

Technologies of the Future

Powered by Data, Driven by Technology, & Sustained by Profits

ABOUT US

As a young start-up, **99 Watts Energy Solutions Pvt. Ltd** is the brainchild of a creative team to promote a paradigm shift in green building and an energy efficient existence.



ROHAN PARIKH
Founder



PETER RUMSEY
Co-Founder



LEE ENG LOCK
Chief Mentor



AMIT DHAIRYAWAN
Co-Founder

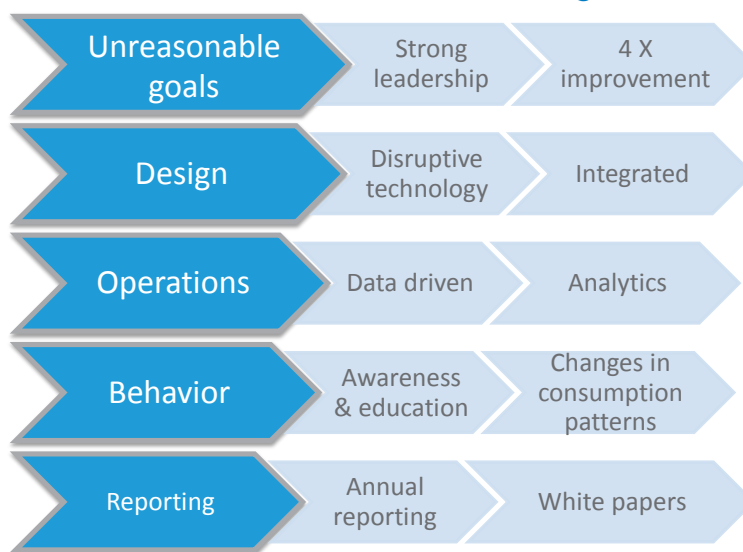


Ramchandran
Co-founder

Future Trends

- Net Zero and ultra low energy buildings with EPI < 70 will become the norm
- IOT, Cloud computing, Big data analytics and Diagnostic software will help in improving the performance of buildings by 15%
- All AMCs will move to Performance contracting
- Solar will be integrated as part of building design
- The design focus will move to increasing employee comfort and productivity
- Future designs will draw inspiration from Nature

Key attributes for innovations and new technologies to succeed

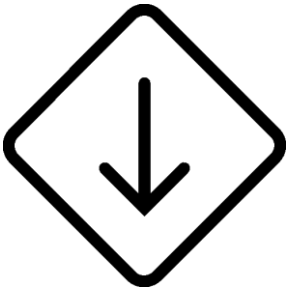


Goals to Leapfrog India to the best in class

Design target	Units	Good	Best	High Performance
Delivered energy performance index (EPI)	kWh/m2/y	125-190	<95	<75
Lighting power density: Design	W/sf	0.8	0.4-0.6	0.4-0.5
Lighting power density: Operational	W/sf	0.6	0.1-0.3	<0.15
Installed computers/appliances	W/sf	1-2	<0.5	<0.7
Glazing R-value (center of glass)	sf-°F-h/Btu	6-10	≥20	>5
Roof solar absorptance and emittance	α, ε	0.4, 0.4	0.08, 0.97	0.1, 0.90
Installed mechanical cooling	Sqft/ton	500-600	1200-1400+	750 – 1000
Chiller plant ikW/TR efficiency	kW/ton	<1.0	<0.7	<0.55

Technology direction to achieve 0.55 ikW/TR

- Fundamentals of low energy cooling
- Low load
- Low friction
- Low lift
- Leverage Tech



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Low Load: High performance envelope to improve comfort

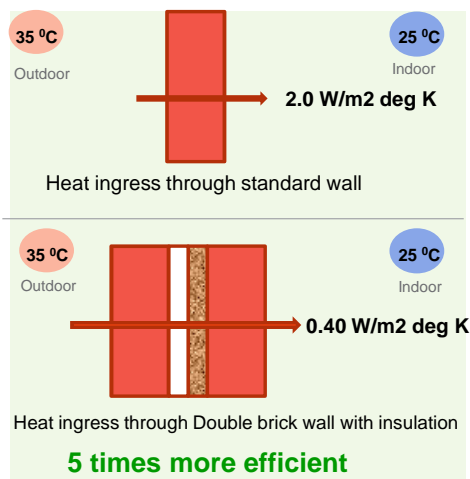
- External heat gain in building to less than 30 W/m²
 - Wall insulation with R value of 15
 - Roof insulation with R value of 16
- Window-wall ratio < 30%
 - Low SHGC of 0.2 with low e glass. Double glazed unit with argon gas to achieve R value of 5.5
 - Glazing completely shaded



