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Building Tuning and Optimisation



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Why tune and optimize HVAC plant?

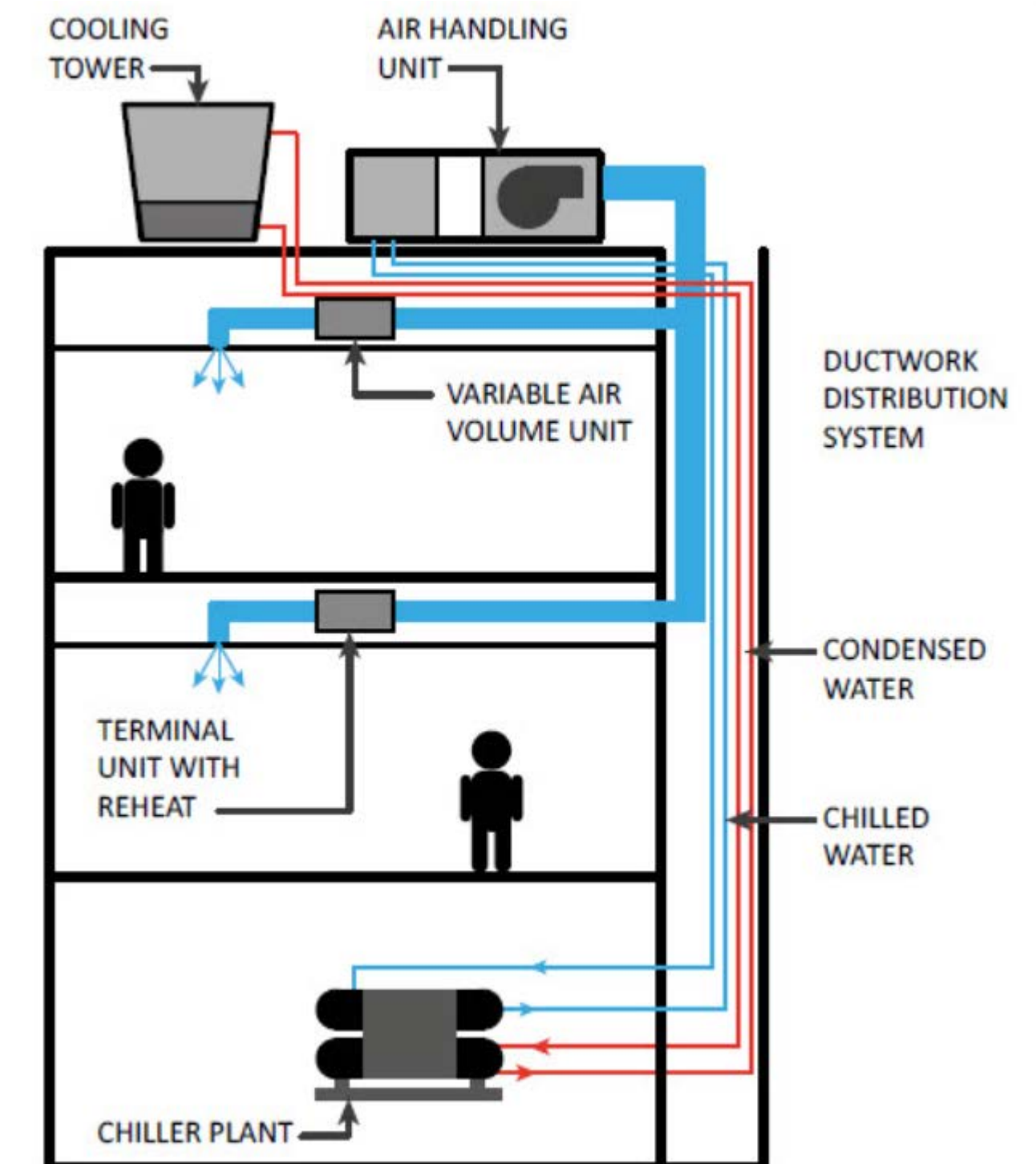
- Improve plant efficiency
- Minimise tenant complaints
- Reduce operating costs



