Oaklins

# Geothermal energy: a route to net zero

**SPOT ON** | HVAC | OCTOBER 2023

"Rising energy costs, pressing climate change realities, and new regulatory standards are driving individuals, companies and governments to seek out more efficient and effective HVAC solutions. Ground source (or geothermal) heat pumps are fast emerging as a compelling alternative to traditional HVAC systems.

In this newsletter we delve into geothermal energy and its potential to provide ecologically conscious HVAC solutions and contribute to international net-zero carbon goals. Given these changing market trends, we also explore the current M&A landscape within the HVAC industry."

**PHILIP BARKER**
HVAC SPECIALIST, OAKLINS

# Market observations

## MARKET TRENDS

Efforts to improve energy efficiency and develop environmentally friendly solutions are a top priority for governments, businesses and consumers alike. Building construction and operation is responsible for 39% of energy-related global greenhouse gas (GHG) emissions, with nearly half of these due to heating, ventilation and air-conditioning (HVAC)[1]. HVAC systems in buildings still rely largely on fossil fuels, but the current global energy crisis as well as the 2050 net-zero target are a sharp reminder of the urgent need to move to more affordable, reliable and cleaner ways of heating buildings.

Geothermal heat pumps (GHPs) are increasingly being viewed as a critical technology for heat decarbonization — they have the potential to reduce global carbon dioxide emissions by at least 500 million tonnes by 2030[2]. What's more, they are quickly becoming more cost competitive, drawing interest from stakeholders across the globe and increasing policy support.

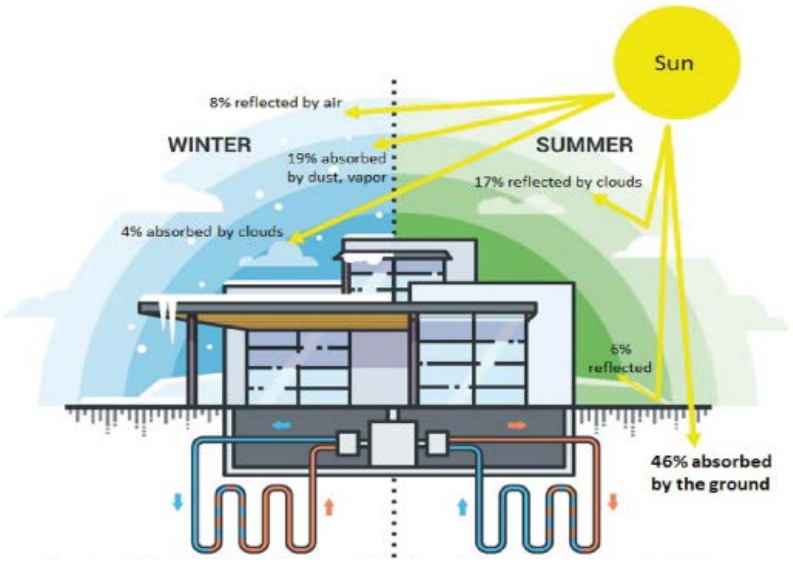
Below, we look in detail at the basic elements of geothermal energy, and discuss the benefits and challenges of .using a GHP system versus implementing a more traditional HVAC system.

### Geothermal energy

The Earth stores thermal energy absorbed from the sun underground in the form of a temperature sink, which acts as a solar battery — the figure below shows how thermal energy is absorbed and stored beneath the Earth's surface. Renewable and clean, this energy is an abundant source of heat that has several applications, including the generation of electricity, direct use, and the heating and cooling of both commercial and residential buildings. The amount of thermal energy available depends on where and how deep one bores into the ground; GHPs leverage the shallow thermal capacity of the planet to heat and cool buildings.

Ground temperatures are relatively constant below the Earth's surface, while air temperatures are usually more variable. Via a series of underground, liquid-filled pipes, GHPs utilize the lagging effect between ground temperatures and seasonal air temperatures to transfer heat from the building to the ground or vice versa.

**Geothermal energy: Earth → Solar battery**




Source: Geothermal Heat Pumps White Paper, Johnson Controls, 2021

[1] Heating and Cooling: a Route to Net Zero Emissions, Climate Homes News, January 2022

