



**- DUSTIN M. EPLEE -**  
 The McDuster: The Next Generation of HVAC  
**INSTITUTE OF CONTEMPORARY ART**  
 Ocean Cooling, Solar Heating, Desiccant Conditioning



## LICL DESICCANT WHEEL SIMULATION PROGRAM

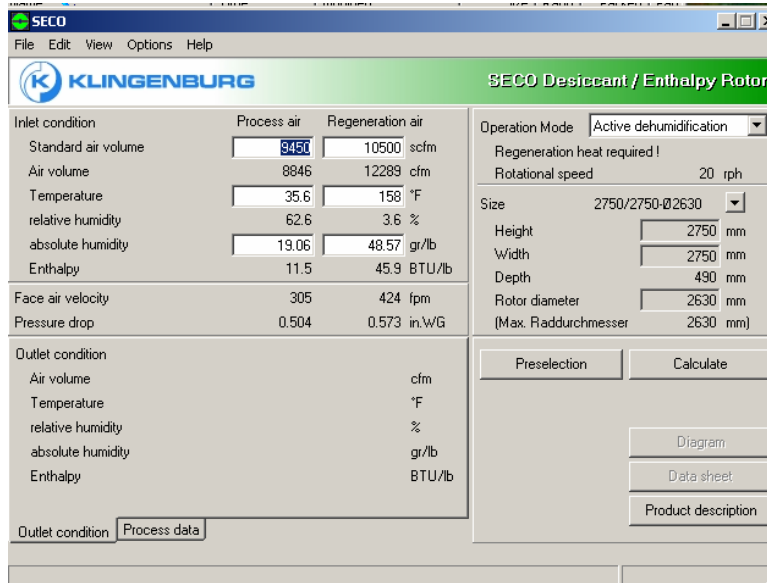
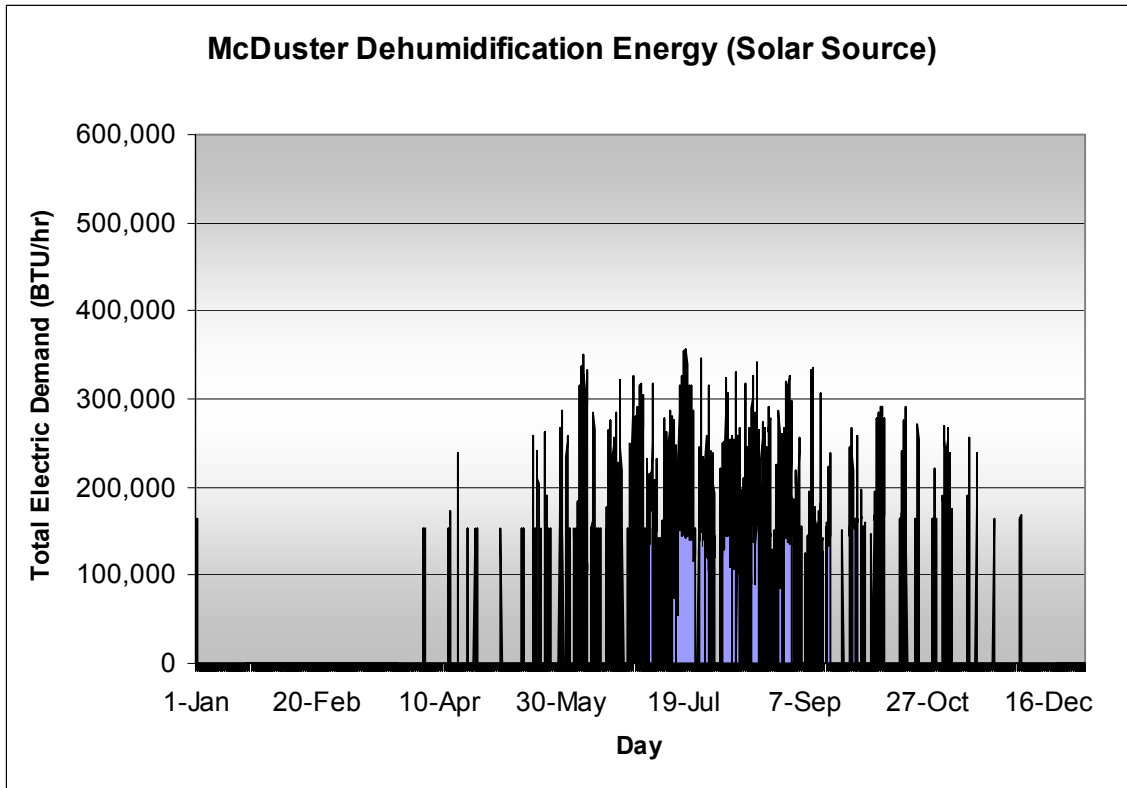


