

Q LOAD CALCULATION GUIDE

34% Glycol/H2O vs Hydromx®

CoP Comparison

THE AIM OF THE PROJECT

To compare the performance of the Compressor for 2 different brines 34% Glycol/H $_2$ O vs Hydromx

The comparison is gong to be done by the ratio of the Coefficient of Performance (CoP) for the periods.

CoP= (Heat Load / Total Energy Consumed)_{July, August, September}

The efficiency = (CoP_{after} / CoP_{before})_{July, August, September}

In this project Hydromx PG is granted to provide the efficiency min. 1,2



TOTAL ENERGY CONSUMED



In order to be able to calculate power factors, it is required to have the consumptions values.

For this purposes, data loggers to log the current draw of the chillers (amp) were installed at the site. It is assumed that the voltage, power factor of the compressors are same all the time, during the test.

Since the calculations are proportional calculations and , total consumption will be the power of "current draw" of the compressors, then the "amp measurements" will be enough to be considered as total consumption.

Hourly mean of the amp will be the source of the formula for KWH calculation.

Power = Amp * V * $\sqrt{3}$ * cos (fi)



TOTAL HEAT LOAD at SIMON FRUIT COLD STORE

There are mainly 3 types of different cooling demand in the system. The amount of energy consumed is the cumulative of all of these.

Heat Load due to Material Cooling;

Q_{material}

This is a batch process and, starts for a certain amount of material at a certain degree and ends as the material reaches the target temperature. Usually, material are entered to chilling process at daily outdoor temp and it continues until they reach 0,3°C.

As soon as the temp is attained ,they moved in to storage cell, which are more stable.

Heat Load due to Cell Cooling $\ensuremath{\mathsf{Q}_{\text{cell}}}$

Cells are subject to 3 different type of heat load during the storing period.

- 1. Temp increase due to Heat loss through the walls. Q_{store}
- 2. Temp increase due to Defrost of fan coils, $Q_{defrost}$
- 3. Temp increase due to Material Loading/ unloading, Q_{loading}

1. Storage Cells temp are usually modulates in between $1,2^{\circ}C - 0,3^{\circ}C$. This is accepted as due to heat loss through the walls.

2. Fan coils in the cells get frozen and the ice has to be melted away. Arbitrarily, the room temperature is increased due to defrosting process.

3. During material loading step, cell temp. increases.

Temp rises needs to be chilled down.

Heat Load due to Removal of Humidity $\mathsf{Q}_{\!_{\mathsf{H}}}$

The humidity of the material is also important for the ripening of the berries.

Upon request, the speed of ripening is adjusted by means of humidity. Humidity extracted and condensed and removed from the cell.

The amount is recorded by operations

The Energy required for condensation of Humidity should be considered by latent heat for condensation.

TOTAL HEAT LOAD

HEAT LOAD FOR COOLING

There are 3 different types of HEAT LOAD on the system that we need to consider

There are 2 sensible heat and 1 latent heat loads on the compressors. We are going to calculate all these HEAT LOADs and sum them up, to interpret the total heat load on the compressors.

1.) ENERGY TO "MATERIAL COOLING",

 $Q_{material} = M_{material} * Cp_{material} * \Delta T$

2.) ENERGY FOR "CELL COOLING"

 Q_{cell} = $M_{air} * Cp_{air} * \Delta T$

3.) ENERGY FOR "HUMIDITY REMOVAL",

$$Q_{H} = M_{cond}^{*}\Delta H_{vap}$$

"Trends with negative slope"



List of Parameters that are needed to be mined from data.- HEAT LOAD

"Trends with negative slope" for the months, of each Cell

1.) ENERGY TO "MATERIAL COOLING", Q_{material}

Material temp Trends with "negative slope" within the cells, for each month Material traffic (kg) in/out within the cells, for each month Cp values of berries & flowers (literature value)

2.) ENERGY FOR "CELL COOLING" Q_{store}, Q_{defrost}, Q_{loading}=Q_{cell} Cell temp Trends with negative slope" within the cells, for each month Amount of air (kg) remaining in the cell

