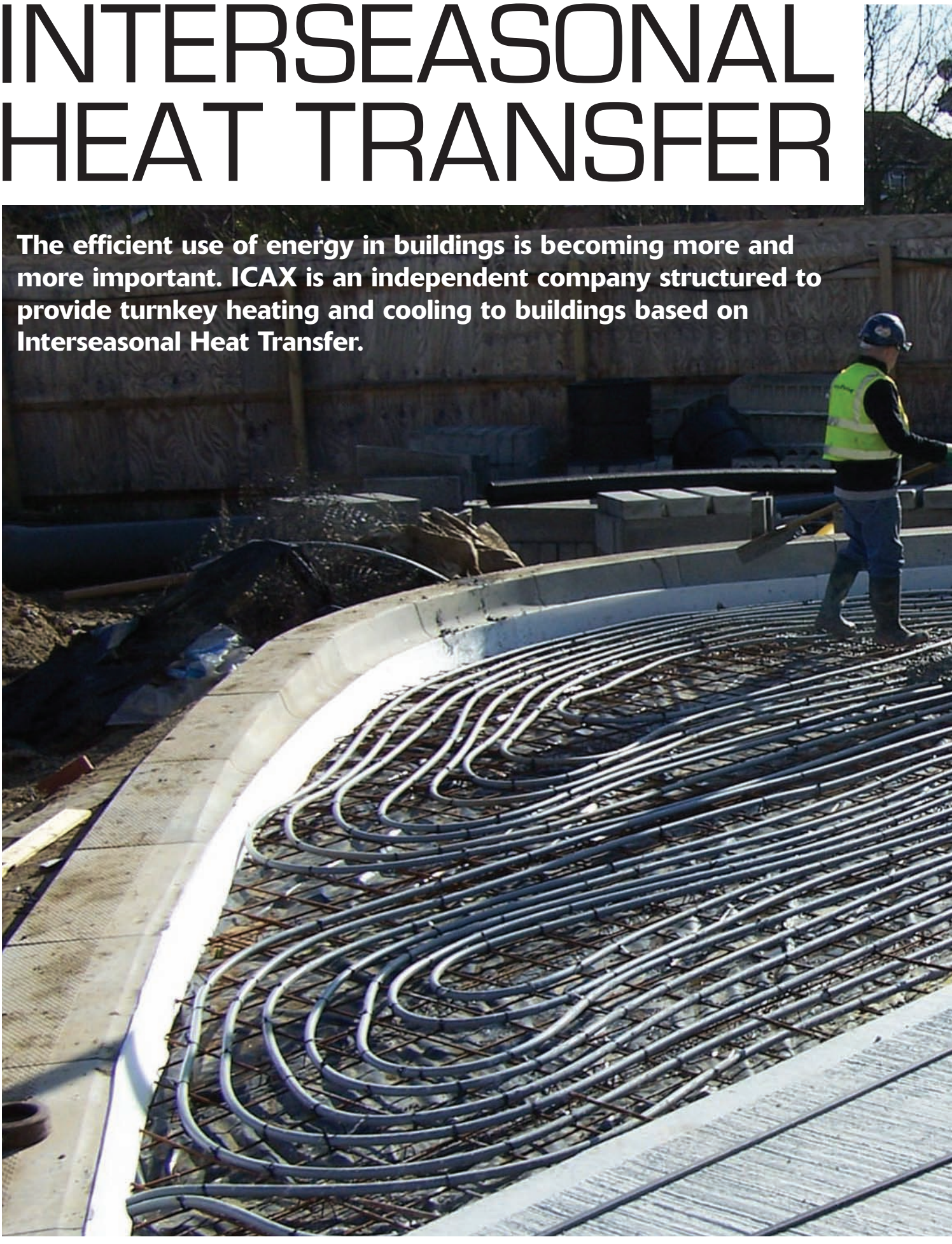
INTERSEASONAL HEAT TRANSFER

The efficient use of energy in buildings is becoming more and more important. ICAX is an independent company structured to provide turnkey heating and cooling to buildings based on Interseasonal Heat Transfer.



