ARMSTRONG

DESIGN ENVELOPE

District Heating Solutions

SOLUTION OUTLINE

FILE NO: 8.11
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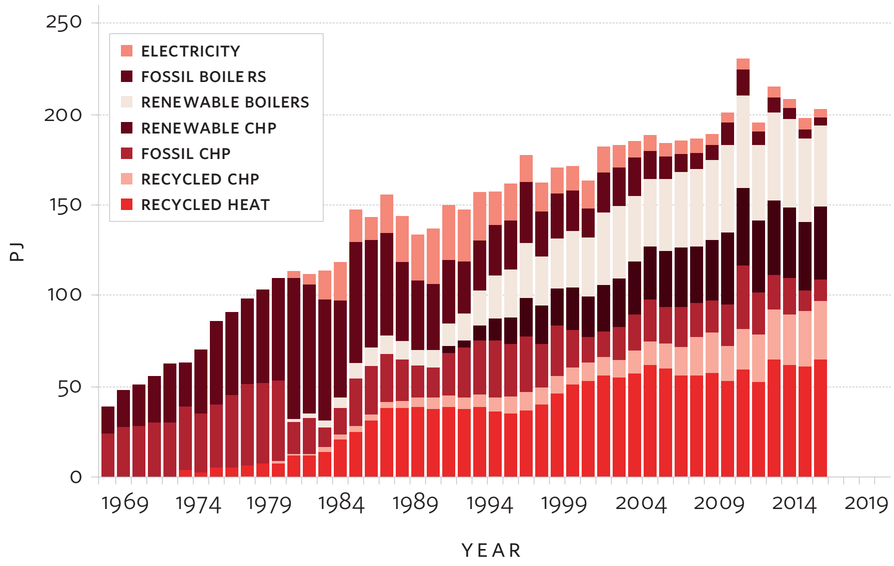
THE CLIMATE CHANGE IMPERATIVE

It is now beyond doubt that the burning of fossil fuels and the subsequent release of carbon into the atmosphere is heating up the planet. This reliance on fossil fuels has to cease.

The current political instability and volatile trading conditions of these fuels all add emphasis to the fact that we need to find cleaner, smarter, sustainable and affordable ways to heat homes & commercial buildings.

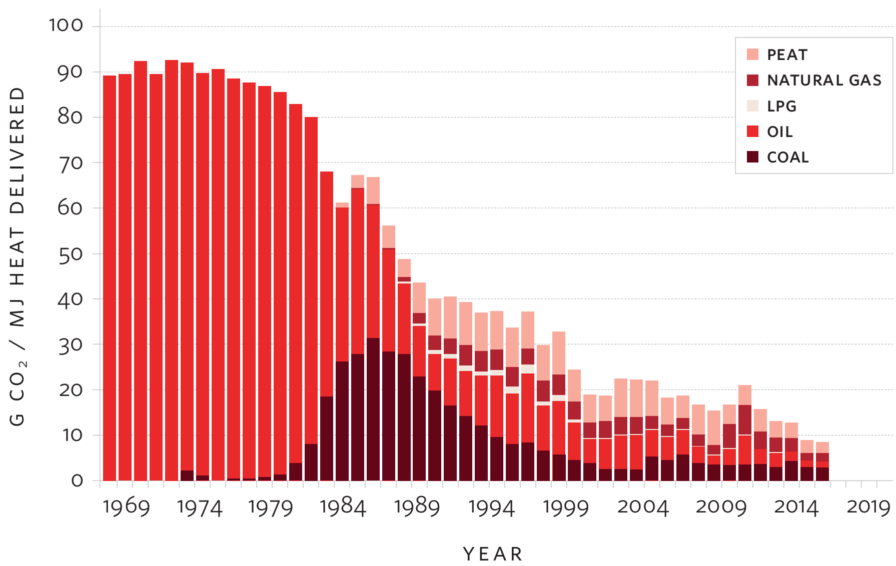
For decades, district heat networks have been successfully deployed across Europe and are a proven method of providing heat to properties while simultaneously reducing carbon emissions.

HEAT SUPPLY TO SWEDISH DISTRICT HEATING SYSTEMS BETWEEN 1969 AND 2015 BY HEAT SOURCE



The graph above shows the increasing volume of heat supplied to buildings via Swedish District Heating systems between 1969 and 2015 by heat source type. **The graph below** shows the change in input fuel during that increase and details the subsequent vast reduction in CO_2 emissions, during that time, despite the increase in output. **SOURCE: WERNER, 2017**

SPECIFIC CO_2 EMISSIONS FROM SWEDISH DISTRICT HEATING BETWEEN 1969 AND 2015 BY INPUT FUEL



There is now an even greater variety of renewable energy sources available and the concept of sector coupling further increases the available energy. But how do we utilise all the various options?

DISTRICT HEATING IS THE ANSWER

District heating systems are source agnostic and allow for multiple energy sources to be utilised, sometimes even on the same heat network. District heating therefore both increases the resilience of heat supply while also creating the opportunity for building owners, councils, towns and cities to reduce their carbon emissions.

District heating systems are completely energy source agnostic and facilitates the use of a variety of energy sources and the utilisation of waste heat.

They facilitates a significant step change in the reduction of carbon emissions (vs traditional heating systems such as Gas or Oil), while also increasing resilience and reliability.

District heating future proofs the supply of heating and domestic hot water and also allows for rapid reduction of carbon emissions to multiple end users.

They removes reliance on traditional fossil fuels and increases available practical energy sources.

District heating systems reduce the pronounced peaks and troughs of individual demand thereby allowing greater renewable utilisation within the energy supply.

District heating is the gateway technology for sector coupling. Allowing waste heat from various sources to be utilised on the heat network.

District heating and thermal storage go hand in hand. Thermal storage allows even greater utilisation of waste heat and renewable sources despite changes in the demand profile.

DISTRICT HEATING SYSTEMS ARE THE GREAT FACILITATOR

Types of energy that can be integrated into district heating:

- Heat-pumps (air, ground and water source)
- Waste heat (from process, sewage treatment, data centres etc.)
- CHP (Combined Heat and Power)
- Solar thermal
- Electric boilers
- Biomass
- Gas and Oil boilers

THE GROWTH OF HEAT PUMPS AS AN ENERGY SOURCE

The decarbonisation of the electricity grid has seen a meteoric rise in the number of heat pumps being installed. Heat pumps are seen as a quick method of carbon reduction and their circa 4 to 1 ration of electricity used to thermal output has further fuelled their use. However, there are two important factors that need to be addressed to get the best out of heat pumps when they are being installed on a district heating network.

Firstly, the relatively low flow temperature, circa 55°C can be problematic. Space heating heat emitters will need to be sized accordingly and under floor heating would be preferred, though not essential. This low flow temperature would dictate that if domestic hot water is stored that a second energy source will be required to lift the domestic hot water higher to avoid Legionella growth. Alternatively it is recommended that domestic hot water is created instantaneously, via plate heat exchangers.

Instantaneously generating domestic hot water significantly reduces the Legionella risk, allowing the domestic hot water to be generated at the temperature required (circa 50°C), but also has the additional benefit of increasing the network delta T and therefore reducing flow rates, pump energy use, network losses and potentially pipe and valve sizes.

Secondly, as heat pumps generally require small delta T's in operation, it is important that the network delta T is not compromised or the aforementioned benefits would be lost. Therefore, the heat pumps need to be able to operate in their own microclimate, not affected by or affecting the network delta T.