3.) ENERGY FOR "HUMIDITY REMOVAL", Q_H

Amount condensate water



Total Heat Load Calculation File

4			weigth of flowers	400	kg/palett	(1									
5		Cells & Time Frames	Capacity (%)	Material Mass (kg)	Material Mass change (Kg)	Air Volune (m3)	Σ ΔΤ Arrange Temp (0°C)	Σ ΔT Product 1 (0°C)	Σ ΔT Product 2 (0°C)	Total (m3)	Used capacity (m3)	Free Space (m3)	Material In (°C)	Qmaterial Change (KJ)	Qair (Kj)	
6		CELL 1 28.08-31.08	100%	18.222,00	1	43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,0	2.709.502,07	7.300,15	
7	CELL1	Aug 2018	100%	18.222,00	0,00	43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,00	2.709.502,97	7.300,15	
9	CELL1	Sep 2018	100%	18.222,00	0,00	43,00	895,70	257,00	467,00	118,00	75,00	43,00	7,00	24.010.764,96	49.800,02	
12	CELL1	Oct 2018			0,00	118,00	1.007,60	352,30	410,60	118,00	75,00	43,00	00,00	19.257.135,72	80.643,02	1
16	CELL1	Nov 2018		5	0,00	118,00	931,80	258,20	235,00	118,00	75,00	43,00	7,00	8.178.293,92	73.201,48	_
18	CELL1	Dec 2018	100%	9.200,00	0,00	43,00	1.670,00	263,80	172,00	118,00	75,00	43,00	0,30	2.305.282,00	92.850,33	
19	CELL1	Jan 2019	100%	9.200,00	0,00	43,00	2.350,20	333,70	274,40	118,00	75,00	43,00	0,30	3.216.849,00	130.668,77	
20	CELL1	Feb 2019	100%	9.200,00	0,00	43,00	808,30	62,30	257,30	118,00	75,00	43,00	0,30	1.690.684,00	44.940,67	
21	CELL1	Mar 2019	100%	9.200,00	0,00	43,00				118,00	75,00	43,00		0,00	0,00	h
22	CELL1	Apr 2019	100%	9.200,00	0,00	43,00	2.072,00	240,10	362,40	118,00	75,00	43,00	-0,40	3.187.225,00	115.201,13	
25	CELL1	May 2019			0,00	118,00	1.931,00	110,10	389,50	118,00	75,00	43,00		2.690.494,00	107.395,03	
26	CELL1	Jun 2019	0%	0,00	0,00	118,00		2.6		118,00	75,00	43,00		0,00	0,00	
29	CELL1	Jul 2019				118,00	1.554,60	815,60	1.107,50	118,00	75,00	43,00		3.510.780,00	224 602.63	
30	CELL1	Aug 2019	54%	10.000,00	10.000,00	77,50	961,30	601,20	453,80	118,00	75,00	43,00	1,40	19.201.000,00	96.329,47	Γ
33	CELL1	Sep 2019			0,00	118,00	579,50	340,20	288,60	118,00	75,00	43,00		11.444.160,00	58.070,25	Γ
58	CELL 6	Aug 2018				0,00	120,20	30,20	62,20			0,00		1.121.680,56	3.807,76	Γ
62	CELL 6	Sep 2018				47,50	1.022,10	347,40	343,80	47,50	23,00	24,50		7.131.273,79	38.338,91	Γ
65	CELL 6	Oct 2018			0,00	47,50	509,20	215,00	264,80	47,50	23,00	24,50		5.261.246,90	17.645.00	Γ
66	Eksik	Nov2018	0%	0,00	0,00	47,50	233,80	194,40	99,30	47,50	23,00	24,50	7,50	0,00	14.359,41	T
69	CELL 6	Dec 2018				0,00	0,00	0,00	0,00			0,00		0,00	9,00	F
72	CELL 6	Jan 2019			0,00	0.00	757,30	338,90	195,40			0,00		5.753.267.52	26.634,22	T
76	CELL 6	Feb 2019				0.00	308,40	118.70	39.80			0,00		1.592.354.40	11.328,81	r
77	Eksik	Mar 2019	0%	0.00	0.00	47.50	108.30	101.20	75.90	47.50	23.00	24,50	9.80	0.00	6.51.52	T
78	Eksik	Apr 2019	0%	0.00	0.00	47.50				47.50	23.00	24.50		0.00	0.00	T
79	Eksik	May 2019	0%	0.00	0.00	47.50				47.50	23.00	24.50		0.00	0.00	۲
80	Fksik	kin 2019	0%	0.00	0.00	47.50				47.50	23.00	24.50		0.00	0.00	t
81	Fksik	bil 2019	0%	0.00	0.00	47.50	692.10	596.70	668.80	47.50	23,00	24.50	17.00	0.00	42,507,05	t
82	Fksik	Aug 2019	0%	0.00	0.00	47.50				47.50	23.00	24.50		0,00	0.00	t
85	CELL 6	Sep 2019	0,0	5,50	5,00	0.00	379.50	132.70	168.50	,50	20,000	0.00		3,050,966,10	14 577 43	t
86	CELLO	Oct 2019	83%	5.650.00	0.00	28.41	999.20	221.70	269.30	47.50	23.00	24.50	1.40	5.040.953.00	36 705 79	t
00	CTU	N 2040	65%	5,656,60	0,00	0.00	(20.00	270.20	200,00		20,00	0.00	1,10	3 507 304 00	37455 20	t
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Amount of Product

Cummulated values of the Product Temp1 & 2

Highest temp of the Product in that cell by that time frame

Total volume & Used capacity of the cells

Air volume of the cells

Material Mass Change Calculated by the in & out traffic of the product

Free Space m3

Q Material Calculation Mass change, density of the product and product temps

Q Air Arrange Temp, Air Volume and air's density

2. Filter & Sort «DateTime» column by

«Oldest to Newest»

- Check the Date Time column for any missing or omitting data; take notes if there are any missing data for after discussions
- a. Check the temp, if it is modulating around set point of the cell

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4]	A	В	С	D	E	F	G	Н	L	I	К	
	Date Time	Arrange T	Product	TeDefrost T	e Product '	TeSetpoint	Cool Actic	Defrost A(V)	entilatio Ala	rm		
	21/12/2019 15:46	8,7	9,8	9,2	13,1	0,7	10	0	10	0		
	21/12/2019 15:45	9,1	10,2	9,6	14,1	0,7	10	0	10	0		
4	21/12/2019 15:44	9,4	10,5	10,2	14,2	0,7	10	0	10	0		
+	21/12/2019 15:43	9,8	10,7	10,5	14,2	0,7	10	0	10	0		
4	21/12/2019 15:42	10,3	11,2	10,9	14,2	0,7	10	0	10	0		
1	21/12/2019 15:41	10,9	13,4	11,7	14,3	0,7	10	0	10	0		
4	21/12/2019 15:40	11,7	14,2	12,7	14,3	0,7	10	0	10	0		
+	21/12/2019 15:39	14,1	14,3	14,8	14,3	0,7	10	0	10	0		
	21/12/2019 15:38	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
8	21/12/2019 15:37	14,6	14,3	15,1	14,3	0,7	10	0	10	0		
4	21/12/2019 15:36	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
8	21/12/2019 15:35	14,6	14,3	15,1	14,3	0,7	10	0	10	0		
3	21/12/2019 15:34	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
	21/12/2019 15	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
	21/12/2019 15:3	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
	21/12/2019 15:31	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
	21/12/2019 15:30	4,6	14,2	15,1	14,3	0,7	10	0	10	0		
2	21/12/2019 15:29	1,6	14,2	15,1	14,3	0,7	10	U	10	U		
2	21/12/2019 15:28	146	14,3	15,1	14,3	0,7	10	0	10	0		
8	21/12/2019 15:27	14,	14,2	15,1	14,2	0,7	10	U	10	U		
	21/12/2019 15:26	14,6	14,2	15,1	14,3	0,7	10	0	10	U		
	21/12/2019 15:25	14,6	14,2	15,1	14,2	0,7	10	U	10	U		
3	21/12/2019 15:24	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
	21/12/2019 15:23	14,6	14,2	15,1	14,3	0,7	10	0	10	0		
9	21/12/2019 15:22	14,6	14,2	15,1	14,3	0,7	10	0	10	U		
8	21/12/2019 15:21	14,6	14,2	15,1	14,2	0,7	10	0	10	0		
1	21/12/2019 15:20	14,6	14,2	15,1	14,2	0,7	10	U	10	U		
	21/12/2019 15:19	14,6	4,2	15,1	14,3	0,7	10	0	10	0		
1	21/12/2019 15:18	14,6	1.2	15,1	14,3	0,7	10	0	10	0		
세	21/12/2019 15:17	14,6	142	15,1	14,3	0,7	10	U	10	U		
셁	21/12/2019 15:16	14,6	14,	10,1	14,3	0,7	10	U	10	U		
5	21/12/2019 15:15	14,6	14,2	10,1	14,3	0,7	10	0	10	0		
3	21/12/2019 15:14	14,6	14,2	15,1	14,3	0,7	10	U	10	U		
	21/12/2019 15:13	14,6	14,2	10,1	14,3	0,7	10	U	10	U		
1	21/12/2019 15:12	14,6	14,2	15,1	14,3	0,7	10	U	10	U		
	21/12/2019 15:11	14,6	14,2	10,1	14,2	0,7	10	0	10	0		
1	21/12/2019 15:10	14,7	14,2	15,1	14,3	0,7	10	0	10	0		
9	21/12/2019 15:09	14,7	14,2	15,1	14,3	U, /	10	U	10	U		





Should be consecutive min by min



4. İn order to determine <u>the temp. with (-)</u> <u>slope</u>, subtract the previous cell from the following one.

