

Energy Efficient Pumps and Pump Solutions for District Cooling

PROVEN TECHNOLOGY



District cooling follows a simple process:

- Water is chilled at a central cooling plant (or taken from the sea).
- Chilled water is pumped through a network of underground pre-insulated pipes to customers' buildings.
- An air-conditioning water system inside the customers' building circulates the chilled water.
- Air is then pumped through the chilled water piping of the air-conditioning system producing cold air.

District Cooling is 40% - 60% more energy efficient than conventional systems - and reduces CO₂ emissions.

If District Cooling were to expand to 25% of the cooling in Europe, 42-50 million tons less CO₂ would be released into the atmosphere each year.

Source for front page: Kjell Thorsson/Fortum



About DESMI

DESMI is a leading, international manufacturer of pumps and pump solutions.

We are one of the most experienced industrial companies in Denmark, established back in 1834 - as a foundry in Aalborg, in Northern Denmark.

Today we are a modern international group with a global presence. We take pride in being in full control of our product quality - with our own factories, R&D department as well as service workshop facilities.

DESMI has produced pumps since the 1870s. Today we are focusing on pump solutions for Marine & Offshore, Industry, Oil Spill Response, Defence & Fuel, District Energy and other utility applications.

We are specialists in providing energy efficient pump solutions with minimum maintenance requirements as well as a long life cycle.

All our manufacturing processes are in accordance with the ISO 9001:2008 quality certification requirements as well as the specifications of our customers.

DESMI provides competitive pump solutions both commercially as well as financially. This requires continuous investments into R&D and currently (2014) we are implementing a larger product development in order to increase our pumps' energy efficiencies even more.

We are also an active stakeholder in new, innovative research in what is called 4th Generation District Heating - by creating proven and more efficient technology for a more energy efficient solution.

In 2014 DESMI received the "Net Member Award" from the Danish Export Association. The award is given for quick implementation of an innovative business concept, big commitment in networks both nationally and internationally, and high growth in exports.



An efficient and environmentally friendly utility service, District Cooling is simple and clean

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:

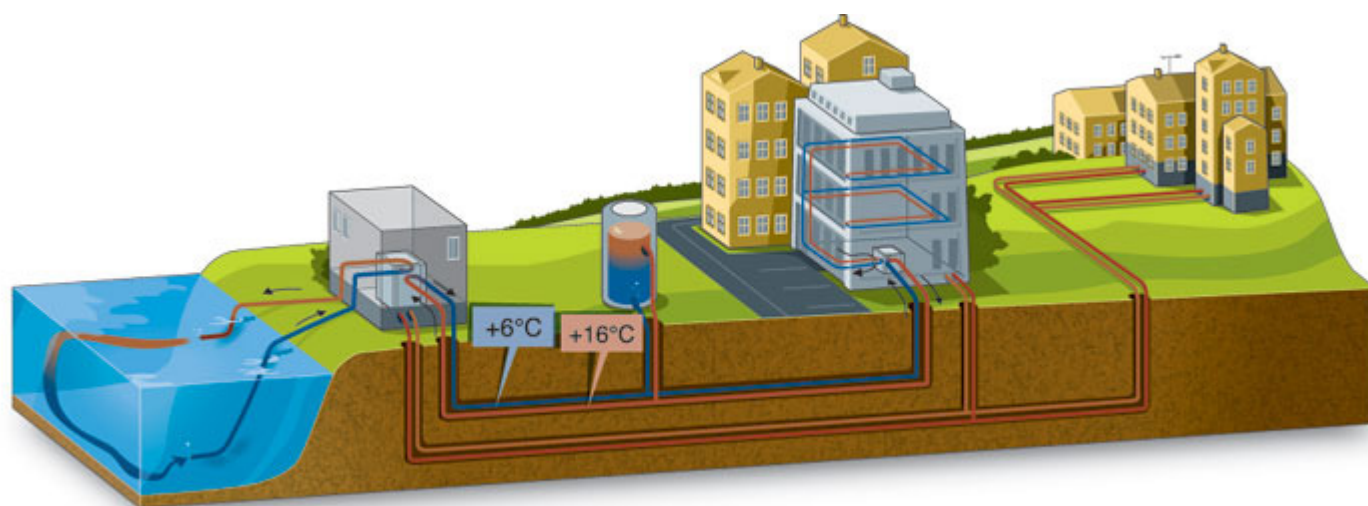
- Free cooling and pre-cooling (seawater)
- Absorption cooling (e.g. steam)
- Compressor-based cooling

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

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 unique pump manufacturing experience - more than 140 years in fact

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).