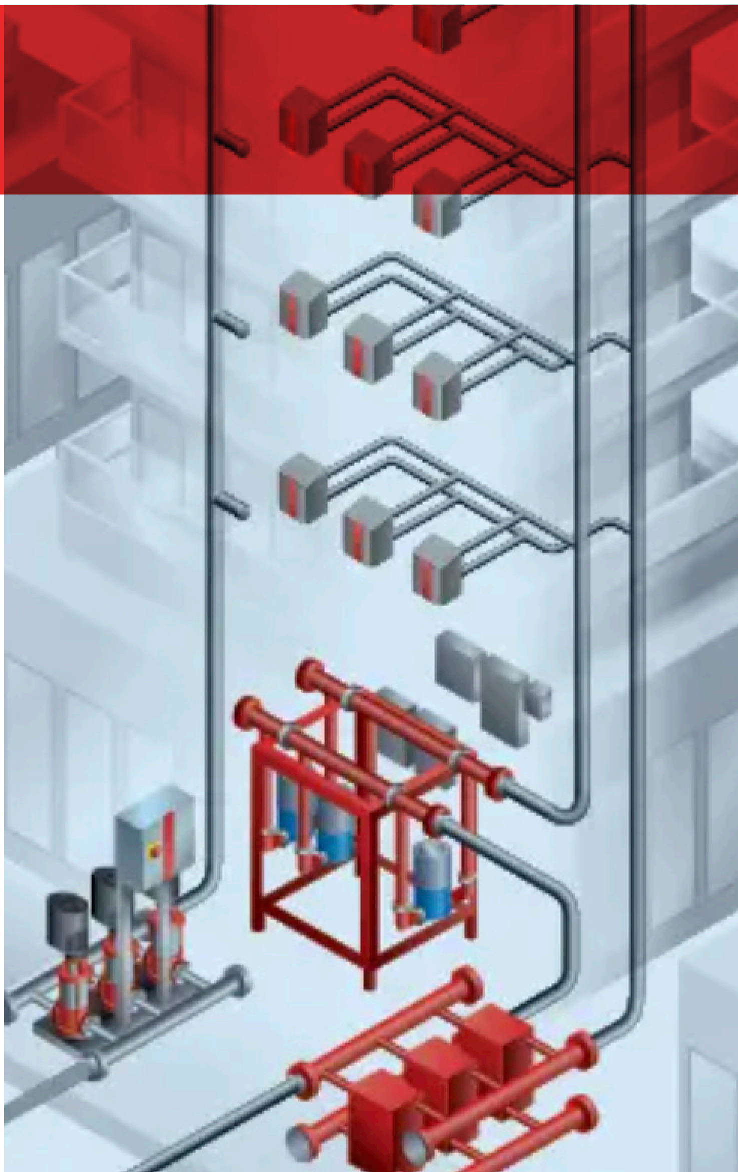
WHAT MAKES DISTRICT HEATING EFFICIENT OR INEFFICIENT?

As you would expect, there are multiple things that effect how efficient or inefficient the district network is. Each issue generally comes down to either increasing or decreasing the network delta T. Small delta T's equal an inefficient network, large delta T's equal an efficient network. The greater the delta T the lower the flow rate required to supply a given amount of energy. Typically, the flow temperature will be fixed and therefore, lowering the return temperature should be the focus as this will increase the delta T.

At every stage of the design, installation, commissioning and operation, the focus should be on maximising the delta T. If the result of a design change, system change etc. would be to reduce the delta T, it should be considered very carefully before the change is made. It should also be noted that reducing the return temperature will allow the majority of renewable sources to provide a greater part of the total output.

Solar and most heat pumps, for example, will struggle to increase the temperature much beyond 55°C. If the network return is 55°C or above, they cannot provide any energy into the building. Some 'higher grade' heat sources producing higher output temperatures can also suffer. Combined head and power units for example will struggle to 'get rid' of its heat and the engine may shut down regardless of the thermal or electrical demand of the building.

FOR MORE INFORMATION
scan the QR code to refer to our white papers on district energy delta T's and thermal store utilisation.



SUMMARY OF DESIGN CONSIDERATIONS TO MAXIMISE DISTRICT HEATING EFFICIENCY:

1. Maximise delta T
2. Lower return temperatures
3. Reduce number of bypasses and their flow rates
4. Maximise pump turndown
5. Accurate and responsive pump control
6. Accurate plant-room sizing (don't oversize the energy sources or pumps)
7. Maximise the utilisation of the thermal store
8. Ensure thermal store stratification and control the energy sources via the stratification layer
9. High levels of lagging

SECTOR COUPLING: THE FUTURE OF CIRCULAR ECOSYSTEMS IN TOWNS AND CITIES.

The European Parliament Committee on Industry, Research and Energy issued a report in 2018 that showed that the hard electrification of energy supply is problematic and may actually be restrictive in achieving our carbon reduction ambitions.

The report also stated that district energy and sector coupling had the opposite effect and helps in the decarbonisation process, increases flexibility of energy supply, increases reliability thereby reducing global costs and the cost of decarbonisation.

The recommendation of the report was a focus on sector coupling rather than hard electrification.

Sector coupling allows energy in various forms to be successfully utilised regardless of changing demands and changing outputs during any typical 24 hour period. Sector coupling can be thought of as a spiders web of energy, of various types, traveling in multiple directions across the web. **There are four fundamentals within the web and four energy systems that are utilised to supply or receive the energy...**