The degrees with (-) numbers are the heat load.

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1	Date Time	√ Arra	ange Temp 💌	rod Y	uct Temp 1 💌	Defrost Temp 💌	Product Temp 2 💌	Setpoint 💌 Cool
2	10/12/2019	09:37	2,6		1	0,7	0,4	0,7
3	10/12/2019	09:38	2,5[=+B3	-B2	1	0,7	0,4	0,7
4	10/12/2019	03:33	1, /		0,9	0	0,4	0,7
5	10/12/2019	09:40	1,2		0,8	-0,6	0,4	0,7
0	10/12/2019	09:41	0,9		0,7	-0,4	0,3	0,7
/	10/12/2019	09:42	0,7		0,5	-1	0,4	0,7
8	10/12/2019	09:43	0,6		0,5	-0,6	0,4	0,7
9	10/12/2019	09.44	0,6		0,5	0	0,4	0,7
11	10/12/2019	09.40	0,7		0,6	0.1	0,4	0,7
12	10/12/2019	09.40	0,7		0,0	0,1	0,4	0,7
12	10/12/2019	09.47	0,0		0,7	0,1	0,5	0,7
14	10/12/2019	09:40	0,0		0,7	0,2	0,4	0,7
15	10/12/2019	09:50	1		0,7	0,1	0,3	0,7
16	10/12/2019	09:51	11		0,8	0,1	0,0	0.7
17	10/12/2019	09:52	1.2		0.8	0.1	0.3	0.7
18	10/12/2019	09:53	1.3		0.9	0.1	0.3	0.7
19	10/12/2019	09:54	1,4		0,9	0,1	0,3	0,7
20	10/12/2019	09:55	1,3		0,8	0,2	0,3	0,7
21	10/12/2019	09:56	1		0,7	-0,2	0,3	0,7
22	10/12/2019	09:57	0,7		0,5	-1,3	0,3	0,7
23	10/12/2019	09:58	0,5		0,4	-1,2	0,3	0,7
24	10/12/2019	09:59	0,5		0,4	-0,3	0,3	0,7
25	10/12/2019	10:00	0,5		0,5	0	0,3	0,7
26	10/12/2019	10:01	0,6		0,5	0	0,3	0,7
27	10/12/2019	10:02	0,6		0,6	0	0,3	0,7
28	10/12/2019	10:03	0,7		0,6	0	0,3	0,7
29	10/12/2019	10:04	0,8		0,7	0	0,3	0,7
30	10/12/2019	10:05	0,8		0,7	0,1	0,3	0,7
31	10/12/2019	10:06	0,8		0,7	0,3	0,3	0,7
32	10/12/2019	10:07	0,8		0,7	0,6	0,3	0,7
33	10/12/2019	10:08	0,9		0,8	0,5	0,3	0,7
34	10/12/2019	10:09	1		0,8	0,5	0,3	0,7
35	10/12/2019	10:10	1,1		0,8	0,5	0,3	0,7
36	10/12/2019	10:11	1,2		0,8	0,5	0,3	0,7

5. Repeat step 4 down to the end of the column

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1	Date Time 🖵	Arrange Temp 💌	-	Product Temp	1 💌 Defr	ost Temp 💌	Product T
2	10/12/2019 09:37	2,6		_	1	0,7	
3	10/12/2019 09:38	2,5	-0,1	-	1	0,7	
1	10/12/2019 09:39	1,7	-0,8	-	0,9	0	
2	10/12/2019 09:40	1,2	-0,5		0,8	-0,6	
3 7	10/12/2019 09:41	0,9	-0,3	-	0,7	-0,4	
	10/12/2013 03:42	0,7	-0,2		0,5	-0.6	
2	10/12/2019 09:43	0,6	-0,1		0,5	-0,8	
0	10/12/2019 09:44	0,0	0.1		0,5	°	
1	10/12/2019 09:46	0,7	0,1	-	0,6	0.1	
2	10/12/2019 09:40	0,7	0.1		0,0	0,1	
3	10/12/2019 09:48	0.8	0,1		0.7	0,1	
4	10/12/2019 09:49	0.9	0.1		0.7	0.1	
5	10/12/2019 09:50	1	0.1		0.8	0.1	
6	10/12/2019 09:51	1.1	0,1		0.8	0.1	
7	10/12/2019 09:52	1.2	0.1		0.8	0.1	
8	10/12/2019 09:53	1,3	0,1		0,9	0,1	
9	10/12/2019 09:54	1,4	0,1		0,9	0,1	
0	10/12/2019 09:55	1,3	-0,1		0,8	0,2	
1	10/12/2019 09:56	1	-0,3		0,7	-0,2	
2	10/12/2019 09:57	0,7			0,5	-1,3	
з	10/12/2019 09:58	0,5			0,4	-1,2	
4	10/12/2019 09:59	0,5			0,4	-0,3	
5	10/12/2019 10:00	0,5			0,5	0	
б	10/12/2019 10:01	0,6			0,5	0	
27	10/12/2019 10:02	0,6			0,6	0	
8	10/12/2019 10:03	0,7			0,6	0	
9	10/12/2019 10:04	0,8			0,7	0	
0	10/12/2019 10:05	0,8			0,7	0,1	
1	10/12/2019 10:06	0,8			0,7	0,3	
2	10/12/2019 10:07	0,8			0,7	0,6	
13	10/12/2019 10:08	0,9			0,8	0,5	
4	10/12/2019 10:09	1			0,8	0,5	
S	10/12/2019 10:10	1,1			0,8	0,5	
10	10/12/2019 10:11	1,2			0,8	0,5	

6. Repeat the same steps for the Product temp.

Insert a column right to «Product Temp1» (between columns D&E)

