

RTS & LabSys Benefits



- Given the investment you have made in test chambers and personnel to operate these chambers, RTS and LabSys help to maximize these investments and get as much testing through the lab as possible
- Besides automating day-to-day operations, RTS and LabSys help with audits
 - + RTS is used by CSA and UL for their test chambers so they are familiar with the reports RTS generates

RTS - Automatic Calibration



- Press a button to perform the calibration and generate reports with UofM - No tweaking of pots
- RTS communicates with temperature and power standards to get the actual data
- Device is calibrated in the system so all losses are corrected for
- Downtime minimized with automated processes

Refrigeration Technology		VAW Calibration Report						Page 1		
Calibrated By	Tech Name	Temperature		81°F		Test Start	06/14/16 9:09:21			
Test number	57080	Humidity		51% RH		Test End	06/14/16 10:07:42			
Room&Stall	20-08					Average Time	90			
Equipment:	Yokogawa 3000 SN:91LC16429					Actual Sample Rate	0.5			
Comment						Version	VAWCal v5.1			
Test Description	System Actual	Test Result	Lower Limit	Upper Limit	Status	Uncertainty	Zero	Gain	% Error	Std Dev
120 V Mid Range Voltage	114.5831	114.7941	112.84	118.28	Pass	0.219	0	0.996421	0.2	0.0049
120 V Mid Range Amperage	1.69629	1.6989	1.67085	1.72173	Pass	0.0077	0.000116	0.999166	0.15	0.00109
120 V Mid Range Wattage	194.3335	194.741	188.5	200.16	Pass	0.31	0	0.995892	0.21	0.1375
120 V Mid Range Voltage	115.0328	115.0059	113.31	116.76	Pass	0.219	0	0.996654	-0.02	0.0061
120 V Mid Range Amperage	1.70891	1.7087	1.68328	1.73454	Pass	0.0077	0.000116	0.99928	-0.01	0.0013
120 V Mid Range Wattage	196.5792	196.5172	190.68	202.48	Pass	0.316	0	0.996208	-0.03	0.1623
120 V Low Range Wattage	10.0176	9.965	9.72	10.32	Pass				-0.53	0.0096
120 V High Range Amperage	4.29051	4.296	4.23206	4.36096	Pass				-0.01	0.00254
120 V High Range Wattage	493.5336	494.523	478.73	508.34	Pass				0.2	0.304
120 V Mid Range Watt-hrs	32.11	32.28	30.5	33.72	Pass				0.53	
220 V Mid Range Voltage	229.5218	229.4939	226.08	232.98	Pass	0.219	1	0.994791	-0.01	0.0061
220 V Mid Range Amperage	0.84909	0.8497	0.83635	0.86183	Pass	0.0077	0.000116	0.999515	0.07	0.0004
220 V Mid Range Wattage	194.8811	194.8514	189.03	200.73	Pass	0.31	0	0.998722	-0.02	0.096
220 V Low Range Wattage	10.0405	10.076	9.74	10.34	Pass				0.35	0.0147
220 V High Range Amperage	2.15827	2.159	2.1259	2.19064	Pass				0.03	0.00086
220 V High Range Wattage	496.6092	497.154	481.71	511.51	Pass				0.11	0.2446
220 V Mid Range Watt-hrs	27.27	27.31	25.91	28.63	Pass				0.15	

RTS - Automatic Calibration



- This view shows calibration dates for all devices connected with test stalls for the lab
- + Makes calibration management easier

