



Design of a heat pump heating system with Aquarea Designer



Project: Suomi 1

Date: 5.9.2013

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Phone: (no data provided) Email: (no data provided)

Building data

<i>Address</i>	Esimerkki
<i>Location</i>	Tampere 33xxx (FIN) (from database)
<i>Building area</i>	120 m ²
<i>Standard heating requirement</i>	6.0 kW
<i>Internal gains</i>	3600 kWh/year
<i>Solar gains (windows)</i>	0 kWh/year
<i>Indoor design temperature</i>	21 °C
<i>Outdoor temp. limit for heating 'on'</i>	15 °C
<i>Heat distribution</i>	Underfloor heating by -- % Radiator heating by 100 % Wall heating by -- %
<i>Max. flow water temperature</i>	45 °C
<i>Max. return water temperature</i>	40 °C
<i>Solar collector area</i>	-- m ²

Service hot water

<i>Type of service</i>	Hot water with heat pump
<i>Tank volume</i>	300 Litre
<i>Average daily need</i>	150 Litre
<i>Cold water inlet temperature</i>	10 °C
<i>Target tank temperature</i>	50 °C
<i>Exchange loss</i>	5 K
<i>Electrical auxiliary heating necessary</i>	yes

Rate data

<i>Description</i>	Suomi	
<i>Shut off times total</i>	0.0 h/day	
<i>Weekends with shut off times</i>	yes	
<i>Daytime rate of heat pump</i>	Time for daytime rate 5 - 19 o'clock	11.5 Ct/kWh
<i>Nighttime rate of heat pump</i>	Time for nighttime rate 19 - 5 o'clock	11.5 Ct/kWh
<i>Heat circulation pump(s)</i>	like heat pump: yes	-- Ct/kWh
<i>Heating element for monoenergetic operation</i>	like heat pump: yes	-- Ct/kWh
<i>Heating element for post heating of hot water</i>	like heat pump: yes	-- Ct/kWh

Climatic data

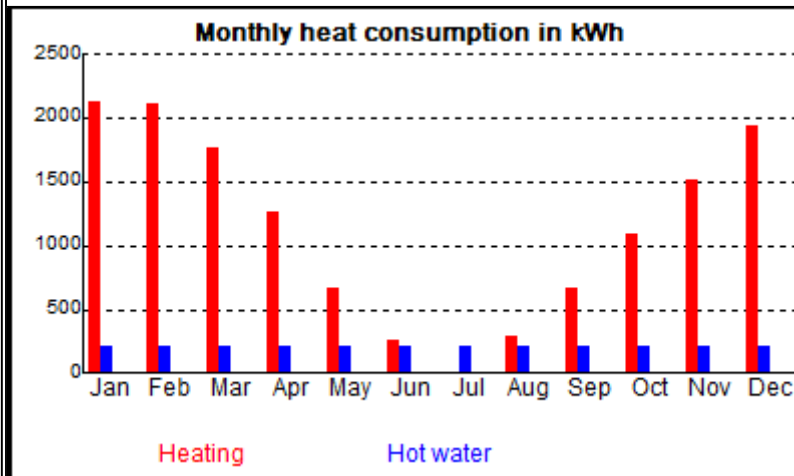
<i>Climatic location</i>	Tampere 33xxx (FIN) (from database)		
<i>Monthly average temperatures in °C</i>			
	<i>Jan</i>	-7.5	<i>Jul</i> 16.0
	<i>Feb</i>	-7.3	<i>Aug</i> 13.9
	<i>Mar</i>	-3.2	<i>Sep</i> 9.4
	<i>Apr</i>	2.6	<i>Oct</i> 4.5
	<i>May</i>	9.5	<i>Nov</i> -0.4
	<i>Jun</i>	14.2	<i>Dec</i> -5.2

Used Panasonic heat pump

<i>Description</i>	WH-SXF12D9E8
<i>Sanitary tank</i>	Nordic Tank 300L
<i>Heat pump type</i>	air / water
<i>Wattage at 2/35</i>	heat: 12.0 kW, electric: 3.5 kW
<i>Recommended flow-through of air</i>	4800.0 m ³ /h
<i>Max. flow temperature</i>	55 °C
<i>Mode of operation</i>	bivalent (parallel)
<i>Design/Bivalent temperature</i>	-20 °C
<i>Number of heat pumps used</i>	1
<i>Wattage of fan</i>	
<i>(included in heat pump performance data: yes)</i>	60 W
<i>Wattage of heat circulation pump(s)</i>	50 W