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d	А	В	С	D	E F	-	G
1	Date Time 🖃	Arrange Temp 💌		 Product Temp 1 Defrost 	T & Cut	-	Setpoint
1	10/12/2019 09:37	2,6		1	C Copy	0,4	
3	10/12/2019 09:38	2,5	-0,1	1	Parts Ort	0,4	
1	10/12/2019 09:39	1,7	-0,8	0,9	Paste Options:	0,4	
j	10/12/2019 09:40	1,2	-0,5	0,8		0,4	
j	10/12/2019 09:41	0,9	-0,3	0,7		0,3	
7	10/12/2019 09:42	0,7	-0,2	0,5	Paste Special	0,4	
J	10/12/2019 09:43	0,6	-0,1	0,5	Insert	0,4	
	10/12/2019 09:44	0,6	0	0,5	Dollars.	0,4	
D	10/12/2019 09:45	0,7	0,1	0,6	Delete	0,4	
1	10/12/2019 09:46	0,7	0	0,6	Clear Contents	0,4	
2	10/12/2019 09:47	0,8	0,1	0,7	E Francisk Collin	0,3	
3	10/12/2019 09:48	0,8	0	0,7	E ronnat Cells	0,4	
1	10/12/2019 09:49	0,9	0,1	0,7	Column <u>W</u> idth.	0,3	
ó	10/12/2019 09:50	1	0,1	0,8	Hide	0,3	
6	10/12/2019 09:51	1,1	0,1	0,8		0,3	
7	10/12/2019 09:52	1,2	0,1	0,8	Unhide	0,3	
8	10/12/2019 09:53	1,3	0,1	0,9	0,1	0,3	
9	10/12/2019 09:54	1,4	0,1	0,9	0,1	0,3	
0	10/12/2019 09:55	1,3	-0,1	0,8	0,2	0,3	
1	10/12/2019 09:56	1	-0,3	0,7	-0,2	0,3	
2	10/12/2019 09:57	0,7	-0,3	0,5	-1,3	0,3	
3	10/12/2019 09:58	0,5	-0,2	0,4	-1,2	0,3	
4	10/12/2019 09:59	0,5	0	0,4	-0,3	0,3	
5	10/12/2019 10:00	0,5	0	0,5	U	0,3	
0	10/12/2019 10:01	0,6	0,1	0,5	U	0,3	
/	10/12/2019 10:02	0,6	0	0,6	U	0,3	
8	10/12/2019 10:03	.0,7	0,1	0,6	0	0,3	
9	10/12/2019 10:04	0,8	0,1	0,7	0	0,3	
0	10/12/2019 10:05	.0,8		0,7	0,1	0,3	
1	10/12/2019 10:06	0,8		0,7	0,3	0,3	
2	10/12/2019 10:07	0,8		0,7	0,6	0,3	
3	10/12/2019 10:08	0,9		0,8	0,5	U, 3	
14	10/12/2019 10:09	1		0,8	0,5	0,3	
0	10/12/2019 10:10	1,1		0,8	0,5	0,3	
0	10/12/2019 10:11	1,2		0,8	0,5	0,3	

Drag outside selection to extend series or fill; drag inside to clear



10. To have the cumulated negative temperatures, formulas will be written in the top cell of the subtraction of the "Arrange(cell) temp", "Product temp 1" and "Product temp 2"

Fil Pa	le <u>Home</u> Inse	12 9 M C		<i>1</i>				
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1	Date Time I Ar	range Temp 💌		Product Temp 1 -	- D	efrost Temp 💌 F	Product Temp 2 💌	
	10/12/2019 09:37	2,6		1		0,7	0,4	
	10/12/2019 09:38	2,5	-0,1	1	0	0,7	0,4	
	10/12/2019 09:39	1,7	-0,8	0,9	-0,1	0	0,4	
	10/12/2019 09:40	1,2	-0,5	0,8	-0,1	-0,6	0,4	
	10/12/2019 09:41	0,9	-0,3	0,7	-0,1	-0,4	0,3	
	10/12/2019 09:42	0,7	-0,2	0,5	-0, 2	-1	0,4	
	10/12/2019 09:43	0,6	-0,1	0,5	0	-0,6	0,4	
l	10/12/2019 09:44	0,6	0	0,5	0	0	0,4	
	10/12/2019 09:45	0,7	0,1	0,6	0,1	0	0,4	
	10/12/2019 09:46	0,7	0	0,6	0	0,1	0,4	
	10/12/2019 09:47	0,8	0,1	0,7	0,1	0,1	0,3	
	10/12/2019 09:48	0,8	0	0,7	0	0,2	0,4	
	10/12/2019 09:49	0,9	0,1	0,7	0.1	0,1	0,3	
	10/12/2019 09:50	11	0,1	0,0	0,1	0,1	0,3	
	10/12/2019 09:52	1,1	0,1	0,0	0	0,1	0,3	
	10/12/2019 09:52	13	0,1	0,0	0.1	0,1	0,5	
i	10/12/2019 09:54	1,4	0,1	0,9	0	0,1	0,3	
	10/12/2019 09:55	1,3	-0,1	0,8	-0,1	0,2	0,3	
	10/12/2019 09:56	1	-0,3	0,7	-0,1	-0,2	0,3	
	10/12/2019 09:57	0,7	-0,3	0,5	-0,2	-1,3	0,3	
	10/12/2019 09:58	0,5	-0,2	0,4	-0,1	-1,2	0,3	
	10/12/2019 09:59	0,5	0	0,4	0	-0,3	0,3	
	10/12/2019 10:00	0,5	0	0,5	0,1	0	0,3	
	10/12/2019 10:01	0,6	0,1	0,5	0	0	0,3	
	10/12/2019 10:02	0,6	0	0,6	0,1	0	0,3	
	10/12/2019 10:03	0,7	0,1	0,6	0	0	0,3	
	10/12/2019 10:04	0,8	0,1	0,7	0,1	0.1	0,3	
	10/12/2019 10:05	0,8	0	0,7	0	0,1	0,3	
	10/12/2019 10:07	0,0	0	0,7	0	0,5	0,3	
	10/12/2019 10:08	0,0	0.1	0,7		0,5	0,3	
	10/12/2019 10:09	1	0,1	0,8		0,5	0,3	

11. ΔT that are subject to cooling process is ready for "the Cell temp" & "the Product temp", for the specific month.