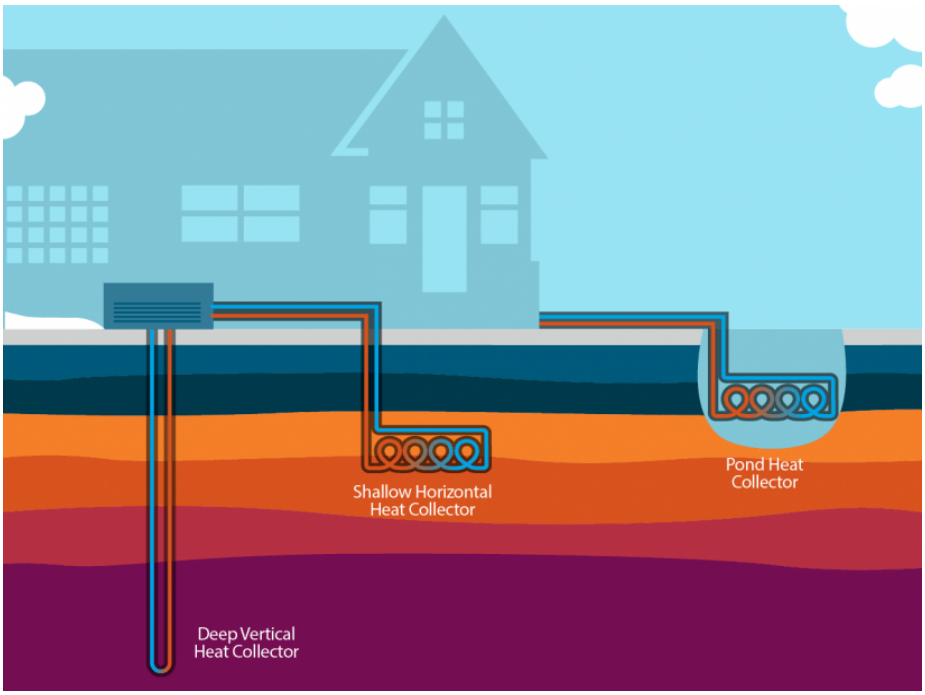
[2] The Future of Heat Pumps, World Energy Outlook Special Report, IEA, 2022

### How geothermal heat pumps work

Heat pumps move heat from one location to another using electricity. Air conditioners and refrigerators are two common examples of air source heat pumps. In principle, GHPs function like conventional heat pumps in a traditional HVAC system but with a fundamental difference — traditional air source systems collect and remove heat using the outside air while GHPs use a ground heat exchanger to transfer heat through a network of underground pipes connected to a building.

A ground heat exchanger consists of high-density polyethylene (HDPE) pipes buried below the frost line, which is the depth at which ground temperatures never drop below 0°C (32°F). This depth varies by latitude, and is deeper the closer you get to the poles. It is at between 0 and 8 feet across North America and much of Europe. Below the frost lines, the ground temperatures can provide a relatively constant water temperature for HVAC design purposes.

### Heat transfer through geothermal heat pumps




Source: Guide to Geothermal Heat Pumps, US Department of Energy

GHPs harness the constant underground temperatures of the shallow earth, which acts as a thermal storage system that enables efficient heating and cooling.

There are four main types of ground loop systems. Three are three closed-loop systems — horizontal, vertical and pond/lake — and the fourth is an open-loop option. All these approaches can be used for residential and commercial building applications. Factors like climate, soil type and land area will determine the best system for a particular building.

A GHP loop system includes:

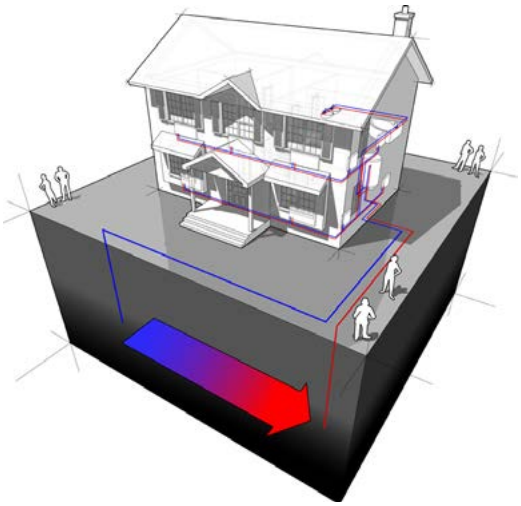
**1. An underground heat collector** — A GHP takes advantage of the Earth as a heat source and sink (thermal storage), using a series of connected pipes buried in the ground near a building. The loop can be buried either vertically or horizontally. It circulates a fluid that absorbs or deposits heat from or to the surrounding soil, depending on whether the ambient air is colder or warmer than the soil.

**2. A heat pump** — When ambient temperatures are colder than the ground, a GHP removes heat from the collector's fluids, concentrates it, and transfers it to the building. When ambient temperatures are warmer than the ground, the heat pump removes heat from the building and deposits it underground.

**3. A heat distribution subsystem** — Conventional ductwork is generally used to distribute heated or cooled air from the GHP throughout the building.

Most closed-loop GHPs circulate an antifreeze solution through a closed loop that is buried in the ground or submerged in water. A heat exchanger transfers heat between the refrigerant in the heat pump and the antifreeze solution in the closed loop[3].