High tech



High performance

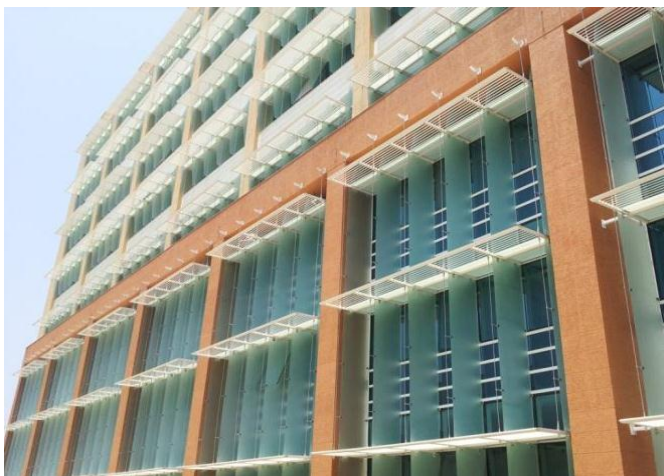


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Improving visual comfort: Glare free day lighting



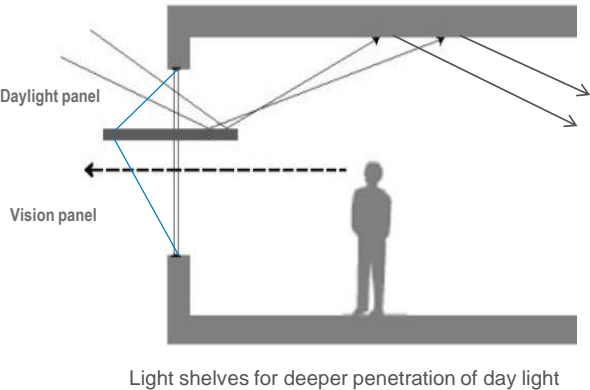
Infosys Hyderabad campus

- Horizontal louvers
- Vertical fins
- Glare free space**
- No window blinds**

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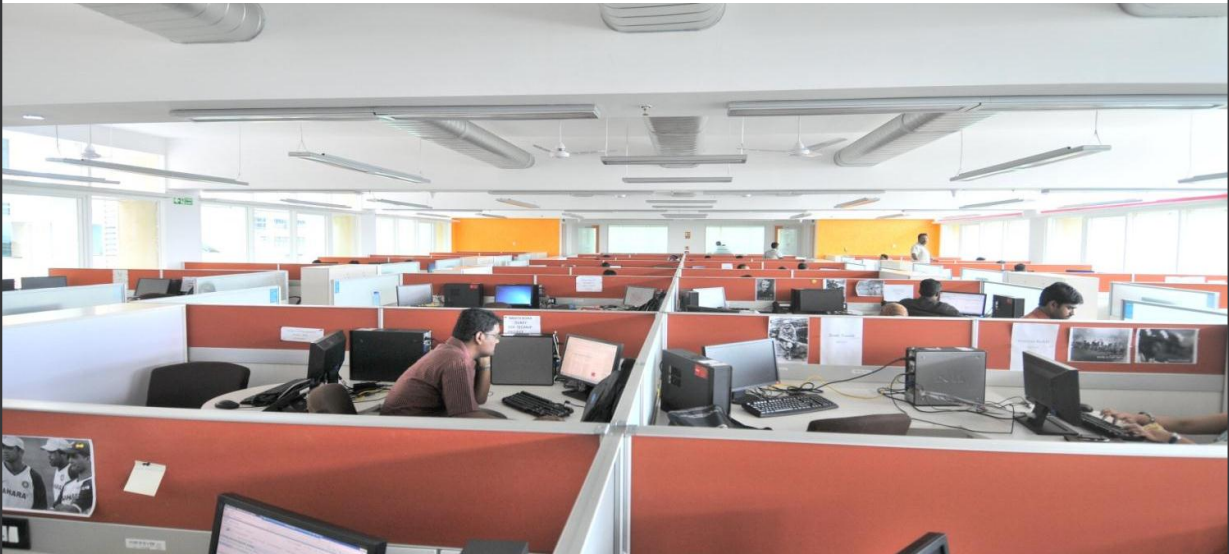
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Improving Visual comfort: Glare free spaces



