

Energy Central Bjerringbro District Heating and Grundfos



Re-thinking the energy system

with groundwater aquifer and heat recovery



An resilient cooling solution...

- A solution that reduces the use of fossil fuels
- Provides year round cooling to production equipment
- Provide waste heat from production as a heat energy to local homes and businesses
- Reduce carbon emissions



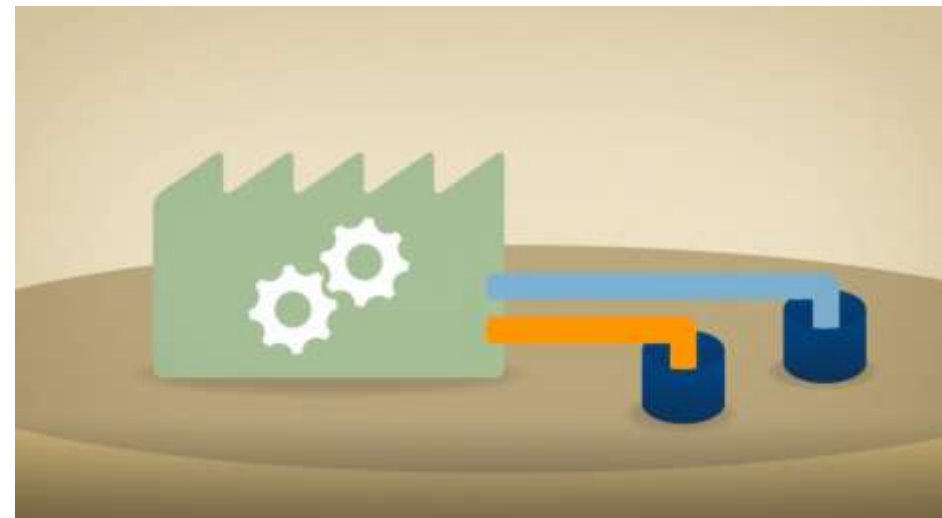
Take when you need...

- September to April waste heat given off by the energy center is used by the Bjerringbro District Heating system.
- During the summer months Energy Central is on standby.



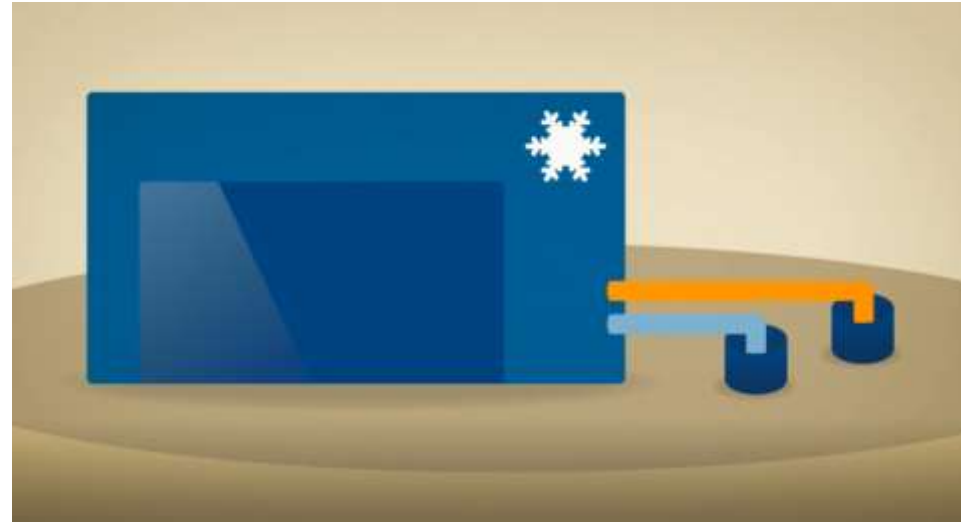
...replace when you can.

- Grundfos draws water from a re-purposed well in town.
- 9° Celsius water from 80 meters below the ground is used for cooling.
- Water is immediately returned to aquifer as indirect heat storage for use in winter.



Recovery is the key to resiliency...

- As summer gives way to autumn the Energy Center resumes delivering cooling to Grundfos and waste heat to local homes and businesses.
- The Energy Center also takes care of cooling the aquifer again so it will be ready to cool the production process the following summer...





140 m2 new ENERGY CENTRAL with refrigerating equipment

1.5 km new pipes under rail, roads and private grounds

2 x 20 feet containers with exchanger and measurement equipment

5 old waterwork boreholes
Rented by Bjerringbro Fællesvandværk

Key numbers for the shared energy centre

Annual cooling output of groundwater cooling for 4 summer months. Groundwater cooling covers cooling consumption 100% of the affiliated factories.	3,500	MWh
Annual heat production of cooling machines. 13,400 MWh covers heat consumption by approx. 750 households, or 15% of Bjerringbro Varmeværk's annual heat production.	13,400	MWh
Annual cooling output of the cooling machines in 8 months. Covering cooling consumption 100% and cooling of the groundwater aquifer.	10,500	MWh
Total investment	34	mdkk
Estimated annual savings	3	mdkk
Total annual reduction in carbon emissions	3,700	Tonnes

Operational expectations

- Cooling water to Grundfos 12 °C (input) 18 °C (outcome)
- Cooling water to groundwater cooling system 12-6 °C (input) and 18 °C (outcome)
- District heating temp. to heating pumps 37 °C
- District heating temp. from heating pumps 67 °C
- Annual cooling production = 10,500 MWh
- Annual production of district heating = 13,589 MWh
- Average COP = 4.4
- Cooling towers, cooling machines and split system must continuously be abolished
- High need of security and backup for cooling systems



Who does what?

- Grundfos invests in a groundwater cooling system and in a new building for heating pumps (a total of 17 million DKK)
- Bjerringbro Varmeværk invests in heating pumps (a total of 17 million DKK) and rents the new Grundfos building
- Each company is responsible for the operation of own facilities
- Business model for sharing of profits



It has been in the papers for the last 30 years....



Key numbers for groundwater systems

Number of drillings	5	Units
Amount of circulated water in ground water systems (max)	705	GPM
Amount of circulated water per. year	400M	gal/year
Groundwater temperature	48.2/9	°F/°C
Cooling capacity before exchange	1,5	MW
Total cooling capacity (4 months of summer operation)	3.500	MWh
Carbon reduction in the entire system (including Bjerringbro Varmeværk)	3700	tonnes carbon/year
Estimated COP value for groundwater cooling	46	COP

Thanks for your attention!

Act
NO**W**
The hidden solutions