THE FOUR FUNDAMENTALS

1. ENERGY SOURCES
2. ENERGY STORAGE
3. ENERGY CONVERSION
4. CONSUMERS & PROSUMERS

THE FOUR ENERGY SYSTEMS

A. POWER (ELECTRICITY)
B. GAS (NATURAL)
C. DISTRICT HEATING
D. DISTRICT COOLING

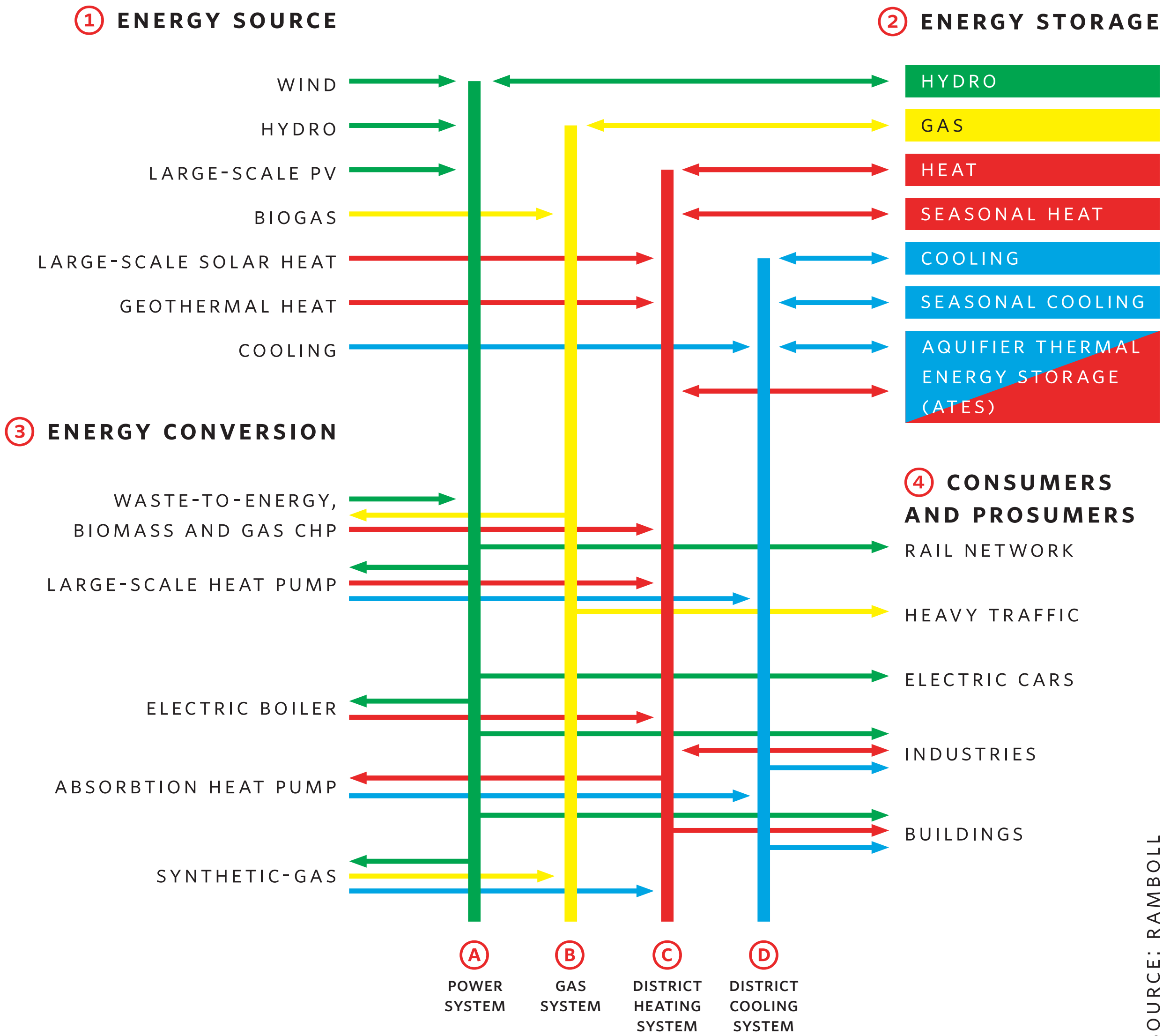


FIGURE 1

SOURCE: RAMBOLL

Referring to figure 1 above, you can see that there are multiple energy sources, such as wind, solar, biogas etc. Some of these sources are unpredictable. The sun may not shine, the wind may not blow for example. Some sources such as geothermal or biogas production are predictable. Our energy use pattern may also fluctuate, but in general there are patterns and it is therefore predictable.

This demand predictability and the availability or otherwise of some energy sources drives both the storage and conversion sectors. The sector coupling grid therefore needs to be smart so that it can 'move' energy around the sectors, based on what source is available, what has the smallest carbon implication and what the predicted demand is going to be.

Again, looking at figure 1, and using wind as an example, we can see that wind supplies electricity into the power grid. However, we can also see that this power can be taken from the grid for hydro electricity. I.e. the power is used to spin pumps to pump water uphill into a reservoir for example. This would typical happen at times of excess wind and low electricity demand. However, knowing that the electrical demand will peak at a particular time, allows the potential energy stored at the high reservoirs to be released and the energy from the spinning turbines is sent into the power grid when required. However, looking at the green power grid, we can also see that the electrical energy produced by wind, can also be used to power large scale heat pumps thereby converting the electrical energy into thermal energy that is sent into the district heating system sector. Alternatively it can be used by electric boilers in the same way or for synthetic gas production. We can also see in the conversion sector that waste to energy or biomass/gas CHP can also provide electricity into the power system.

Looking specifically at the district heating system or grid, we can see that thermal energy can be put into the system in a number of different ways. It can come directly from solar thermal and geothermal sources, from thermal stores, seasonal heat, and aquifer storage in the storage sector. It can also come from waste heat from process or data centres for example in the end user sector.

Spend some time looking at figure 1 and tracing the flow of energy through the different sectors and different systems, you soon get a feel for energy flowing across the grids and the intelligence that predicts or anticipates demand and prepares the networks and the energy location to meet the predicted demand.

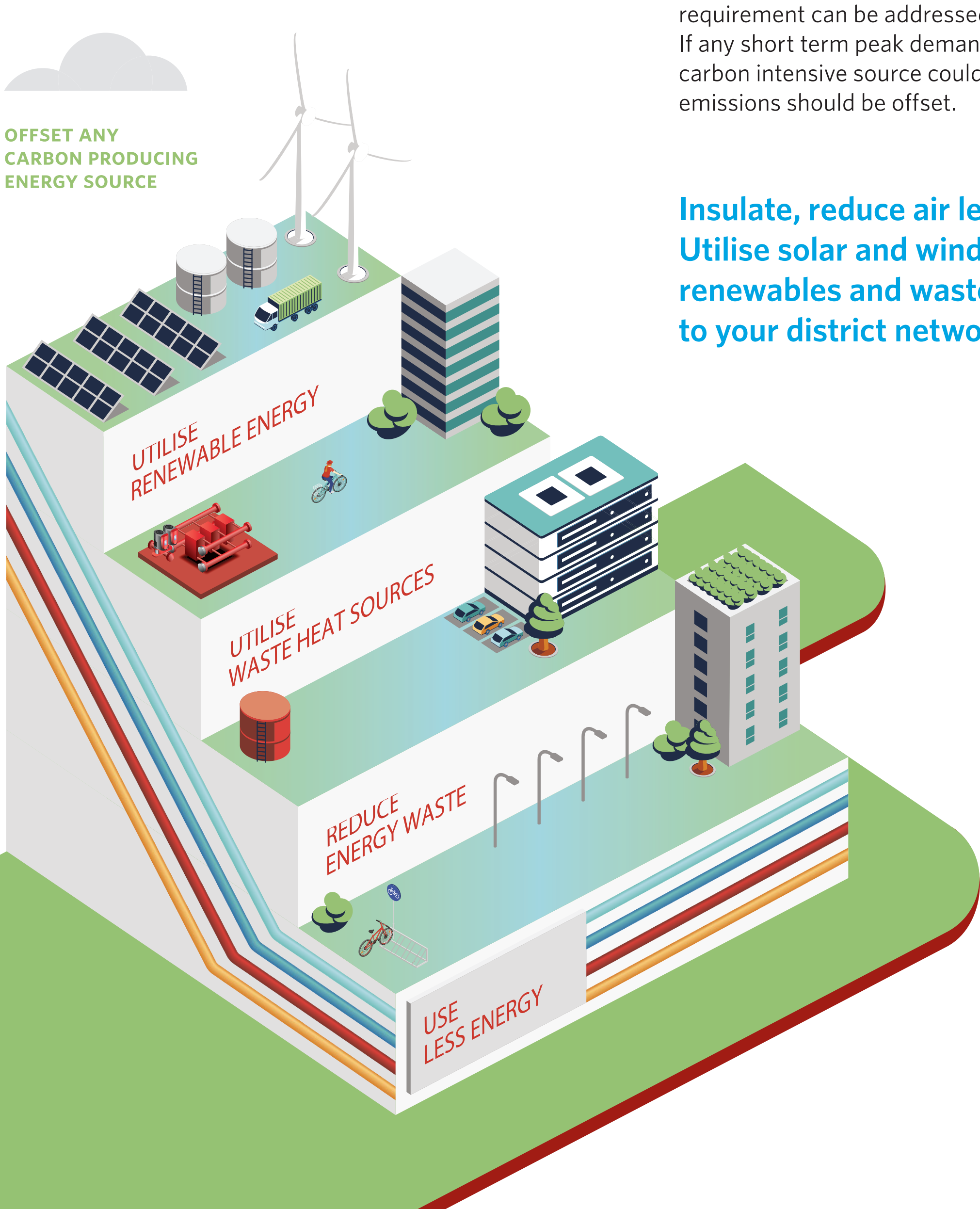
HOW FAR CAN SECTOR COUPLING GO?

