# UTILITY

## Energy Efficient Pumps and Pump Solutions

PROVEN TECHNOLOGY

DESMI

# UTILITY

DESMI supplies energy efficient and reliable pump solutions to District Heating, Combined Heat & Power/Waste-to-Energy Plants, Boiler Heating Plants, Tri-generation Plants, District Cooling Plants and networks, Medium/Larger HVAC, Power Generation, Leisure Industry, Sprinkler Systems and Waste Water (focus on Danish market).

Reliability, energy optimisation and ease of maintenance are important parameters for a company that services cities, buildings and especially people.

# DISTRICT HEATING

District Heating is an energy distribution network that transports heated water generated in a centralized utility through piping to residential homes and commercial buildings primarily in urban areas.

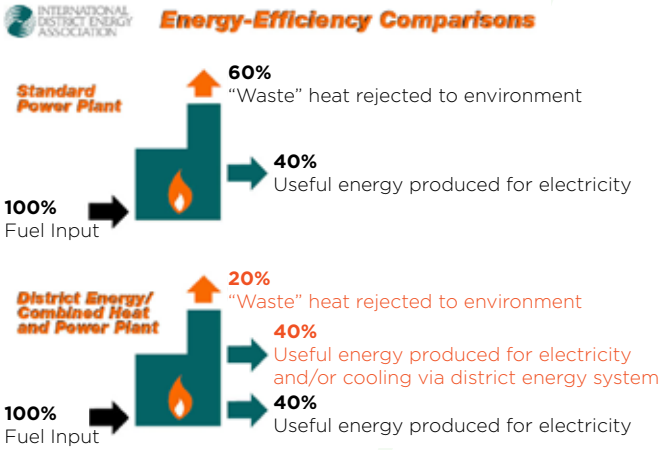
District Heating is clean, efficient and cost-effective due to its flexibility, scale of production and optimal heat generation conditions.

The heat is often obtained from a CHP (Combined Heat & Power) Plant burning fossil fuels or increasingly also biomass a.o. Waste-to-Energy Plants are another good source for heat and electricity.

Between the CHP plant and the distribution network there is a transmission pipeline through which heated water is pumped further onto the distribution network and into the individual buildings. The cooled water is then pumped back to the plant for re-heating.

The fundamental idea of District Heating is to use energy that is already available and that otherwise would be wasted and cause pollution.

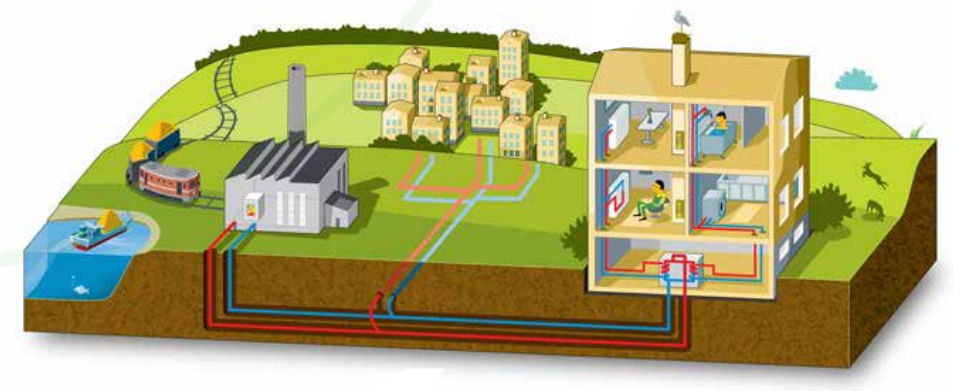
In order to reduce primary energy demand and $CO_2$ emissions, District Heat generation is often based on heat recycled from mainly CHP Plants, which includes a variety of fuels such as renewables, natural gas and oil. Alternatively it could be surplus energy from Waste-to-Energy plants, other power plants or industries. The positive economic and environmental benefits are shown in below illustration.




*Source: IDEA*

DESMI have been involved with District Heating for approx. 90 years. It means we have developed strong competences to handle a variety of different pump applications.

We are able to provide solutions both for the CHP Plants (or Biomass/Waste-to-Energy Plants) as well as for the transmission and distribution pipe network.



*Source: Kjell Thorsson/Fortum*

DESMI's extraordinary experience as manufacturer and supplier of high quality pump solutions for district heating is an important resource for the innovative research programme "4th Generation District Heating Technologies and Systems", known as 4DH.