Figure 20 – Manufacturer’s Interface Desiccant Modeling Software (Not Excel Compatible)





- DUSTIN M. EPLEE -  
 The McDuster: The Next Generation of HVAC  
**INSTITUTE OF CONTEMPORARY ART**  
 Ocean Cooling, Solar Heating, Desiccant Conditioning



**HUMIDIFICATION WITH DESICCANT WHEEL SIMULATION PROGRAM**

**Table 7 - McDuster Desiccant Humidification at Design Loads During 24 hour Period (January 15th through January 16th)**

Time 01/15/05 - 01/16/05	Outdoor Air Conditions		Return Air Conditions			Supply Air		Return Air	
	Temp (F)	Humidity Ratio (gr/lb)	Temp (F)	Humidity Ratio (gr/lb)	Relative Humidity	Temp (F)	Humidity Ratio (gr/lb)	Temp (F)	Humidity Ratio (gr/lb)
7:00 PM	29.1	9.79	71.0	62.34	55.00%	137.0	51.83	40.5	20.30
8:00 PM	27.1	9.20	71.0	62.34	55.00%	138.0	51.76	38.9	19.84
9:00 PM	25.2	9.21	71.0	62.34	55.00%	138.0	51.68	37.9	19.83
10:00 PM	23.0	8.85	71.0	62.34	55.00%	137.0	51.69	35.6	19.56
11:00 PM	21.0	8.46	71.0	62.30	54.97%	140.0	51.53	34.0	19.23
12:00 AM	19.1	7.76	71.0	62.30	54.97%	147.0	51.39	32.5	18.67
1:00 AM	17.1	6.65	71.0	62.30	54.97%	158.0	51.17	30.9	17.78
2:00 AM	14.9	5.93	71.0	62.00	54.70%	158.0	50.79	29.1	17.14
3:00 AM	12.7	5.91	71.0	61.30	54.10%	158.0	50.22	27.4	16.99
4:00 AM	10.2	5.61	71.0	60.70	53.57%	158.0	49.68	25.4	16.63
5:00 AM	8.6	4.95	71.0	60.00	52.96%	158.0	48.99	24.1	15.96
6:00 AM	7.7	4.21	71.0	58.80	51.92%	158.0	47.88	23.4	15.13
7:00 AM	6.6	3.80	71.0	57.10	50.44%	158.0	46.44	22.5	14.46
8:00 AM	6.6	3.80	71.0	55.30	48.87%	158.0	45.00	23.4	14.10
9:00 AM	7.7	4.21	71.0	53.60	47.38%	158.0	43.72	23.4	14.09
10:00 AM	8.6	4.56	71.0	52.40	46.33%	158.0	42.83	24.1	14.13
11:00 AM	9.7	4.61	71.0	51.60	45.64%	158.0	42.20	25.0	14.00
12:00 PM	11.1	5.93	71.0	50.90	45.02%	158.0	41.91	26.1	14.92
1:00 PM	12.4	6.60	71.0	51.40	45.46%	158.0	42.44	27.1	15.56
2:00 PM	13.2	7.80	71.0	52.40	46.33%	158.0	43.48	27.8	16.72
3:00 PM	17.1	8.30	71.0	54.30	47.99%	158.0	45.10	30.9	17.50
4:00 PM	21.0	8.90	71.0	56.30	49.74%	158.0	46.82	34.0	18.38
5:00 PM	23.0	9.23	71.0	58.40	51.57%	158.0	48.57	35.6	19.06
6:00 PM	25.0	9.90	71.0	60.50	53.40%	NA	NA	NA	NA

