

CHANGES IN THE AIR CONDITIONING MARKET BROUGHT ABOUT BY THE ENERGY CRISIS AND DECARBONIZATION

— GROWTH OPPORTUNITIES CREATED BY ADDRESSING ENVIRONMENTAL CHALLENGES —

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SUMMARY

- The energy crisis, accelerating process of decarbonization, and arrival of heat waves, as well as strong economic support and regulation by governments in response to these issues, are major environmental changes that are currently occurring in air conditioning-related areas.
- Policy support in response to such changes has led to a growing need for solutions that contribute to improving efficiency and functionality in air conditioning-related areas, such as converting from petroleum and gas to heat pumps, conserving energy, and reducing CO2 emissions.
- Players who address these new needs and environmental challenges will potentially have access to significant opportunities for growth and guide the world toward ESG promotion through DX control technologies, energy management, and other means for the retrofit market.¹

1. ENVIRONMENTAL CHANGES IN AIR CONDITIONING-RELATED AREAS

By 2050, the global demand for air conditioning will increase roughly three-fold to approximately 5.6 billion units, and the new level of demand for electricity will be equivalent to the current power generation capacities of Japan, the US, and Europe combined.² It is said that responses within the air conditioning field will determine the future of climate change. Meanwhile, environmental changes such as governments' strong economic support for the energy crisis and decarbonization are currently leading to business opportunities in air conditioning-related areas around the world.

1-1. Energy-related policies

In May 2022, the European Commission announced the REPowerEU Plan,³ a set of measures to end Europe's dependence on Russian fossil fuels by 2027 and to reduce Russian gas consumption to two-thirds by the end of 2022. The plan sets a target of installing 30 million new heat pumps in the EU by 2030 and stipulates environmental regulations that require new public buildings to achieve zero emissions by 2027.

Similarly, in March 2022, the Chinese government announced its 14th Five-Year Plan for Building Energy Conservation and Green Building Development.⁴ China will promote measures such as ensuring energy efficiency in buildings by installing optimized control systems, promoting the proliferation of heat pumps, and promoting wider usage of new power supply systems for buildings based on installing solar power generation systems and storage batteries. Due to soaring energy prices, many other countries, especially in Europe, are

¹ Retrofit: The act of updating old-style machines through refurbishing or remodeling

² International Energy Agency (IEA) report "The Future of Cooling," 2018 https://iea.blob.core.windows.net/assets/0bb45525-277f-4c9c-8d0c-9c0cb5e7d525/The_Future_of_Cooling.pdf

³ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

⁴ http://www.gov.cn/xinwen/2022-03/17/content_5679461.htm

also promoting energy conservation measures.

1-2. Decarbonization-related policies

As governments will inevitably need to work toward decarbonization over the long term, they are currently developing strategies to address climate change, even while facing an energy crisis. On August 16, 2022, the US government passed the Inflation Reduction Act, under which it plans to invest 369 billion dollars, along with tax credits and subsidies, over the course of 10 years in the area of climate change. A notable feature of the Act is its goal of reducing emissions by financially supporting the introduction of new technologies, which will create significant business opportunities in the air conditioning field. Specifically, the US government intends to provide a total of 36.5 billion dollars in tax credits to promote the installation of renewable energy and energy-saving equipment such as heat pumps in homes as well as the construction of new energy-efficient homes.⁵ In Japan, the GX (Green Transformation) Implementation Council at the Prime Minister's Office is considering a plan to invest a total of 150 trillion yen in the public and private sectors over the course of 10 years, which is expected to promote low-carbonization and decarbonization in buildings as in the US.⁶

1-3. The arrival of heat waves

The arrival of heat waves in more and more areas around the world will also have a major impact on the air conditioning field. In August 2022, Europe, China, and other regions experienced record heat waves. In France, the government called on its citizens to conserve water in response to a drought. China suffered its worst heat wave in 60 years, with several provinces frequently recording temperatures as high as 40°C. Sichuan Province, which relies on hydroelectric power generation for 80% of its electricity needs, lost half of its stored water. This, along with the increased use of air conditioning, resulted in power supply shortages. Heat waves, which have become normal in many parts of the world, increase the demand for air conditioning and power consumption.

