



2019 ETCC Webinar Series

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Dynamic Air Balancing for Commercial HVAC Systems

75F Zoning System

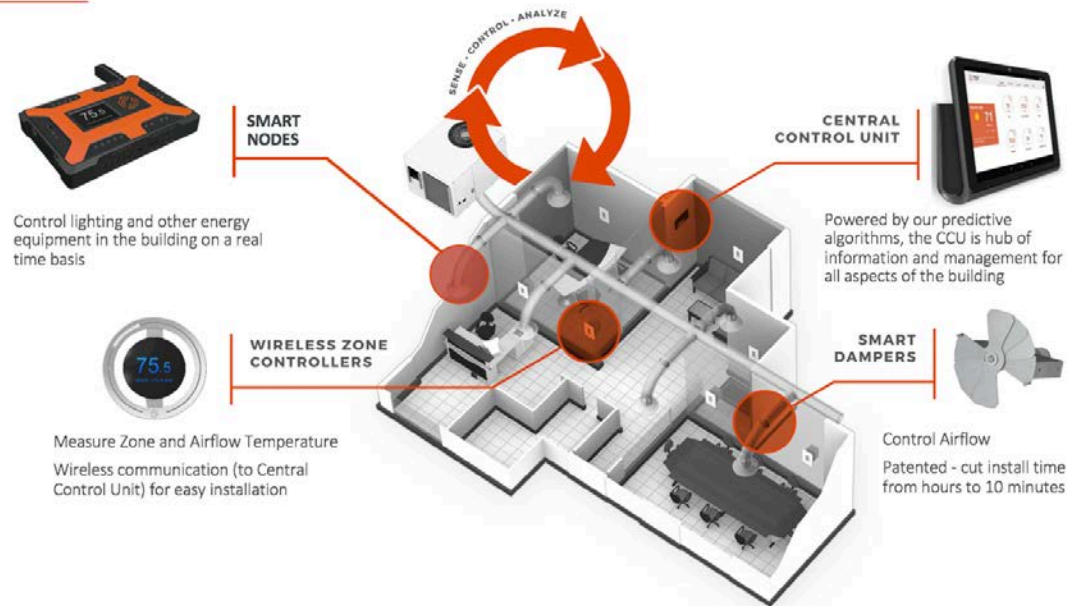
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Technology

- 75F Dynamic Air Balancing system designed to improve comfort and save energy:
 - Smart dampers in each zone controlled.
 - Wireless zone controllers (thermostats, occupancy, temp sensors).
 - Proprietary control strategy operates RTU and smart dampers based on zone conditions.
 - Other options include occupancy sensors, setback schedules, DCV/economizer operation.
- Target markets are small to medium commercial buildings with 3-20 ton constant volume RTUs.
- User-friendly online portal provides facility managers key data about RTU operation and schedules, set points, and air temperatures in each zone. *These are the additional non-benefits of small commercial EMS.*



Building Intelligence in a Box



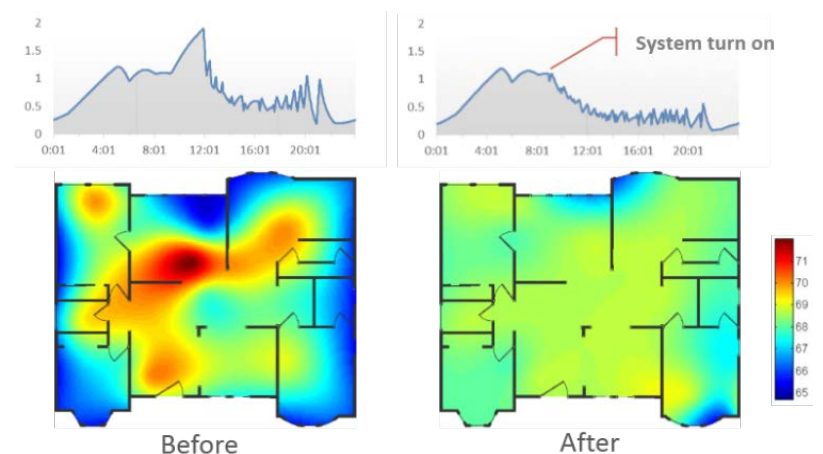
Technology Background

A schematic diagram of the 75F system and its components

Indirect competitors of 75F: Emme, Honeywell Zoning Systems, to name a few...

Technology Background

- Baseline technology is RTU operating at constant volume with no demand controlled ventilation (DCV).
- System balancing shows energy savings: 8-13%
 - Rob Falke, “How Does Air Balancing Save Energy,” *Contracting Business Magazine*, 2010.
- 75F claims:
 - 35% heating energy savings including savings from DCV.
 - 20% cooling energy savings.