Product Traffic determination (The amount of the products moving in & out to the cells with time frames)

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2	Date	Kg	%	Kg	%	Kg	<i>%</i>	Kg	%	кg	%	Kg	%	кg	1 %	кg	%	кg	<i>%</i>	Kg	%	кg	%	кg	<i>%</i>	
3	28/08/2018	18222	100	18620	100	19115	99,8	19610	100			6670	100		0		0		0	3280	94	0		0		
4	29/08/2018	18222	100	18620	100	19115	99,8	19610	100			6670	100		U		U		U	3280	94	U	0	0		
5	30/08/2018	18222	100	18620	100	19115	99,8	19610	100			6670	100		U		0		0	3280	94	0		0		
0	31/08/2018	18222	100	18620	100	19115	99,8	19610	100			6670	100		U		0		U	3280	94	1000	40	0		
-	02/09/2010	10222	100	10620	100	19188	100	19610	100	3193	53	6670	100		0		0		0	3280	14	1000	40	3495	100	
8	02/09/2018	10222	100	18620	100	19188	100	19610	100	3193	53	6670	100		0		0		0	3280	- 4	1000	40	3495	100	
9	03/09/2018	10222	100	18620	100	19188	100	19610	100	3193	53	6670	100		U		U		U	3280	- 4	1668	48	3495	100	
10	04/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100		0		0		U	3280	4	1668	48	3495	100	
11	05/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100	00020	U		U		U	3280	4	1668	48	1250	36	
12	05/09/2018	18222	100	18620	100	19100	100	19610	100	3193	53	6670	100	19/35	54		0		0	2400	69	1668	48	1250	36	
13	07/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100	19/35	54		0		U	2400	69	1660	48	1250	36	
14	08/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100	19/35	54		U		U	1100	89	1668	48	400	11	
15	09/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100		U			119/05	54	2400	69	1668	48	400	11	
16	10/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100				U	19/35	54	2400	69	1668	48	400	11	
1/	11/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100		0		0	19/35	54	2040	69	1668	48	400	11	
18	12/09/2018	18222	100	18620	100	19188	100	19610	100	3193	55	6670	100		U	9	U	19/35	54	2040	69	1668	48	400	11	
19	13/09/2018	18222	100	18620	100	19188	100	19610	100	3193	53	6670	100		0	-	0	19/35	54	1680	48	1668	48	400		
20	14/09/2018	18222	100	18620	100	19100	100	19610	100	3193	53	3532	53		U		0	19/35	54	1680	48	3510	100	400	- 11	
21	15/09/2018	18222	100	10020	100	19188	100	19610	100	U	U	3532	53		0		U	19/35	54	3500	100	3510	100	U		
22	15/09/2018	18222	100	18620	100	19188	100	19610	100	U	U	3532	53		U	a	U	19/35	54	3500	100	3510	100	U		
23	17/09/2018	18222	100	18620	100	19188	100	19610	100	U	U	3532	53		U		0	19/35	54	3500	100	3510	100	U		
24	18/09/2018	18222	100	18620	100	19188	100	19610	100	U	U	3532	53		U	2	U	19/35	54	2180	62	3510	100	0		
25	19/09/2018	18222	100	10620	100	19100	100	19610	100	0	0	3532	53		0		0	19/35	54	2100	22	2642	75,5	0		
26	20/09/2018	18222	100	18620	100	19188	100	19610	100	U	U	3532	53		U		U	19/35	54	1740	90	2642	75,5	U		
27	21/09/2018	18222	100	18620	100	19188	100	19610	100	U	U	3532	53		U		0	19/35	54	1740	50	2642	75,5	0	0	
28	22/09/2018	18222	100	18620	100	19188	100	19610	100	U	U	6025	90		U		U	19/35	54	1740	50	2642	75,5	U		
29	23/09/2018	18222	100	18620	100	19188	100	19610	100	0	0	6025	90		0	-	0	19/35	54	1 740	90	2642	/5,5	0	0	
30	24/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0		0	19/35	54	3292	4	3417	97,5	3432	- 98	
31	25/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0		0	19/35	54	3292	4	3417	97,5	3432	98	
32	26/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0		0	19/35	54	3292	4	3417	97,5	3432	98	
33	27/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0		0	19/35	54	3292	94	3417	97,5	3432	98	
34	28/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0	8	0	19/35	54	3292	4	3417	97,5	3432	98	
35	29/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0		- 0	19/35	54	3292	4	3417	97,5	3432	98	
36	30/09/2018	18222	100	18620	100	0	0	19610	100	5945	100	6025	90		0		0	19/35	54	3292	94	3417	97,5	3432	98	

1.For Cell 1,it's seen that, on Sep2018, the amount of the product is 18.222 kg and no product is moved out. Cell is 100% full.

On the other hand, there is a traffic during Sep2018 for Cell 11. This traffic is effecting the consumption on the Cooling Energy by opening the cell doors and placing warmer degree products in the cells.



Product Traffic determination (The amount of the proucts moving in & out to the cells with time frames)

, A	utoSave (••• 8 7 %) • 🤆 - 📮 📲 🖭	3 🗅 🗢	сор с	alculation_In	terim_Jul_Au	g_v05 ×		₽ Sea	arch			3. If there is an in&out product traffic in the cell more
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A	A	В	С	D	E	F	G	Н	1	J	К	L	M	
4			weigth of flowers	400	kg/palett		S AT		k a					
				Material	Material Mass		Arrange	Σ ΔΤ	Σ ΔΤ					
			Capacity	Mass	change	Air Volume	Temp	Product 1	rroduct 2	Total	Used capacity	Free Space	E.	
5		Cells & Time Frames	(%)	(kg)	(Kg)	(m3)	(Dec)	(0°C)	(0ºC)	(m3)	(m3)	(m3)	Material I	
259	CELL 10	Jul 2019		8	-	0,0U	1.739,70	1.274,90	1.286,10		<i></i>	0,00		
264	CELL 10	Aug 2019		8		0,00	3.012,70	1.501,30	520,30		2	0,00		
271	CELL 10	Sep 2019			33	0,00	1.636,20	345,70	133,00	-	3	0,00		
276	CELL 10	Oct 2019				0,00	2.080,80	476,10	192,20		2	0,00		
284	CELI 10	Nov		0	2	0,00	2.121,70	252,50	373,60	5	8	0,00		
287	CELL 10	Dec 2019		2		0,00	2.056,10	560,40	118,70			0,00		
289	CELL 11	Aug 2018	terret terret			0,00	473,30	201,60	18,30	100000000		0,00	2002	
290	CELL 11	CELL 11 01.09-13.09	48%	1.668,00	1.668,00	20,52	1.394,20	260,00	26,90	27,00	13,50	13,50	8,60	
291	CELL 11	CELL 11 14.09-18.09	100%	3.510,00	1.842,00	13,50	607,30	58,40	417,30	27,00	13,50	13,50	10,30	
292	CELL 11	CELL 11 19.09-23.09	76%	2.642,00	-868,00	16,81	567,70	51,50	57,10	27,00	13,50	13,50	11,70	
293	CELL 11	CELL 11 24.09-30.09	98%	3.417,00	//5,00	13,84	685,70	39,40	64,40	27,00	13,50	13,50	8,40	
294	CELL 11	Sep 2018				0,00	3.254,90	409,30	565,70		8	0,00		
301	CELL 11	Uct 2018		Ø		0,00	3.123,00	2/1,20	63,80		8	0,00		
509 91E	CELL 11	NUV 2018		5		0,00	2.077,90	420,90	09,30			0,00		