**Geothermal heat pumps configurations**

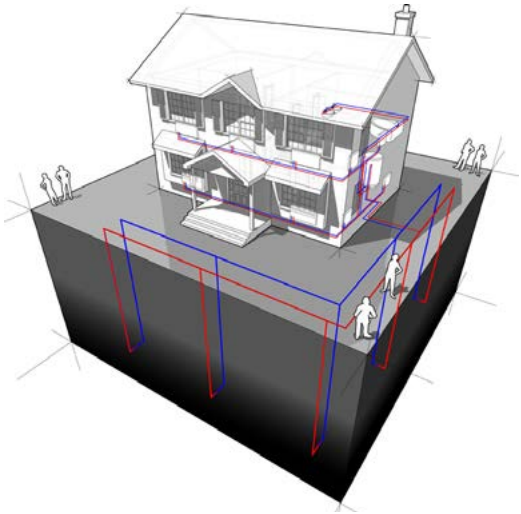


**Open loop**

**Cost**
$

**Type**
Pump & Discharge
Standing column

**Loop Temps**
41°F (5°C) to 77°F (25°C)

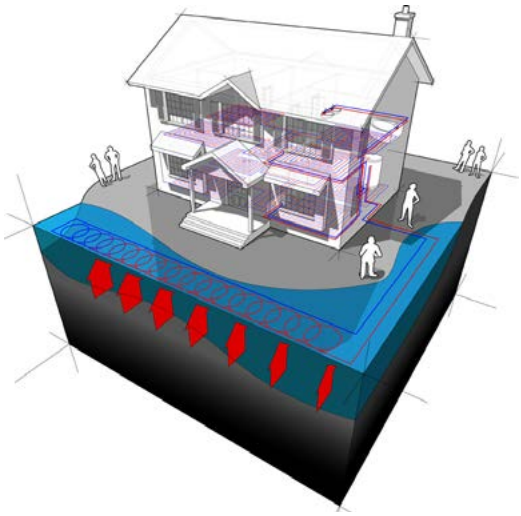


**Closed loop**

**Cost**
$$$

**Type**
Vertical
Horizontal

**Loop Temps**
30°F (-1.1°C) to 90°F (32.2°C)



**Pond/lake loop**

**Cost**
$$

**Type**
Slinky
Submersible plate

**Loop Temps**
30°F (-1.1°C) to 90°F (32.2°C)

* shown

Source: Guide to Geothermal Heat Pumps, US Department of Energy

[3] Source: Guide to Geothermal Heat Pumps, US Department of Energy

## BENEFITS AND CHALLENGES OF GHP SYSTEMS

### Reduced carbon footprint

- GHPs reduce the carbon emissions resulting from a building's energy use by up to 50%[4], and have some of the lowest emission levels of all HVAC applications.
- GHPs release virtually no emissions onsite. However, unintended leaks of fluorinated gas can decrease their positive climate impact. With today's refrigerants, heat pumps still reduce greenhouse gas emissions by at least 20% compared with a gas boiler, even when running on emissions-intensive electricity. This reduction can be as large as 80% in countries with cleaner electricity[5].

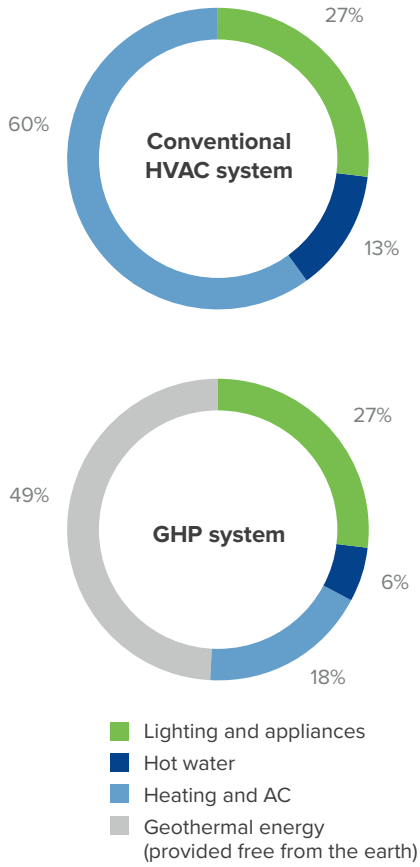
### Energy efficiency

- GHPs are advantageous compared with traditional systems because they tap natural, free underground heat. By leveraging electricity to harness ambient heat from the ground, water or air, GHPs reduce electricity use by 30 to 60% compared with alternative systems, because the electricity which powers them is used only to collect, concentrate and deliver heat, not to produce it. The US Environmental Protection Agency considers them to be one of the most efficient heating and cooling systems available[6]. In addition, in cooler conditions, ground source heat pumps are more efficient than their air source counterparts.

### Cost

- Heat pumps can be a cost-effective alternative to standard HVAC systems as, over their lifetime, they can save consumers money and provide a shield from price shocks. The lifespan of a GHP system is typically longer than a traditional air source heat pump because most of the system components are located inside the building or underground. GHP systems have an average life expectancy of 20+ years for the heat pump itself, and of 25 to 50 years for the underground infrastructure[7].
- While there is a high upfront construction cost associated with GHP infrastructure, there is generally no need to install a boiler or cooling tower, eliminating the cost of maintenance associated with that equipment. The higher initial cost of installation is typically returned in energy savings within five to 14 years[8].

