	128.57	0.1376	0.0581	0.0004	0.0581
9	0.8363	17.91693	128.57	0.1394	0.0571	0.0005	0.0571
10	0.2531	10.098174	128.57	0.0785	0.0936	0.0009	0.0936
11	0.3433	11.002368	128.57	0.0856	0.0836	0.0017	0.0836
12	0.3616	11.945208	128.57	0.0929	0.0751	0.0042	0.0753
13	0.2828	11.944512	128.57	0.0929	0.0782	0.0029	0.0782
14	0.3869	11.37381	128.57	0.0885	0.08	0.0006	0.08
15	0.3663	11.485908	128.57	0.0893	0.079	0.0006	0.079
16	0.3962	12.310296	128.57	0.0957	0.0723	0.0007	0.0723
17	0.5463	14.242056	128.57	0.1108	0.0603	0.0026	0.0604
18	0.5804	13.497336	128.57	0.105	0.0645	0.001	0.0645
19	0.2069	9.356412	128.57	0.0728	0.0935	0.001	0.0935
20	0.2811	10.724022	128.57	0.0834	0.0791	0.0043	0.0792
21	0.2977	9.960888	128.57	0.0775	0.0865	0.0022	0.0866
22	0.2282	10.137774	128.57	0.0788	0.0847	0.002	0.0847
23	0.3156	10.533658	128.57	0.0819	0.0808	0.0009	0.0808
24	0.4659	10.24992	128.57	0.0797	0.0836	0.0003	0.0836
25	0.3161	11.44524	128.57	0.089	0.0732	0.0018	0.0732
26	0.4384	11.529558	128.57	0.0897	0.0725	0.0003	0.0725
27	0.4643	12.126786	128.57	0.0943	0.0683	0.0013	0.0683