ΔT for the "Cell Temp" & "Product Temp" for specific amount within the month



1. When there is a traffic in the cell, we should find the row numbers which refers the in & out dates

2. After finding the product in and out dates, the corresponding row numbers are entered in the formula

3. The calculated figure is entered to the related cell in the Main File

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4			weigth of flowers	400	kg/palett									
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				Material	Mate. Mass		An	ΣΔT	E AT					
5		Cells & Time Frames	(%)	ike)	(Kg)		(01C)	- occa	(010)	(m3)	(m3)	(m3)		
6		CELL 1 28:08-31:08	100%	18.222,00		43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,00	
7	CELL1	Aug 2018	100%	18.222,00	0,00	43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,00	_
9	ceui	Sep 2018	100%	18.222,00	0,00	43,00	895,70	257,00	467,00	118,00	75,00	43,00	7,00	
12	CELL1	Oct 2018			0,00	118,00	1.007,60	352,30	410,60	118,00	75,00	43,00	7,00	_
16	CELLI	Nov 2018	122106430	08000033	0,00	118,00	931,80	258,20	235,00	118,00	75,00	43,00	7,00	_
18	CELLI	Dec 2018	100%	9.200,00	0,00	43,00	1.670,00	263,80	172,00	118,00	75,00	43,00	0,30	_
19	CEU1	Jan 2019	100%	9.200,00	0,00	43,00	2.350,20	333,70	274,40	118,00	75,00	43,00	0,30	
20	ciui	Feb 2019	100%	9.200,00	0,00	43,00	808,30	62,30	257,30	110,00	75,00	43,00	0,90	-
21	CELLI	Aug 2019	100%	9,200,00	0,00	43,00	2.072.00	240.10	963.40	110,00	75,00	43,00	.0.40	-
25	CIUI	Mar 2019	200%	3.200,00	0,00	110.00	1 931 60	119.10	109.50	110,00	75,00	43,00	-0,40	-
26	CELLI	kin 2019	05	0.00	0,00	118.00	1.551,00	11.0,10	505,50	118.00	75,00	43.00		-
29	CEU1	Aul 2019				118.00	1.554.60	815.60	1,107,50	118.00	75.00	43.00		-
30	CELLI	Aug 2019	54%	10.000.00	10.000.00	77,50	961.30	601.20	453.80	118.00	75.00	43.00	1,40	_
33	CELL1	Sep 2019			0,00	118,00	579,50	340,20	288,60	118,00	75,00	43,00		_
58	CHLIG	Aug 2018				0,00	120,20	30,20	62,20			0,00		_
62	CELLG	Sep 2018		_		47,50	1.022,10	347,40	343,80	47,50	23,00	24,50		_
65	CELL 6	Oct 2018			0,00	47,50	509,20	215,00	264,80	47,50	23,00	24,50		
66	tksik	Nov2018	0%	0,00	0,00	47,50	233,80	194,40	99,30	47,50	23,00	24,50	7,50	_
69	CELLO	Dec 2018		_		0,00	0,00	0,00	0,00			0,00		
72	CELL 6	Jan 2019			0,00	0,00	757,30	338,90	195,40			0,00		
76	CILLS	Feb 2019		-		0,00	308,40	118,70	39,80			0,00		
77	Bisik	Mar 2019	0%	0,00	0,00	47,50	108,30	101,20	75,90	47,50	23,00	24,50	9,80	_
78	Besik	Apr 2019	0%	0,00	0,00	47,50			<u> </u>	47,50	23,00	24,50		
79	Utsik	May 2019	0%	0,00	0,00	47,50		L		47,50	23,00	24,50		
80	Bisik	kin 2019	0%	0,00	0,00	47,50			-	47,50	23,00	24,50	-	_
81	Besik	Aul 2019	0%	0,00	0,00	47,50	692,10	596,70	668,80	47,50	23,00	24,50	17,00	
82	Bisik	Aug 2019	0%	0,00	0,00	47,50				47,50	23,00	24,50	1	_
85	CHLL6	Sep 2019		-		0,00	379,50	132,70	168,50			0,00		-
86	CHLL 6	Oct 2019	83%	5.650,00	0,00	28.41	999.20	221.70	269.30	47.50	23.00	24.50	1.40	



Product Traffic determination (The amount of the proucts moving in & out to the cells with time frames)

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A	В	с	D	E	F	G	н	1	J	к	4	М		
4		weigth of flowers	400	kg/palett		E VAT								
			Material	Material Mass		ک ک Arrange		Σ ΔΤ					¢	
~		Capacity	Mass	change	Air Volum	e Temp	Product 1	Product 2	Total	Used capaci	ty Free Space			
5	Cells & Time Frames	100%	(kg)	(Kø)	(m3)	(0°C)	(0°C)	(0°C)	(m3)	(m3)	(m3)	Material In (
7 CEU1	Aug 2018	100%	18.222.00	0.00	43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,00	2.	
9 CELL1	Sep 2018	100%	18.222,00	¢,00	43,00	895,7	257,00	467,00	118,00	75,00	43,00	7,00	24.	
12 CELL1	Oct 2018			0,00	118,00	1.007,60	352,30	410,60	118,00	75,00	43,00	7,00	19.	
16 CELL1	Nov 2018	CONTRACTOR OF CONTRACTOR	omora	0,00	118,00	931,80	258,20	235,00	118,00	75,00	43,00	7,00	8.	
18 CELL1	Dec 2018	100%	9.200,00	0,00	43,00	1.670,00	263,80	172,00	118,00	75,00	43,00	0,30	2.	
20 CELL1	Feb 2019	100%	9.200,00	0,00	43,00	808.30	62.30	274,40	118,00	75,00	43,00	0,30	3.	
21 CELL1	Mar 2019	100%	9.200,00	0,00	43,00				118,00	75,00	43,00			
22 CELL1	Apr 2019	100%	9.200,00	0,00	43,00	2.072,00	240,10	362,40	118,00	75,00	43,00	-0,40	3.	
25 CELL1	May 2019			0,00	118,00	1.931,60	119,10	389,50	118,00	75,00	43,00		2.	
26 CELL1	Jun 2019	0%	0,00	0,00	118,00				118,00	75,00	43,00			
29 CELL1	Jul 2019	E4%	10 000 00	10.000.00	118,00	1.554,60	815,60	1.107,50	118,00	75,00	43,00	1.40	3.	
33 CELL1	Sep 2019		10.000,00	0.00	118.00	579.50	340.20	288.60	118,00	75.00	43,00	1,40	11.	
58 CELL 6	Aug 2018				0,00	120,20	30,20	62,20			0,00		1.	
62 CELL 6	Sep 2018				47,50	1.022,10	347,40	343,80	47,50	23,00	24,50		7.	
65 CELL 6	Oct 2018			0,00	47,50	509,20	215,00	264,80	47,50	23,00	24,50		5.	
66 Eksik	Nov2018	0%	0,00	0,00	47,50	233,80	194,40	99,30	47,50	23,00	24,50	7,50	-	
69 CELL 6	Dec 2018		2	0.00	0,00	0,00	0,00	0,00	1	~	0,00		-	
72 CELL 6	5an 2019 Feb 2019			0,00	0,00	308.40	336,90 118,70	39.80			0,00		5.	
77 Eksik	Mar 2019	0%	0,00	0,00	47,50	108,30	101,20	75,90	47,50	23,00	24,50	9,80		
78 Eksik	Apr 2019	0%	0,00	0,00	47,50				47,50	23,00	24,50			
79 Eksik	May 2019	0%	0,00	0,00	47,50				47,50	23,00	24,50			
80 Eksik	Jun 2019	0%	0,00	0,00	47,50			-	47,50	23,00	24,50			
81 Eksik	Jul 2019	0%	0,00	0,00	47,50	692,10	596,70	668,80	47,50	23,00	24,50	17,00		
85 CELL6	Aug 2019 Sep 2019	U76	0,00	0,00	47,50	379.50	132.70	168,50	47,50	23,00	24,50		3.	×
86 CELL 6	Oct 2019	83%	5.650,00	0,00	28,41	999,20	221,70	269,30	47,50	23,00	24,50	1,40	5.	HYDRON
00 001 0	N 2040			1	0.00	1 2000	270.20	200 50			0.00			Eneray Savina Solu
	Main File	interim_July2020 Inte	erim_Aug2020	interim_Sep2	2020 He	at Load_201	9 Heat l	.oad_2020	Pivot_L	ise this	Pivot_Interim2	1020 Com	parison	