2. THE NEED FOR NEW SOLUTIONS THAT CONTRIBUTE TO IMPROVING EFFICIENCY AND FUNCTIONALITY

The economic support and regulations mentioned earlier have led to a growing need for improvements to efficiency and functionality in air conditioning fields, such as converting from petroleum and gas to heat pumps, conserving energy, and reducing CO2 emissions.

2-1. Eurocentric expansion of the heat pump market

Heat pump technology is attracting attention in Europe. Heaters in Europe make use of boilers that burn fossil fuels to produce hot water, which is then circulated through pipes. Heat pumps, on the other hand, produce hot water by drawing in heat from the atmosphere. Since, in addition to not consuming fossil fuels, heat pumps are more efficient than boilers and other heat sources,⁷ the European Parliament has designated them as a renewable energy source, and each country is providing policy support.⁸ Japanese companies Daikin Industries and Panasonic are responding to such robust demand by investing approximately 40 billion yen⁹ and 20 billion yen,¹⁰ respectively, and increasing production at their European plants. The US-based Carrier expects heat pumps to account for half of its sales in the European market over the next five years. Exports from China

⁵ In addition to tax credits, the government will also provide a total of 8.8 billion dollars in refunds, which includes 4.3 billion dollars provided through state governments over a 10-year period to residents who improve the overall energy efficiency of their homes.

⁶ <https://www.csg.org/2022/08/16/understanding-the-inflation-reduction-act/>
<https://criepi.denken.or.jp/jp/serc/discussion/download/22007dp.pdf>

⁷ According to the IEA (Net Zero by 2050: A Roadmap for the Global Energy Sector), the amount of heat pump-generated energy (primary energy) consumed is only 55% of that of gas boilers. <https://www.iea.org/reports/net-zero-by-2050>

⁸ The UK government has set the goal of creating a market of over 600,000 units annually by 2028. The government will provide subsidies of up to 6,000 pounds (approximately 995,000 yen), lower initial costs by 25% to 50% by 2025, and make the ownership and operating costs of heat pumps comparable to those of boilers by 2030.

⁹ <https://www.daikin.co.jp/press/2022/20220708>

¹⁰ <https://news.panasonic.com/jp/press/jn220902-1>

to Europe are also showing rapid expansion, with exports to Italy, Poland, and Spain growing by more than 50% in the first half of 2022 compared with the same period in the previous year and overall export sales expanding by 68.2% during the same period to 3.45 billion yuan (approximately 70.2 billion yen).¹¹ The European heat pump market is expected to achieve an average annual growth rate of 30% through to FY2025, followed by an average annual growth rate of 10% all the way to FY2030.¹²

2-2. The need for energy conservation and the retrofit market

Currently, there are approximately 3 billion air conditioners, refrigeration equipment, and heat pumps in operation worldwide. The global growth rate of demand for electric power between 2018 and 2050¹³ is estimated to be 37% for cooling, 25.5% for home electric appliances, 12.4% for heating, 7.8% for lighting, and 17.4% for other services. Considering this demand growth, power conservation is an urgent issue. The IEA points out that by promoting highly energy-efficient cooling measures, the demand for electricity consumption could be reduced by 45%. Of particular note, North America and other regions are introducing inverter-equipped air conditioners and implementing measures to reduce the power consumption of existing air conditioners at an accelerating pace. In the global air conditioning field, the retrofit market is expected to grow at an average annual rate of more than 7% between 2020 and 2025, creating 2.7 trillion yen worth of new demand.¹⁴ Power conservation in the air conditioning field, which accounts for 10% of the world's power consumption, will have a significant impact.

2-3. Growing demand in Asia

The IEA predicts that India will become the world's largest air conditioning market by 2050 and that roughly half of the increase in air conditioning capacity in 2050 will come from India and China. Demand for air conditioning equipment is also predicted to continue to grow in emerging countries such as Indonesia, which is located in a region of tropical and subtropical climates and where income levels are expected to rise. The retrofit market will also grow, primarily in China and Japan, with Asia accounting for 43% of worldwide growth between 2020 and 2025. This rate of growth is faster than in other regions due to increased investment in real estate.

3. ISSUES AND PLAYER TRENDS DRAWING ATTENTION IN THE AIR CONDITIONING FIELD

Players who address the aforementioned new needs and environmental challenges will potentially have access to significant opportunities for growth through the development of next-generation technologies and the utilization of DX in control technologies and energy management.