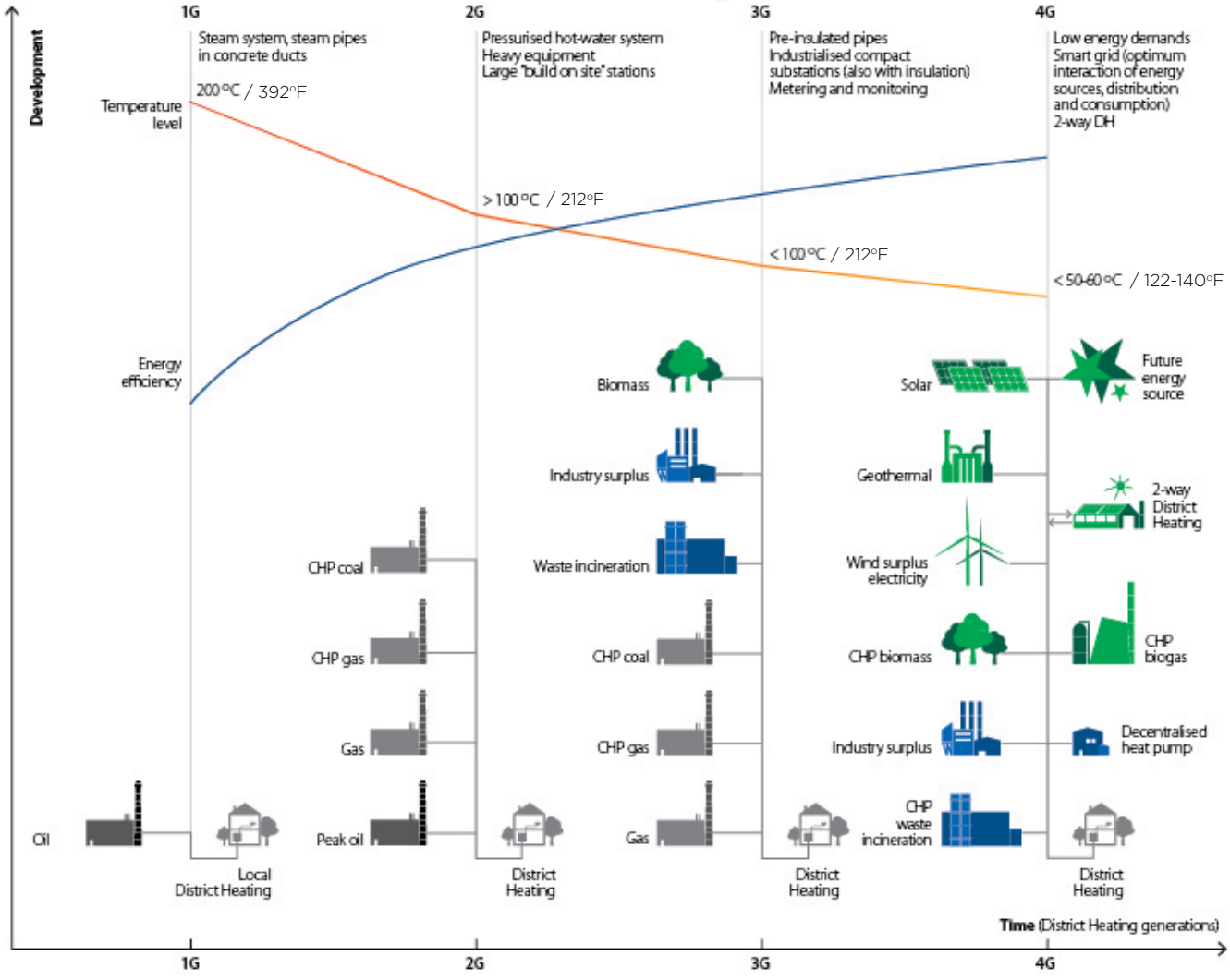
4DH is an international research centre supported by The Danish Council for Strategic Research. Such development is fundamental to the implementation of the Danish objective of being fossil fuel-free by 2050 as well as the European 2020 goals. Research period currently funded 2012-2018.

Stakeholders for this research include Aalborg University, Danish District Heating Association, leading Danish consulting engineers, leading district heating utility companies in Denmark, and a handful of leading component/system manufacturers/ suppliers, including DESMI a.o.