$Q_{material} = M_{material} \times C_p \times \Delta T_{Product 1 \& 2}$

Energy Saving Solution

 $Q_{\text{Material}} Calculation$ $Q = M_{\text{material}} \times C_p \times \Delta T_{\text{Product 1 \& 2}}.$

There are two types of product: Berries and Flowers. The C_p values of these are 3,64 (kj/kg) for the berries and 1,15 (kj/kg) for the flowers.

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A	В	с	D	E	F	G	Н		J	К	L	М	N	Р	Cn
4		veigth of flowers	400	kg/palett											CΡ
5	Cells & Time Frames	Capacity (%)	Material Mass (kg)	Material Mass change (Kg)	Air Volume (m3)	Σ ΔT Arrange Temp (0°C)	Σ ΔΤ Product 1 (0°C)	∑ ∆T Product 2 (0ºC)	Total (m3)	Used capacity (m3)	/ Free Space (m3)	Material In (°C)	Qmaterial Change (KJ)	Qair (Kj)	
259 CELL 10	Jul 2019		- F.		0,00	1.739,70	1.274,90	1.286,10		<i>\$</i>	0,00		7.096.471,20	47.350,94	
204 CELL 10	Aug 2019		8		0,00	1 636 20	345 70	133.00		2	0,00		1 405 308 45	36, 23,58	Average of the Product Temp
276 CELL 10	Oct 2019				0,00	2.080.80	476.10	192.20	-	8	0.00		1.757.519.40	57,480.02	100
284 CELL 10	Nov 2019				0,00	2.121,70	252,50	373,60		2	0,00		2.394.681.29	48.881,54	102
287 CELL 10	Dec 2019		0		0,00	2.056,10	560,40	118,70			0,00		2.797.340,00	47.230,38	
289 CELL 11	Aug 2018				0,00	473,30	201,60	18,30			0,00		0,00	16.523,38	
290 CELL 11	CELL 11 01.09-13.09	48%	1.668,00	1.668,00	20,52	1.394,20	260,00	26.90	27,00	13,50	13,50	8,60	870.959,54	36.991,42	
291 CELL 11	CELL 11 14.09-18.09	100%	3.510,00	1.842.00	13,50	607,30	58,40	417,30	27,00	13,50	13,50	10,30	+1291)/2 🕨	10.600,73	
292 CELL 11	CELL 11 19.09-23.09	76%	2.642,00	-868,00	16,81	567,70	51,50	57,10	27,00	13,50	13,50	11,70	522.100,59	10 227 31	Material Mass
293 CELL 11	CELL 11 24.09-30.09	98%	3.417,00	775,00	13,84	685,70	39,40	64,40	27,00	13,50	13,50	8,40	645.525,97	12.268,47	
294 CELL 11	Sep 2018		-	÷	0,00	3.254,90	409,30	565,70		i.	0,00		5.077.548,84	72.197,92	
309 CELL11	Nov 2018		0	S	0,00	2 877 90	426.90	89 30		2	0,00		2 045 221 36	65 287 01	
315 CELL 11	Dec 2018		6	-	0.00	2.417.60	561.40	90.40		5	0.00		2.561.296.92	50.991.86	
321 CELL 11	Jan 2019		8		0,00	2.223,00	209,50	122,30		č.	0,00		1.104.887,42	47.814,18	
328 CELL 11	Feb 2019				0,00	1.115,10	346,60	247,70			0,00		893.328,80	28.961,83	

Q_{cell} Calculation

$Q_{Cell} = M_{Air} \times C_p \times \Delta T_{Cell}$

The key calculation factor in this is how much of the cell capacity is used in percentage (please see next slide)