ICAX is an independent company structured to provide turnkey heating and cooling to buildings based on Interseasonal Heat Transfer. It came into being in 1999 following a research programme that was conducted by Mark Hewitt and Andy Ford, who were providing a course in the North London Polytechnic. The course that they were providing was on the efficient use of energy in buildings. That was the origins of the idea behind inter-seasonal heat transfer.

THE THEORY

This process works by capturing heat energy from the sun via a collection pipe network just beneath the surface of black tarmac roads (or car parks or school playgrounds). It then stores the energy in computer-controlled Thermal Banks in the ground under the foundation of buildings, and releases it to heat the buildings in winter via heat pumps linked to underfloor heating.

The temperature of the ground at a depth of seven metres in the UK will normally be very close to 10°C – the temperature will vary very little between summer and winter as heat only moves very slowly in the ground. ICAX uses this characteristic of the ground to store heat from summer to winter. Using fluid – in an array of pipes – as the transport mechanism solves the difficulty of getting the heat into the ground – and out again.

The way in which heat is absorbed and released by the ground is complex and required to be studied using complex iterative methods that have only become practical with the use of computational fluid dynamics ("CFD"). The computer models developed by ICAX have since been tested in practical installations and refined to reflect empirical results. These have been used to refine the design parameters for successful Thermal Banks.

A Thermal Bank is used to store warm temperatures over a very large volume of earth for a period of months, as distinct from a standard heat store, which can hold a high temperature for a short time in an insulated tank.

It is a characteristic of earth that heat only moves very slowly through it – as slowly as one metre a month. ICAX has discovered how to input surplus heat into the ground over the summer months and extract that heat over the winter months for use in the space heating of buildings.

COEFFICIENT OF PERFORMANCE

Most people think that if you put heat into the ground that it flows away like a river, but the interesting thing about the ground, is that heat moves through it very slowly, about a metre per monthly. The fundamental problem with ground source heat pumps is that people assume that they can take the heat out of the ground and it will magically flow back towards the pump. If you extract heat from the ground, the ground gets colder and therefore you have to pump harder in order to get heat out of the ground.

When you look at information about heat pumps on the web it will tell you that you can expect a coefficient of performance of 4 and the other thing is that you will have a constant temperature in the ground. It is worth analysing this, because the coefficient of performance of 4 means that for 1 kilowatt of electricity you get 4 kilowatts of heat. You will be most likely to get that at the beginning of the heating season in Autumn, but what is more important is the seasonal coefficient of performance, the number over the heating season. That is usually down at about 2.5 or 2.6 this is a more relevant number as it applies to the season as a whole and very much less than the 4 that is usually quoted.

The other factor that is frequently quoted is the constant temperature of the ground. This is simply not true if you take temperature out of the ground. If you extract heat from the ground the temperature of the ground goes down.

Edward Thompson of ICAX makes an important observation about ground temperature: "If you go out on a Midsummer's day in, lets say, Hyde Park, and go down 6 metres and take the temperature you will find that it's very close to 10°C. If you come back at midnight on Christmas Eve to the same place you will find that the temperature is still 10°C at 6 metres. The reason for this is that

TERRA FIRMA GROUND INVESTIGATION

TFGI is an innovative, practical and solution driven ground engineering company and a proud partner to ICAX Limited, delivering on-site renewable energy and sustainable development targets to construction projects throughout the UK.

TFGI undertake ground investigations, specialist drilling, providing reports, advice and expert opinion on your projects and the ground that lies underneath them. They will help you understand the ground, develop workable solutions and deliver the answers you need to meet your design requirements.

Industry leading in the field TFGI have unrivalled experience in geotechnical and geo-environmental services, from preliminary advice through to final delivery of cost effective solutions that save both time and money.