Glare free design without blinds

Improving Employee Health and Productivity



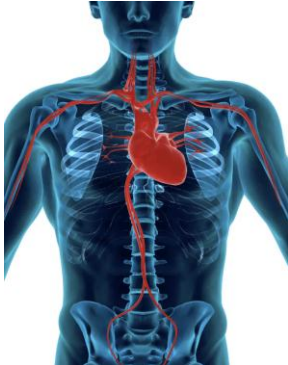
Low Friction Design



15 W/GPM



7.5 W/GPM

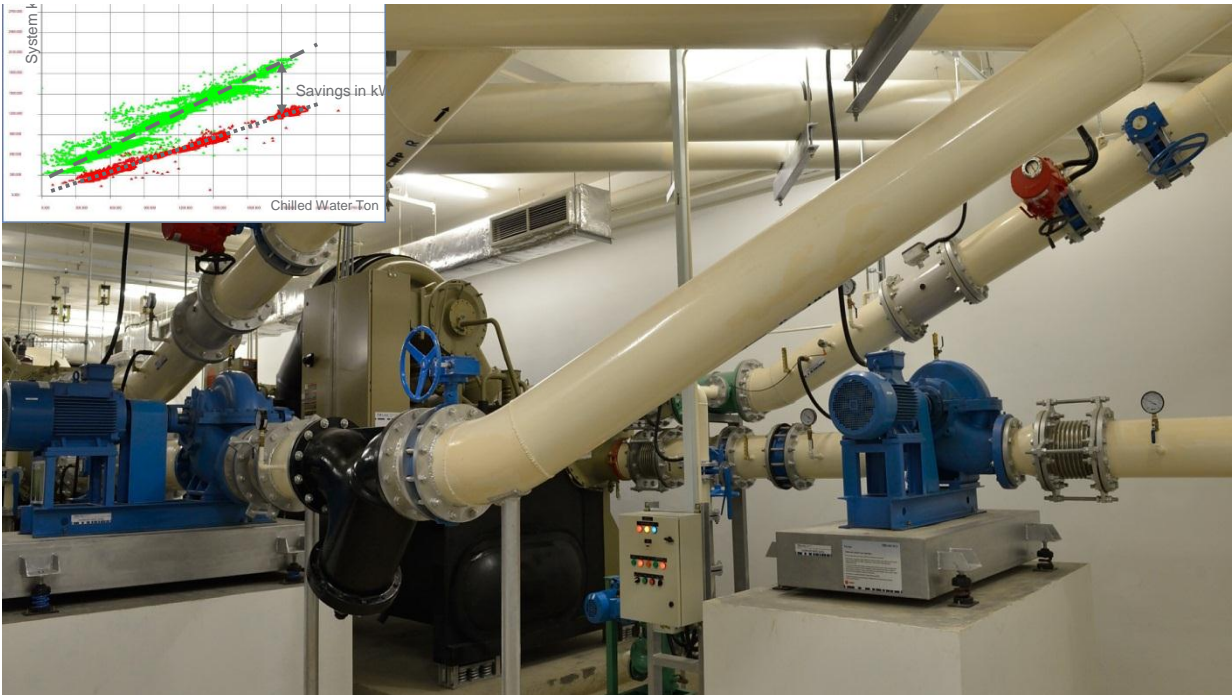
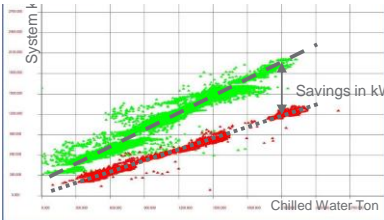


1.5 W/GPM

60,000 miles of
blood vessels

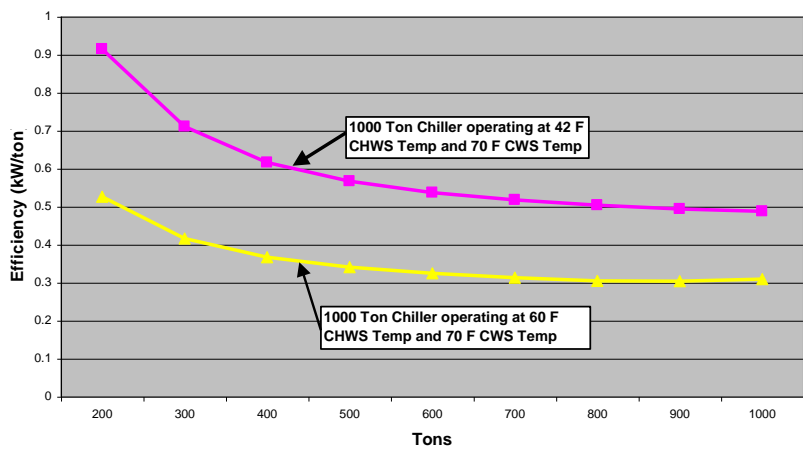
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Low Lift Cooling