Source: <https://www.mobilecrane trader.com>

7 Key Focus Areas

- AHU Fan Speed / Static Pressure Operation
- Temperature Control
- Economy Cycle Operation
- Min OA Damper & CO2 Control
- Water Flow Control
- VAV Temperature Control
- Ambient Lockouts



Source: hubglobalccsinstitute.com

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Successful Tuning & Optimisation Program

➤ Visibility





Supply Air Temperature Setpoint [TREND]	
VAV cool load high if terminal load >	90 %
VAV cool load normal if terminal load <	50 %
Supply air temp setpoint high limit	23.0 °C
Supply air temp setpoint low limit	11.0 °C
Percentage of VAVs at high cooling load	0.0 %
Number of VAVs at high cooling load	0
Number of VAVs available for selection	5
High Outside Air Enthalpy Setpoint Offset	
If outside air enthalpy is >= setpoint is lowered by	60 kJ/kg / 1.0 °C
High O/A enthalpy offset disabled at <=	53 kJ/kg
Low Outside Air Enthalpy Setpoint Offset	
If outside air enthalpy is <= setpoint is raised by	45 kJ/kg / 1.0 °C
Low O/A enthalpy offset disabled at >=	52 kJ/kg
Calculated supply air temp setpoint	24.0 °C
Supply air temperature	20.3 °C

Supply Air Static Pressure Setpoint [TREND]	
VAV "Not Satisfied" if damper position >	90 %
VAV "Satisfied" if damper position <	80 %
Supply air static pr. setpoint high limit	300 Pa
Supply air static pr. setpoint low limit	120 Pa
Percentage of VAVs Not Satisfied	40.0 %
Number of VAVs Not Satisfied	2
Percentage of VAVs Satisfied	60.0 %
Number of VAVs Satisfied	3
Number of VAVs available for selection	5
If total % VAVs "Not Satisfied" is >= after a delay period of	50 % / 5 min
increase static pressure setpoint by	20 Pa
If total % VAVs "NotSatisfied" is <= after a delay period of	0 % / 15 min
decrease static pressure setpoint by	5 Pa
Calculated supply air static pr. setpoint	120 Pa
Supply air static pressure	0 Pa
Supply air fan VSD	100.0 %

Minimum Outside Air Control [TREND]	
% Open calc. via linear scale between min/max setpoints.	
Min. O/Air Damper:	Return Air CO2:
Min. Position 10 %	Setpoint 600 ppm
Max. Position 100 %	Setpoint + 200 ppm
Minimum outside air damper	10.0 %
Return air carbon dioxide CO2	1 ppm

Economy Cycle Enable / Inhibit [TREND]	
Allow e/cycle if outside air enthalpy < AND outside air temperature < AND outside air temperature > AND outside air enthalpy - 5 kJ/kg < return air enthalpy	45.0 kJ/kg / 23.0 °C / 6.0 °C
Return air enthalpy	20.1 kJ/kg
Current economy control status	Inhibit Economy
Economy dampers (% outside air)	0.0 %

Optimum Start is Enabled & Inactive [TREND]	
Target average floor temp at occupancy	22.5 °C
Max start time before scheduled occupancy	60 min
Occupancy time	13.98 hr
Energy "Peak" tariff schedule	Active
Optimum Start Status Today:	
Average floor temp reached at occupancy	20.0 °C
Time plant started	07:00:00

Optimum Stop is Enabled & Inactive [TREND]	
Cooling Plant Optimized Stop (SAF remains running). Stop time calculated via linear scale between hi/lo setpoints	
Outside Air Temperature:	Optimum Stop Timer:
Low Setpoint <= 35.0 °C	Max Time 25 min
High Setpoint >= 20.0 °C	Min Time 15 min
Heating Plant Optimized Stop (SAF remains running). Stop time calculated via linear scale between hi/lo setpoints	
Outside Air Temperature:	Optimum Stop Timer:
High Setpoint >= 22.0 °C	Max Time 60 min
Low Setpoint <= 14.0 °C	Min Time 15 min