**Cost comparison**




Source: Geothermal Heat Pumps White Paper, Johnson Controls, 2021

### KEY TAKEWAYS

1. HVAC systems in buildings account for a major proportion (39%) of global GHG emissions
2. GHPs can bring down global $CO_2$ emissions by 500 million tonnes by 2030 and reduce electricity use by 30–60%
3. Despite higher initial costs, GHPs offer long-term savings, with returns seen within five to 14 years

[4] Geothermal Heat Pumps White Paper, Johnson Controls, 2021
[5] The Future of Heat Pumps, World Energy Outlook Special Report, IEA, 2022
[6] Geothermal 101: Basics of Geothermal Energy Production and Use, Geothermal Energy Association, 2009
[7] Guide to Geothermal Heat Pumps, US Department of Energy
[8] GeoVision: Harnessing the Heat Beneath Our Feet, Department of Energy, 2019

**Government incentive schemes**

- Global agreements, such as the Paris Agreement, commit countries to reducing GHG emissions. As part of these commitments, governments are actively promoting sustainable heating and cooling solutions such as heat pumps.
  - **USA:** In April 2023 the Department of Energy announced a selection of projects that would receive funding to help communities design and deploy geothermal heating and cooling systems.
  - **Canada:** In November 2022 the federal government announced financial support via its Oil to Heat Pump Affordability (OHPA) rebate scheme.
  - **UK:** The government is aiming for 600,000 heat pumps to be installed in UK homes per year by 2028[9]. There are a variety of government incentives/grants to facilitate this: Heat Pump Ready Programme, Boiler Upgrade Scheme, etc.
  - **EU:** The SPIRIT project, backed by the European Union's Horizon Europe project, commenced in September 2022 and is designed to incentivize the use of industrial heat pump technologies within the food and paper industries across Norway, Belgium and the Czech Republic.

**Other considerations**

- **Contamination:** The increased water temperature from open-loop systems can increase the pH level of the water, which in turn can lead to the dissolution of minerals and cause collapse and clogging.
- **Geological concerns:** The installation of GHPs in certain areas may be impossible due to geological constraints, such as unfavorable properties in the soil or rock.
- **Potential landscape alterations:** Installing a geothermal heat pump involves installing a ground loop system, which can lead to significant above-ground alterations. The amount of space and land available is also a key consideration.
- **Load imbalance:** Based on their location and designed purpose, some buildings are heating or cooling dominant — i.e. they have a load imbalance. The long-term operation of GHPs under load imbalance conditions can lead to thermal build-up or depletion, resulting in performance degradation. This problem can be corrected with a hybrid system that supplements the heating and cooling capacity of a geothermal loop with a boiler or water tower. Hybrid systems also offer greater flexibility than standalone GHPs.

Geothermal energy dates back to 1912, when Heinrich Zoelly patented the use of the heat pump to draw heat from the ground. Despite continued research, ground source heat pumps were not fully commercialized until the 1970s and we have only begun to fully recognize the vast benefits to be gained from utilizing geothermal technology in heat pumps. It is clear there are a plethora of benefits, both environmental and cost related, to be gained from increasing the roll out of HGPs. Their uptake is currently limited, despite their considerable potential, highlighting the importance of educating the industry and facilitating a quicker roll out of the technology on both a national and an international level.

[9] Heat Pump Investment Roadmap, GOV.UK

[10] The History of Geothermal Heating, ADA Heating and Air

# Recent M&A activity

**Below we outline a selection of deals from 2023:**

## 1. OEMS

- In July, **Modine Manufacturing Co.**, a US-based manufacturer of HVAC systems for buildings, acquired **Napps Technology Corp**, a designer and provider of chillers, heat pumps and condensing units for commercial and industrial applications
- In July, **AirReps LLC** together with a subsidiary of **Daikin Comfort Technologies North America**, acquired **Integrated Systems & Controls LLC**, a US-based industrial HVAC provider. AirReps also simultaneously acquired **InControl**, a manufacturer of controls and energy management products including control monitoring and metering
- In June, **Johnson Controls International plc**, a US-based manufacturer of automotive interior products, batteries, and heating and air-conditioning systems for buildings as well as security and detection systems, acquired **M&M Refrigeration LLC**, a designer and manufacturer of industrial refrigeration systems, from **Source Capital LLC**
- In June, Swistzerland-based industrial group **Georg Fischer** acquired Finland-based company **Uponor**, a plumbing and heating systems manufacturer. The bid valued Uponor at c. US$2.3bn.
- In May, **Rheem Manufacturing Co.**, a global leader in the manufacture of high-quality, sustainable and innovative water heaters, tankless water heaters, air conditioners, furnaces, pool heaters and HVAC systems for residential and commercial applications, acquired **MHG Heiztechnik GmbH**, a Germany-based manufacturer and supplier of sophisticated space heating and domestic hot water heating systems
- In March, **HARGASSNER Holding GmbH**, an Austria-based heating equipment manufacturer, acquired a majority stake in **Heiztechnik sp**, a Poland-based manufacturer of heat pumps and boilers
- In January, **Daikin Industries Ltd.**, a Japan-based manufacturer of air-conditioning and refrigeration equipment, fluorochemicals and oil hydraulic motors, acquired **Williams Distributing Co.**, a US-based distributor of HVAC equipment and residential building products