- Notes:**
- 1) Outdoor Air Conditions Taken From Carrier's Hourly Analysis Program during the driest 24-hour period of the year (Boston, MA)
  - 2) Enthalpy Wheel Effectiveness assumed to be .80
  - 3) Conditioned space under positive pressure (10,500 CFM supply and 9,450 CFM return)
  - 4) Assumed no occupancy in gallery space during 24 hour period
  - 5) Infiltration ignored due to positive pressure, moisture release from building materials, and the presence of security personnel
  - 6) Assumed 3F rise from fan and air stream exposed motor
  - 7) Desiccant wheel performance modeled Klingenburg SECO Desiccant/Enthalpy Rotor software
  - 8) Space must be maintained at 50% +/-5% Relative Humidity
  - 9) LiCl SECO wheel size = 2,750 mm

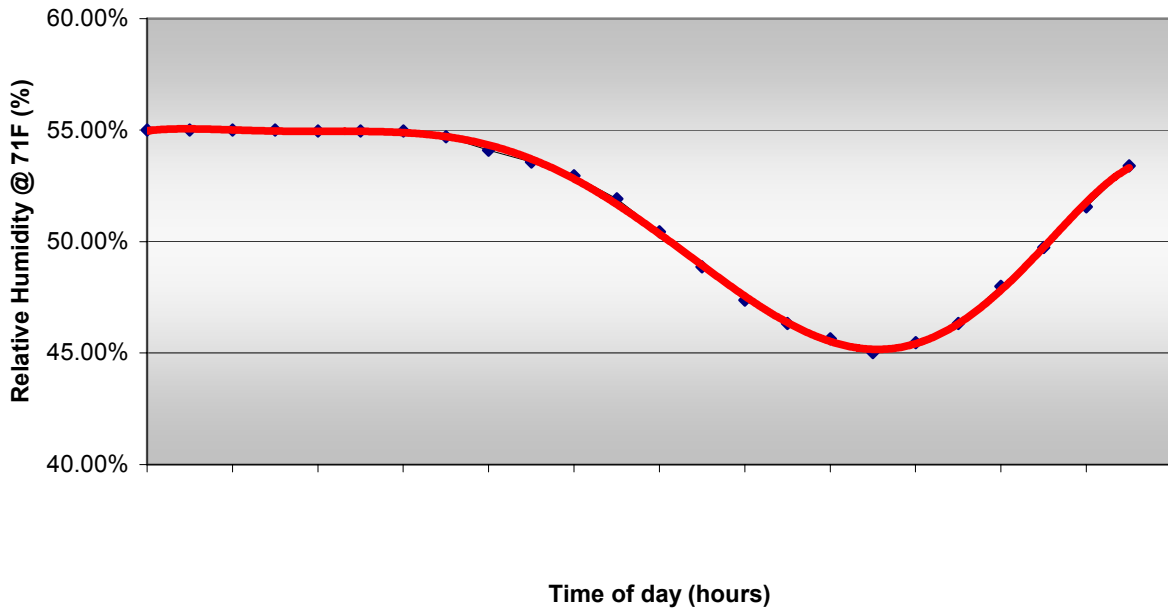


- DUSTIN M. EPLEE -

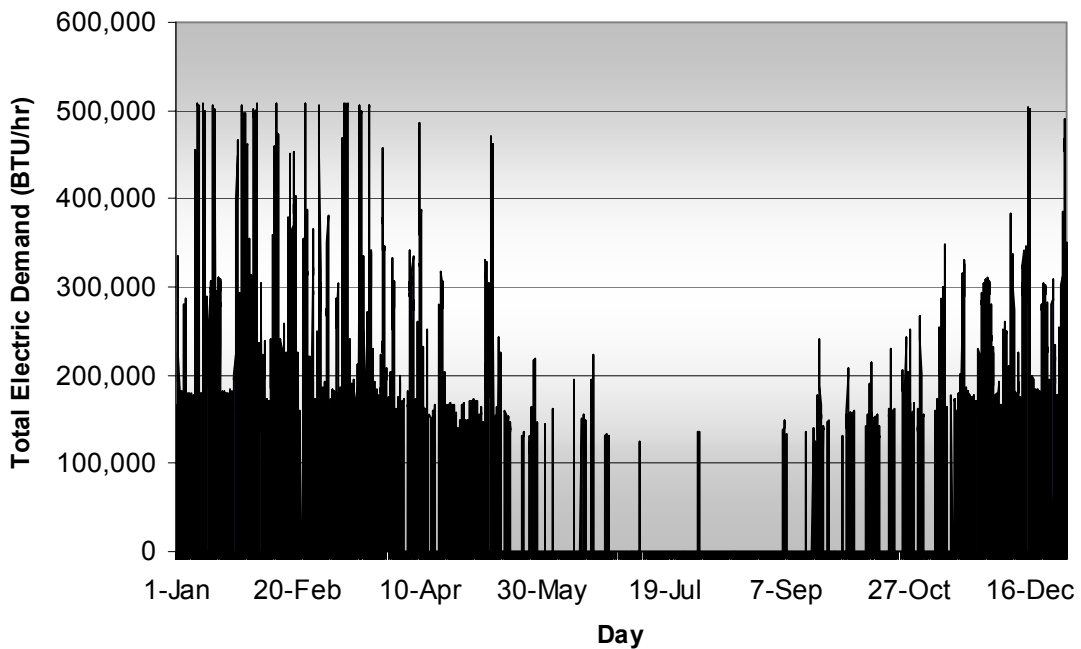
The McDuster: The Next Generation of HVAC  
INSTITUTE OF CONTEMPORARY ART  
Ocean Cooling, Solar Heating, Desiccant Conditioning



