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Operational Running Costs Field Heating System

The big advantage of our radiant heating system is the reduction of energy consumption, which means fewer yearly operational costs for the field owner compared to other heating systems. The radiant heating ribbons will be connected to a control system which will automatically switch the system on and off based on the parameters set by the field owner. The energy will be turned into heat immediately. As this is the main differentiator in comparison to other field heating systems (e.g. water based systems) it is obvious that the yearly operational costs can be calculated. In this document we have calculated the operational costs of the yearly expected energy consumption of the field heating system for various regions worldwide. Based on the Winter Temperature Profiles of these regions we have worked out one or two alternative usage profiles for:

- a heating system that will be running during the whole winter season
- a heating system which will only be used for shortening the winter season. This will be applicable to regions with extreme wintery conditions. Normally these regions already apply a winter stop for approximately two months with temperatures often below minus 20°C.

In both calculations we have added one column for full (100%) usage of the field heating system and one for usage of the field heating system for limited training purposes and playing weekly competition games. All the information below is based on the temperature sheets we collected from the internet (www.weather.com). The calculations are based on an average field size (105 x 70 m¹) and an average field location.

The operational costs have been calculated at € 0,11 per kWh. In order to get an estimate of the expected yearly costs for your facility, you can check to which region your facility belongs, based on the table with average temperatures. You can always contact us should extra information be required.

For estimating the operational costs we have used the following parameters:

- 1) Ice days: number of days per year when the highest and lowest temperature is below 0° Celsius. For these days we have calculated 20 hours of operation at 100%.
- 2) Freezing days: Number of days when the lowest temperature is below minus 5° Celsius. For these days we have calculated 16 hours of operation (100%).
- 3) The total costs of operation are based on an installation of 300 kW, energy costs € 0,11 per kWh. All based on availability during the season period of 7 days a week.
- 4) The total costs of operation are based on an installation of 300 kW, energy costs € 0,11 per kWh, based on the fact that the pitch heating will be only be used for games and some limited training purposes. Only 60% usage of the operation compared to "full operation". Obviously the above is an indication and should be discussed further based on "real data and timeslots" when the field heating system is being used.



Region Astana (KZ), Sapporo (JP)

Average monthly temperatures

Month	Average temp high Celcius	Average temp low Celsius
January	-11	-17
February	-10	-18
March	-4	-12
April	10	0
May	20	8
June	25	13
July	27	15
August	25	13
September	18	7
October	9	0
November	-2	-9
December	-9	-15

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	150	10			
	3000 operating hours	160 operating hours	3160	948.000 kWh € 104.280	568.800 kWh € 62.568

Calculation 2: Operation without 60 days Wintertime					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	90	10			
	1800 operating hours	160 operating hours	1960	588.000 kWh € 64.680	352.800 kWh € 38.808



Region Oslo (NO), Stockholm (SE), Munich (DE), Bucharest (HU)

Average monthly temperatures

Month	Average temp high Celcius	Average temp low Celcius
January	0	-4
February	2	-4
March	5	-2
April	10	2
May	16	7
June	19	11
July	22	13
August	21	13
September	16	9
October	9	4
November	4	0
December	0	-3

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	60	30			
	1200 operating hours	480 operating hours	1680	504.000 kWh € 55.440	302.400 kWh € 33.264



Region Berlin (DE), Wolfsburg (DE), Hamburg (DE), Kopenhagen (DK)

Average monthly temperatures

Month	Average temp high Celcius	Average temp low Celcius
January	3	-1
February	4	-1
March	8	2
April	14	5
May	19	10
June	22	13
July	24	15
August	24	14
September	19	11
October	14	7
November	7	3
December	3	0

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	0	40			
	0 operating hours	640 operating hours	640	192.000 kWh € 21.120	115.200 kWh € 12.675



Region St Petersburg (RU), Helsinki (FI), Vladivostok (RU)

Average monthly temperatures

Month	Average temp high Celcius	Average temp low Celcius
January	-4	-8
February	-4	-8
March	2	-4
April	9	1
May	15	7
June	20	12
July	22	15
August	20	13
September	15	8
October	8	4
November	1	-2
December	-2	-6

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	120	30			
	2400 operating hours	480 operating hours	2880	864.000 kWh € 95.040	518.400 kWh € 57.024

Calculation 2: Operation without 60 days Wintertime					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € and CAD ³⁾ Maximum costs	Total cost of average operation in € and CAD ⁴⁾
2011/2012	60	30			
	1200 operating hours	480 operating hours	1680	504.000 kWh € 55.440	302.400 kWh € 33.264



Region Toronto (CA), Dnepropetrovsk (UA), Warsaw (PL), Chicago (US)

Average monthly temperatures

Month	Average temp high Fahrenheit	Average temp high Celcius	Average temp low Fahrenheit	Average temp low Celsius
January	31	-1	18	-8
February	31	0	19	-7
March	39	4	26	-3
April	50	10	36	2
May	62	17	46	8
June	72	22	55	13
July	77	25	60	16
August	76	24	60	16
September	68	20	53	12
October	56	13	42	6
November	45	7	33	1
December	35	2	24	-5

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	75	30			
	1500 operating hours	480 operating hours	1980	594.000 kWh € 65.340	356.400 kWh € 39.204

Calculation 2: Operation without 60 days Wintertime					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	15	30			
	300 operating hours	480 operating hours	780	234.000 kWh € 25.740	140.400 kWh € 15.444