## 2. DISTRIBUTORS

- In February, **Martin-Belaysoud S.A.**, a France-based building, heating and bathroom products distributor, acquired through its subsidiary **Tereva SAS**, 75% of **Solipac**, a distributor of solar thermal, solar photovoltaic and heat pump systems

## 3. INSTALLATION & SERVICE PROVIDERS

- In April, a consortium led by **Energy Impact Partners LLC**, a venture capital firm, invested in the c. US$16.6m series A funding round of **HeatTransformers B.V.**, providers of a digital platform intended to support the installation of hybrid heat pumps
- In January, **Francks Kylindustri AB**, a Sweden-based installer of cooling and heating equipment, acquired **Haugaland Kjoleservice AS**, a Norway-based provider of services and products for refrigerators, freezers, and heat pumps/air-conditioning for the grocery, marine and industrial sectors
- In January, a group of investors led by **Thomas von Koch** (private investor) invested in a funding round by **Qvantum Energi AB**, a Sweden-based heat pump systems and technology company. The funds raised were US$43.9m

# Case studies

### SMITHS GROUP PLC HAS ACQUIRED HEATING & COOLING PRODUCTS (HCP)

HCP is a US-based manufacturer of HVAC solutions. It manufactures and distributes high-quality sheet metal products including pipes, elbows, boots, rectangular ducts, duct fittings, wall stacks, oval and black stove pipes and fittings, spiral pipes, and spiral PVC pipes and fittings, to serve the residential and light commercial HVAC markets. Smiths Group plc has a market value of c. US$7.5bn and is a leading industrial technology company serving the medical technology, security and defense, general industrial, energy, and space and aerospace markets worldwide. Smiths acquired HCP for US$82 million.

HCP's unaudited revenue for the 12 months to 31 July 2023 was US$69 million.

HCP was purchased from a private seller in a proprietary transaction and will be integrated into Smiths' Flex-Tek division. The addition of HCP will further expand Smiths Group's presence in the North American HVAC market, enabling Smiths to serve customers with an even broader product range, including HCP's patented axial and radial seal duct technology that improves energy efficiency.

Oaklins Evelyn Partners, based in the UK, supported Mark Filippell, of Oaklins former US member firm Western Reserve and now at Citizens Capital Markets, as sell side advisor to HCP in this transaction.


Philip Barker, Oaklins' HVAC specialist and director at Oaklins Evelyn Partners, said: ***"We are delighted to have helped our former Oaklins colleague Mark Filippell in this high-profile transaction, demonstrating our considerable expertise within the HVAC sector."***

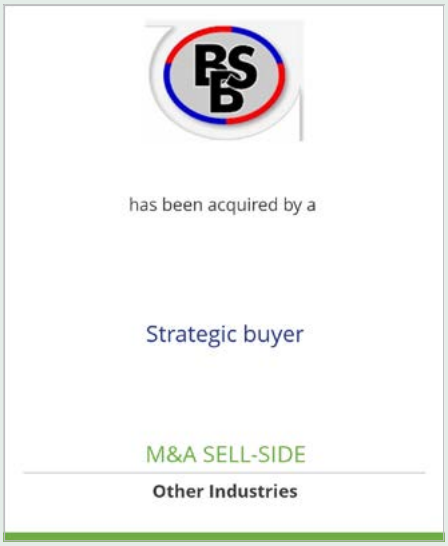
### BBS GEBÄUDETECHNIK GMBH HAS BEEN ACQUIRED

The shareholders of family-owned BBS Gebäudetechnik GmbH, based in Germany, have sold 100% of their shares in the company to a strategic buyer. The acquiror is backed by a fund that is in the process of building a group in this space.

By selling the company, the shareholders have secured the long-term future of their family business and have found a strategic partner for the further development of the company.

BBS Gebäudetechnik specializes in the installation of heating and cooling technology, ventilation and sanitary systems as well as electrical engineering. With its approximately 40 employees, the specialist company offers solutions for technical installations in large-scale projects, from planning to maintenance. Its range of services also includes electrical engineering for building automation, which is in high demand, as well as measurement and control technology for operating modern and climate-efficient buildings.

Oaklins' team in Germany acted as the exclusive advisor to the shareholders of BBS Gebäudetechnik GmbH in the sale process.