The research is about creating an optimum energy saving, district heating system, which include supply of low temperature heat (down to 55°C / 131°F) through pre-insulated piping network.

Key parameters include: Low energy demands, reduced heat loss & optimum interaction energy source, distribution and consumption.

See also www.4dh.dk




*Source: Danfoss/4DH*

# COMBINED HEAT & POWER PLANTS

There is an almost unlimited number of solutions, i.e. utilizing heat and power from Incineration/Waste-to-Energy Plants, Biomass Fueled Boiler Plants, Geothermal, Solar Heat etc.

DESMI has strong experiences with the supply of various pump applications to these kind of plants.

In Combined Heat & Power Plants there are both water and steam based pump applications.

DESMI's solutions cover mainly the water based applications. Temperature levels in general below 150°C / 302°F and pressure ratings up to a maximum of 25 Bar / 363 psi.

# Combined Heat & Power Plant

Cogeneration or Combined Heat & Power (CHP) is the use of a heat engine or power station to simultaneously generate electricity and useful heat.

Cogeneration is a thermodynamically efficient use of fuel. In separate production of electricity, some energy must be discarded as waste heat, but in cogeneration this thermal energy is put to use.

All thermal power plants emit heat during electricity generation, which can be released into the natural environment through cooling towers, flue gas, or by other means. In contrast, CHP captures some or all of the by-product for heating as hot water for district heating with temperatures ranging from approximately 80 to 130°C / 174 to 266 °F.

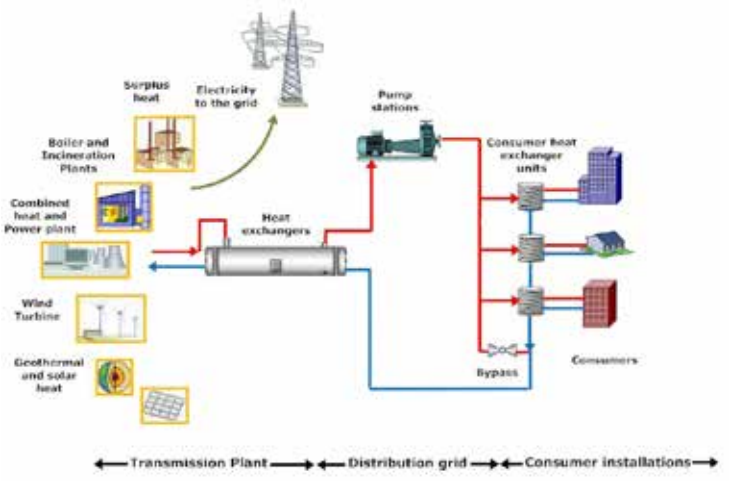
The supply of high-temperature heat first drives a gas or steam turbine-powered generator and the resulting low-temperature waste heat is then used for water or space heating as described in cogeneration.

At smaller scales a gas engine or diesel engine may be used. Tri-generation differs from cogeneration in that the waste heat is used for both heating and cooling, typically in an absorption chiller.

The increased focus on sustainability has made CHP more attractive, as it substantially reduces carbon footprint compared to generating steam or burning fuel on-site and importing electric power from the grid.

Denmark has a leading role within this technology as more than 60% of heating in Denmark comes from District Heating. This heat very often originates from Combined Heat & Power Plants.Over recent years many foreign delegates have visited Denmark to learn from the Danish experience, bringing with them technology for the Danish manufacturers and/or solution providers.

*Thermal Power Plant*



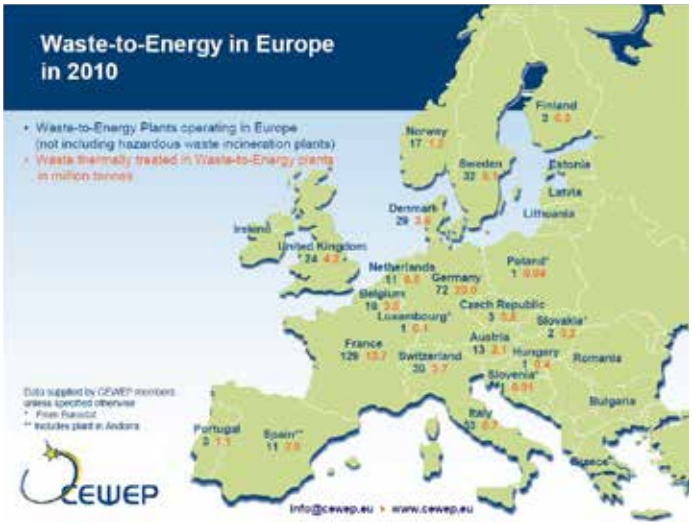

With DESMI's headquarter located in Denmark, the local authorities drive for innovative solutions which has helped DESMI to focus on developing energy efficient pump solutions for this industry. We are today seeing our pumps being installed all over the world within this business sector – i.e. on projects in Denmark, Sweden, UK, The Netherlands, Mongolia, China etc.