Figure 1 is not exhaustive and other sources can be plotted in a similar way. It is also worth noting that as we become more in tune with sector coupling, we can increase the symbiotic relationship of the four sectors. Why not use the electrical energy stored in the electric cars and send it into the power system during the early hours if required, then recharge them prior to say 8am ready for use during the day? If a building has an Low Temperature Hot Water (LTHW) thermal store as part of its heat supply, why not use this thermal energy and send it back into the district heating system to be used elsewhere through the night, process maybe or into an absorption heat pump to send cooling into the cooling network? The original buildings thermal store can be recharged ahead of any predicted peak.

When we look at an individual building, there is a hierarchy of importance that we need to utilise on the path to carbon reduction (see fig. 2). There is a tendency to jump straight to the energy supply and the energy sources and try and utilise zero or low carbon energy. However, this misses the first and crucial step on the pathway to carbon reduction.

The first step should be to minimise energy demand of the building. This stage is often seen as 'less exciting' and could very well be the reason that less focus is applied in this area. It is crucial however, that we start with minimising demand. This can be insulation, making the building more airtight, flow restrictors on boosted cold water and domestic hot water, ensuring areas are only heated or cooled when occupied etc. Once the building's energy demand has been reduced in this way, the subsequent lower energy requirement can be addressed with renewable energy. If any short term peak demands still exist, then a more carbon intensive source could be used, but the carbon emissions should be offset.

Insulate, reduce air leakage and water use. Utilise solar and wind energy. Integrate renewables and waste energy sources in to your district network.



4 For the small power requirements, draw on zero carbon sources

3 Leverage heat sinks and sources along with storage (thermal)

2 Make systems as efficient as possible to minimize power consumption

1 Design to minimize energy demand for lighting, heating and cooling

FIGURE 2

THE CHEAPEST ENERGY IS... THE ENERGY WHAT YOU DON'T USE.

That's why lowering the thermostat or turning off lights when you don't need them etc. should be our first action.

And while there's no substitute for good design, there are things that can be done to improve the efficiency of district heating systems:

It starts with the basics - lagging all pipes to the highest standards, but also the valves and other fittings on the network to avoid heat losses. But thereafter, it requires a little more thought.

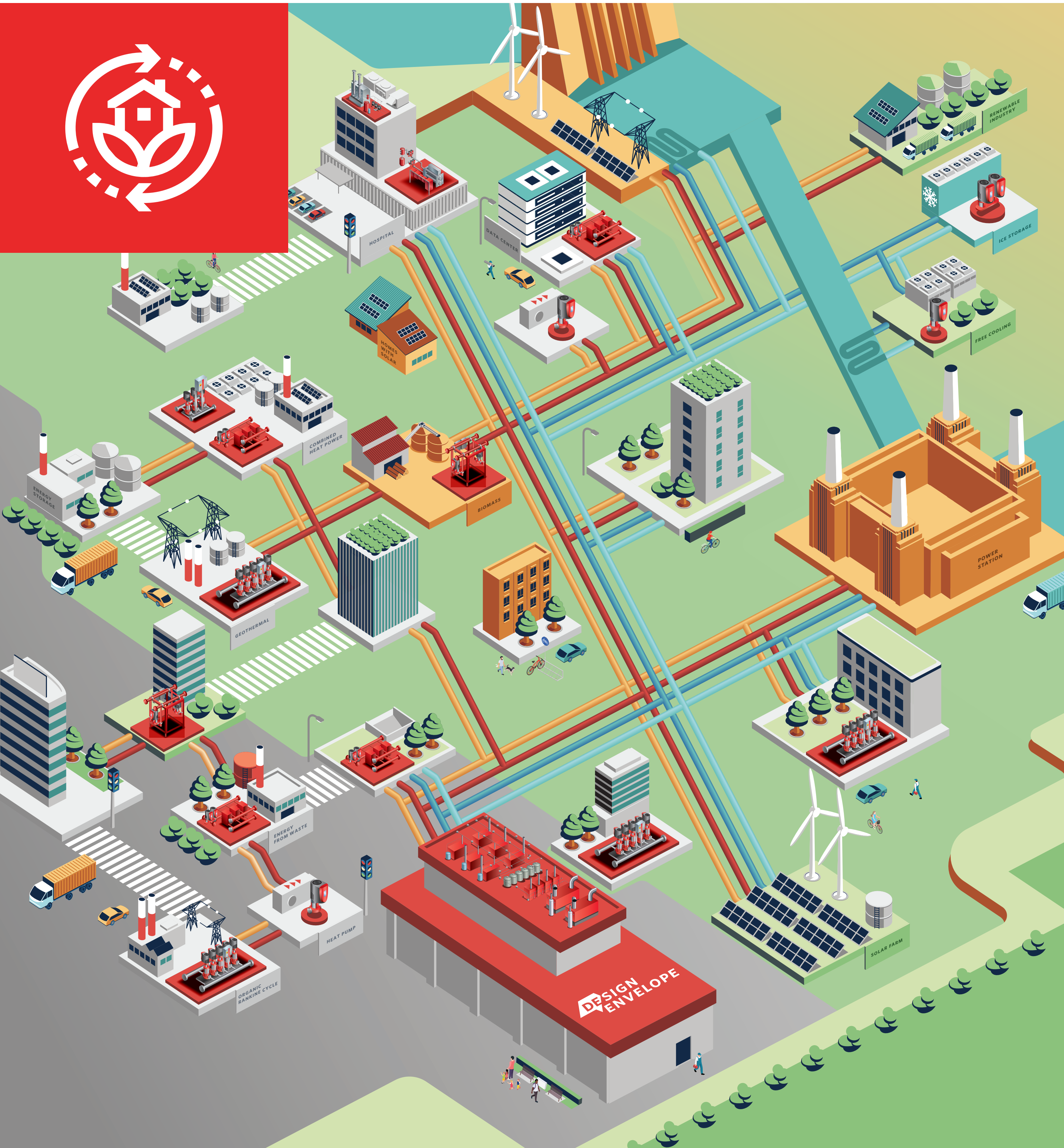
Typically, the average building is not as efficient as it should, or could, be. So how do we optimise each building and therefore the network as a whole?

We've seen how maximising the delta T or lowering the return temperature makes the network more efficient, but how do we do that, and where do we start?

With heat networks, it's always best to start, furthest away from the plant-room and then make your way back through the network to the plant-room. So, looking at the apartments, offices or rooms, the first check should be to make sure that the heat emitters are sized and more importantly, are balanced correctly. Checks on the delta T can be made at each heat emitter and at the connection of each office or apartment.

The next step would be to check any bypasses have been commissioned correctly and that the flow rates through the bypasses are low. These two factors are critical to achieving a good delta T. Back at the plant-room, if bypasses are located here, the same rules apply, it is imperative that they are controlled correctly and only allow flow through when absolutely necessary.

WHOLE LIFECYCLE SOLUTIONS FOR SUSTAINABLE CITIES



ARMSTRONG KNOWS HOW

With our core competencies in providing the building industry with Fluid Flow, Energy Transfer, Demand-Based Automation solutions and a thorough understanding of the requirements of CP1 code of practice for district heating, Armstrong Fluid Technology District Heating Solutions can help deliver superior lifetime network performance through system design excellence, technologically advanced pumping equipment, system control and optimisation.

Design Enveloped Pumps significantly reduce operating costs and CO_2 emissions through demand-based, parallel pumping control and best efficiency staging.

Design Envelope Technology enables built in redundancy so no need for dormant back up assets.

