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AIRAH Qld – 19 October 2011
Energy Efficient Plantroom Design

Phillip Carruthers

The Drivers

National Construction Codes (NCC) – Section J

- Drives the efficiency of individual plant items

Minimum Energy Performance Standards (MEPS)

- Can’t buy plant that was once popular

NABERS commitments

- Has financial teeth for the Landlord

Other legislation & reporting requirements

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Basic Comments

Section J

- The heater debacle (BCA 2010) reversed in BCA2011)
- Going to be tighter
- Alternate solutions are going to reduce

MEPS

- Packaged units generally can’t conform unless the fan is pathetic!
- Solution has been to install a booster fan (now that’s smart)
- High density population must have precooled outside air.

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Major Plantroom Energy

Chillers

- Were the main consumer but are now on par with pumps and fans
- Low load performance has improved but be careful
- Still critical for CW & CHW flow stability
- CW temperature is a real issue for efficiency

Pumps

- VSD’s are worth the effort and cost but control them with something
- Look at the selection to be sure that stability is okay at reduced speed
- Discuss the control method with Chiller Manufacturer.

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Some Impacts

Number of Passes

- Look at the PD through the vessels (2 pass vs 3 pass)

The Sweet Spot

- Where does the chiller reach it’s peak efficiency?
- What flows impact upon the efficiency
- When to step and step down chillers

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Proposition:

If you have two 1200kWr centrifugal chillers working in parallel:

- How would you schedule them? What control points would be used?
- What factors will impact upon efficiency?
- Would the factors be different if the compressor was a screw?
- At what point do you think the step up from one to two chillers would happen?
- How much difference would there be if the CHW vessel was three pass?

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Some Data

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Lag on to 30%					
%	kWr	**Lead (kWi)**	**Lag (kWi)**	**System (kWi)**	**kWi/kWr**
100	2400	230	230	460	0.19
90	2160	189	189	378	0.17
80	1920	157	157	314	0.16
70	1680	129	129	259	0.15
60	1440	106	106	212	0.15
50	1200	88	88	175	0.15
40	960	79	79	158	0.16
30	720	71	71	142	0.20
20	480	79		79	0.16
15	360	71		71	0.20
10	240	63		63	0.26
5	120	55		55	0.46

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Lag on to 50%					
%	kWr	**Lead (kWi)**	**Lag (kWi)**	**System (kWi)**	**kWi/kWr**
100	2400	230	230	460	0.19
90	2160	189	189	378	0.17
80	1920	157	157	314	0.16
70	1680	129	129	259	0.15
60	1440	106	106	212	0.15
50	1200	230		230	0.19
40	960	103		103	0.22
30	720	81		81	0.22
20	480	89		89	0.19
15	360	71		71	0.20
10	240	56		56	0.23
5	120	46		46	0.38

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Comparison	
30% kWi/kWr	50% kWi/kWr
0.19	0.19
0.17	0.17
0.16	0.16
0.15	0.15
0.15	0.15
0.15	0.19
0.16	0.22
0.20	0.22
0.16	0.19
0.20	0.20
0.26	0.23
0.46	0.38

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			30%		50%	
%	kWr	Flow (L/s) (8.0^{O}K TD)	Pump (L/s)	ByPass (L/s)	Pump (L/s)	ByPass (L/s)
100	2400	72	72	0	72	0
90	2160	64	72	8	72	8
80	1920	57	72	15	72	15
70	1680	50	72	22	72	22
60	1440	43	72	29	72	29
50	1200	36	72	36	36	0
40	960	29	72	43	36	7
30	720	21	72	51	36	15
20	480	14	36	22	36	22
15	360	11	36	25	36	25
10	240	7	36	29	36	29
5	120	4	36	32	36	32

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CONCLUSION

Plant efficiency is not just a case of selecting equipiment. It's a combined effort of looking at load profiles, COP profiles and all ancillary plant.

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BUT REMEMBER!!!!!

When you’re up to your armpits in alligators it’s difficult to remember that your original task was to drain the swamp

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