**McDuster Desiccant Humidification at Design Loads During 24 Hour Period  
(January 15th through January 16th)**



**McDuster Humidification Energy (Solar Source)**

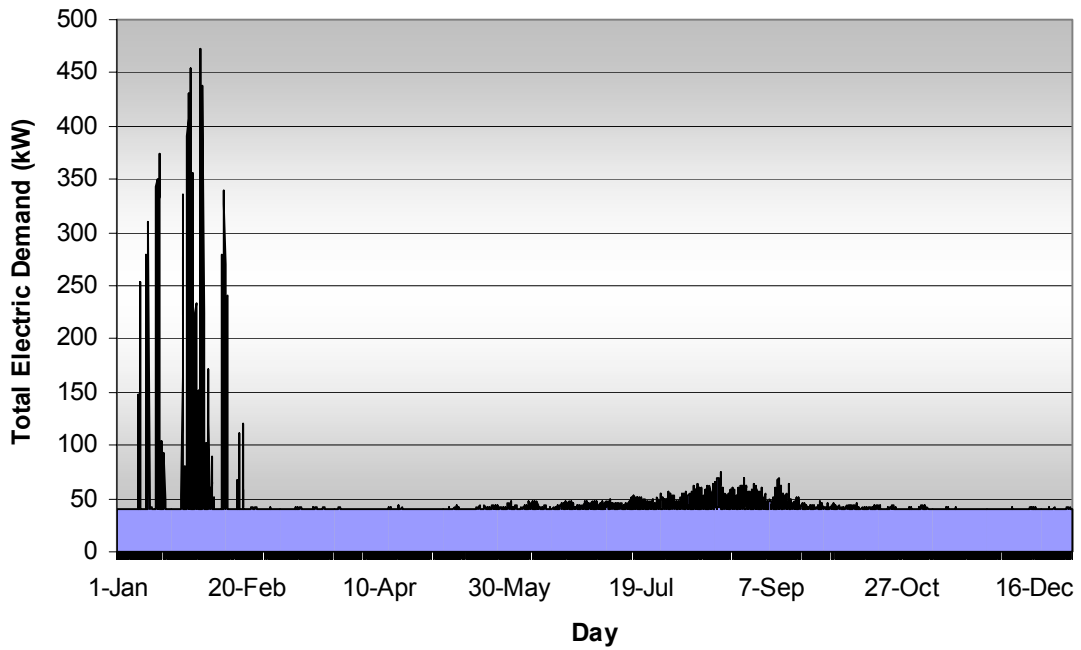




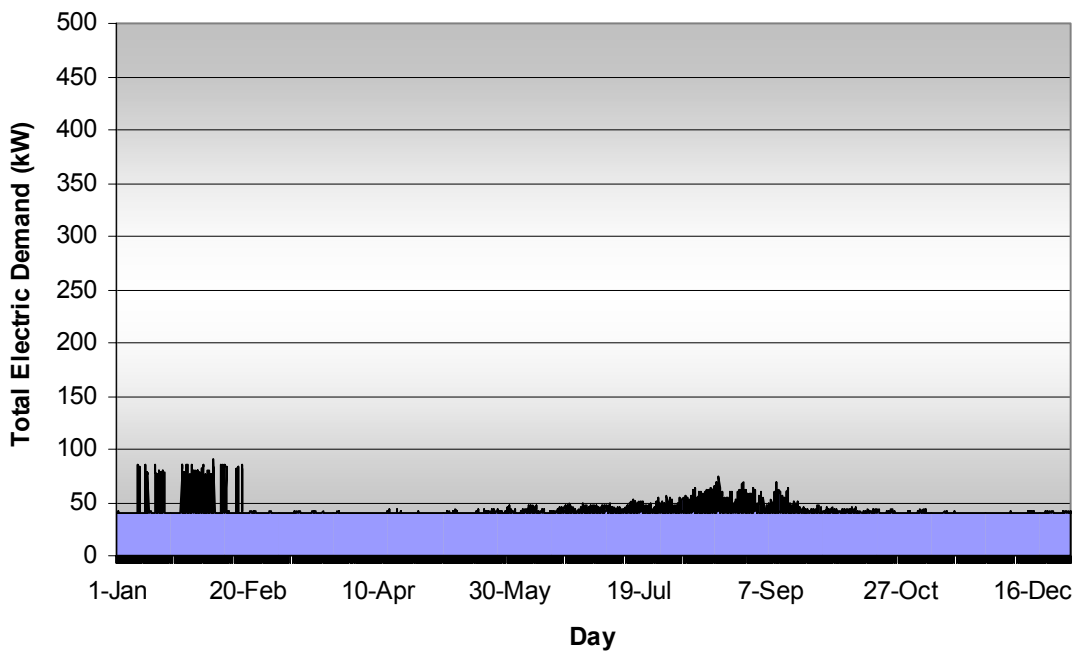
**- DUSTIN M. EPLEE -**  
The McDuster: The Next Generation of HVAC  
**INSTITUTE OF CONTEMPORARY ART**  
Ocean Cooling, Solar Heating, Desiccant Conditioning