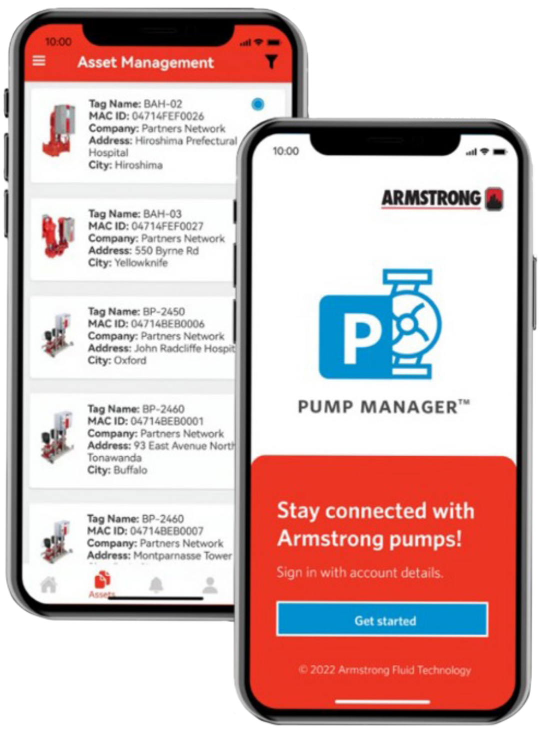
Complete Prefabricated Packaged solutions are designed, constructed and tested to meet the individual requirements of a project thereby reducing construction time, costs and risk.

Armstrong are your complete single source supplier for end to end system solutions for District Heating Networks.

DELIVERING ENERGY EFFICIENCY FOR LIFE

A main cause of operational inefficiency in HVAC systems is performance drift. This term refers to the incremental degradation in pump performance that occurs as component efficiency and system conditions 'drift' away from the original level of operation. Unfortunately, many accept this loss of efficiency as inevitable. However, Active Performance Management services, such as Pump Manager help prevent performance drift and maintain optimised performance for the life of the system.

The software collects data using cloud-based technology and embedded intelligence to deliver insights into pump performance and optimisation recommendations. With Pump Manager, operating savings start from day one and simple payback is usually reached within a few years. Energy savings continue for the life of the system, delivering up to 40% savings on consumption related to HVAC operation.



1 DESIGN ENVELOPE PUMPS

Armstrong Design Envelope pumps are a complete solution for heating, cooling and plumbing systems. The integration of a perfectly matched hydraulics, motive power and intelligent variable speed control creates the highest value pumping solution.

Design Envelope technology is a demand-based, intelligent control solution that:

- Models equipment and system behaviour
- Monitors actual system conditions
- Dynamically adjusts equipment operation to match system demand

SIZING AND SELECTING FOR EFFICIENCY

Design Envelope solutions reduce pumping costs through variable speed, demand-based operation — consuming only the energy required, based on current system demand. Design Envelope pumps use a combination of optimised impeller size and speed control for energy efficient operation within a given performance envelope.

The performance envelopes are selected for the best pump efficiency where variable flow systems operate most often. This ensures a building's pumping system consumes as little energy as possible.

SCAN THE QR CODE to find out more about Armstrong's Design Envelope technology.

DESIGN ENVELOPE

ENGINEERED BEYOND THE OBVIOUS

TECHNOLOGY

MAXIMUM ENERGY & COST SAVINGS

UP TO **70%+** ENERGY SAVINGS*

UP TO **65%** INSTALLED COST SAVINGS*

1

HIGHEST
ENERGY
EFFICIENCY

Armstrong Design Envelope Pumps provide you with highest energy efficiency.

2

LOWEST
INSTALLED
COST

Design Envelope Pumps provide lowest installed equipment cost, plus savings in infrastructure such as transformers, switch gear, power cables, concrete and cabling.

3

LOWEST
OPERATING
COST

Design Envelope Pumps provide lowest operating & maintenance cost.

4

LOWEST
CARBON
FOOTPRINT

Design Envelope Pumps provide buildings with the lowest carbon footprint.

5

LOWEST
PROJECT
RISK

Design Envelope Pumps provide lowest project and operating risk, with solutions adaptable to design and building changes.

VERTICAL IN-LINE PUMPS (VIL)

THE HEART OF YOUR BUILDING

Mechanical room space savings
Pumps require minimal floor space or can be installed overhead.

Reduced vibration
Dynamically balanced impeller and shaft assembly operates with minimum vibration.

Lowest installed cost
Component, Material and Labour savings —fewer fittings and no inertia base required.

Lowest installed cost
Component, Material and Labour savings —fewer fittings and no inertia base required.

Reliability
Vertical In-Line design requires less maintenance, at a lower cost, than any other pump configuration.

Easy maintenance
15 minutes to replace the mechanical seal — no need for realignment; saves up to £500.

For a 7.5 kW pump, save £1,500 with pipe mounting and no inertia base

Available for outdoor operation

DESIGN ENVELOPE

TANGO PUMPS

Unmatched Energy Efficiency:

Advanced hydraulic design supports industry-leading flow efficiency

Armstrong DEPM motor technology delivers an additional 6-20% efficiency, meeting IE5 efficiency standards

Control algorithm constantly reviews operating conditions and adjusts output to meet immediate flow requirements at minimum energy consumption

DUAL-PUMPING CONFIGURATION

The traditional duty/standby approach to redundancy in HVAC systems inflates the installed costs for equipment and labour, and adds to the carbon footprint of the building.

Tango's dual-pumping configuration modernises the approach to redundancy. Pumps and motors are selected from a range of sizes to achieve a level of redundancy that matches the requirements of the application.

With the proper approach to redundancy, HVAC requirements can be met for all but the most extreme days of the year; and for those few days, variation in temperature will be minimal.

PARALLEL PUMP CONTROL

SAVE UP TO 30% ON OPERATING COSTS

Parallel Pump Control is a patented technology that improves the efficiency of a multi-pump installation through optimised load sharing.

The traditional approach to control in a multi-pump installation involves staging pumps on the basis of motor speed. Parallel Pump Control technology stages pumps based on operating efficiency rather than motor speed and improves the efficiency of the full pump array by up to 30% over traditional multi-pump installations.

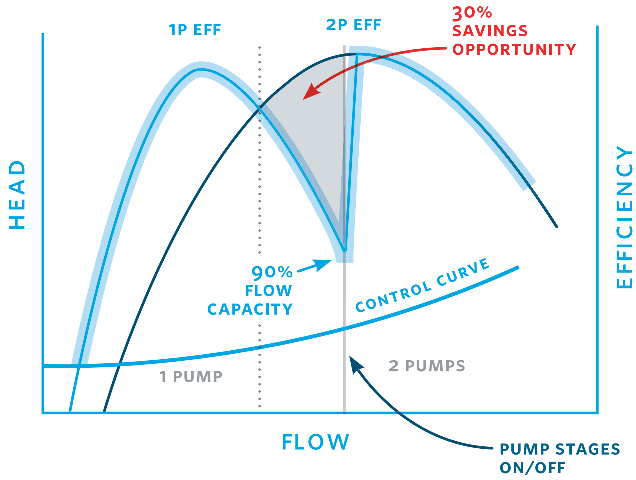
HVAC loads and flow requirements change throughout the day. In the left graph below, the point where the dotted vertical grey line intersects the pump efficiency curves represents the flow level at which one pump in the array should be staged on or off. The solid grey line, however, indicates where staging often occurs with speed-based control, which forces the pump array to operate at efficiency levels that are less than optimal.

In an installation of up to four pumps, Parallel Pump Control monitors pump speed and stages pumps at the correct flow levels to optimise efficiency, as shown in the bottom-right graph.

