Technical Bulletin (TB-0054)

BITZER Parallel Software and Bin Analysis Guide

Version 1, April 2014

BITZER Parallel Software Guide Table of Contents

Contents

Section 1: General Information

1.1 Additional information can be found in the following publications:

TB-0037 BITZER Software Guide and Updates

1.2 Software Purpose and Use:

The Bitzer Parallel Software is intended to allow users to easily and quickly run calculations with multiple compressors in scenarios that exceed the scope of the parallel section in the official software. This program also allows for Bin analyses to be run, estimating the energy consumption for a compressor or rack based on user defined operating conditions.

Section 2: User Defined Inputs

2.1 Multiple Compressor page inputs:

- **Model Numbers**
  Select the compressor type or series (New Ecoline, Open Drive Recips, etc.)
- **Refrigerant**
  Select the refrigerant type that will be used in the compressor(s)
- **Cooling Capacity Required**
  Input the cooling capacity required for the rack or compressor. This is generally less than the actual capacity provided by the compressors in order to show a slight safety factor in sizing
- **Sat. Suction Temp**
  Input the saturated suction temp of the refrigerant entering the compressor
- **Useful Superheat**
  The drop down may be set to either “User Defined Useful Superheat” in which case the input values will be used, or “100% Useful Superheat” and the input value will be disregarded
- **Return Gas Temp / Compressor Superheat**
  Temperature of refrigerant entering compressor or a suction superheat value may be entered
- **Sat. Discharge Temp**
  Input the saturated discharge temp of the refrigerant leaving the compressor
- **Ambient Subcooling / Liquid Temp**
  Input the ambient subcooling in the condenser or liquid temp leaving the condenser
- **Motor Version**
  Select the desired motor types to display. User may select Motor 1 for High Temp applications, Motor 2 for Low Temp applications, Both Motor 1 and 2, or Motor 3 for R134a Low Temp only
- **Voltage Supply**
  Select the voltage supplied to the compressor
- **Lubrication Method**
  Select the lubrication method to adjust compressor models shown. CE4 / C4 series compressors may be either pump or centrifugally lubricated.
- **Ref. Temperature**
  Select refrigerant reference temp to use in calculations, either dew point or mean temp
- **Quick Calc**
  Enabling Quick Calc mode will only run calculations for selected compressors (Qty. greater than zero)
- **Operating Mode**
  Select Auto, Standard, or CIC liquid injection operating modes. Auto will choose CIC where applicable.
- **External Subcooling**
  If the rack or compressor will be subcooled using an external source or rack to receive the subcooling load, this option may be enabled. Selecting yes will allow the user to enter either a liquid temp after the subcooler or a subcooling value to use.

2.2 Bin Analysis page inputs:

- **Analysis ID#**
  Input the column number (1-14) in which to save the bin analysis summary
- **Rack Identifier**
  Input a rack identifier label
- **Suction Group**
  Input a suction group label
- **Run Bin Temp ID#**
  Select the bin temp ID to use (1-3). Bin 1 is defined by selected location. Bins 2 and 3 are user defined and may be edited
- **Utilize Variable Load ID#**
  Select a variable load setting to use. 100% does not evaluate a variable load and uses the cooling capacity required from the multiple compressors page for the entire year. Variable load ID 1 and 2 are user defined as a percentage of the cooling capacity required for each bin temp
- **Min Condensing Temp**
  Input a minimum saturated condensing temperature. Once the minimum condensing temp is reached, all remaining run hours will be calculated with the minimum condensing
- **Condenser TD**
  Input a condenser TD to be added to the ambient bin temps for calculating saturated discharge temps
- **Apply Subcooler Load From**
  Input a bin ID between 1 and 14 in order to apply an external subcooling load from a previously run bin analysis ID to the next analysis run
- **Apply Secondary Subcooler Load From**
  Input a bin ID other than 0 in order to apply an external subcooling load from a previously run bin analysis ID to the next analysis run. This is useful in split suction calculations where the subcooling load from two suction groups is applied to a single rack

3.0 Using the Multiple Compressors Page

Operating Parameters and Main Selection

Refer to section 2.1 for a list of input parameters and their functions. Upon completing the input parameters in Figure 1 below, the calculate button may be used to populate a list of compressors and their performance data. If switching between compressor types, new model numbers will not appear until the calculate button is clicked.