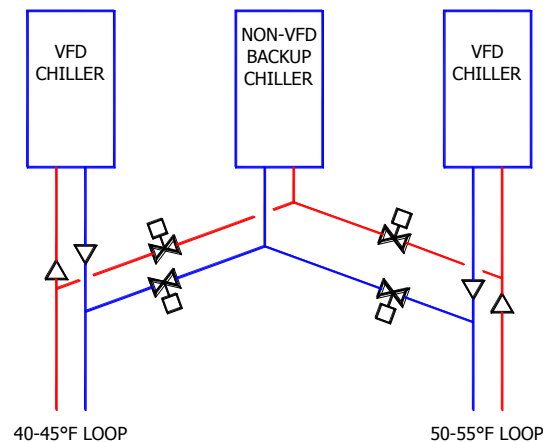
Comparison of Low Temperature and Medium Temperature Chillers



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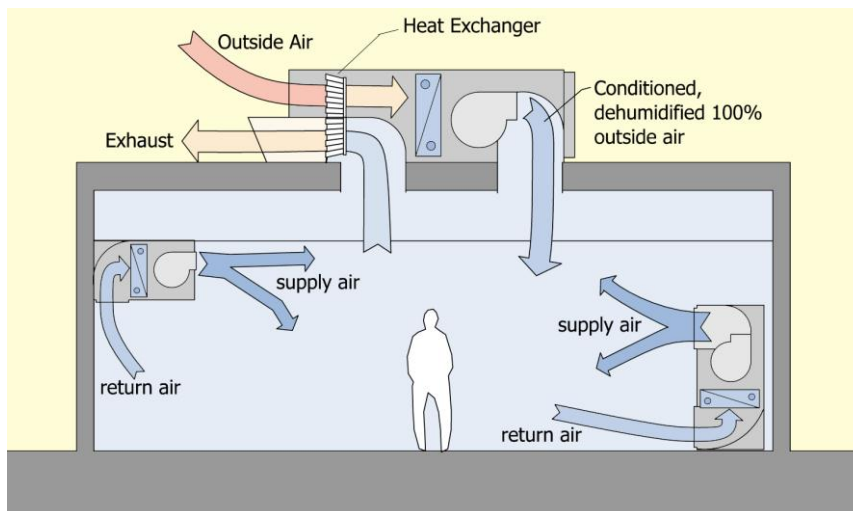
Rumsey Dual Temperature Loop Concept



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Decouple Ventilation from Temperature Control



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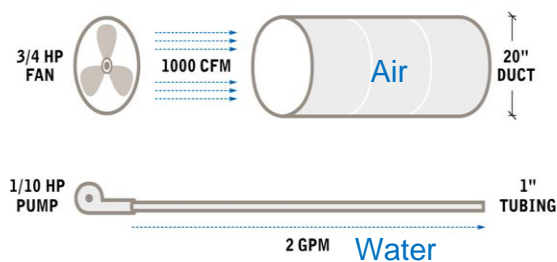
Low energy heat transportation while saving plenum space

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Water has **3400 times** higher heat carrying capacity than air for the same volume