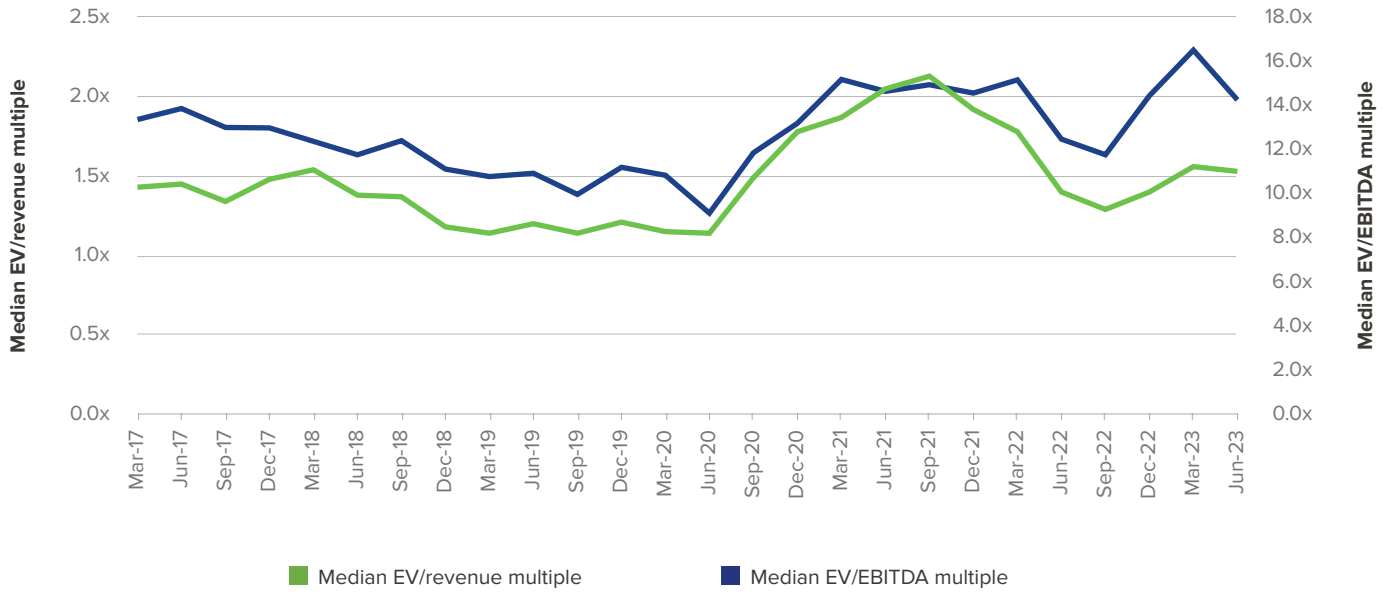
# Selected public company valuations

| Manufacturers | Head office location | Enterprise value (US$m) | Enterprise value | |
|---|---|---|---|---|
| | | | LTM sales | LTM EBITDA |
| A. O. Smith Corporation |  | 10,785 | 2.7x | 13.6x |
| AAON, Inc. |  | 5,240 | 5.5x | 29.3x |
| Daikin Industries, Ltd. |  | 53,746 | 2.0x | 14.4x |
| De'Longhi S.p.A. |  | 3,901 | 1.0x | 9.0x |
| Ferguson plc |  | 36,988 | 1.1x | 9.2x |
| Gree Electric Appliances, Inc. of Zhuhai |  | 17,619 | 0.8x | 4.6x |
| Johnson Controls International plc |  | 52,499 | 2.0x | 13.2x |
| Modine Manufacturing Company |  | 2,781 | 0.7x | 7.4x |
| NGK Insulators, Ltd. |  | 4,103 | 1.0x | 4.7x |
| NIBE Industrier AB (publ) |  | 17,540 | 5.6x | 32.0x |
| Sinko Industries Ltd. |  | 241 | 0.8x | 4.9x |
| SPX Technologies, Inc. |  | 4,222 | 2.3x | 15.3x |
| Systemair AB (publ) |  | 1,536 | 1.7x | 16.0x |
| Watts Water Technologies Inc. |  | 6,100 | 2.7x | 14.1x |
| Zehnder Group AG |  | 765 | 1.0x | 8.5x |