SDG&E Pilot Study Host Site

- An industrial facility with adjacent office space
- The office space on 2nd floor and conditioned by 9 packaged constant volume rooftops (RTUs). Existing RTUs are 11 years old.

PACKAGE GAS/ELEC SCHEDULE																	
TAG	MAKE/MODEL	AREA SERVED	INDOOR FAN				COOLING			HEATING		ELECTRICAL DATA			FILTERS	OPER. WEIGHT (LBS.)	REMARKS
			CFM	E.S.P.	B.H.P.	O.S.A.	TOT. (MBH)	SENS. (MBH)	SEER	INPUT (MBH)	AFUE	VOLTAGE	MCA	FUSE			
AC 1	CARRIER 48PGLM04	2ND FLOOR NW OFFICES	200	0.6	.33	135	36.0	26.1	14.0	51.0	80	460-3	9.0	15	(4)16x20x2	948	WITH FACTORY FLAT BASED CURB, MANUAL OSA HOOD AND FILTER RACK
AC 2	CARRIER 48PGLM04	2ND FLOOR BRK/CONF	1200	0.6	.33	310	36.0	26.1	14.0	51.0	80	460-3	9.0	15	(4)16x20x2	948	WITH FACTORY FLAT BASED CURB, MANUAL OSA HOOD AND FILTER RACK
AC 3	CARRIER 48PCNM03	2ND FLOOR CONF	800	0.6	.20	170	24.9	17.9	14.0	51.0	80	208-1	21.8	30	(4)16x20x2	936	WITH FACTORY FLAT BASED CURB, MANUAL OSA HOOD AND FILTER RACK
AC 4	CARRIER 48PGLM04	2ND FLOOR NE OFFICES	200	0.6	.33	150	36.0	26.1	14.0	51.0	80	460-3	9.0	15	(4)16x20x2	948	WITH FACTORY FLAT BASED CURB, MANUAL OSA HOOD AND FILTER RACK
AC 5	CARRIER 48PGLM05	2ND FLOOR RD LAB	1600	0.6	.50	210	48.9	35.5	14.8	51.0	80	460-3	11.4	15	(4)16x20x2	1063	WITH FACTORY FLAT BASED CURB, MANUAL OSA HOOD AND FILTER RACK
AC 6	CARRIER 48PGLM04	2ND FLOOR WEST OFFICES	1200	0.6	.33	250	36.0	26.1	14.0	51.0	80	460-3	9.0	15	(4)16x20x2	948	WITH FACTORY FLAT BASED CURB, MANUAL OSA HOOD AND FILTER RACK
AC 7	CARRIER 48PGDM12	2ND FLOOR WEST OPEN OFFICE	4000	0.8	2.06	630	125.6	95.3	12.0 EER	181.0	80	460-3	27	30	(4)20x25x2	1561	WITH FACTORY FLAT BASED CURB, DRY BULB ECONOMIZER AND FILTER RACK
AC 8	CARRIER 48PGDM12	2ND FLOOR EAST OPEN OFFICE	4000	0.8	2.06	630	125.6	95.3	12.0 EER	181.0	80	460-3	27	30	(4)20x25x2	1561	WITH FACTORY FLAT BASED CURB, DRY BULB ECONOMIZER AND FILTER RACK
AC 9	CARRIER 50PG-C06	2ND FLOOR IT ROOM	2000	0.6	.75	0	62.4	45.9	14.8	-	-	460-3	15.4	25	(4)16x20x2	991	PROVIDE HEAD PRESSURE CONTROLLER COOLING ONLY 24-HOUR