Chilled Water Valve Outside Air Temp Override	
Valve overridden closed if o/air temp > AND Return air temperature <	15.0 °C / 24.0 °C
CHW valve override status	Allow CHW
Chilled water valve	0.0 %

Perimeter VAV EDH Outside Air Temp Override	
Perimeter duct heaters disabled if:	
Outside air temperature >	15.0 °C
OR floor override is in effect	No Action
Perimeter EDH override status	Override Active

Warm Up Mode is Enabled & Inactive [TREND]	
Warm-up time schedule	Inactive
Enable if W/up sched active & o/air temp < AND average floor temperature <	12.0 °C / 19.0 °C
Disable if Occ sched active or o/air temp > OR average floor temperature >	18.0 °C / 22.0 °C
Post warm-up cooling delay	30 min
Average floor temperature	20.4 °C

Night Purge Mode is Enabled & Inactive [TREND]	
Night purge time schedule	Inactive
Enable if N/P sched active & o/air temp < AND outside air enthalpy < AND average floor temperature >	20.0 °C / 52.0 kJ/kg / 25.0 °C
Disable if N/P sched inactive or o/air temp > OR outside air enthalpy > OR average floor temperature < OR night purge maximum run time expired	22.0 °C / 55.0 kJ/kg / 22.0 °C / 120 min
Average floor temperature	20.4 °C

Perimeter VAV Airflow Vmin Setpoints	
If return air carbon dioxide CO2 <	600 ppm
Perimeter VAV Vmin overridden to ELSE Perimeter VAV Vmin is set to	0 % / 30 %
Return air carbon dioxide CO2	1 ppm
Vmin % of Vmax	

VAV Setpoint Solar Reset Enabled [TREND]	
If solar gain temperature sensor >= perim zone temp setpoints lowered by	35.0 °C / 1.0 °C
East perimeter solar temperature	20.0 °C
North perimeter solar temperature	20.0 °C
West perimeter solar temperature	20.0 °C