# WASTE-TO-ENERGY PLANTS

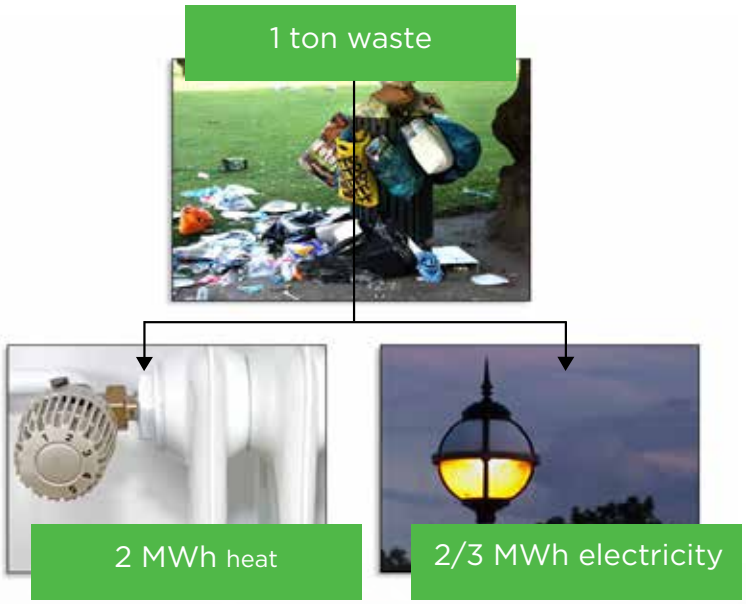
*AffaldVarme Aarhus, Waste-to-Energy Plant.*

Energy recovery from waste is a very good idea: 1 ton of waste can be converted to 2 MWh heat and 2/3 MWh electricity.

In Denmark alone more than 3.5 million ton of waste is being incinerated every year. It is one of the most popular ways to create heat and electricity and there is a strong trend to build a lot more Waste-to-Energy Plants around the world for obvious reasons such as environmental as well as financial.




*The illustration shows the use of Waste-to-Energy Plants in Europe as it was in 2010*




## High efficiency and big savings

As an example: In May 2013 DESMI delivered an NSLH pump to AffaldVarme Aarhus (The WtE plant in the second largest city of Denmark, providing District heating for a population of approx. 285.000 people). The pump was chosen on the basis of three parameters:

- High efficiency and thus better operating economy. DESMI's solution brought an energy saving of 224,000 kWh per year compared to the previously used pump
- Easy access for maintenance as the pump is mounted on the motor, which means that there are no bearings other than those in the motor.
- A fair and competitive price

Since the pump mentioned was supplied – DESMI have in the spring 2014 obtained orders for 17 more large pumps from this client

# POWER GENERATION

DESMI's experience with power plants is partly connected to Denmark's leading position with Combined Heat & Power Plants (Co-generation) as well as Waste-to-Energy Plants, Biomass Plants etc.

We have energy efficient pump solutions available for almost all hot water and cooling applications in such plants. This brochure aims to give you some practical examples of our experience.

In conventional power plants, primary system applications include boiler feed pumps, condensate pumps, cooling water circulation pumps, loop systems pumps and wide range of utility applications.

Secondary Systems Applications can include fuel transfer pumps, lubricating pumps, service water pumps, injection pumps for water treatment, cooling applications and storage systems.

In addition to our range of centrifugal pumps we also offer our ROTAN® positive displacement gear pumps to handle more viscous media (i.e. for fuel related applications).

