Akton Associates
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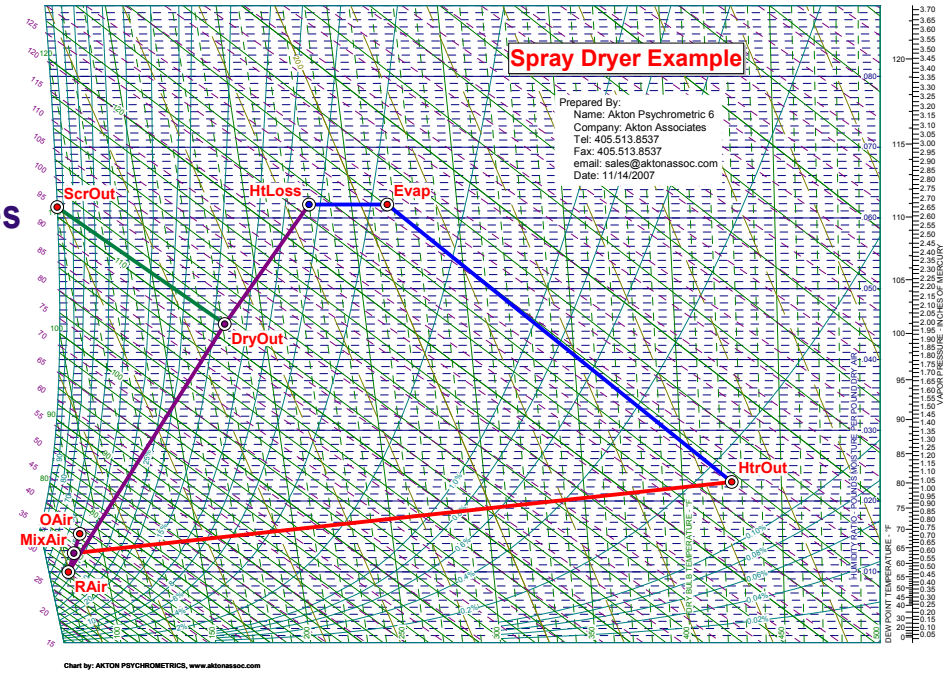
ALTITUDE: 276 FEET
BAROMETRIC PRESSURE: 29.624 in. HG



	t	tw	rh	W	h	v	p	Vtot	m	ma	mw	Qtot
	F	F	%	lbm/lbm	Btu/lbm	ft^3/lbm	lbm/ft^3	CFM	lbm/min	lbm/min	lbm/min	BTU/hr
OAir	90*	74.8	50*	0.01537	38.527	14.336	0.0697	6000*	418.2	411.6	6.565	
RAir	80*	65.0	45*	0.00996	30.120	13.956	0.0716	6000*	429.6	425.3	4.279	
MixAir	84.9	70.2	48.4	0.01263	34.262	14.143	0.0706	12000	847.2	836.5	10.7	
HtrOut	425*	125.3	0.17	0.02269*	130.3	23.338	0.0428	19998*	855.9	836.5	19.42	4,892,026
Evap	267	125.8	3.3	0.06190	137.1	20.334	0.0491	18160*	891.7	836.5	55.19	346,440
HtLoss	230	122.8	6.3	0.06190	127.2	19.299	0.0518	17214*	891.7	836.5	55.19	-537,840*
RAir	80*	65.0	45*	0.00996	30.120	13.956	0.0716	6000*	429.6	425.3	4.279	
DryOut	181.2	111.3	12.6	0.04501	94.87	17.492	0.0571	23122	1320	1260	59.43	
ScrOut	110.7*	110.7	100	0.06152	94.87*	15.952	0.0626	21447*	1343	1260	82.60	289

GIVEN: An existing spray dryer with the following characteristics. Needs to be modeled. Air stream is single pass.

*(* = User Input Data, Analysis is based on ACFM <not SCFM>)*

A. Inlet air Flow: Outside Air 6000 ACFM @ 90º F 50% R.H. Inside Air 6000 ACFM @ 80º F 45% R.H.
B. Inlet air heated by natural gas fired heater to 425º F.
C. Process stream atomized into dryer at 4000 lbs/min, 50% solids, 50% water, 180º F.
D. Dryer at -3 inches water gage and 230º F. Exit Temperature
E. Cooling air from the room introduced prior to air stream leaving dryer.
F. Air stream cleaned by cyclones and wet scrubber before exit to atmosphere. Modeling the Dryer using the Akton Psychrometric Chart The following procedure is one of several that can be done using this computerized Psychrometric Chart.

Start: Set the chart pressure for 14.55 psia. (This will give the Exact conditions within the dryer. Values outside will vary slightly due to different absolute pressures, but will be well within the tolerances of usually less than 1% error.)

1. Input the two inlet air streams; outside air and room air, as Entry points: "OAir" 6000 ACFM @ 90º F, 50% R.H. "Rair" 6000 ACFM @ 80º F, 45% R. H.

2. Mix the two streams and establish the "MixAir" point.

3. Set the heater outlet point "HtrOut" by the set temperature of 425° F and the value dh/dw of 9,553 BTU/lb. (This value is based on the Lower Heating Value LHV for methane. This value should be adjusted for natural gas used in your dryer heater since this value can differ from pure methane.) The LHV is used since the water generated will be as vapor and not condensed.

4. Set the evaporation drying line as follows: The water in the feed is 2000 lb/hr. or 33.33 lb/min at a temperature of 180º F. Use the enthalpy of the water from steam tables giving the ratio = 147.92 btu/lb. This sets the "Evap" point at a temperature of 267° F which is above the measured temperature of 230° F, Therefore, account for this difference by heat loss.

5. Set the Heat Loss Point "HtLoss" by the value Q tot=-537,840 btu/hr. (This value Q tot is determined by first setting the point at 230° F. Since for the measured conditions this value is known, the program will return the value for Q Tot of -537,840 btu/hr. The change to the Q Tot value as the set point allows the user to make this a Dynamic Model with a set heat loss that will allow the user to modify the model)

6. Establish the cooling air as room air as an entering point as 8000 ACFM @ 80°F, 45% RH.

7. Mix this dryer stream with the cooling air and establish dryer out point- "DryOut".

8. Establish the scrubber to atmosphere point by holding enthalpy constant and adjusting dry bulb such at RH=100% - This is "ScrOut" point.

The above computer model for this dryer enables the engineer to change various parameters such as feed quantity and heater outlet temperature to check the affect on the system.