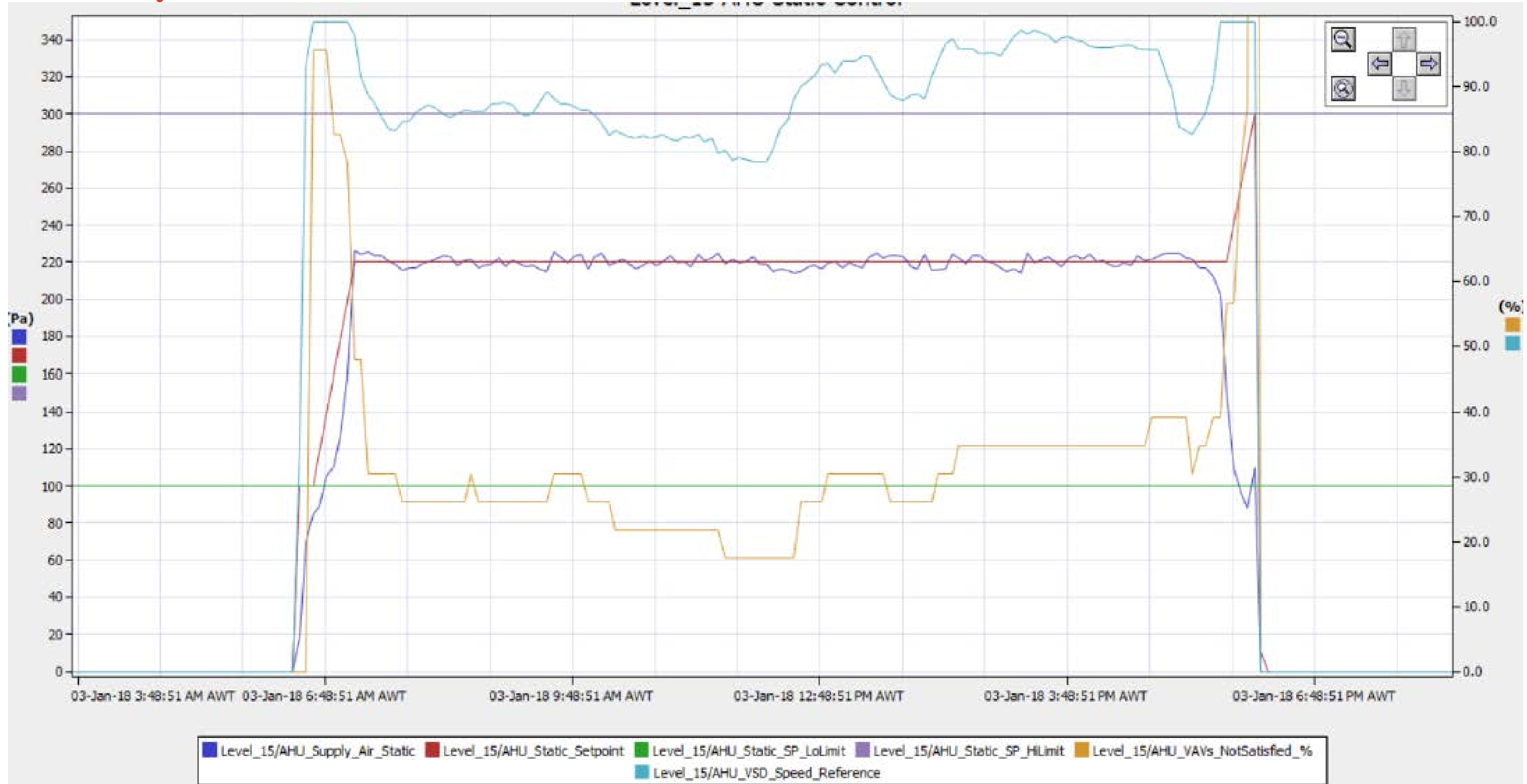
Current Operating Mode
Unoccupied

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Successful Tuning & Optimisation Program

- Visibility
- Trending / Multi-Point Trending





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- Trending / Multi-Point Trending
- Clear Process





Task	Summer			Autumn			Winter			Spring		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
AHU VAV Static pressure performance					X						X	
AHU VAV supply air temperature performance				X				X				
AHU VAV economy cycle performance	X					X						
AHU VAVRAF pressure control	X					X						
AHU VAVOA Flow control	X					X						
AHU VAV CO2 monitoring				X						4		
AHU/FCU temperature control				X						4		
Chiller performance (Temperature/Pressure)			X							4		
Chiller CCW and Cooling Tower performance			X							4		
Carpark loop control performance		X							2			
Heating Water control performance		X							2			
Tenant CCW control performance		X							4			
Tenant clean/dirty, supply/exhaust systems performance		X							4			
tower Run Hours Report	X	X	X	X	X	X	X	X	X	X	X	X
Tower After Hours Report	X	X	X	X	X	X	X	X	X	X	X	X
Operator Override Summary	X	X	X	X	X	X	X	X	X	X	X	X
Building Alarm Summary	X	X	X	X	X	X	X	X	X	X	X	X
Report preparation	X	X	X	X	X	X	X	X	X	X	X	X
Monthly review meetings with Facility Manager, Controls Contractor & Mechanical Contractor	X	X	X	X	X	X	X	X	X	X	X	X
Unallocated Hours to be directed to loops and general investigations	X	X	X	X	X	X	X	X	X	X	X	X



Successful Tuning & Optimisation Program

- Visibility
- Trending / Multi-Point Trending
- Clear Process
- Committed Team





Thank You!