# DESMI has for example replaced pumps in Power Plants around the world

*The Helius CoRDe Ltd Plant, Scotland.*

*The Rabigh IPP Oil Fired Power Plant, Saudi Arabia.*

Combined Heat & Power Plants / Waste-to-Energy Plants / Biomass Boiler Plants / Solar Heating Plants:

- Denmark - Vestforbrænding, Waste-to-Energy Plant, Copenhagen.
- Denmark - Nordforbrænding, Waste-to-Energy Plant, Copenhagen.
- Denmark – AffaldVarme Aarhus. Waste-to-Energy Plant, Aarhus
- Denmark – Dronninglund Solar Heating Plant.
- Denmark – VEKS Combined Heat & Power Plant, Copenhagen.
- Denmark – Skanderborg-Hørning Biomass Boiler Plant
- The Netherlands - WKC Almere Power plant, Nuon Energy (Vattenfall)
- The Netherlands - Pumerend Biomass Boiler Plant, 44 MW
- China - Zunhua Power and Heating plant (160 km / 99 miles east of Beijing)
- Mongolia - Thermal Power Plant No. 2 – Ulaanbataar
- UK - The Helius CoRDe Ltd Plant – Biomass Fueled. Rothes, Speyside - Scotland

Other Types of Power Plants:

- UK - Pulrose Power Station, Isle of Man
- Saudi Arabia - Rabigh IPP Oil Fired Power Plant, 2 x 660 MW (ACWA Power /KEPCO/SEC).
- China - TianWan Phase 3 & 4 Nuclear Power Plant China National Nuclear Corporation/ Alstom. 2 x MW 1060
- Lebanon - Zouk and Jiyeh Diesel Combined Cycle (DCC) Power Plants, near Beirut. Total MW 272 (194 MW and 78 MW respectively)

# DISTRICT COOLING

District Cooling is an efficient and environmentally friendly utility service, which provides chilled water from a centralized cooling plant (or cold water from the sea) through a network of pipes to multiple residential, industrial and commercial buildings for air conditioning purposes.

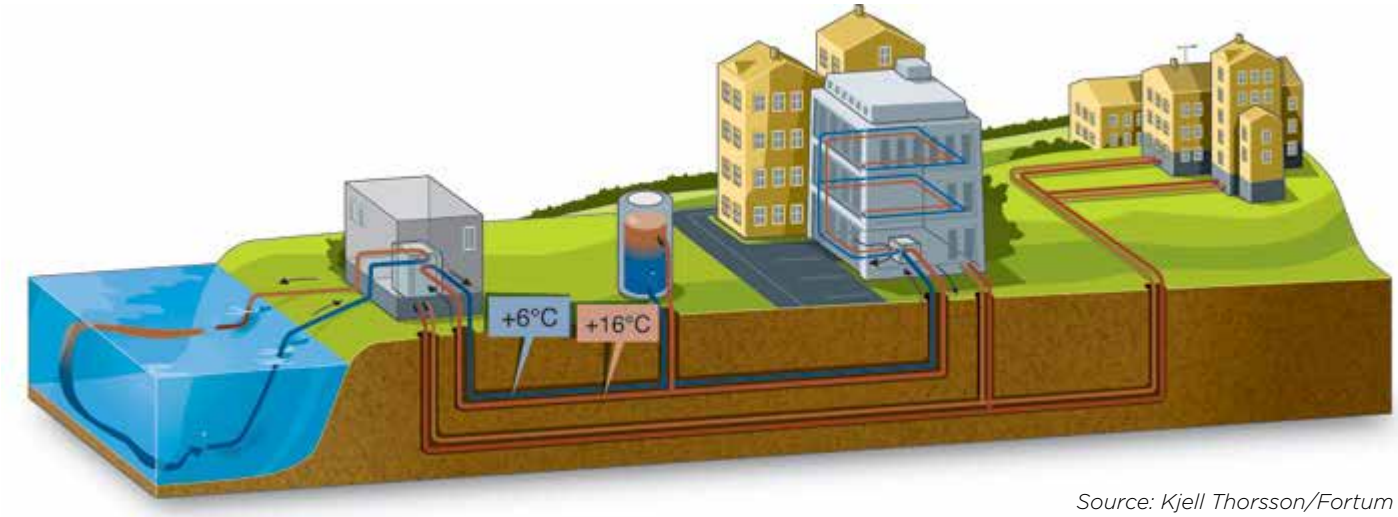
District Cooling is simple and clean. It creates a cool, efficient indoor climate, without the need for bulky refrigeration equipment and noise in or near residences. The supply is assured year-round with minimal maintenance needed, which is reflected in reduced operating costs and lower investment requirements. Cooling water originates from either:

- Free cooling and pre-cooling (seawater)
- Absorption cooling (e.g. steam)
- Compressor-based cooling

The following are just a few of the numerous benefits of using District Cooling:

- Increased energy efficiency
- Better quality of cooling
- Reliability in the excess of 99.9%
- Reduction of noise by eliminating the need for chillers in buildings (i.e. roof tops)
- No mould growth due to effective humidity control
- Significantly reduced air pollution/decreased emissions of ozone-depleting refrigerants
- Minimum maintenance requirements, more privacy and security
- Better building aesthetics - no bulky outdoor equipment. Therefore, more consideration given to the built environment
- Freeing up of rooftops/outdoor space
- Average industrial equipment lifespan is 30 years versus 15 years for commercial equipment
- District Cooling systems consume far less energy than chillers
- Higher energy utilization and reduced energy consumption
- Enables owners to conserve energy, improve operating efficiency and protect the environment while simultaneously lowering government spending by reducing electricity infrastructure
- Typical supply/return temperatures vary between 4-6/13-16°C / 39-43 / 55-61°F

DESMI provides pumping solutions both for water intake (e.g. seawater), centralized cooling plants as well as the piping network.




*Source: Kjell Thorsson/Fortum*

# DESMI has in excess of 140 years' experience in the manufacture of pumps

Denmark is recognised for being a global leader within District Heating as well as District Cooling, due to extensive use in Denmark (today more than 60% of total energy used for heating originates from District Heating).

This has assisted us at DESMI in becoming a premier technology supplier in this field. Creation of pump solutions for District Heating goes back approx. 90 years and remain market leaders, developing new technologies and solutions e.g. 4th generation (low temperature) District Heating, among others.

Since District Cooing is built on similar philosophies as District Heating, it has been a natural progression for DESMI to develop pumping solutions for District Cooling.

- We provide energy efficient pumps and pump solutions.
- We adapt our pump solutions to specific customer requirements.
- We supply competitive solutions, technically as well as commercially.
- The pump designs are based on DESMI Proven Technology from many years of experience within District Energy.
- We supply flexible solutions also related to motor specifications as well as other accessories, such as frequency converters etc.
- Robust construction assists with providing solutions for many different types of application (long life cycle).
- DESMI is a medium sized manufacturer with a high level of production flexibility and full focus on customer solutions.
- Our pump solutions range from the medium to larger sized applications – where knowhow and flexibility to individual project requirements are essential.
- DESMI is a global company and are close to their clients/partners, we provide maximum understanding supported by effective after-sales service.
- DESMI's extensive experience with marine pumps means we are a leading supplier for seawater applications, which includes S.W. cooling (as we have our own foundry for such requirements).

In conclusion DESMI's pump competences include solutions for District Cooling Plants, Transmission & Distribution Networks etc.
Pressure ratings up to 25 bar / 363 psi.


DESMI NSL


DESMI NSLV


DESMI DSL


DESMI ESL

DESMI NSLH

# YOUR COMPETENT PARTNER

DESMI's Utility Division is responsible for providing energy efficient pump solutions into District Cooling, District Heating, HVAC and Power Generation applications a.o.

The HVAC/Cooling arena include cooling applications to buildings such as: Scyscrapers, datacenters, hotels, shopping malls, airports, convention centres but also more industrial applications with cooling towers etc. The pump solutions from DESMI mainly cover the medium and larger pump sizes.

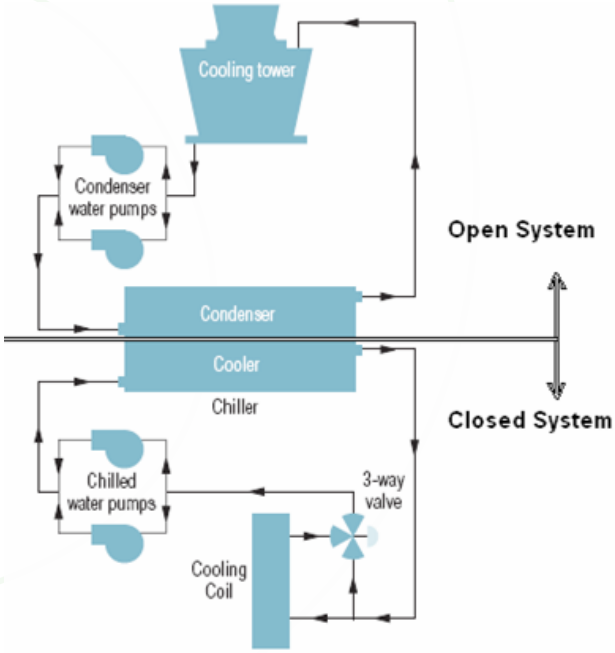
It sometimes connects/overlaps with District Cooling networks and Chiller Plants for distribution of cooled water to whole areas of a city, industrial areas etc. The cooling as well as the heating part of DESMI's HVAC range also relates to DESMI's active involvement with District Energy over the past 90 years, an area where we have strong competences on a vast number of pump applications. DESMI's competences includes pumps for both open and closed systems, as per the illustration to the right.

