

Cooling the industrial workplace efficiently

WHITE PAPER

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Air cooling offers energy-efficient cooling

j i q d kbpda s km (kkhġ c e o e je jp d haj ca = o ran ca chk h temperatures rise, a bigger proportion of the world's resources will go towards cooling habitats. On account of sheer scale, the cooling demand for commercial & industrial premises far outweighs the demand from residential properties.

Pn et j hi apdk okb kkhejc na skabqhu eja ejp?kkhejc pa djenqao are either too expensive to operate or compromise on ventilation. Wellventilated cooling solutions are unable to reduce indoor temperatures to a convenient degree.

Bknpkk hkjc(ej kkn kkhejc doeilhea ailhkuaa da hpd(j je hkn environmental compromises. However, 'air cooling' involves none of these kilnki eoao pk ano cnaajan jikna kn has ukb kkhejc



As economies grow and the world gets more urbanized, the power consumed to cool homes and offices is expected to surge 33-fold by 2100.

Global temperatures have been rising steadily. According to NASA, the average global temperature has risen 0.15-0.20°C per decade since the 1980s¹.

?he pa djca j i ejknej na oao ej ran cachk hpailan poprao koph i ga anpejl npokbpdaskm praiaj kojohu dkp = o i e∋jppailan poprao neoa(pola ai j bkn kkhejc eo atla pa pk crks = o a kjki eao crks j polaskmh capo i kna on jeva (polalksan kjoqia pk kkholki ao j k ao eo atla pa pk ooprca 33-fold by 2100²?ki i an e hlrklanpeao ej Oejc lkna(bkn at i lba(bra u olaj 0, kbpdaenajancu op cap on cooling³.

India could perhaps bear much of the brunt of this global phenomenon. The country is already located in one of the hottest regions in the world.



en kj epekjejc d o aajpdai kop i klop klop npa djk Nkcubkn a hejc sept dec dpai lan popao opp(pdana nak rekope or jp cao pk poleo bkni kb kkhejc = en kj epekjejc eo at lajoe a j k ano heppharajpeh pekj u Nks anejc pai lan popnao j na qejc dqi e epu(en conditioners tend to have an adverse impact on the human body. Constant exposure can qoa nu ogej (b pec qa(drkje ebbjacoao(j na polejc lrk hai o⁴.

For better ventilation, commercial property owners have other options. Circulating fans, rkkbatpn pkro(j at d qopb jo khoks anpai l an pqnao j k an cna prajpen pekj Pdaoa ouqpai o nab ni kna a k)bmeaj ku j namqema b n haoo ajancu(s de d i a jokks an ajancu kopo j oi khon kj bkkpl nejp ks ar an (pdau na qj ka pk l rkre a pda namqema har ah of cooling.



? en qh pejc b jo j na q a dqi j ogej l an al pe ha pai l an pqnao qppda e anaj a eo jacheze ha j k jhu l kooe ha eo en ol aa o na dec dan pd j 20 getki apano j dk qn At d qop fans and roof extractors can only extract dust and pollutants from indoors and have no a a pk j i eajppai l an pqnao

These are some of the compromises of traditional cooling technologies. But there is a better solution.

- 1. http://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php
- 2. https://www.theguardian.com/environment/2015/oct/26/cold-economy-cop21-global-warming-carbon-emissions
- / dpplo6+ssspdacqnejki+oqopejka) qoejaoo+.,-0+kp+,-+ajancu)a eajp)ee)kjepekjejc) na godnkqcd
- 4. http://globalnews.ca/news/258330/top-5-health-problems-associated-with-air-conditioning/



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mp.php ny-cop21-global-warming-carbon-emissions cu)a eajp) en)kj pekjejc) na godrkqcd -with-air-conditioning/





Evaporative air cooling is a solution that maximizes cooling while minimizing costs and carbon emissions. It is a well-balanced cooling technique that is

Ar Ikn pera kkhej ceo pola i kop natural way to cool structures. It skngo uar Ikn pejc kkhs pan to cool air around it. The water rlkneo hapkoecje jphuna qa surrounding air temperature. = qoqukjqpa ejPdehj kjhqapdpka)ckanoj bpknusknganosana hapk lp to this natural, non-refrigerated cooling much better if their bodies were not already accustomed pk npe eh kkhejcbrki en) conditioners⁵. In other words, the body is more comfortable when the surroundings are cooled naturally.