Source: Capital IQ

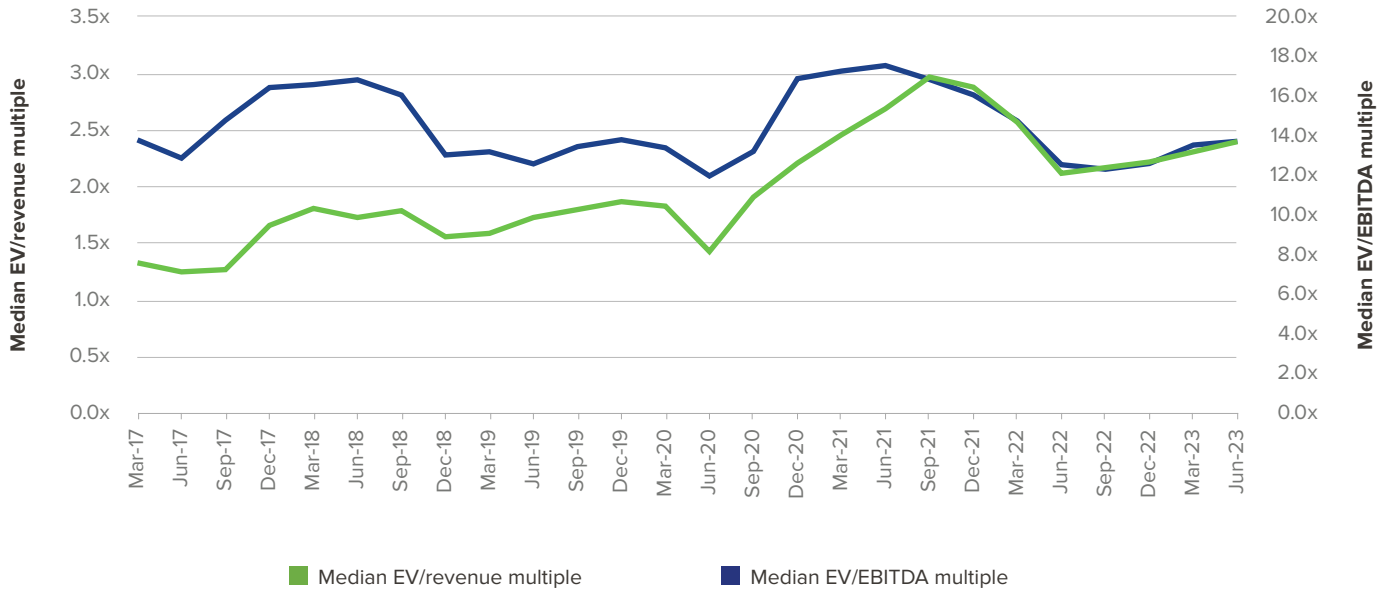
# Selected public company valuation trends