On our website and in our brochures for District Energy, Power Generation etc. you can find a number of case stories to showcase our competences built over more than 140 years of pump manufacturing at DESMI.

Our focus at DESMI is to provide pump solutions with optimum energy efficiencies, which can help reduce pollution and save resources for the authorities and consumers.

DESMI undertakes full control from R&D to the final supply of fully tested products. We have our own foundry, own factories and takes pride in supplying the reknowned quality DESMI products.

Today DESMI have employees in approx. 25 countries around the world – and we have dedicated, competent partners/distributors in many other countries. DESMI is a company in growth still expanding significantly into wider geographical areas as well as continued R&D investments in an ever stronger product portfolio. So we want to be your competent partner for pump solutions, A company capable of adding value to your business




CHILLED WATER SYSTEM

# DESMI Supply to Large HVAC Contract in Vietnam

Lotte Center Hanoi is a skyscraper in Hanoi, Vietnam, completed in 2014. The tower has 65 floors and features a modern architectural style.

The tower is one of the highest buildings in Vietnam – and it includes offices, entertainment complex, shopping mall and a convention center.
The project budget was USD 400 million.

DESMI supplied 68 nos NSL centrifugal pumps for HVAC applications on this project: NSL100-330, NSL125-330, NSL150-330, NSL200-330, NSL250-330, NSL300-415 & ESL50-180



DESMI NSL

*Courtesy Doul International, LTD. Architects & Consultants*

# DESMI Supply to Datacenter in Amsterdam

DESMI have supplied 6 nos NSL250-330 pumps for cooling a datacenter for the plant AMS 2 with Telecity in Amsterdam.

Interxion's Amsterdam carrier- and cloud-neutral datacentres provide highly secure, scalable infrastructure for mission-critical IT systems, with a wide range of connectivity solutions.

The campus supports the latest high-density power configurations and has been designed using energy-efficient modular architecture.

The entire facility infrastructure is monitored 24/7 (chillers, CRACs, fire panels, generators, UPS, etc.) and built with use of sustainable energy such as free cooling, ground water cooling and waste heat re-use, but never at the expense of reliability and availability.

The Amsterdam datacentres use 100% certified green power from biomass, wind and water. The facility environment is continuously monitored to constantly improve efficiency.

The facility mentioned consist of a 746 $m^2$ of data servers. The DESMI pumps have been installed in 2007 without any downtime and running continuously since then, as endorsed by the client (April 2014).

# LAND-BASED SPRINKLER SYSTEMS

DESMI offers dimensioning and guidance when complete units for fire protection, including electronic control, are supplied. All solutions are in accordance with national as well as international fire-fighting regulations.

The units can be supplied as a permanent containerized solution or as a transportable unit.

### Transportable pump units

Pump and motor/engine are built together in a compact unit which is easy to transport. Most common is the use of self-priming pumps. The pump can be fitted with electric motor or diesel/petrol engine together with battery and fuel tank. Transportable pumping systems are also available in explosion proof design.

### Complete container solution

The complete sprinkler or fire-fighting system can be supplied in a container with all internal pipings lead via bulkheads through the container wall for connection to supply and pressure line.

### Sprinkler pumps with electric motor or diesel engine

The complete unit can be supplied on base plate. Further, as the pumps are also designed for diesel duty, they can be built-together with electric motor or diesel engine. Pump and motor are fitted on base plate via a flexible coupling.

The base plate is well-dimensioned, precisely levelled and ready for simple and quick on-place mounting. Further the complete unit is fitted with fuel tank and start batteries.

### Electronic control unit

A complete sprinkler system includes an electronic control panel. The panel is connected to the pressure switch in the piping system and it automatically starts the pump system when it receives a pressure drop alert.