3-1. The proliferation of heat pumps and development of next-generation refrigerants

One issue related to heat pumps, which are showing signs of expansion, is the development of next-generation

¹¹ China exported roughly 2 million units to Europe in 2021, and this number is expected to grow to approximately 10 million units per year over the next few years.

<https://wallstreetcn.com/articles/3671085>

¹² Daikin Industries Q1 Financial Results Briefing for the Fiscal Year Ending March 2023 held on August 2, 2022

https://www.daikin.co.jp/-/media/Project/Daikin/daikin_co_jp/investor/data/kessan/20220802/script-pdf.pdf?rev=71d50310b452422f8f2f26f4b71a41a9

¹³ Growth rates of demand for electric power by usage category

¹⁴ <https://www.marketsandmarkets.com/Market-Reports/industrial-refrigeration-system-market-245749288.html>

https://sainttrofee.nl/wp-content/uploads/2019/01/NoteTech_29-World-Statistics.pdf

refrigerants.¹⁵ The shift to new refrigerants that have a low global warming potential¹⁶ (GWP) and do not damage the ozone layer is now seen as irreversible, in part due to the tightening of global warming-related regulations. In Europe, although global warming-related regulations are encouraging the pursuit of natural refrigerants,¹⁷ a trade-off must be made between the performance and the safety and environmental friendliness of refrigerants, and at present, there exists no chemical substance that is perfect in all respects. Currently, refrigerants with GWPs of over 1,000 are used in large refrigeration equipment. In the future, regardless of intended use, it will presumably be necessary to use refrigerants with GWPs of 150 or lower, or even 10 or lower, which is the equivalent of natural refrigerants. However, leading up to that point, refrigerant manufacturers¹⁸ will need to come up with new innovations in terms of the trade-offs between performance and environmental friendliness.¹⁹

3-2. Noteworthy reductions in the power consumption of air conditioning and refrigeration equipment

Technologies that halve the power consumption of compressors in existing air conditioning and refrigeration equipment are drawing attention. For example, existing compressors maintain the temperature of the refrigerant at a constant level regardless of the external air temperature. However, if the temperature of the refrigerant changes in accordance with the capacity required based on the external air temperature, then the frequency of compressor operation and shutdown can be suppressed, which will reduce energy consumption and contribute to energy conservation. Companies such as Daikin Industries,²⁰ US-based PlasmaGuard Corporation,²¹ and Japan-based i-Grid Solutions²² provide services to reduce the power consumption of air conditioning and refrigeration equipment through AI-based optimized control. In some cases, these services have succeeded in reducing power consumption by 20% to 50%, which incentivizes companies to make use of these services in reducing electricity costs as well as in promoting their decarbonization efforts.²³ Approximately 3 billion air conditioning, refrigeration, and heat pump units are in operation worldwide. Given this scale, an energy conservation revolution could have as much impact on the industry as the introduction of LEDs had on the lighting industry.

¹⁵ Refrigerants are chemical substances that are circulated inside air conditioning, refrigeration, and other equipment to cool air. Some refrigerants have a GWP of over 1,000 on a scale in which carbon dioxide is set at a value of 1, and if such refrigerants leak into the atmosphere when the equipment malfunctions or is disposed of, they will have a significant impact on global warming. It is necessary to develop next-generation refrigerants that have a lower impact on global warming. Heat pumps use R32 refrigerant, an alternative to hydrofluorocarbon (HFC), and at MOP28 (the 28th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer) held in Kigali, Rwanda, in October 2016, a proposed amendment was adopted to make alternatives to HFCs new targets of the Protocol's regulations (Kigali Amendment). The amendment stipulates a reduction in alternatives to HFCs in CO2 conversions in developed countries from 2019 and in emerging countries from 2029.

https://www.meti.go.jp/shingikai/sankoshin/seizo_sangyo/kagaku_busshitsu/pdf/005_07_00.pdf

¹⁶ Global Warming Potential (GWP): The number indicates the degree that greenhouse gases are capable of causing warming, using carbon dioxide as the baseline.