Because HVAC pumping systems mostly operate at part-load, a design using two or more smaller pumps is more efficient than one larger pump. In a two-pump system, if one pump fails, the remaining pump can serve the system requirements with up to 70% flow redundancy. The capacity split can be adjusted based on the building type and duty requirement.

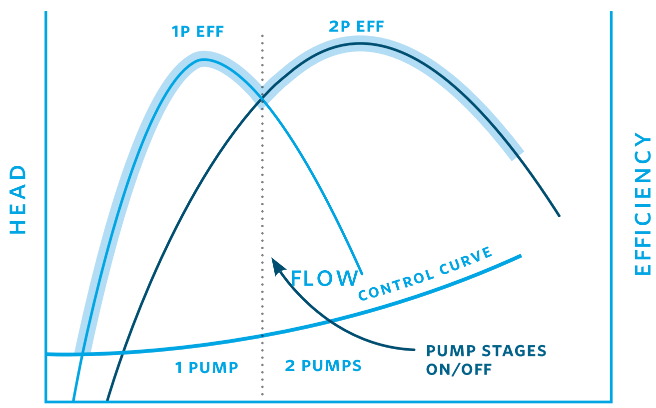
TRADITIONAL

SPEED-BASED STAGING



PARALLEL PUMP CONTROL

BEST-EFFICIENCY STAGING



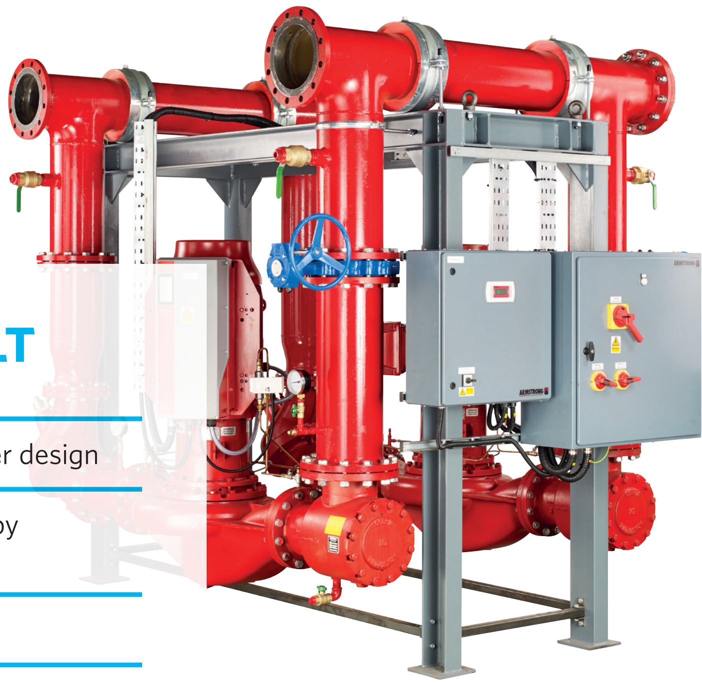
SCAN THE QR CODE
to find out more about Armstrong's Parallel pump control technology.

2 INTELLIGENT FLUID MANAGEMENT SYSTEMS (IFMS)

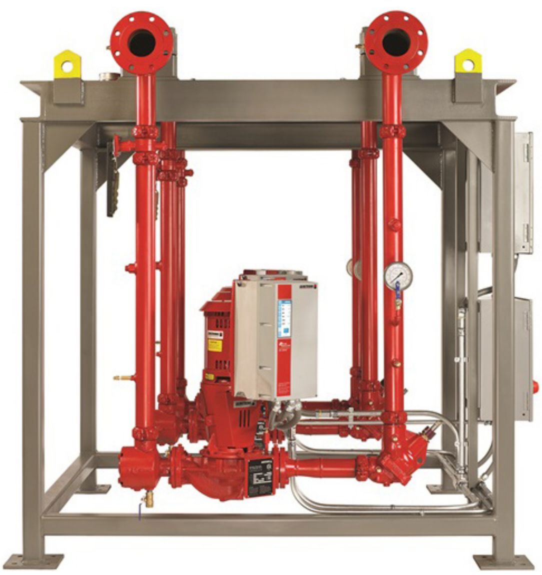
UP TO 50%

LOWER LIFE CYCLE COST

Serving both chilled water and hot water applications, the Design Envelope iFMS is a prefabricated all-variable pump station that offers value in a new-build or retrofit project.



THE VALUE	THE RESULT
Simplied mechanical room design	More than 20% faster design
Modular construction approach offering greater design flexibility	Project risk reduced by more than 30%
Fast and easy installation	Lowest installed cost
Energy savings	Lowest life cost
Confidence in system design quality and manufacturing quality	Reduced risk with ensured performance



SCAN THE QR CODE
for further information on Armstrong Design Envelope Intelligent Fluid Management Systems (iFMS)

Alternatively, please visit:
https://armstrongfluidtechnology.com/en/products/design-envelope-intelligent-fluid-management-system

DESIGN ENVELOPE

3 BUILDING SUBSTATIONS

As the length of the district energy piping increases, the pumping pressures required also increase. It may be that deemed that these pressure are to great for an individual building.

In addition, as we start to bridge across sectors, have different chemical breakdowns or requirements between fluids that we need to hydraulically separate the two fluids. To allow heat transfer and to keep both fluids separate, we need a plate heat exchanger or PHE. Once we separate the two fluids be that on the network or in the basement of a building for example, then we'll need a pump on the secondary side and a control valve on the primary side.

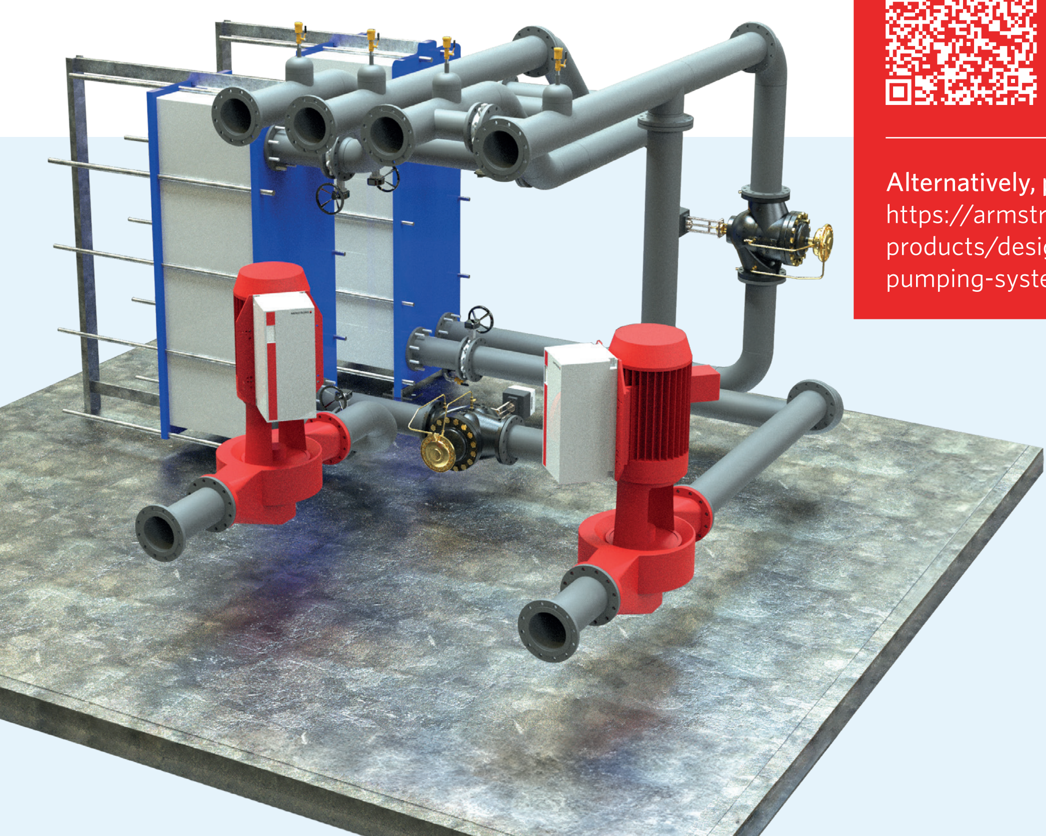
There is also a requirement for isolation and very often filtering or straining, energy metering, pressurisation equipment etc. It is common that all these items are supplied as a complete packaged product, sometimes skid mounted, sometimes in an enclosure. We refer to these packaged items as a substation. On larger networks the amount of substation can be significant with each building connected having a substation at the connection point.