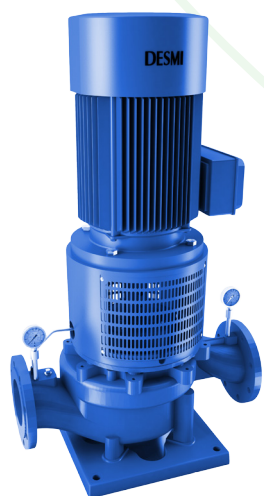
This has assisted us at DESMI in becoming a premier technology supplier in this field. Creation of pump solutions for District Heating goes back approx. 90 years and remain market leaders, developing new technologies and solutions e.g. 4th generation (low temperature) District Heating, among others.

Since District Cooling 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.



DESMI NSL



DESMI NSLV



DESMI DSL



DESMI NSLH



DESMI ESL

Greater Copenhagen Utility district cooling plants at: “City square” & “Adelgade/Kgs. Nytorv”

HOFOR has the English name “Greater Copenhagen Utility”.

District cooling concepts with HOFOR:

- In the winter months, production of cooling is by seawater, which is brought into the cooling system by a pipeline from the harbour. Production is totally free of CO₂ emission and is called free cooling.
- The seawater is not cold enough in the summer months to cover the whole cooling demand. Therefore, surplus heat is used to produce cooling as well. This method is called absorption cooling.
- A compressor cools the seawater (as support when peak demand is very high and the capacity of surplus cooling is too low). The main part of HOFOR's cooling production is based on “free cooling” and these compressors are only used in very high demand periods.

DESMI has supplied pumps for the “free cooling” part of HOFOR district cooling system. This method relies on a small amount of electricity to distribute the cooling to the customer.

Furthermore, it secures a reliable delivery of cooling to the customer versus a decentralised cooling

set-up. DESMI has extensive experience in seawater pumps due to supplying marine pumps for moer than 100 years.

DESMI has supplied pumps for the two stations HOFOR has established (The first of its kind in Denmark).

City Square Pumping Station:

- 3 Nos. DSL 300-320C/D-F + 200 kW 4 pole motor (inline pumps in bronze + duplex impeller) - Duty point 1250 m³/h, 35 m.
- 1 No. NSL 150-330/E02 + 75 kW 4 pole motor (inline pumps in bronze + duplex impeller) - Duty point 400 m³/h, 35 m.
- 1 No. NSL 100-215/E02 + 4 kW 4 pole motor (inline pump in bronze + duplex impeller) - Duty point 50m³/h, 14 m.

Adelgade (Kgs. Nytorv) pumping station:

- 6 NSLV 300-415/E02 + 160 kW 4 Pole motor (end suction pump in bronze + duplex impeller) with priming pump 114N - Duty point 625 m³/h 36 m.



District cooling Zuidoost Lob Amsterdam

Nuon, part of Vattenfall, is a leading energy company that generates electricity and produces gas, heating and cooling, which it supplies to approximately 2.2 million households, companies and organizations in the Netherlands.

In 2009 DESMI supplied some of our energy efficient pumps to Nuon for a district cooling project in the south area of Amsterdam. Capital Cooling from Sweden did the engineering.

The DESMI pumps supplied (NSL 300/525/A02-I complete with 630 kW 3 x 690 Volts 1800 rpm e-motors) are used to distribute lake water to the heat exchangers in the production plant.

In February 2010 the cooling plant was ready to start up the district cooling pumps and we were invited to be present at the commissioning - from where the photos shown were taken.

The Nieuwe Meer (from where the cooling water originates) is deep and the water in the lower layers of the lake is always cold (6-8 °C) making it a large, cold water reservoir.

Nuon (Vattenfall) utilises the cold water from the lake and brings it to buildings and datacentres (DESMI also supplied pump solutions to some of these) in the Zuidas region. This method of cooling is a natural and inexhaustible source and therefore very sustainable. It leads to a substantial reduction in CO₂ emissions, which DESMI is proud to be a part of.

The supply of very large pumps for a technically demanding project has given DESMI valuable experience and another very strong district cooling reference. Not at least because Amsterdam, with a population of 750,000 inhabitants in the city and 400,000 households is a very "green" community with high standards.

By 2020 a population of 100,000 will be connected to District Energy in Amsterdam. Total capacity of District Cooling to reach MW 120.



Dubai Metro - District Cooling, UAE - Case Story



The Dubai Metro is the world's first district-cooled mass transit system, according to Stanley Consultants.

A distribution network provides centralised cooling via pre-insulated, buried steel piping to all Dubai Metro stations. Five district cooling plants were built specifically for the Dubai Metro, with the following installed capacities:

- Al Rigga 10,000 TR
- Al Barsha 7,500 TR
- Jumeirah Island 7,000 TR
- Jebel Ali Industrial 4,400 TR
- Al Rashidiya 7,500 TR

A total of 52 km of piping was needed for the district cooling network.

DESMI pumps were installed for air cooling purposes in some of Dubai's metro stations mentioned above.