**McDuster Energy Demand Using Instant Booster Heating**



**McDuster Energy Demand Using Steam Booster Heating**



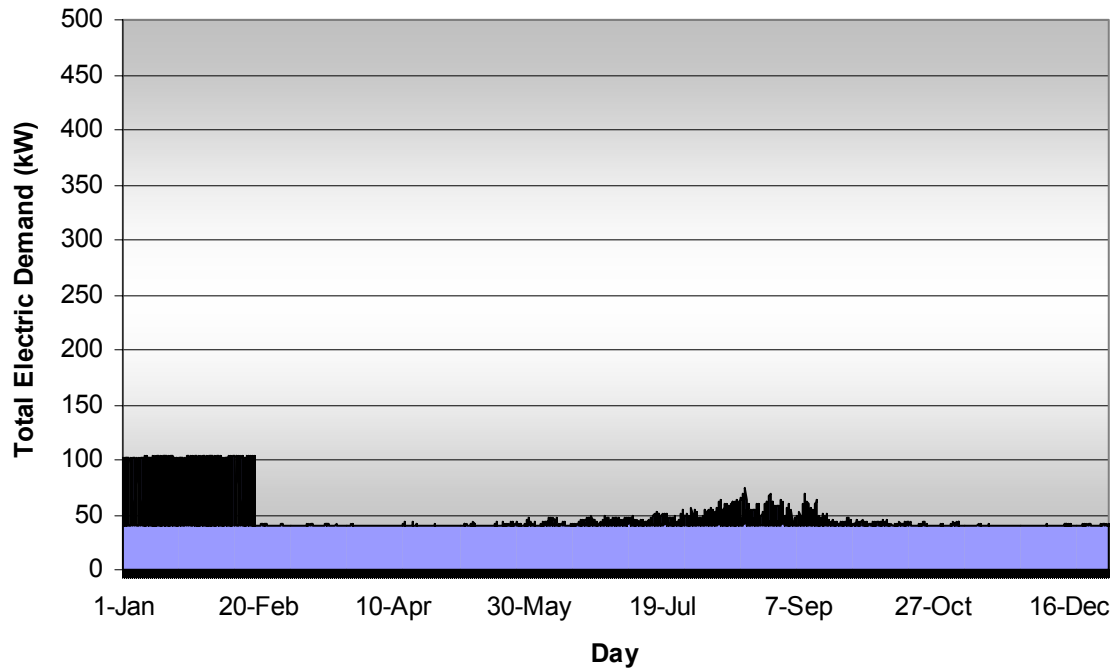


- DUSTIN M. EPLEE -

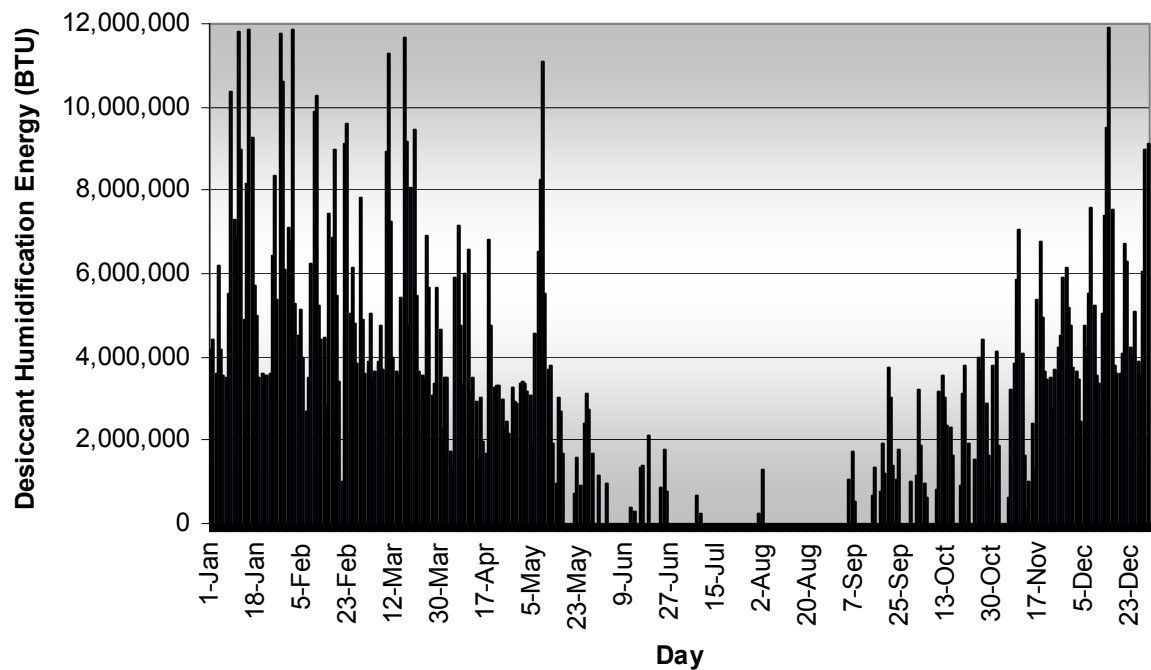
The McDuster: The Next Generation of HVAC  
**INSTITUTE OF CONTEMPORARY ART**  
Ocean Cooling, Solar Heating, Desiccant Conditioning



### McDuster Energy Demand Using Off-Peak Booster Heating



### Daily Desiccant Humidification Energy





- DUSTIN M. EPLEE -

The McDuster: The Next Generation of HVAC  
**INSTITUTE OF CONTEMPORARY ART**  
Ocean Cooling, Solar Heating, Desiccant Conditioning