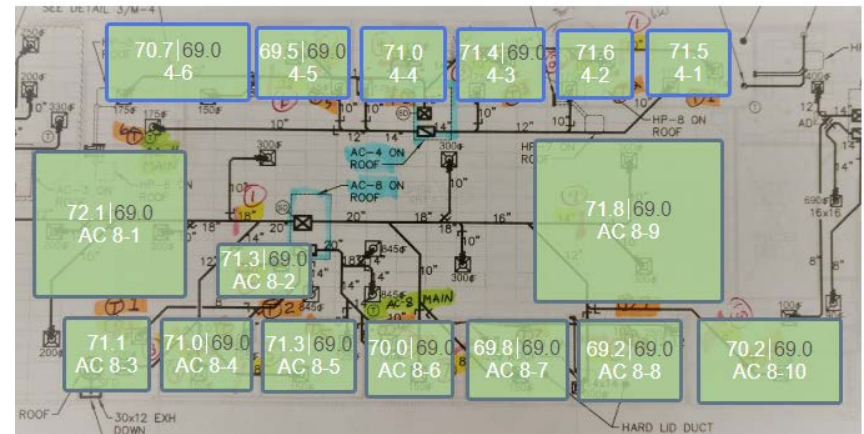
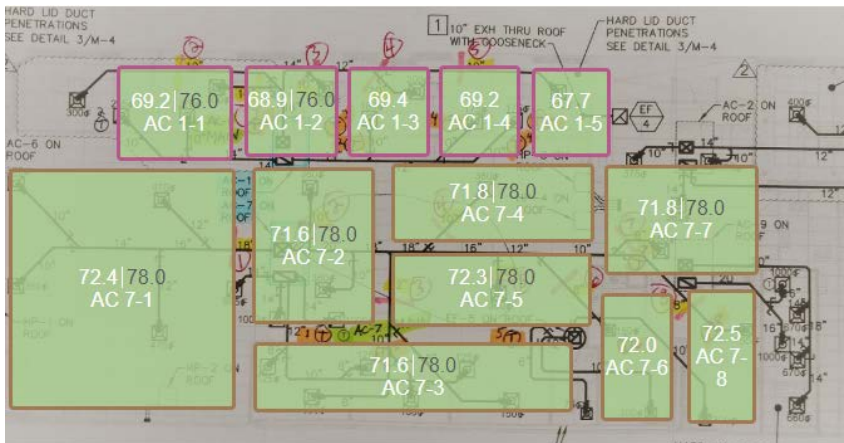
Floor Plan Tagged with RTUs

RTU AC/1 (3 tons) has 5 zones

RTU AC/7 (10 tons) has 8 zones

RTU AC/4 (3 tons) has 6 zones

RTU AC/8 (10 tons) has 10 zones



- Zoning system should provide the most benefit when the space is zoned properly. Two groups of RTUs provide the mean of validation

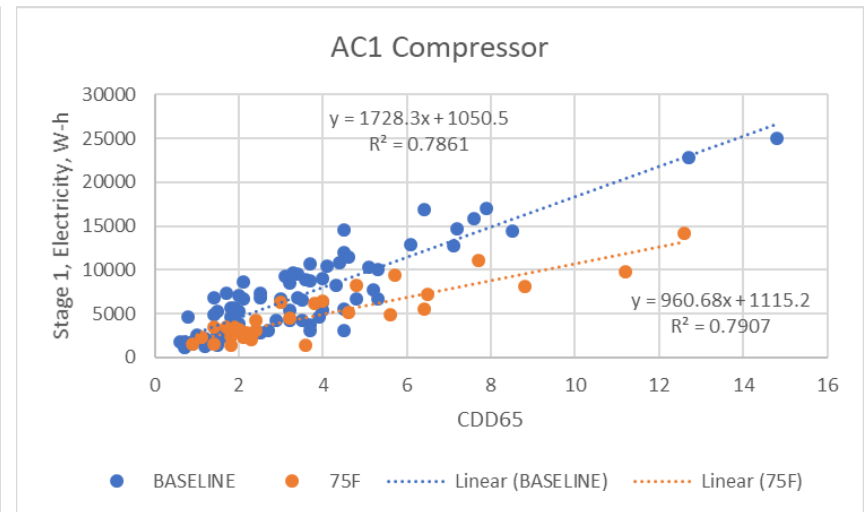
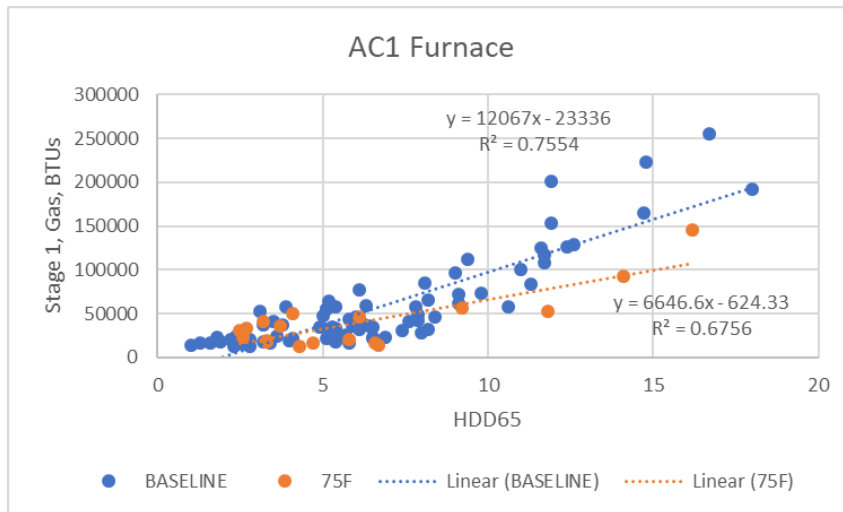
SDG&E Pilot Monitoring

- Data collected over range of heating degree days and cooling degree days from November 2017 through November 2018, monitoring period:
 - Baseline RTU operation
 - 75F dynamic balancing operation
 - 75F dynamic balancing and DCV operation (not tested)
- System operated with adjacent one-week periods of baseline and 75F during the monitoring period.
- 75F has other capabilities that **were not** evaluated in this demo: *occupancy sensors, economizers, IAQ sensors, and demand response capabilities*. Some of these capabilities are being rolled out in 2019.