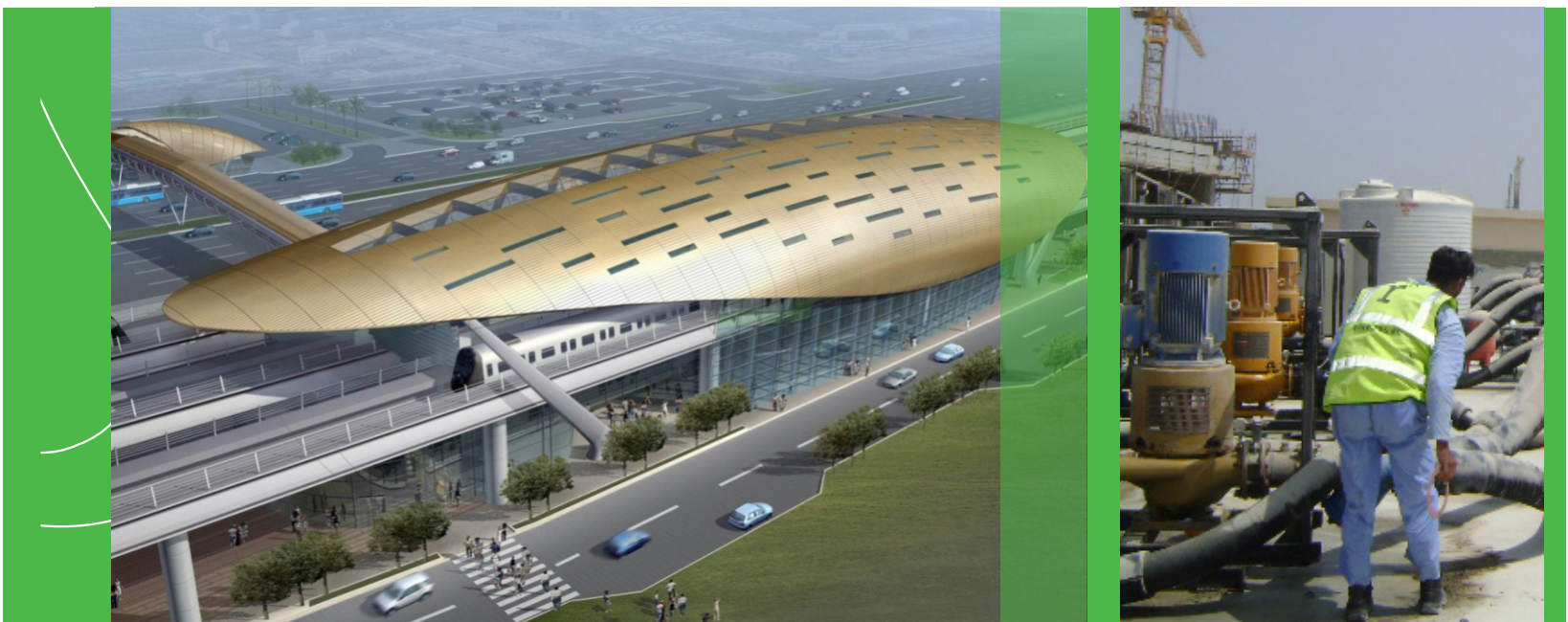
DESMI model NSL 125-330 with a capacity of 162 m³/h at 35 mLC were chosen for the installation.

The pumps are mounted with 30 kW motors.



DESMI NSL125-330

Stanley consultants, who designed the project, emphasized that district cooling was particularly suited to the Dubai Metro. Not only did it reduce the electromechanical areas inside the stations but it also reduced the total power consumed by 30 - 50%. This, in turn, reduced the total carbon footprint of the project. It also reduced the noise and vibration, as opposed to the alternate stand-alone solution of having roof-top air-cooled chillers and pumps.



Dubai Metro

Korea - Cooling Application for Doosan Heavy Industry Factory



Name of Scheme: "The improvement of System 6 of Doosan Heavy Industry Co".

Doosan is one of Korea's foremost EPC contractors for plant projects inside or outside Korea. They fabricate, cast and compress metal materials needed by industry. Their business system creates consistency across all of Doosan's businesses, maximizing the efficiency and driving the performance-based culture. That is exactly why DESMI were asked to conduct a survey based on the supply on 9 DESMI NSL centrifugal pumps.

The installation of the NSL pumps from DESMI in place of previously installed pumps of another brand brought Doosan Heavy Industry the following benefits:

- A significant 35% annual energy saving in electricity costs due to more efficient DESMI pumps.
- A flow increase of 18%, due to the higher flow capacity of DESMI pumps.
- A 50% space saving, due to DESMI pumps being more compact.
- A noise reduction of approx. 15% by using the DESMI pumps.