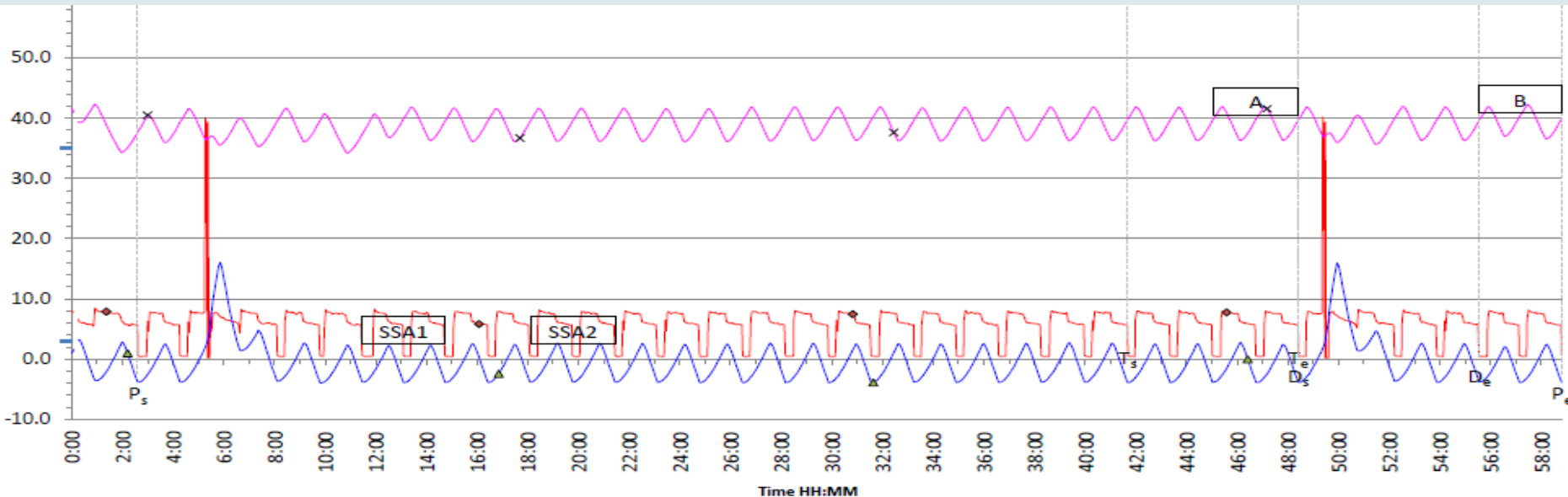
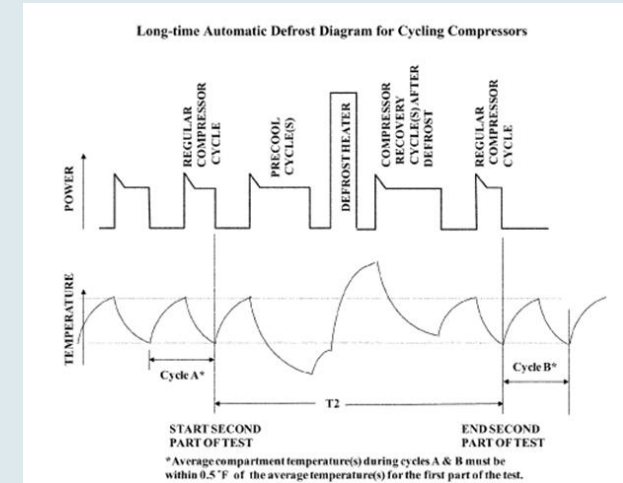
Calibration Overview

Stall	Vaw Months Due	Vaw Cal Date	Vaw Cal Due	Vaw Test Num	TC Months Due	TC Cal Date	TC Cal Due	TC Test Num	PSI Months Due	PSI Cal Date	PSI Cal Due	PSI Test Num	CL Months Due	CL Cal Date	CL Cal Due
01-01 <input type="checkbox"/>	10	08/25/16	08/25/17	7819	10	08/24/16	08/24/17	7759	10	8/24/2016 8:00:49 AM	8/24/2017 8:00:49 AM	7750	10	8/24/2016 2:08:22 PM	8/24/2017 2:08:22 PM
01-02 <input type="checkbox"/>	10	08/25/16	08/25/17	7820	10	08/24/16	08/24/17	7760	10	8/24/2016 8:05:34 AM	8/24/2017 8:05:34 AM	7751	10	8/24/2016 2:42:10 PM	8/24/2017 2:42:10 PM
01-03 <input type="checkbox"/>	10	08/25/16	08/25/17	7821	10	08/24/16	08/24/17	7762	10	8/24/2016 8:09:50 AM	8/24/2017 8:09:50 AM	7752	10	8/24/2016 3:19:25 PM	8/24/2017 3:19:25 PM
01-04 <input type="checkbox"/>	10	08/25/16	08/25/17	7822	10	08/24/16	08/24/17	7763	10	8/24/2016 8:12:21 AM	8/24/2017 8:12:21 AM	7753	10	8/24/2016 3:47:27 PM	8/24/2017 3:47:27 PM
01-05 <input type="checkbox"/>	10	08/25/16	08/25/17	7824	10	08/24/16	08/24/17	7769	10	8/24/2016 8:15:02	8/24/2017 8:15:02	7755	10	8/25/2016 6:22:08	8/25/2017 6:22:08