Preliminary Result – RTU AC/1 (Serves Perimeter Offices)

45% - Natural Gas Savings during the monitoring period

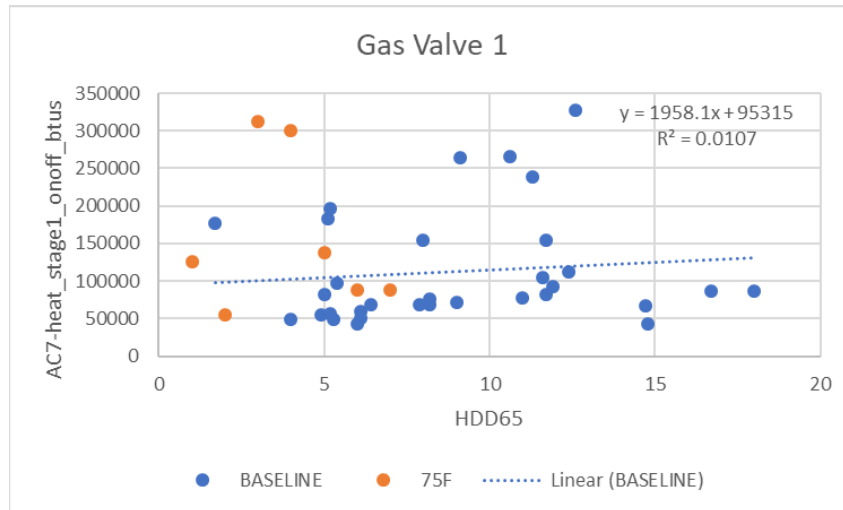
44% - Electricity Savings during the monitoring period



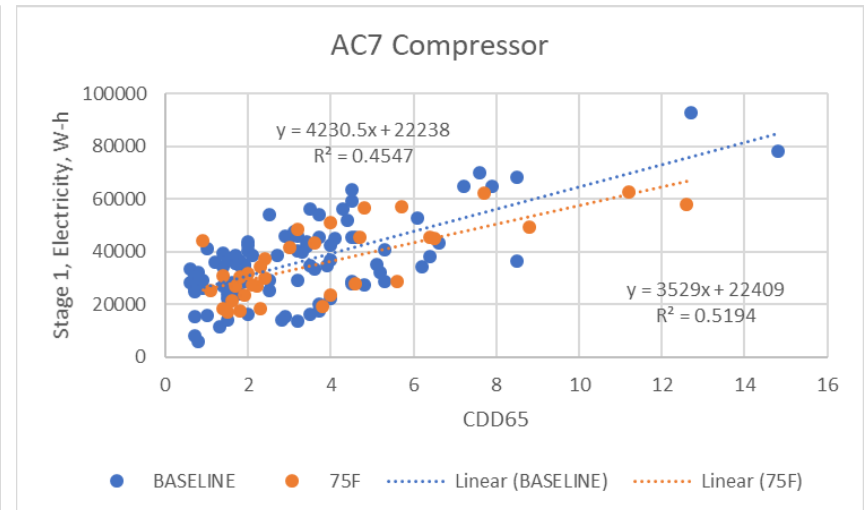
- The results are comparable to AC/4, which also serves the perimeter offices.

Preliminary Result – RTU AC/7 (Serves Open Offices)

No measurable savings



No measurable savings



- The results are comparable to AC/8, which also serves the open office areas.
- The open office space provide natural air mixing that diminishes the benefits of zoning.

Preliminary Results

- Occupants comfort improved with zone balancing based on feedback from the site Corporate Engineering Manager.
- The manager also appreciated the value of online dashboard in terms of verifying temperatures and historic data.
- *Upcoming project final report will include further discussion on simple payback calculation*
- The savings can be incrementally higher if DCV were to be implemented
- Nicor Gas ETP tested 75F zoning system on two RTUs in 2015/2016 heating season. The 12 zone RTU reduced natural gas consumption by 27% and 21 zone RTU reduced natural gas consumption by 25%.
- A simple payback tabular calculator to be developed for 75F zoning based on RTU size and # of zones. Previous Nicor Gas study showed higher RTU size and lower # of zones yielded favorable paybacks. Results of open office areas to be omitted from the tabular calculator.

The final report will be available in coming weeks.
Ongoing 75F pilot with SCG in a similar building type.
The project will be published on ETCC-CA.com under
project ID: ET15SDG1081.

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