The survey concluded that the new DESMI pumps had a far better energy efficiency, involved less maintenance costs, saved important floor space and were easier to install. Now a total of 30 DESMI pumps are in operation within the factory.

Saving Electricity 35%

Noise Reduction 15%

Power Saving 35%

Flow Increase 18%

Space Saving 50%



DESMI has supplied for these District Cooling Projects among others:

A Few Examples on Projects already won by DESMI:

- **Sweden** – Process Pumpar e.g. NSL 80-265, 100-265, 125-330, 150-265, 150-215, 200-265, 250-330, 250-415 centrifugal pumps.
- **Czech Republic** - Renetra NSL pumps.
- **Korea** – Hanyang University – NSL 150-330, 200-330, 250-330, 250-265, 300-415 centrifugal pumps.
- **Korea** - Seoul SemiConductor, Ansan – NSL 125-415, 250-330 centrifugal pumps.
- **Korea** – POSCO Pohang 1 & 2 – NSL 80-265, 250-415 centrifugal pumps.
- **Korea** – Iljin Steel - NSL 200-525, NSLD 300-415 centrifugal pumps.
- **China** – Novozymes Biotechnology Plant, Tianjin DSL 300-320, 400-495 & NSL 250-265, 250-415 centrifugal pumps.
- **China** – Novenco Hi-Pres Air Handling Equipment (WUXI) Co. Ltd, PVLN/ESL centrifugal pumps.
- **India** - LaurusTecnico Energy & Utilities Solutions Company, e.g. NSL 80, 100 etc.
- **The Netherlands** - TeleCity Group Amsterdam data centres 6 x NSL 250-330 B02 4 x 45 kW and 2 x 90 kW
- **Hong Kong** – HGC Waston Data Centre.

DESMI is a member of the following DC related associations:

- International District Energy Association (IDEA).
- UK District Energy Association (ukDEA).
- China District Heating/Cooling Association.
- Germany District Energy Association (AGFW)
- Danish Board of District Heating & Cooling (DBDH).
- State of Green, Denmark.
- Danish Energy Industries Federation (DI Energy)
- Lean Energy Cluster, Denmark (CLEAN)



DESMI Pump Solutions - District Cooling

Vertical & Horizontal In-Line and End Suction Pumps



DESMI NSL

DESMI DSL

DESMI ESL

DESMI NSLV

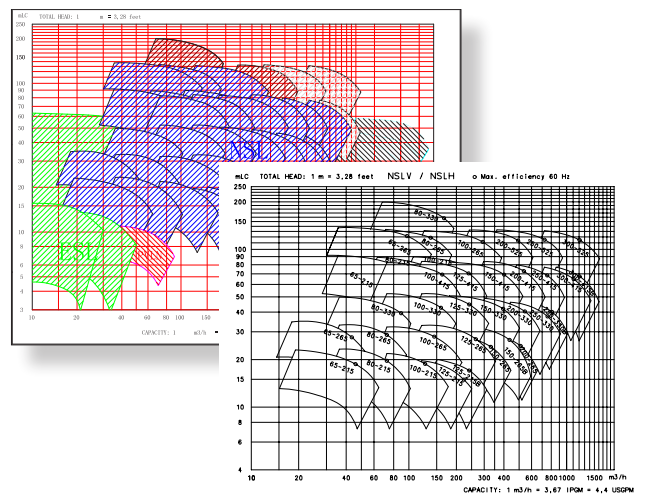
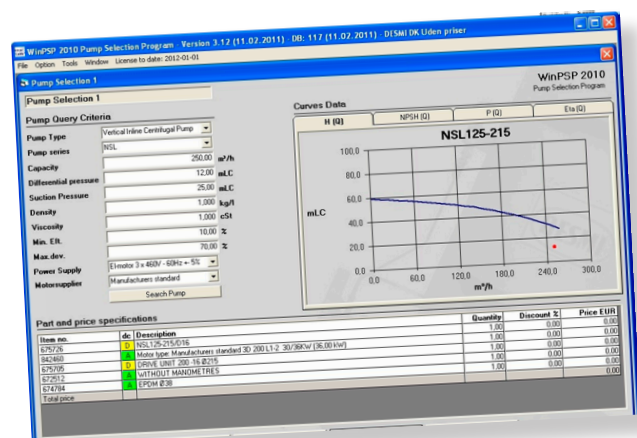
DESMI NSLH

Pump selection programme available for download

All centrifugal pumps can be selected by our DESMI Pump Selection Programme called WinPSP. The program is available for download from www.desmi.com

The program can be used by designers, operators, service providers and anybody who wants pump information.

Find curves for existing pumps, obtain GA drawings for initial designs and compare efficiency, motor power, NPSH and other data to select the right pump - Alternatively contact DESMI to obtain the required information.





You can read more about our utility solutions at www.desmi.com or send your email to desmi@desmi.com

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