TFGI operate across the industry at all levels from single residential developments through to major residential, commercial, retail and public infrastructure projects. They have experience of challenging sites, contaminated land, restricted access, live rail, highway and airport environments – and the satisfied clients to support this.

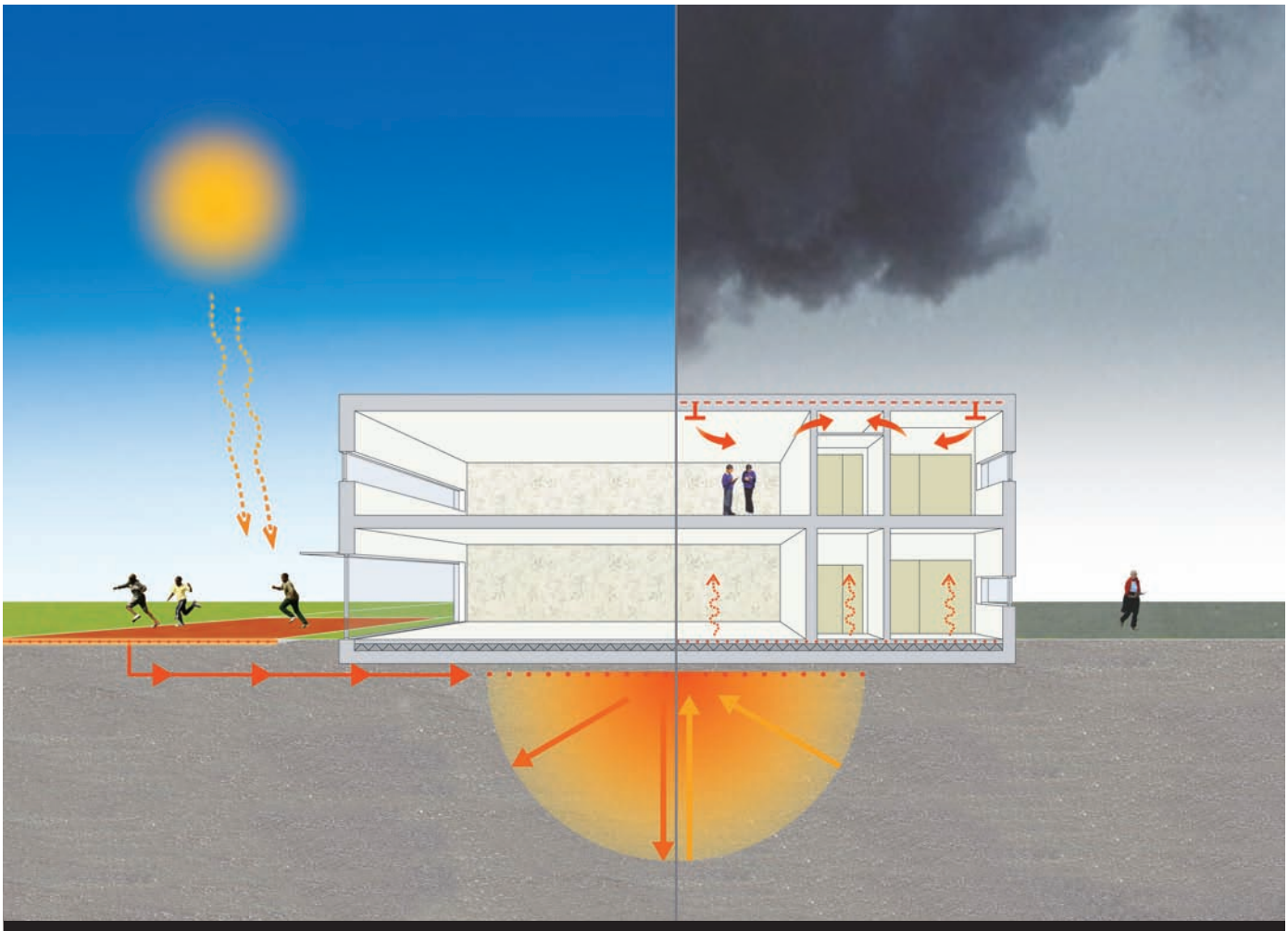
Their depth of practical and professional experience in the construction industry enables them to understand your project, work with your designers and contractors and deliver your solution when and where you want it.