Pumping Air Vs. Water for same cooling capacity

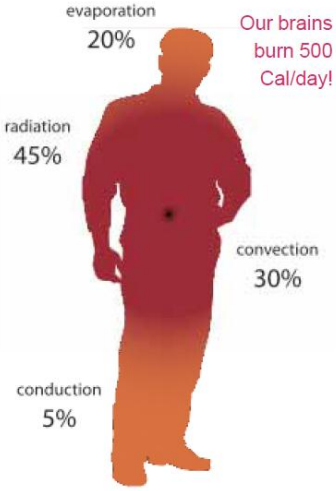
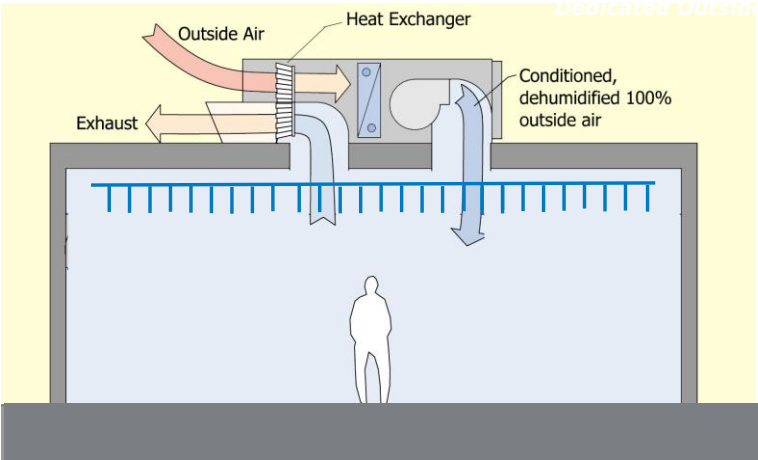


Pumping cost is **7.5 times** lower with water as a medium of heat transfer

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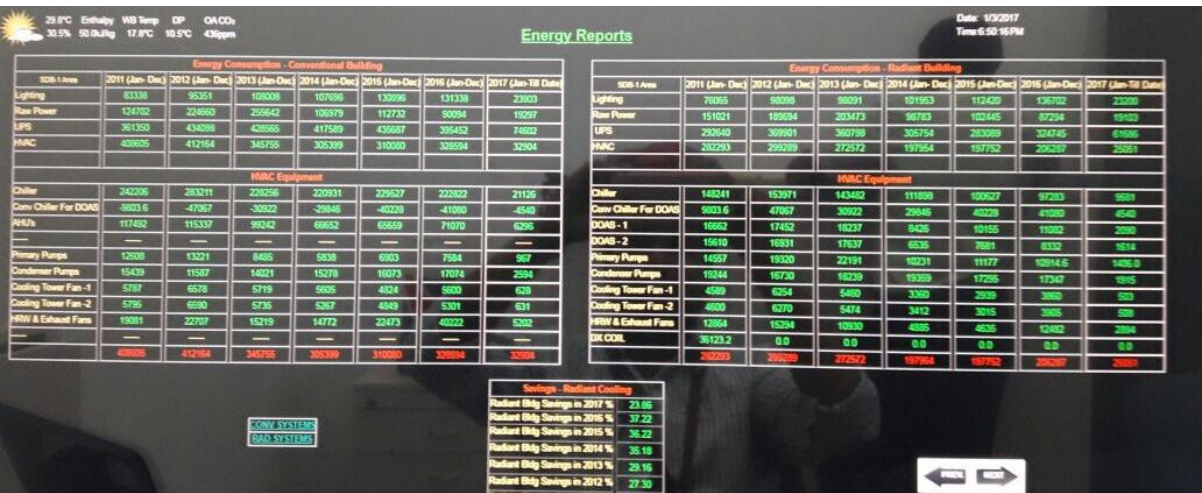
Radiant Baffle System: Plant ikW/TR = 0.5



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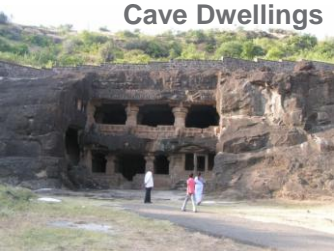
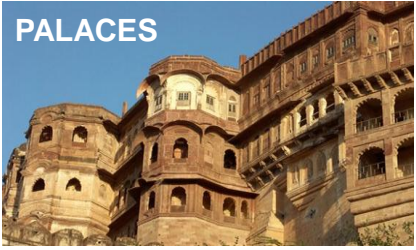
Proven 37% improvement over air conditioning



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We have all experienced Radiant cooling



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Images of 99 watts baffle ceilings



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Radiant baffles



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Radiant Panels and Sails



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Leveraging Technology: Human Sensors



BUILDING  ROBOTICS
INTRODUCING


beautifuldecoratingideas.com

Better Human Comfort by Radiant cooling

- Comfort studies done by **University of California at Berkeley's** centre for built environment and by **Technical University of Braunschweig, Germany** prove that Radiant cooled buildings are more comfortable than the air conditioned buildings.
 - The main reason for better comfort is that the mean radiant temperatures of all surfaces in the radiant buildings are lower than in air conditioned buildings.
 - One can feel the same comfort in a radiant building with air temperature of 26 degrees as a air conditioned building with air temperature of 24 degrees
 - Better control on ventilation due to decoupling of cooling and ventilation