RTS - Automatic Reports



- RTS checks for stability and starts/stops the test at the appropriate time
- PDFs available immediately at end of test for lab/engineer to make decisions quickly
- Example of auto-gen 2014 energy test PDF
 - + These annotations are also on the real-time trend



LabSys – Finding data



- Result data for a request automatically shows up in request

Request Steps
Add Step
Mark As Complete
Add Comment
Clone Step
Batch Assign

Edit	Step Status	Lab	Procedure/Instructions	Results	Assigned	Step Title
<input type="checkbox"/>	Complete	Thrm	6/5/2017 9:50:25 AM - [User] - Status for the step titled DOE - Department of Energy Testing has changed. The new status is now Complete.			DOE - Department of Energy Testing

Request Attachments
Add File

File Link	File Name	Attachment Type	Description	Date

Request Log

Date	Message	User
4/7/2017 9:09:16 AM	Request status changed to: Submitted	[User]

Result Data - Completed Tests

Test Num	Project	Test Type	Unit
16762		Energy-Refrigeration-DOE	17P0046 -
16770		Energy-Refrigeration-DOE	17P0049 -
16813		Energy-Refrigeration-DOE	17P0049 -

Each step of the request is tracked with comments

Status of request is tracked

Test data associated with a lab request is automatically connected with that request

RTS - Data Summarization



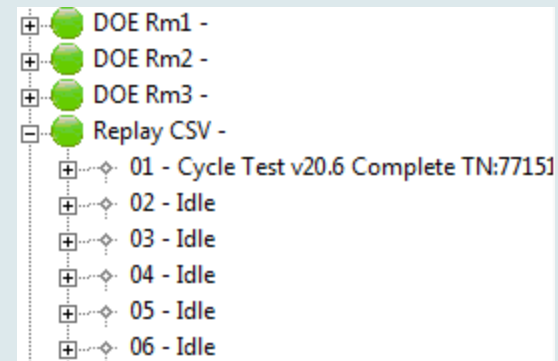
- Multiple test results can be added quickly into an Excel Summary by typing the test number and pressing the button
- Engineers and techs should never have to manually type data into Excel
- Spreadsheet also provides a link to the PDF report

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1			Get Aham															
2			Summary															
3	Test Number	Product ID	Stall	Control Settings	Cab Avg	Frz Avg	ADC Kwh24	Percent Run	Left Amb	Right Amb	Avg On	Avg Off	CycPerHr	Avg Watts on	Avg Watts Defrost	Total Defrost	PPKwh24	TPKwh24
4	2052	15P0159	02-01	Med/Med	88.75	-1.40	0.0000	40	88.84	88.55	0.2850	0.2850	1.00	88.36	288.88	0.1740	1.0000	0.0000
5	2051	15P0160	02-02	Med/Med	88.48	0.40	0.0000	40.8	88.55	88.54	0.2850	0.2850	1.00	88.4	282.76	0.1640	0.9917	0.0000
6	2050	15P0156	02-03	Med/Med	88.54	-1.80	0.0000	48.1	88.1	88.50	0.2740	0.2740	1.00	88.36	288.77	0.1740	1.0000	0.0000
7	2049	15P0161	02-04	Med/Med	88.75	-0.80	0.0000	48.2	88.80	88.86	0.2850	0.2850	0.99	88.37	282.87	0.1650	0.9900	0.0000
8	2048	15P0157	02-05	Med/Med	88.82	-0.84	0.0000	48.8	88.55	88.55	0.2847	0.2848	0.99	88.55	288.55	0.1650	0.9900	0.0000
9	2047	15P0155	02-06	Med/Med	88.55	-0.80	0.0000	48.1	88.88	88.2	0.2248	0.2747	1.00	88.57	288.27	0.1650	1.0000	0.0000
10	2046	15P0158	02-07	Med/Med	88.58	-0.80	0.0000	48.8	88.48	88.58	0.2248	0.2848	1.00	88.56	288.88	0.1650	0.9900	0.0000
11	2045	15P0162	02-08	Med/Med	88.28	-1.24	0.0000	48.2	88.28	88.40	0.2850	0.2850	0.99	88.88	288.78	0.1650	0.9900	0.0000