TFGI have particular expertise in meeting the challenges of geothermal energy provision for residential, commercial and retail industries. They work closely with leading green energy designers to convert designs to practical reality and have invested heavily in the latest drilling, installation and grouting technology and plant to ensure successful geothermal provision. TFGI will investigate, plan, install, test and warrant your geothermal project.

TFGI also invest heavily in all of their people recognising commitment to their staff and their career development and have recently gained Investors In People status.

TFGI very much look forward to hearing from clients with potential drilling projects where they can rest assured they will be given a professional service to help put their project on a solid footing.

For more information please contact TFGI on 01494 791110 or visit their website at www.tfgi.co.uk



Interseasonal Heat Transfer works by capturing heat energy from the sun via a collection pipe network just beneath the surface of black tarmac roads (or car parks or school playgrounds). It then stores the energy in computer-controlled thermal banks in the ground under the foundation of buildings, and releases it to heat the buildings in winter via heat pumps linked to underfloor heating.

heat moves very slowly in the ground and 7 metres down is far enough for the temperature to be constant if you don't extract heat from the ground. If you do extract heat from the ground the temperature goes down and it can goes down relatively quickly, very close to the pipes, but not very far from the pipes. So it is the discovery that heat moves vary slowly in the ground that we have turned on its head and used as an asset. The implication is that we can actually put heat into the ground in Summer and it will still be there the following Winter."

CASE STUDY: TESCO AT GREENFIELD OLDHAM

The ICAX design for Interseasonal Heat Transfer at Greenfield provided cooling in summer by extracting heat from the supermarket and, instead of blowing this into the atmosphere like an air conditioning chiller, ICAX stored the heat in Thermal Banks in the ground.

When heating is needed in winter the ICAX system extracts the stored heat from the Thermal Bank using a ground source heat pump and distributes it within the building. This recycling of waste heat through the Thermal Bank, allows ICAX to deliver a significantly higher coefficient of performance than would be achieved by a traditional "unassisted GSHP".

RECYCLING THERMAL ENERGY

The ICAX Skid looks at the most cost effective energy source at any given time, and enables the transfer of heat from where it is available most easily to the areas of the building that need heat. If heat is not available from these sources the system looks to extract heat from the Thermal Bank using a ground source heat pump. The natural energy system also has access to an air source heat pump for those spring days when the external air temperature is rising and the heat store in the ground is depleted at the end of the heating season. The ICAX Skid uses an intelligent approach to save energy and re-cycle heat whenever an opportunity arises.

SAVING ENERGY

The IHT scheme underlines Tesco's commitment to saving energy and lowering its carbon emissions. These are significant commitments from a large organisation and Tesco is continuously exploring the ways in which it can reduce the carbon footprint of its stores. As a global business Tesco recognises an important role in helping to minimise climate change. With the overarching goal to be a zero-carbon business by 2050.

A TURNKEY PACKAGE

ICAX provides consulting services to advise on the design of ground source energy systems that can achieve long term sustainable heating and cooling systems. The advice is based on thermal models that have been developed by ICAX over many years of research to achieve thermal equilibrium. ICAX clients for these Thermal Modelling services have included Mott MacDonald, Tesco, Highways Agency, REHAU, Telford & Wrekin Borough Council, Merton Borough Council, the European Union.

It is a cleantech company helping to meet the demand for on-site renewable energy and sustainable development by using interseasonal heat stores to achieve low carbon buildings.

Clients are provided with a turnkey package for meeting sustainable energy targets on construction projects. ICAX undertakes design and installation to ensure that heating and cooling needs are met in a sustainable way. It also provides a complete range of services from initial feasibility through design and delivery, to in use maintenance.

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