<https://www.jccca.org/faq/15950>

https://www.env.go.jp/earth/report/h25-04/4_chapter4.pdf

¹⁷ Refrigerants made from environmentally friendly substances that exist in nature, such as ammonia, hydrocarbon (propane), carbon dioxide (CO₂), water, air (nitrogen), etc. Proliferation remains stagnant due to the high cost of implementation as well as various challenges posed by the substances: ammonia is toxic and odorous, hydrocarbon (propane) is flammable, and carbon dioxide is inefficient as a refrigerant.

¹⁸ Daikin Industries is developing a next-generation refrigerant that uses an olefin compound as its main ingredient and has a GWP of about 1/70th that of R32 (which has a GWP of 675), and aims to commercialize it by around 2030. The US-based Honeywell aims to develop a practical refrigerant with a GWP of less than 300 by mixing a compound with a GWP of less than 1 with other gases. AGC aims to develop a practical refrigerant with an overall GWP of 200-300 by the mid-2020s using a next-generation refrigerant with a GWP of 0.3, although the presumption is that it will be mixed with existing R32 refrigerant.

<https://www.nikkei.com/article/DGXZQOUF297Q60Z20C21A6000000/>

¹⁹ <https://www.nikkei.com/article/DGXZQOGH167JA0W2A810C2000000/>

²⁰ https://www.daikin.co.jp/csr/environment/climatechange/air_conditioner

²¹ <https://www.plasmaguardllc.com/energy-saver>

²² <https://enudge.igrid.co.jp/>

²³ In addition to the industrial sector, if services to reduce the energy consumption of household air conditioners continue to proliferate, it could have a significant impact on the household sector as well.

3-3. Increasing demand in Asian and DX-based energy management

In addition to services reducing the energy consumption of individual air conditioning and refrigeration units, services that optimize energy consumption for entire buildings and factories are also drawing attention. In the US, Carrier and Johnson Controls both expanded their digital control services for air conditioning and refrigeration equipment in the third quarter of FY2022. In China, DX companies such as Tencent²⁴ are playing a key role in optimizing energy control. Power consumption²⁵ by Chinese data centers is increasing at a rate of roughly 10% per year. Tencent's data center is working to optimize energy consumption and achieve decarbonization in line with the national strategy. For example, waste heat generated by servers is reused to heat the municipal water supply up to 55°C via heat pumps and then provide citizens with heat. At the same time, in Japan, NTT²⁶ has partnered with the French company METRON²⁷ to create databases based on digital twins²⁸ using external data points, such as temperature, humidity, and production volume, as well as the operating status of all machines in a facility. They then make use of machine learning technology to analyze operation scenarios for the entire manufacturing process, from which they make suggestions for improvement. It is expected that these examples of energy management expertise in which DX companies are now engaging will expand into emerging countries in ASEAN and other regions in the future, and competition over acquiring these markets is drawing attention.

4. FUTURE OUTLOOK

The energy crisis and the need to achieve decarbonization are prompting governments around the world to provide strong economic support, and these factors are creating significant business opportunities in the air conditioning field. Over the next 30 years, the number of air conditioning units in operation worldwide is expected to increase three-fold.²⁹ The growing demand for energy and how best to respond to climate change are long-term issues that companies in the air conditioning field will need to address. These companies face both business risks and business opportunities, and addressing these will lead to growth.

In the retrofit market for air conditioning and refrigeration equipment, AI-based technological innovations are creating services that reduce the power consumption of compressors, which could lead to trends similar to those brought about by the LED revolution. Digital control of entire buildings and factories by DX companies could expand to encompass regional energy management involving storage batteries.

The players who address these will potentially have access to significant opportunities for growth and guide the world toward the realization of a sustainable society, and the future of such players will be a major focus of attention.

²⁴ <https://www.tencent.com/zh-cn/articles/2201125.html>

²⁵ China operates roughly 74,000 data centers with over 12 million servers, which, in combination, consume an amount of energy each year equivalent to that generated by burning 18 million tons of common coal.

²⁶ <https://www.ntt-f.co.jp/news/2020/20200529.html>

²⁷ <https://www.metron.energy/ja/nttfacilities/>

²⁸ Digital twin: A form of technology that makes use of various data points collected from the real world to produce a near-perfect replica of the original circumstances within a computer.

²⁹ IEA report "The Future of Cooling"