# LEISURE INDUSTRY

- ✓ HIGH EFFICIENCY
- ✓ 25% EXTRA FLOW
- ✓ OPERATIONAL RELIABILTY
- ✓ CONSIDERABLE KW SAVINGS
- ✓ LONG LIFE WITHOUT CORROSION


### $CO_2$ consumption significantly reduced

DESMI has many years of experience in the swimming pool/public baths (aqua parks) industry and to ensure low energy consumption and pumps with high efficiency levels, we have developed new, highly effective, all bronze swimming pool pumps at reasonable prices.

### Bronze is the best material

The choice of all bronze is very deliberate. Bronze is definitely the best material when it comes to pumping chlorinated water. The efficiency remains virtually unchanged throughout the pump's lifetime, and since it is substantially higher for the new pumps, in many cases, a smaller pump can be utilised, which gives additional savings.

The savings are not only in the cost calculation, but also in the environmental aspects (power consumption and $CO_2$). We read and hear about it every day, and we all need to take responsibility.

With the new, highly efficient all bronze swimming pool pumps, there is much to save in terms of kW consumption and thus also $CO_2$.

### DESMI has e.g. supplied for these projects:

- Denmark – Scandinavian Water Slides, Helsingør. PVLN pumps a.o.
- Denmark – Fakse Svimming Pool. PVLN pumps a.o.
- Denmark - Fjord & Bælt Centret, Kerteminde. NSL centrifugal pumps

## Our dedicated global DESMI Service Team delivering local service


The efficient and reliable operation of DESMI products is a requirement of both the customer and DESMI. In this regard, the DESMI Service Team can support and enhance these operations on a global scale.

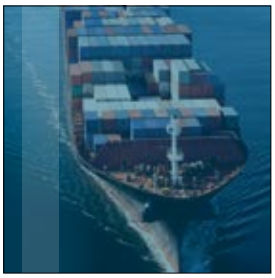
The DESMI Service Team are all factory-trained and available to answer both your technical and practical demands.

The DESMI Service Team can also offer customized programmes to meet specific client requirements and be your partner of choice. In case of emergency breakdowns, we can send over pumps and equipment within 48 working hours or access our global parts database and have the equipment operational in the shortest possible time.

DESMI Service Team supports a working culture based on an appropriate respect for health, safety and environmental issues.

DESMI is a global company specialising in the development and manufacture of pump solutions for marine, industry, oil spill combating, defence & fuel and utility both locally and globally. Our product range - supplemented with agency products from other leading world-class manufacturers - is complemented by related services such as the design and installation of pumping systems, oil spill recovery packages, and a first class after-sales service which can include full technical support, commissioning and product training.

DESMI equipment is sold to more than 100 countries via a network of subsidiaries and distributors on six continents.



## MARINE & OFFSHORE

Thousands of DESMI pumps are at work on the seven seas, and these pumping solutions are living proof that our customers are satisfied with the performance of our products. For more than 50 years we have supplied marine pumps to the world's fleet - from the largest container ships to the smallest fishing vessels. Regardless the size of the ship we know the owners' demands for many years of trouble-free operation. In recent years we have also taken on the supply for offshore installations worldwide.

## INDUSTRY

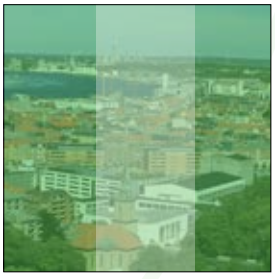
The key factors in all areas of the process industry are reliability, productivity and performance of the production plant. These are precisely the parametres addressed by the DESMI range of products, systems and services for the industry segment.

## OIL SPILL RESPONSE

The oil spill response solutions from DESMI are trusted in the industry. Whether your requirement is for offshore or the shoreline area; the Arctic or Equatorial environment, we continue to deliver proven solutions for all spill conditions – and we offer the very best life cycle costs.

## DEFENCE & FUEL

Utilising products from other world class equipment suppliers to compliment the extensive DESMI pump range, DESMI design and build liquid handling solutions used by military forces around the globe. Based on many years experience with systems suitable for working in austere conditions and environments we provide total liquid management – from project management and systems integration to procurement and logistics planning.



## UTILITY

DESMI provides pumps and pump solutions for the supply of district heating/cooling and wastewater (focus on Danish market) etc. Operational reliability, energy optimization and service-friendliness are essential headlines for a business that services cities, buildings and not least, people.

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