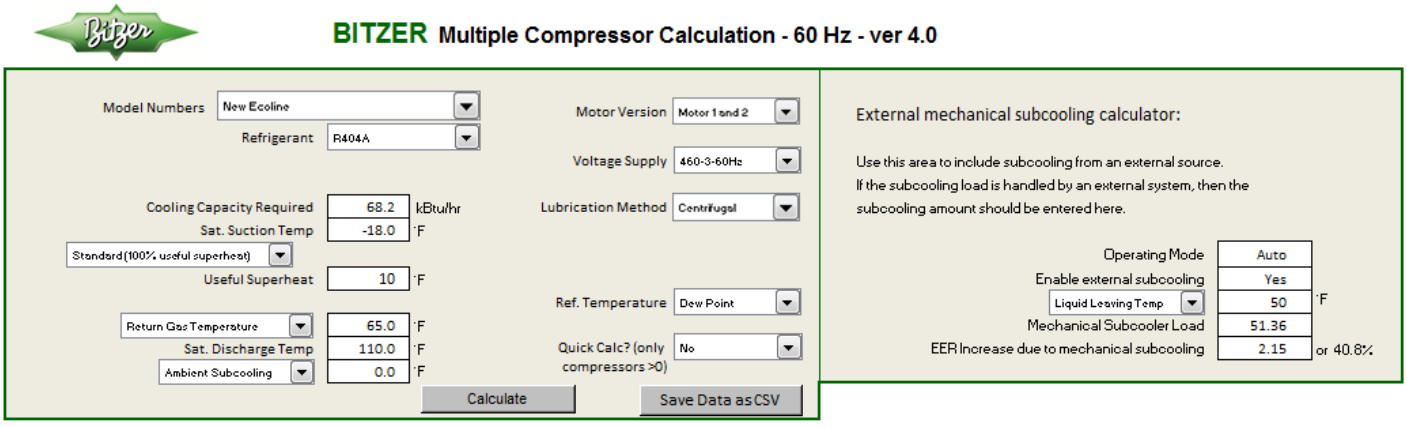

Figure 1. Operating Parameters

Once a list of compressors and performance data has been generated, compressors may be selected by quantity as shown below if Figure 2. If Quick Calc is enabled, performance data for compressor models with a quantity greater than or equal to one will be calculated.

Model Numbers	Displacement CFH	Comp Cap kBtu/hr	Evap Cap kBtu/hr	Mass Flow lbs/hr	Power kW	Operating Current (A)	Discharge Temp (°F)	# of Comps
2KES-05	173.0	9.1	9.1	153.1	0.9	1.7	180.6	1

Figure 2. Compressor Quantity

Section 4: Using the Bin Analysis Page

Bin Analysis Parameters

Refer to section 2.2 for a list of input parameters and their functions. Upon completing the input parameters in Figure 3 below, the bin analysis can be completed by clicking the Run Bin Analysis button.

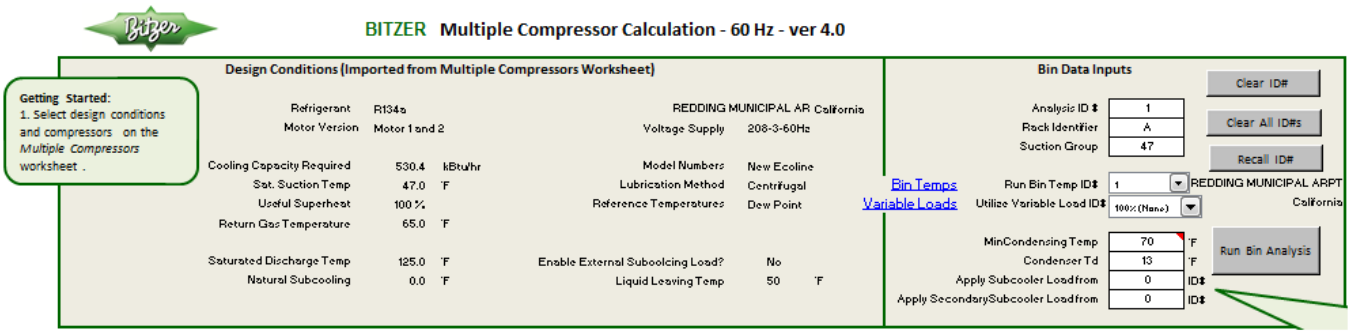

Figure 3. Bin Analysis Parameters

4.1 Clearing and Recalling Previous Analyses:

Previously run analyses may be cleared using either of the two Clear ID# buttons. The Clear ID# button will only clear the current ID# in the Analysis ID text box. Clear all ID#'s will clear all previously run analyses. Analyses may also be recalled in order to make slight changes easier. Clicking the Recall ID# will automatically re-run the multiple compressors page with the compressors and design conditions from whichever ID# was in the Analysis ID text box. This will also replace all input parameters on the Bin Analysis page with those from the analysis ID recalled.

4.2 Summary Data:

Each bin analysis run will output a set of summary data as shown in Figure 4. This summary contains information from the Multiple Compressors page as well as the Bin Analysis Page. Saturated suction temp, saturated discharge temp, natural subcooling, external subcooling, return gas temp, useful superheat, design load, compressor and evaporator capacity and safety factors all come from the input design conditions on the Multiple Compressors page. The rest of the data comes from the analysis page and calculations. Total energy consumption for the year is shown at the bottom of this section for both the compressor and evaporator capacity. All compressors chosen, 1-10, are shown here as well.