Calculation results

Monthly heat consumption



Total heat consumption

Heat consumption supplied	Space heating in kWh	Service hot water in kWh
<i>by heat pump</i>	13154	2488
<i>by second heat source</i>	570	34

Power consumption

By heat pump	
<i>for space heating</i>	4097 kWh/year
<i>for service hot water</i>	849 kWh/year

By Oil heating (additional power for non-monovalent mode of operation)	
<i>for space heating</i>	570 kWh/year
<i>for service hot water</i>	34 kWh/year

By auxiliary components

	<i>Fan</i>	
(included in heat pump performance data: yes)		78 kWh/year
	<i>Heat circulation pump(s)</i>	264 kWh/year

Operating time of heat pump

<i>for space heating</i>	1089 h/year
<i>for service hot water</i>	206 h/year

Heat withdrawal from heat source

<i>for space heating</i>	9220 kWh/year
<i>for service hot water</i>	1674 kWh/year

Annual energy costs***Caused by heat producers***

<i>Heat pump</i>	598 €
<i>Oil heating</i>	79 €

Caused by heat consumers

<i>Space heating</i>	538 €
<i>Service hot water</i>	109 €
<i>Heat circulation pump(s)</i>	30 €

Total

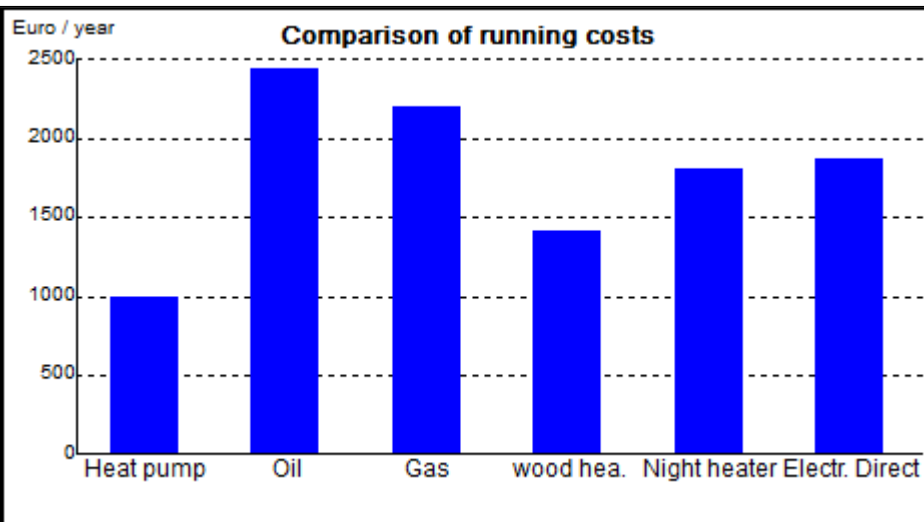
677 €

Annual C.O.P.

3.2 (auxiliary power included:)

Operational costs

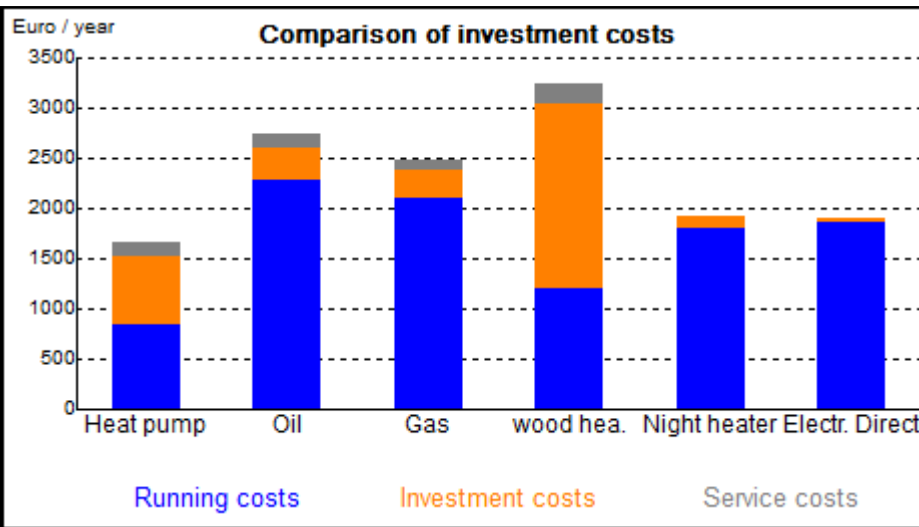
Type of heating	Price in Ct/kWh	Efficiency [%]	Additional costs in €/year	Total costs in €/year
<i>Heat pump</i>			315	992
<i>Oil</i>	11.5	88	265	2439
<i>Gas</i>	10.0	90	350	2207
<i>Electric night storage heater</i>	10.5	100	100	1805
<i>Electric heating element</i>	11.5	100	0	1868
<i>wood heating</i>	5.0	80	343	1410