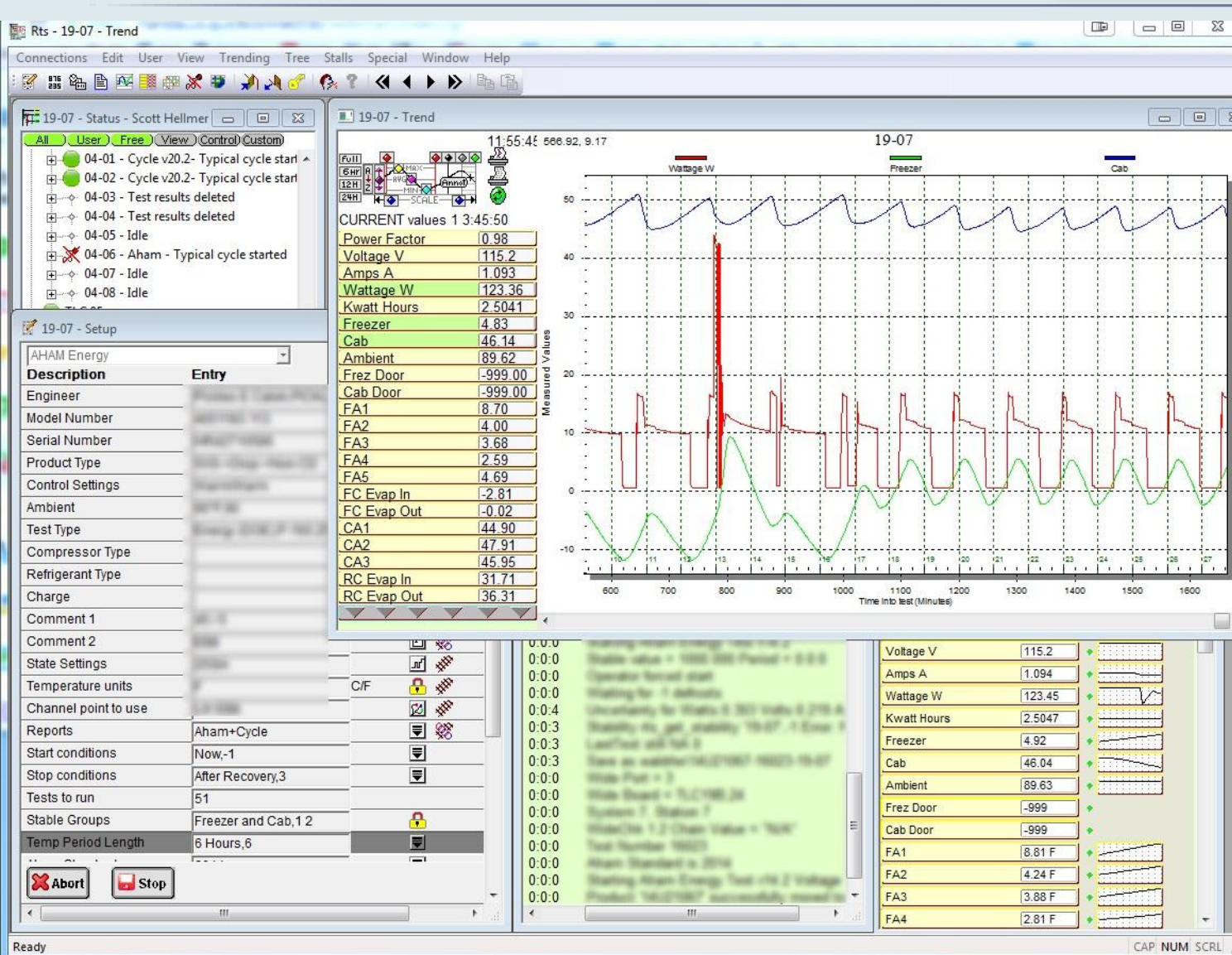
RTS - Replay



- RTS can 'replay' .csv test data through the test script in order to correct for issues like:
 - + Ambient issue at start of test
 - + Incorrect labeling or state detection
 - + Wrong test run initially
 - + Correct an issue with the test script
- This feature can save many hours to reclaim a test that would have been useless
- New PDF auto-generated in LabResults
- Replay station looks just like a physical test station except that it reads from a .csv instead of physical I/O
- Takes about 30 seconds to replay a test



RTS - Data Visualization



RTSMAN is a windows executable installed on client PCS to see real-time data

It allows the operator to :
Stop and start tests

Enter setup data
View different trends

See current state of the test

