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Comparisons Between Electric & Non-electric Air Conditioning

Non-electric air conditioning is powered by fuels & waste heats with the refrigerant of Lithium Bromide (LiBr) and water. It is internationally known as absorption chiller. In 2007, BROAD non-electric air conditioning sales amounted to 1,700MW cooling capacity, which can meet air conditioning demand of regular buildings at 28 million square meters or energy efficient buildings at 56 million square meters. BROAD non-electric was invented in 1992. Through major technological upgrading by 10 times, BROAD products have achieved very high energy efficiency.

Compared with conventional electric air conditioning, the energy efficiency of BROAD non-electric air conditioning is 2 times higher, while their CO₂ emissions are 4 times lower and investment is 1/3 less.

1. The total energy efficiency of electric chillers is about 52%, and CO₂ emissions are 0.68kg/ kWh.
 - The energy efficiency for coal-based power plants in China is about 13% (including exploitation, transportation, power generation, transmission and transformation). Before people only calculated the power generation efficiency after coals reached in power plants and ignored the huge waste in exploration and transportation, which has resulted in wrong information of high power generation efficiency)
 - Energy efficiency of electric chillers is about 400% (300% for conventional air-cooled chillers and 500% for water-cooled chillers)
 - Total efficiency is: $13\% \times 400\% = 52\%$
 - CO₂ emissions per kWh cooling capacity are about 0.68kg (power consumption 0.25kWh and coal consumption $0.235 \text{ kg} \times 2.9 \text{ kg CO}_2$).
2. Energy efficiency for gas-fired non-electric chillers is 112%, and CO₂ emissions are 0.15 kg/kWh
 - Total efficiency of gas exploitation and transportation is about 82%
 - Efficiency of non-electric chillers is 136% (BROAD)
 - Total efficiency is $82\% \times 136\% = 112\%$
 - CO₂ emissions per kWh cooling capacity are 0.15 kg (gas consumption $0.074\text{m}^3 \times 1.98 \text{ kg CO}_2$)
3. Non-electric chillers driven by waste heat (exhaust) from power generation do not consume useful energy, so their energy efficiency is infinitely high.
4. Investment on electric chillers: about Euros 165/kWh cooling capacity (calculation per 3.5MW model)
 - Electric chiller cost: Euros 65/ kWh cooling capacity
 - Boiler, boiler room and other related facilities: Euros 40/ kWh cooling capacity
 - Power distribution facilities and power supply room: Euros 60/kWh cooling capacity
5. Investment on non-electric chillers: about Euros 112/ kWh cooling capacity (calculation per 3.5MW model)
 - Three functions in one unit (cooling, heating and hot water), no need for other equipment.