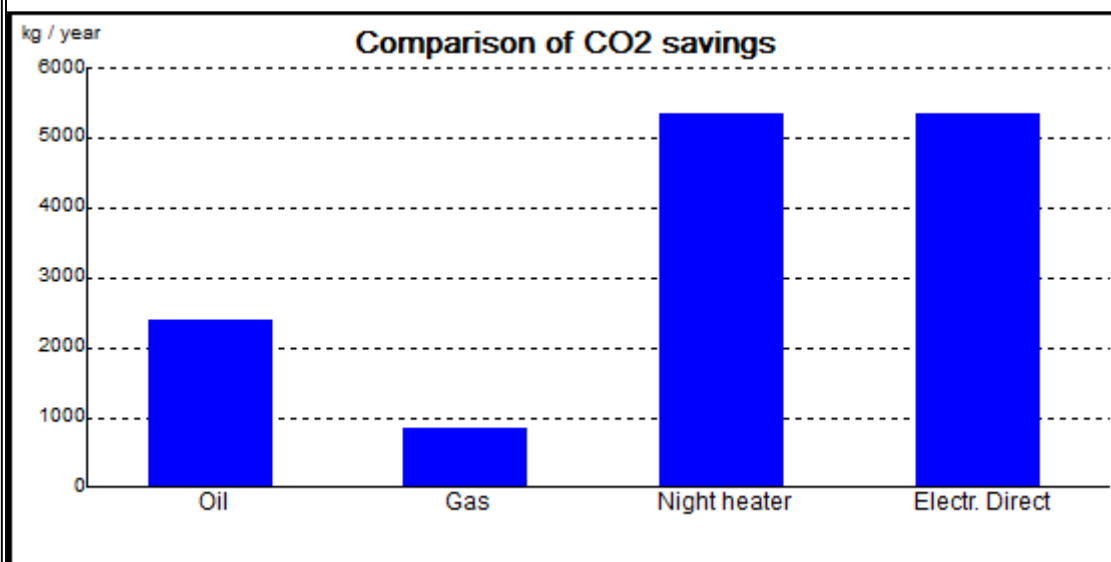
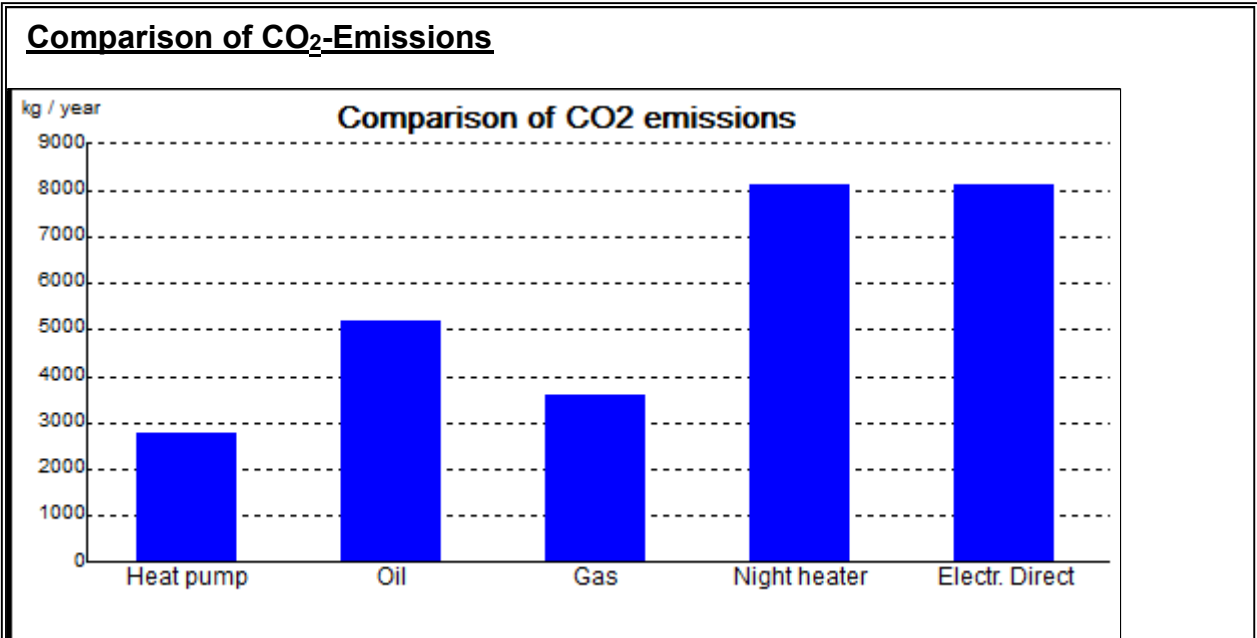
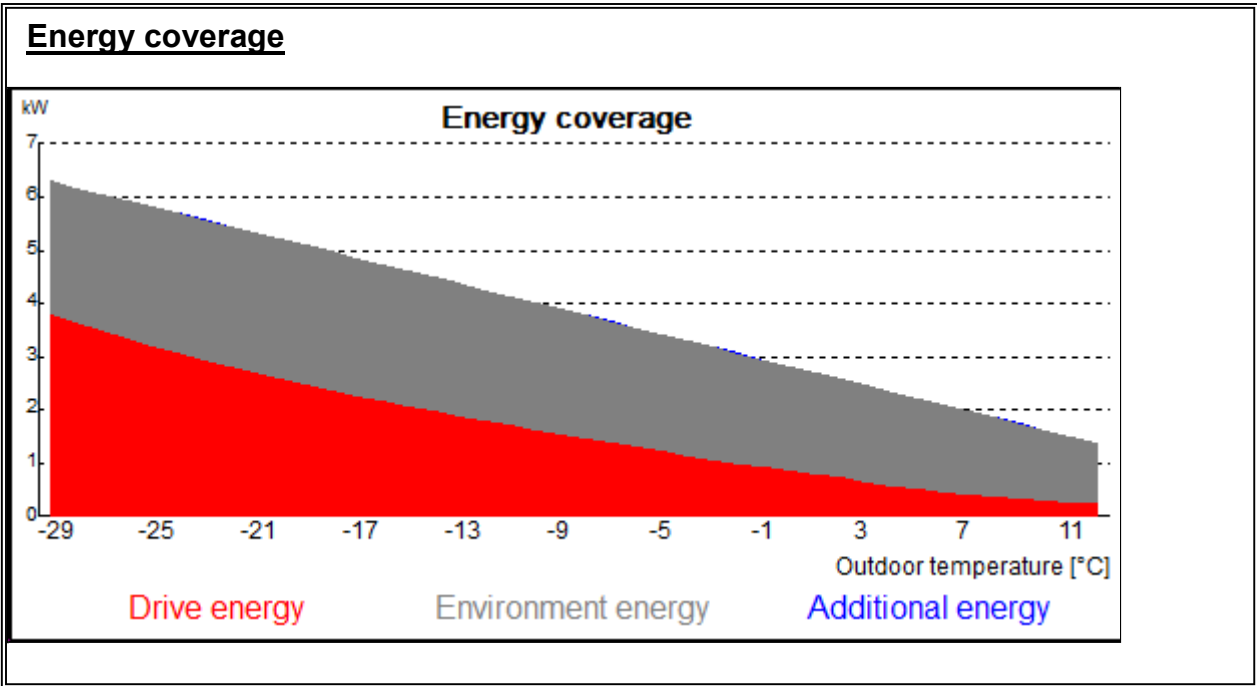


Investment costs

Reference period: 20 years
 Rate of interest: 6.0 %

Type of heating	Sum of investment costs in €	Operational costs in €/year	Investment costs in €/year	Total costs in €/year
<i>Heat pump</i>	7750	992	674	1666
<i>Oil</i>	4000	2439	319	2758
<i>Gas</i>	3700	2207	276	2483
<i>Electric night storage heater</i>	1500	1805	130	1935
<i>Electric heating element</i>	500	1868	43	1911
<i>wood heating</i>	21500	1410	1845	3255





This calculation is based on user values and valid for normal meteorological conditions. The correct adjustment of the heat pump heating system is assumed. This calculation cannot guarantee that the calculated values are fulfilled in practical operation.