Region New York, US

Average monthly temperatures

Month	Average temp high Fahrenheit	Average temp high Celcius	Average temp low Fahrenheit	Average temp low Celsius
January	40	4	27	-3
February	42	6	29	-2
March	51	10	35	2
April	62	17	45	7
May	72	22	54	12
June	80	27	63	17
July	85	29	69	20
August	83	28	68	20
September	76	24	61	16
October	64	18	50	10
November	54	12	41	5
December	44	7	32	0

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	10	30			
	200 operating hours	480 operating hours	680	€ 22.240	€ 13.465



Region Moscow, Russia

Average monthly temperatures

Month	Average temp high Celcius	Average temp low Celsius
January	-5	-8
February	-4	-9
March	2	-5
April	11	2
May	18	8
June	22	12
July	24	14
August	22	12
September	15	8
October	8	3
November	0	-3
December	-4	-8

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	135	15			
	2700 operating hours	240 operating hours	2940	€ 97.020	€ 58.212

Calculation 2: Operation without 60 days Wintertime					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € and CAD ³⁾ Maximum costs	Total cost of average operation in € and CAD ⁴⁾
2011/2012	75	15			
	1500 operating hours	240 operating hours	1740	€ 57.420	€ 34.452



Region Krasnodar (RU), Washington (US)

Average monthly temperatures

Month	Average temp high Fahrenheit	Average temp high Celcius	Average temp low Fahrenheit	Average temp low Celsius
January	38	4	27	-3
February	40	5	26	-3
March	49	10	33	1
April	63	17	44	7
May	72	22	52	11
June	80	26	60	15
July	85	30	64	18
August	85	29	63	17
September	75	24	54	12
October	63	17	44	7
November	49	9	36	2
December	40	4	29	-2

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	20	50			
	400 operating hours	800 operating hours	1200	€ 39.600	€ 23.760



Region Boston (US)

Average monthly temperatures

Month	Average temp high Fahrenheit	Average temp high Celcius	Average temp low Fahrenheit	Average temp low Celsius
January	37	3	23	-5
February	39	4	25	-4
March	46	8	31	0
April	56	13	41	5
May	67	19	50	10
June	76	25	60	15
July	82	28	65	19
August	80	26	64	18
September	72	22	57	14
October	62	16	46	8
November	52	11	38	3
December	42	5	28	-2

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	15	55			
	300 operating hours	880 operating hours	1180	€ 38.940	€ 23.364



Region Amsterdam, Brussels (Europe)

Average monthly temperatures

Month	Average temp high Celcius	Average temp low Celsius
January	5	1
February	6	1
March	9	3
April	13	5
May	17	8
June	19	11
July	22	13
August	22	13
September	19	11
October	14	8
November	9	5
December	6	2

Calculation 1: Operation whole year					
	Ice days ¹⁾	Freezing days ²⁾	Total yearly hours of operation	Total costs of full operation in € Maximum costs ³⁾	Total cost of average operation in € ⁴⁾
2011/2012	10	35			
	200 operating hours	560 operating hours	760	€ 25.080	€ 15.048



Region Fairbanks, Alaska

Month	Average temp high Fahrenheit	Average temp high Celsius	Average temp low Fahrenheit	Average temp low Celsius
January	3	-16	-11	-23,9
February	11	-11,7	-7	-21,7
March	25	3,9	2	-16,7
April	44	6,7	21	-6,1
May	61	16,1	36	2,22
June	71	21,7	48	8,9
July	72	22,2	51	10,6
August	66	18,9	45	7,2
September	54	12,2	34	1,1
October	32	0	16	-8,9
November	12	-11,1	-2	-18,9
December	7	-13,9	-8	-22,2

Calculation 1: Operation whole year						
	Ice days ¹⁾	Freezing days A ²⁾	Freezing days B ³⁾	Total yearly hours of operation	Total costs of full operation in € and CAD ⁴⁾ Maximum costs	Total cost of average operation in € and CAD ⁵⁾
2011/2012	140	40	20			
	2800 operating hours	640 operating hours	360 operating hours	3800	€ 125.400 CAD 182.400	€ 75.240 CAD 109.440

Calculation 2: Operation without 60 days Wintertime						
	Ice days ¹⁾	Freezing days A ²⁾	Freezing days B ³⁾	Total yearly hours of operation	Total costs of full operation in € and CAD ⁴⁾ Maximum costs	Total cost of average operation in € and CAD ⁵⁾
2011/2012	80	40	20			
	1600 operating hours	640 operating hours	360 operating hours	2600	€ 85.800 CAD 124.800	€ 51.480 CAD 74.880

- 1) Ice days: number of days per year when the highest and lowest temperature is below 0° Celsius. For these days we have calculated 20 hours of operation of 100%.
- 2) Freezing days A: Number of days when the lowest temperature is below minus 5° Celsius. For these days we have calculated 16 hours of operation (100%).
- 3) Freezing days B: Number of days when the lowest temperature is between 0° Celsius and minus 5° Celsius. For these days we calculate 18 hours of operation (100%).



- 4) The total costs of operation are based on an installation of 300 kW, energy costs € 0,11 per kWh (CAD 0,16: exchange rate 0,70). All based on availability during a season period of 7 days a week.
- 5) The total costs of operation are based on an installation of 300 kW, energy costs € 0,11 per kWh (CAD 0,16: exchange rate 0,70). Based on the fact that the pitch heating will be only used for games and some limited training purposes. Only 60% usage of the operation compared to "full operation". Obviously the above is an indication and should be discussed further on "real data and timeslots" when the field is being used.