FEATURES

- Variable primary pumping control in a headered or dedicated configuration, or secondary/tertiary pumping control in a headered configuration
- Best efficiency staging with parallel sensorless
- Up to 8 pumps, 16 zones and 8 flow sensitive equipment (variable primary)
- Responds to cooling or heating zone demand via return temperature sensors, dP sensors, cooling zone valve position, sensorless technology, hybrid (sensorless with instrumented critical zone)
- End-of-Curve protection based on Parallel Sensorless™ technology (sensorless pumps) or pump operating speed (non-sensorless pumps)
- Flow verification capability

SCAN THE QR CODE
for further information on the Design Envelope Integrated Pumping System (IPS 4000 controller)

Alternatively, please visit:
https://armstrongfluidtechnology.com/en/products/design-envelope-4000-integrated-pumping-system

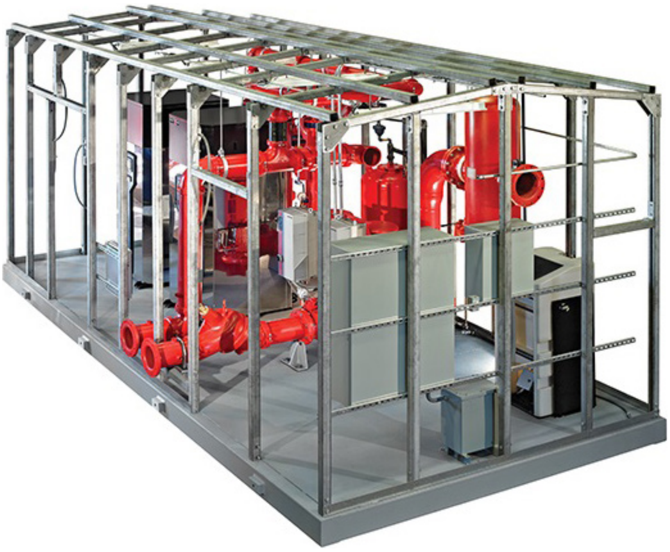


4 PRE-PACKAGED ENERGY CENTRES

Armstrong pre-packaged energy centres allow for a scalable and modular approach to providing heating or cooling for district energy schemes, allowing the energy centre to grow in-line with the district scheme development rather than installing full load capacity at day 1.

- Design in accordance with CP1 code of practice for heat networks
- Configurable - Wide range of capacities available
- Modular & Scalable - Build out and expand needs inline with the project/changing requirements
- Heat Pump ready
- Energy source agnostic
- Single or multiple thermal stores
- Energy source control and optimisation
- Control via the thermal store stratification layer
- Specific strategies based on energy source type
- Full design and sizing support provided to meet your project needs
- Integration with BMS systems

SCAN THE QR CODE to find out more about Armstrong's Engineered-to-order Packaged Systems



THE BENEFITS OF AN OFFSITE BUILT AND PRE-PACKAGED SOLUTION

Offsite manufacturing and modular construction are methods of building where multiple components are assembled remotely (or a different location to its intended final location), then delivered and where necessary re-assembled on site.

Off-site manufacturing facilitates:

- 'Off-site' build and test to the highest quality standards
- Minimal disruption on site
- Reduced site errors, and local interpretation errors
- Factory tested performance
- Reduced commissioning time
- Reduced installed cost
- Reduced project risk
- Single source supply less risk/oversight/administration
- Modular/Scalable solutions that can grow as your Heat Network (or load) grows.
- Delivery of a safe, high-quality scheme where risks are managed, and environmental impacts controlled.

HIGHEST ENERGY EFFICIENCY

LOWEST INSTALLED COST

LOWEST OPERATING COST

LOWEST PROJECT RISK

5 WASTE HEAT TRANSFER STATIONS

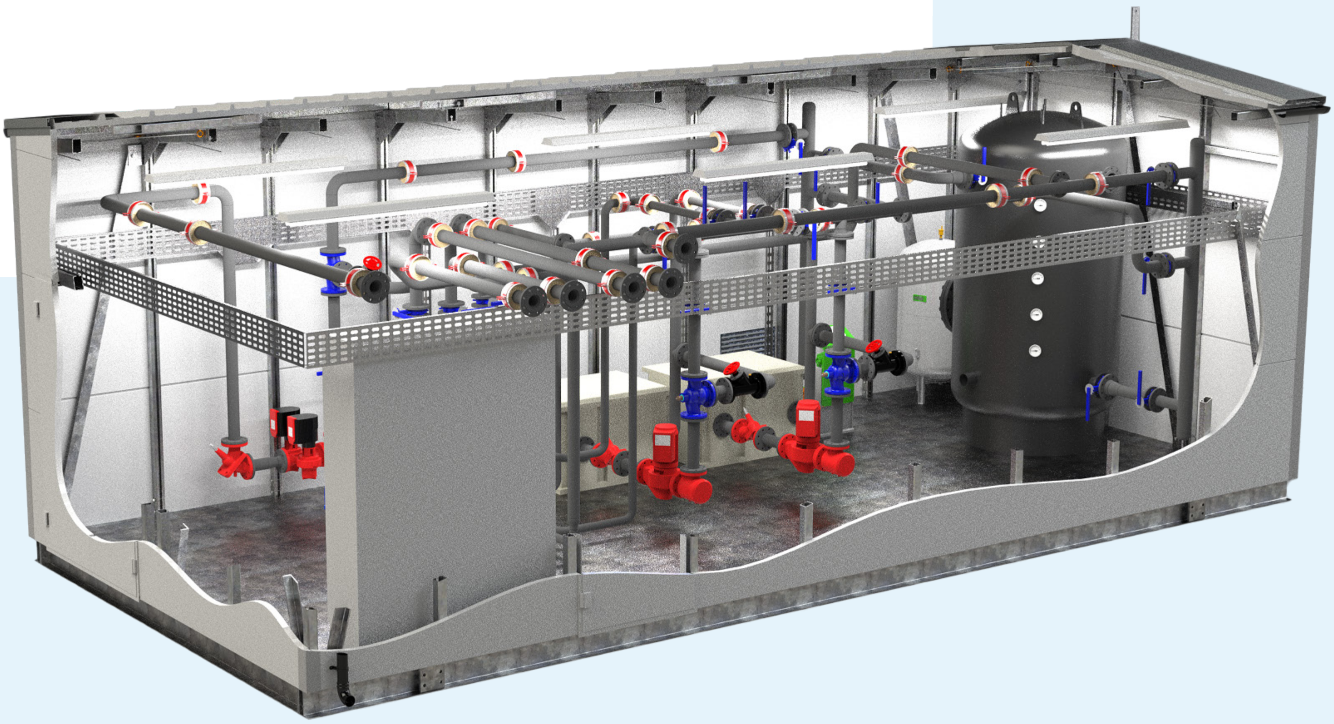
It is estimated that over 60% of our total building heat energy requirement could be met if we captured the heat that is wasted every day. Manufacturing processes, datacentres cooling, transport infrastructure and wastewater processing are just a few of the potential sources of heat available.