## EMEA HISTORICAL MULTIPLES



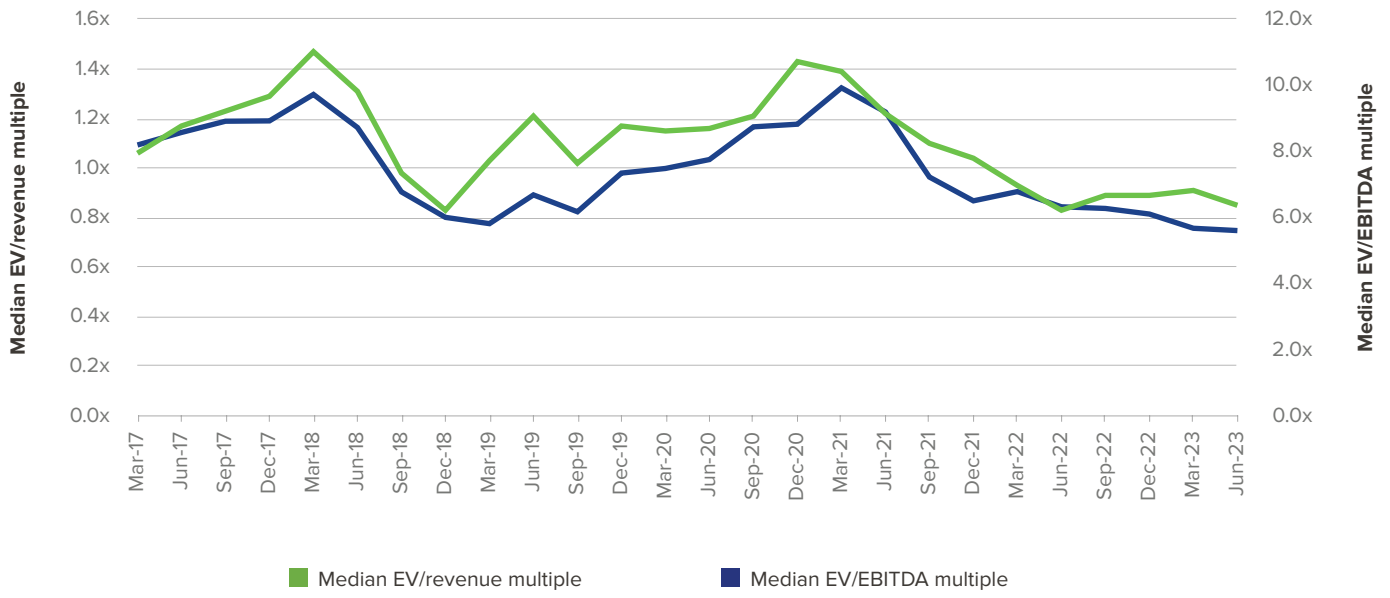

Source: Capital IQ

## AMERICAS HISTORICAL MULTIPLES



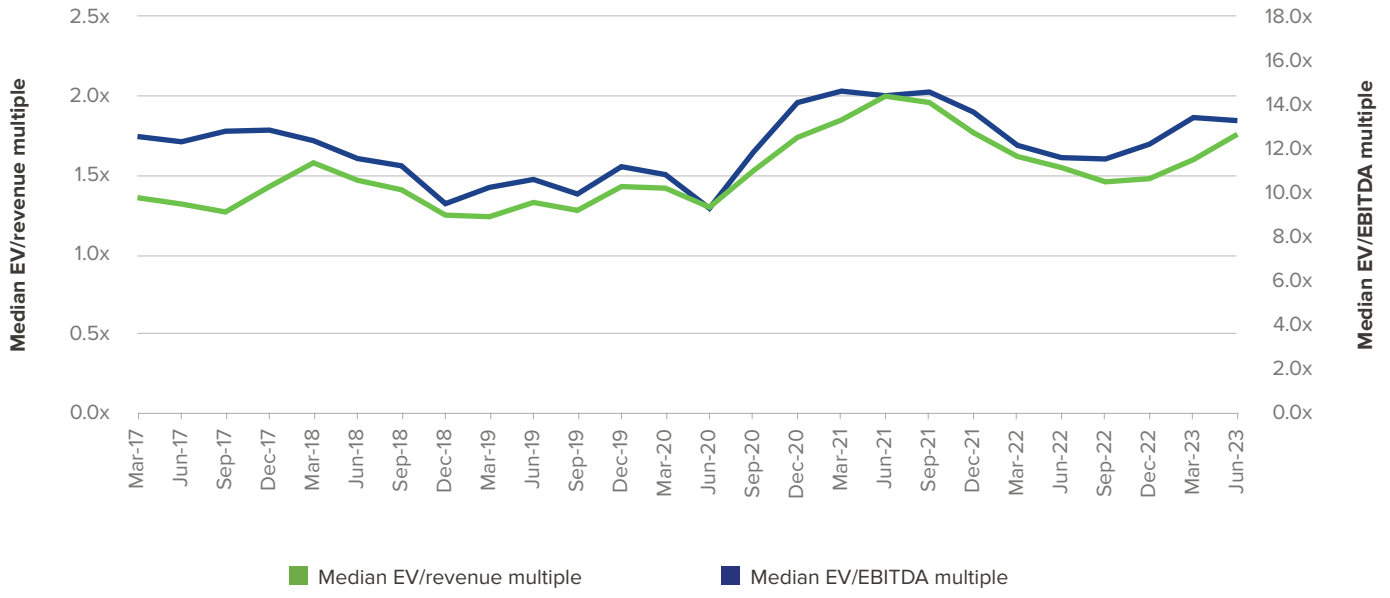

Source: Capital IQ

## ASIA-PACIFIC HISTORICAL MULTIPLES




Source: Capital IQ

## GLOBAL HISTORICAL MULTIPLES




Source: Capital IQ

# Deep local roots, global commitment

Oaklins brings you opportunities from across the world and we meet you with our expertise wherever you are

## OAKLINS OFFERS A COMPREHENSIVE RANGE OF SERVICES

- M&A advisory (buy- and sell-side)
- Growth equity and equity capital markets advisory
- Debt advisory
- Corporate finance services

HVAC is one of our focus areas. Combining comprehensive sector knowledge with global execution has led Oaklins to become one of the most experienced M&A advisors in the HVAC sector, with a large network of relevant market players worldwide. This results in the best possible merger, acquisition and divestment opportunities for HVAC companies.

If mergers, acquisitions, or divestitures of businesses or business units are part of your strategy, we would welcome the opportunity to exchange ideas with you.

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Philip leads Oaklins' HVAC team and is a director of mergers & acquisitions and head of industrials at Oaklins Evelyn Partners, one of Oaklins' member firms in the UK. Previously, he spent 20 years as head of industrials at Oaklins Cavendish. Philip has completed over 15 sales in the HVAC sector, including assisting Oaklins Sweden on the sale of VoltAir Systems, air handling units for heat recovery in buildings, to Volution; the sale of Energy Technique, fan coils and commercial heating products, to Volution; the sale of Greenwood Air Management, ventilation and extractor fans, to Zehnder; the sale of Levolux, solar shading screens, to Alumasc; working with Oaklins Denmark to sell York Novenco, HVAC+R systems for marine and offshore, to Dania Capital; and the sale of Nuaire, fans and ventilation systems, to ECI Private Equity.

**United by a strong belief that we can achieve the extraordinary.** Oaklins is a global team of 850+ financial advisory professionals in 45 countries providing M&A, growth equity, ECM, debt advisory and corporate finance services to support entrepreneurs, corporates and investors in reaching their goals.

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