LabSys - Management

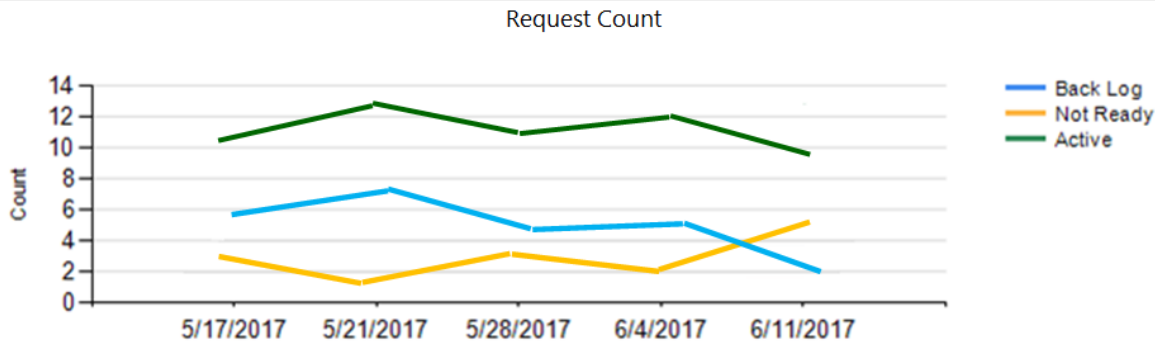


- Reports to track lab Capacity and First Pass yield over time

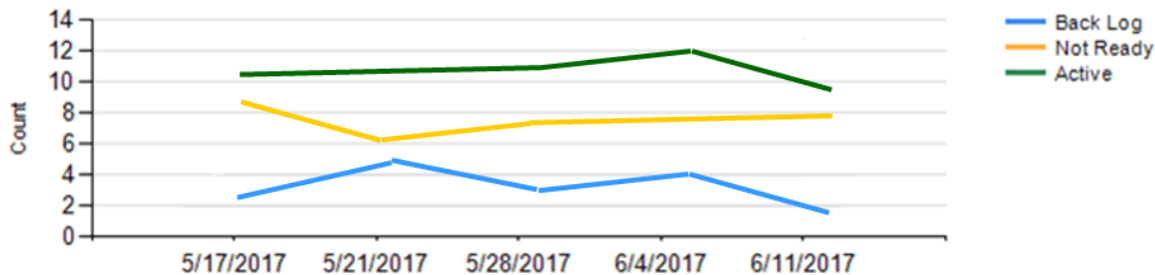
Lab Capacity Request Track

Lab Name

Lab Name 1



Lab Name 2



LabSys-RTS Integration



- Entering data twice is time consuming and leads to errors. This is minimized by:
 - + RTSMAN dropdowns are populated by Requests and Units from LabSys
 - + RTS changes current location of Unit in Labsys when test starts
 - + Calibration dates are pulled from RTS into Labsys

Access to data



- Providing appropriate access to lab data allows decisions to be made faster
 - + Anyone on the Company LAN can access real-time trend data and result data.
 - × This can be limited if desired
 - + Install script provided to set up client PCs for real-time access.