The district heating and cooling networks are the facilitator that allows for this waste heat to be captured and utilised. Indeed the utilisation of waste heat via the district networks is a fundamental part of sector coupling. The rise in 'edge' datacentres that are located close to high population density areas is clearly an opportunity that shouldn't be missed. But what do we need to take advantage of this readily available heat?

The Armstrong waste heat transfer station makes the gathering and using of this heat easy. Modular and configurable, the plate heat exchangers, pumps valves and inbuilt optimisation means that whatever the waste energy source, it can be utilised in the most efficient manner. If the waste heat needs boosting to meet the requirements of the network, then additional 'top up' energy sources can included. Available as a skid mounted configuration or a totally packaged and enclosed plantroom.

FEATURES

- Stand-alone waste heat or waste plus energy source
- Suitable for a wide variety of energy sources
- Additional energy sources are available
- Pre-packaged
- Modular
- Multiple plate number and sizes
- Waste heat transfer on the secondary and primary
- Data centre energy capture



CONNECTIVITY

FLOW INFORMS

The rate of fluid flow in an HVAC system is crucial to understanding how the different components are operating. Without information on system flow, it's difficult to diagnose and optimise performance. With accurate flow information, the picture changes entirely. Armstrong can optimise each component and the overall system.

Design Envelope Pumps monitor flow so accurately they function as a flow meter. Industry standards recommend balancing system flows to ±5% accuracy. Design Envelope pumps deliver accuracy of ±5%.*

Highly accurate and reliable: no issues with fouling, so no need to service or re-calibrate.

Low installation cost:
easy installation for retrofits.

Integral to pump:
no additional space or wiring required.

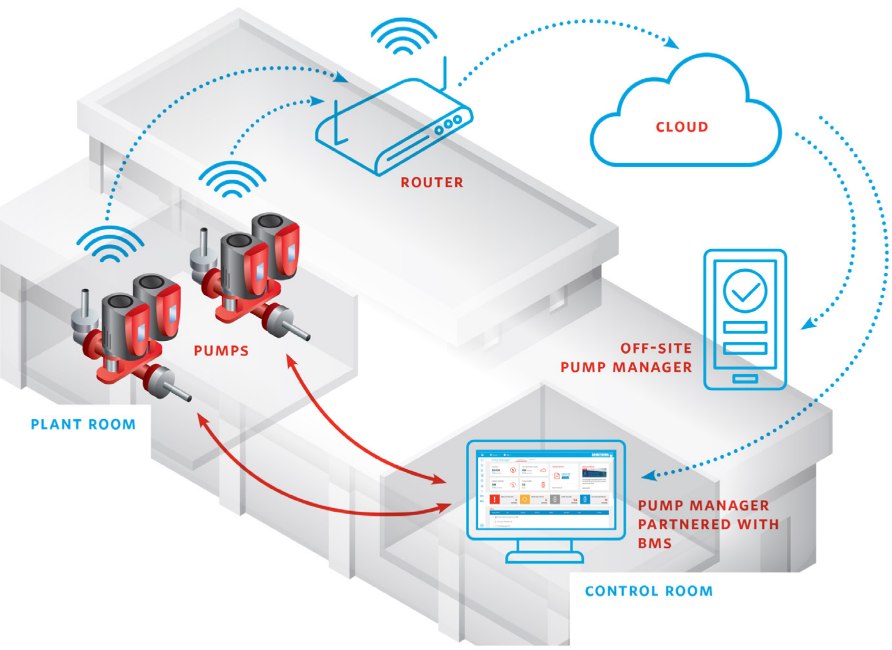
Energy savings:
accurate flow data informs optimization of an entire hvac system.

For evaluating an HVAC system, just two flow values and four temperature points provides all the data needed to understand flow rates, heat loads and operating efficiency.

ACTIVE PERFORMANCE MANAGEMENT™

Active Performance Management is a systems management approach that optimises HVAC systems at any stage of a building's lifecycle by continually learning from a broad network of installations and responding to changing HVAC requirements.

The combination of smart commissioning with real-time alerts and system transparency addresses performance drift and maintains occupant comfort.

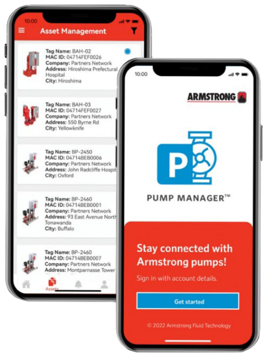


PUMP MANAGER™

Pump Manager is a cloud-based subscription service that enables Active Performance Management™ in Armstrong intelligent Design Envelope pumps.

It proactively tracks and manages pump performance and provides early diagnostic warnings, web accessible trends and analysis along with automated reports.

Pump Manager helps customers make informed decisions and take immediate action to deliver the best possible HVAC performance.



Increase system uptime and reliability

Enhance existing building management systems

Reduce operating costs

Improve tenant comfort

Improve transparency and building resilience

Make informed capital investment decisions

Available online or as an app

SCAN THE QR CODE
for more information on our Pump Manager service.

OPTI-POINT™ TECHNOLOGY

OPTI-POINT™ delivers persistent efficiency optimisation in any operating scenario.

In the period immediately post commissioning mechanical systems operate near optimal efficiency. Over time, as components age, and settings are adjusted by operators, system efficiencies can drift away from optimal levels. Though the rate of this change is slow, the added cost in energy use can be significant.

OPTI-POINT™ prevents drift in hvac performance and efficiency. Using digital twin technology and persistent optimisation through exploration, OPTI-POINT™ finds and implements the best possible combination of settings for every operating scenario.

- Optimised performance in any operating condition.
- Protection against degradation of system efficiency.
- Real-time diagnostic and predictive maintenance recommendations.

SELF LEARNING FOR ENERGY SAVINGS, NO MATTER WHAT HAPPENS

Machine learning algorithm provides edge optimisation and faster response to unexpected situations

Proactive learning approach constantly scans for anomalies and explores new operation scenarios

Automatic adjustmenst address issues that threaten efficiency levels and energy savings goals

ECO*Pulse service provides remote operator alerts

OPTI-POINT™ identifies, prevents and corrects the most common sources of performance drift:

Equipment aging
Environmental building condition
System contamination
Turnover within operation teams
Major space or equipment retrofits
Impulsive system adjustments

CPD TRAINING

Armstrong are pleased to offer a free CIBSE Accredited CPD on district energy titled:

Why District Energy? Guaranteeing Performance and Where District Energy is Heading which we are able to provide in a 1-hour lunch and learn session at your own offices or you are welcome to join us at any of our UK sites.

To arrange a CPD, please email:
ukhvacsales@armstrongfluidtechnology.com

For details of our full range of CPD accredited courses, please visit our website or email:
ukhvacsales@armstrongfluidtechnology.com

WEBINARS

Armstrong offers a regular webinar series covering various topics and subject matters from the HVAC industry.

SCAN THE QR CODE
for details of our upcoming webinars and how to register.

A comprehensive library of previously played webinars are also available on demand for viewing at a time more convenient to you.

For further details how Armstrong can support your District Heating schemes, please visit our website at: www.armstrongfluidtechnology.com/en-gb/sector-expertise/district-energy or email uksales@armstrongfluidtechnology.com

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