There are a number of other advantages of air cooling:

Ar Ikn pera en kkhano maikna kop)a a pera oej a pola Inkaoo consumes 80% less energy. = en kkhejc ar e ao mas a polan naoeep jp j namqena haoo maintenance. A eajp en kkhano j

reduce dry air temperatures to nearly 95% of the wet-bulb temperature⁶.



ana o dks pda pa djemqa op go ql c ej op pda i kop lkl qh n kkhejc pa djkhkcu) en kj epekjano = o pda cqna kra ajkpao (en kj epekjano k an kjoe an ha kkhejca eaju j jhks an pda pailan pqna pk oap acmaa ks ar an (pdeo cuopai eo hok nai ng huajancu) dqjcnu (s de dha o pk dec dan klan pejc kopo = opq u bkqj pd ppdal n o epe power consumption of air conditioners was just as high as the operational kjoqil pekj (s de da a perahu kq ha pda kop kbnqjjejc j en conditioner³ =? qjepo hok oar anahu hk grajpeh pekj j en qh pekj kbbnaod en s epdej kj ja ol a

Roof extractors are cheaper alternatives, but they compromise on the kkhejca egj u

Kjhuar Ikn pera en kkhano jk ancna prajpeln pekj ja a pera kkhejc at lower operational costs.

Fresh Air Ventilation	Poor	At ahhajp\$na qao cakbej kkn ee%		
Suitable For High-Temperature Environments	No	Yes		
Suitable For Dry Climates	No	Yes		
Air Blast	Low	ecd\$=en?dethAap%		
Capital Costs	High	Low (1/8th of air conditioners) ⁸		
Power Spike	Yes (at startup)	Jk\$qapkh gkbkilnacokn%		
Carbon Footprint	High	Low		

	°C	% RH	Drop in ⁰C	Air	Cooling kW				
0.02,	44	20	- 3 -	33.9	583.1	18400	/-3	1051	
QLQ. 4	44	20	- 3 -	15.3	262.4	11040	23.8	459	
QLO-4	44	20	- 3 -	10.2	- 30 5	5520	/-3	315	
QLQ, 5	44	20	- 3 -	5.1	43 1	2208	39.6	160	
QLQ, 2	44	20	15.2	3.4	51.8	3/2	3, 0	98	
QLQ, 0	44	20	15.2	2.3	34.6	552	62.6	65	
CFD48	44	20	15.2	12.4	190.1	-03.	129.1	366	

= j llhao)pk) llhao kil neokjkb en kkhano j en kjepekjano odkso dks ej qopne h kkhano joveje jphuna q a pola n kjbkkplnejp j pola pkjjao kbj poqnho: o namoqena pk kkh kii an e hol a kran osti kjpollanek

?kjoe an j at i l ha6pda Qui l dkju QLQ2, i k ahs kqh na q apda n kj footprint by over 1051 points and save 258 tonnes of natural gas consumption over a six month period (assuming a steady level dry bulb temperature and humidity). Bigger and more powerful air coolers deliver more air (ventilation) and have a more noticeable impact on ambient temperatures. The energy o r ej coo ha hkj coe a pda oeva kbpda ki i an e h kkhej c amqe i ajp

In other words, air coo conditioner.

Pdebaa perakui a jo6 Low size transformer Low sized cable Hks oeva Iperalks an namqerai ajp Hks oeva kjprkhos ep dcan

1 dpd 6+sssoeaja ena pki+oeaja+npe ha+lee+,/3433445.5,,-2=

2 dpd od sss odn a knc+naok qn ao)) I q he pekjo+d j kkg+.,-2) odn a) d j kkg) dr)ou opai o) j)amqeli ajp

3 http://www.nrel.gov/docs/fy15osti/60801.pdf

4 Ar Ikn pera kkhan+Ar Ikn pera kkhan′S panheja kkhejc ki



In other words, air coolers consume just 1/10th the power need for an air





Governments and local authorities are under renewed pressure to limit

carbon footprint of their equipment and properties.

Pda op pa ckranji ajpkb? Heknje (bknat i l ha(k ano j ejpanaop)braa Hk j bkn commercial projects that can reduce the carbon footprint of the business. California hok k ano na pakbol pk /,, bknnal h ejc en kj epekjanos epd en kkhano Qei ehn rebates and incentives are available in other states⁹ Pda A hok d o j qi ankb na pao j ej ajperaobkni rkfa popd p j kkopajancu)a eaju ej pdeos u¹⁰.

Pdaoao dai ao janal he pa ejai ancejca kjki ezo hega je j?dej ?qnnajphu janepdan kqjpnuk ano juola e hejajpeta knna pabknajancu)a ezip kkhejcirkfa po = ptna pa(oqoeu(ptatai lpekjo(knlks)ejpanacplkt jo kqh dahl ejopepopekjo replace their air conditioners and invest in eco-friendly air coolers.

i I hai ajpġ cajarcu a ejp solutions for comfort cooling in industrial and commercial applications will have a vast and hk jc h œġ c a a pk j pda kr an hh energy scenario in the country. The Indian Bureau of Power and qra q kb Ajarcu A ej u \$ A4% can help encourag4F00.8000C-9.9000304400500480004C0051805004C005100400030048iifornia throughiforgram031 583.2111 TmD4B0004005CTmD)TjfC221300882 311Tc 001 Tw 104B0040500005C3 -3.2 Td189.0552 3048005600480030055004800450B004







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