Analysis ID#		1
Refrigerant		R134a
Rack Identifier		A
Suction Group		47
Bin Temp ID# or Location		MUNICIPAL
Minimum Condensing Temp	°F	70
Condenser Td	°F	13
Subcooling Applied from ID#		0
Saturated Suction Temp	°F	47.0
Sat Discharge Temp (Design)	°F	125.0
Subcooling / Liq Temp (Natural)	°F	0 (SC)
Subcooling / Liq Temp (Mechanical)	°F	
RGT / Suction Superheat	°F	65.0
Useful Superheat	°F or %	100%
Design Load	MBTU/hr	530.4
Comp Capacity (Design)	MBTU/hr	680.9
Comp Capacity Safety Factor		128.4%
Evap Capacity (Design)	MBTU/hr	680.9
Evap Capacity Safety Factor		128.4%
Max Subcooling (at External HTX)	MBTU/hr	0.0
Total Energy Calc (NRE)	kw*hrs	177,512
Total Energy Calc (Comp Capacity)	kw*hrs	177,512

Comp1	4FES-3
Comp2	4VES-7
Comp3	4PES-15
Comp4	4JE-15
Comp5	6HE-28

Figure 4. Bin Analysis Summary Data

4.3 Bin Data:

Raw bin data from the most recently run analysis is available below the summary section as shown in Figure 5 below.

			Required Load		Adjustment of Load (SC, Variable)			Subcool to	Condenser	Comp Capacity*		Net Ref Effect (Evap Capacity)			Annual Energy Consumption		Mass	
Index	Bin Temp °F	Hours Hrs	SDT (°F)	Load kBtu/hr	SC Load kBtu/hr	Var Load %	Adj Load kBtu/hr	the External kBtu/hr	Capacity kBtu/hr	Ave EER*	Power* (kW)	Capacity kBtu/hr	Ave EER	Power (kW)	CC (YR)* kW hrs	NRE / EC (YR) kW hrs	Flow lbs/hr	Messages
1	120.0	0.1	133	530.40	0.0	100.0	530.40	0.0	840.2	10.3	51.5	631.2	10.3	51.5	2.6	2.6	11233.5	Tentative Data.
2	115.0	2.8	128	530.40	0.0	100.0	530.40	0.0	865.0	11.1	47.6	662.2	11.1	47.6	132.8	132.8	11400.6	Tentative Data.
3	110.0	18.9	123	530.40	0.0	100.0	530.40	0.0	889.5	12.1	44.0	693.3	12.1	44.0	831.7	831.7	11562.2	Tentative Data.
4	105.0	62.5	118	530.40	0.0	100.0	530.40	0.0	913.6	13.1	40.6	724.5	13.1	40.6	2536.5	2536.5	11718.6	Tentative Data.
5	100.0	161.5	113	530.40	0.0	100.0	530.40	0.0	937.3	14.2	37.4	755.7	14.2	37.4	6034.6	6034.6	11869.8	Tentative Data.
6	95.0	276.4	108	530.40	0.0	100.0	530.40	0.0	960.7	15.4	34.3	786.8	15.4	34.3	9493.9	9493.9	12015.9	Tentative Data.
7	90.0	352.2	103	530.40	0.0	100.0	530.40	0.0	983.7	16.8	31.5	818.0	16.8	31.5	11085.9	11085.9	12157.0	Tentative Data.
8	85.0	423.5	98	530.40	0.0	100.0	530.40	0.0	1006.2	18.4	28.8	849.2	18.4	28.8	12349.1	12349.1	12293.1	Tentative Data.
9	80.0	534.0	93	530.40	0.0	100.0	530.40	0.0	1028.4	20.3	26.2	880.3	20.3	26.2	13968.4	13968.4	12424.2	Tentative Data.

Figure 5. Bin Data

Section 5: Troubleshooting

5.1 Bin Analysis will not complete:

If a bin analysis will not complete or causes an Excel error, click the end button in the error message and check the bin data populated. This error will most likely be due to running the compressor(s) selected outside of their operating limits, causing zeros to be imported into the Bin Analysis page. These zeros will cause issues as the compressor data is used in separate calculations for this page. If this is the case, the bin data will normally show up normal until a certain condition, usually a lower condensing temp, where there will be zeros for power and capacity data. If this is the case, either the design saturated suction temp or the minimum condensing will need to be changed to ensure the compressor is run within application limits for the entire analysis.

5.2 Data will not display in Multiple Compressors page:

If Data will not display in the Multiple Compressors page after clicking the Calculate button, the following checks should be performed:

- Ensure at least one compressor has a quantity greater than zero associated with it
- Ensure the correct compressor-motor type is selected (1 for high temp, 2 for low temp, and 3 for low temp R134a)
- Check the Error Messages column on the right hand side of the compressor data section for any error that may have come up and re-calculate after adjusting the design conditions accordingly