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A	В	c	D	E	F	G	н	1	J	к	L	м	N	P		~
4		weigth of flowers	400) kg/palett											. /	
5	Cells & Time Fram	Capacity es (%)	Material Mass (kg)	Material Mass change (Kg)	Air Volume (m3)	Σ ΔΤ Arrange Temp (0°C)	Σ ΔΤ Product 1 (0°C)	∑ ∆T Product 2 (0ºC)	Total (m3)	Used capacity (m3)	Free Space (m3)	Material In (°C	Omaterial Change I (KJ)	Opir (Kj)		
259 CELL:	0 Jul 2019			4	0,00	1.739,70	1.274,90	1.286,10			0,00		7.096.471,20	47.350,94		C
264 CELL:	0 Aug 2019				0,00	3.012,70	1.501,30	520,30			0,00		7.438.922,40	72.858,26		
271 CELL:	0 Sep 2019				0,00	1.636,20	345,70	133,00			0,00		1.405.308,45	36.12 ,58		
276 CELL:	0 Oct 2019		5		0,00	2.080,80	476,10	192,20	-	1	0,00		1.757.519,40	57.480,02		
284 CELL:	0 Nov 2019			-	0,00	2.121,70	252,50	373,60			0,00		2.394.681,38	48.881,54		
287 CELL :	0 Dec 2019			e	0,00	2.056,10	560,40	118,70	-	2)	0,00		2.797.340,00	47.230,38	-	
289 CELL:	1 Aug 2018			-	0,00	473,30	201,60	18,30		43	0,00		0,00	16.523,38	-	
290 CELL:	1 CELL 11 01.09-13.	09 48%	1.668,00	1.668,00	20,52	1.394,20	260,00	26,90	27,00	13,50	13,50	8,60	870,959,54	36 991 42		The air volume left in the
291 CELL:	1 CELL 11 14.09-18.	100%	3.510,00	1.842,00	13,50	607,30	58,40	417,30	27,00	13,50	13,50	10,30	3.038.866,74	*G291	5	
292 CELLS	1 CELL 11 19.09-23.	00 00% U9 /6%	2.642,00	-868,00	10,81	55/,/0	20.40	57,10	27,00	13,50	13,50	9.40	522.196,58	12.337,31		
295 CELL:	1 Sep 2019	90%	3.417,00	775,00	13,04	3 254 00	39,40 400 30	565.70	27,00	13,50	15,50	0,40	5 077 549 94	72 107 02		
301 CELL	1 Oct 2018				0,00	312300	271.20	63.80			0,00		5.077.540,04	62 932 10		
309 CELL	1 Nov 2018				0,00	2.877.90	426.90	89.30			0.00		2.045.221.36	65.287.00	-	
315 CELL	1 Dec 2018				0.00	2.417.60	561.40	90.40			0.00		2.561.296.92	50.991.86		Cell Temp
321 CELL	1 Jan 2019				0,00	2.223,00	209,50	122,30			0.00		1.104.887.42	47.814,18		Centemp
328 CELL	1 Feb 2019				0,00	1.115,10	346,60	247,70			0,00		893.328.80	28.961,83		
329 CELL	1 Mar 2019	0%	0,00	0,00	27,00	606,60	302,50	86,60	27,00	13,50	13,50	13,40	0,00	21.177,01		
330 CELL :	1 Apr 2019	0%	0,00	0,00	27,00	78,40	85,60	63,10	27,00	13,50	13,50	15,30	0,00	2.737,02		
331 CELL :	1 May 2019	0%	0,00	0,00	27,00	96,20	122,70	68,90	27,00	13,50	13,50	18,90	0,00	3.358,44		
332 CELL :	1 Jun 2019	0%	0,00	0,00	27,00	180,20	145,40	120,90	27,00	13,50	13,50	23,50	0,00	6.290,96		
335 CELL :	1 Jul 2019				0,00	255,50	211,80	107,70			0,00		383.883,50	7.551,27		
339 CELL :	1 Aug 2019				0,00	2.693,60	1.655,50	62,70			0,00		7.127.365,70	63.757,65		

$Q_{Cell} = M_{Air} \times C_p \times \Delta T_{Cell}$

The Volumetric calibration of the Cells are provided by Simon Beheer for the capacity occupied and remaining volume ie, if the berries are fully occupying the cell 11, it takes 13,5 m3 of the total of 27m3. 13,5 m3 is remaining with air.

Q_{cell} Calculation



Total Heat Load Calculation File

The main file which the cumulated numbers, highest product temp, amount of product is entered in is used for calculating the Q load. Along with the manuel entries as explained above, this file also have given and calculated values

Α		weigth of flowers	-						_							Amount of Product
4		weigen of frowers		kg/parett		Σ ΔΤ				0	·					
			Material	Material Mass		Arrange	Σ ΔΤ	Σ ΔΤ					Qmaterial			
2443		Capacity	Mass	change .	≜ir Volume	Temp	Product 1	Product 2	Total	Used capacity	Free Space		Change	Qair		Cummulated values of the
5	Cells & Time Frames	(%)	(kg)	(Kg)	(m3)	(0°C)	(0°C)	(0°C)	(m3)	(m3)	(m3)	Material In (°C)	(KJ)	(Kj)		Dreduct Toren 1.9.2
6	CELL 1 28.08-31.08	100%	18.222,00		43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,00	2.709.502,07	7.300,15		Product lempt & Z
7 CELL1	Aug 2018	100%	18.222,00	0,00	43,00	131,30	10,90	70,80	118,00	75,00	43,00	7,00	2.709.502,07	7.300.25	_	
9 CELL1	Sep 2018	100%	18.222,00	0,00	43,00	895,70	257,00	467,00	118,00	75,00	43,00	7,00	24.010.764,96	19.800,02		
12 CELL1	Oct 2018			0,00	118,00	1.007,60	352,30	410,60	118,00	75,00	43,00	7,00	19.257.13572	80.643,02	1	
16 CELL1	Nov 2018	2112/01/02/02		0,00	118,00	931,80	258,20	235,00	118,00	75,00	43,00	7,00	8.178 293,92	73.201,48		
18 CELL1	Dec 2018	100%	9.200,00	0,00	43,00	1.670,00	263,80	172,00	118,00	75,00	43,00	0,30	2.305.382,00	92.850,33	_	
19 CELL1	Jan 2019	100%	9.200,00	0,00	43,00	2.350,20	333,70	274,40	118,00	75,00	43,00	0,30	3.216.849,00	130.668,77		
20 CELL1	Feb 2019	100%	9.200,00	0,00	43,00	808,30	62,30	257,30	118,00	75,00	43,00	0,30	1.690.684,00	44.940,67		
21 CELL1	Mar 2019	100%	9.200,00	0,00	43,00				118,00	75,00	43,09		0,00	0,00		TILO
22 CELL1	Apr 2019	100%	9.200,00	0,00	43,00	2.072,00	240,10	362,40	118,00	75,00	43,00	-0,40	3.187.225,00	115.201,13		lotal Q _{cell}
25 CELL1	May 2019			0,00	118,00	1.931,60	119,10	389,50	118,00	75.90	43,00		2.690.494,00	107.395,03		
26 CELL1	Jun 2019	0%	0,00	0,00	118,00				118,00	75,00	43,00		0,00	0,00		
29 CELL1	Jul 2019				118,00	1.554,60	815,60	1.107,50	112,00	75,00	43,00		3.510.780,00	224.602,63		
30 CELL1	Aug 2019	54%	10.000,00	10.000,00	77,50	501,30	001,20	453,80	118,00	/5,00	43,00	1,40	19.201.000,00	96.329,47		Air volume of the cells
33 CELL1	Sep 2019			0,00	118,00	579,50	340,20	288,60	118,00	75,00	43,00		11.444.160,00	58.070,25		
58 CELL 6	Aug 2018				0.00	120.20	30,20	62,20	1		0.00		1.121.680.56	3.807.76	-	
62 CELL 6	Sep 2018				47.50	1.022.10	347.40	343.80	47.50	23.00	24.50		7.131.273.79	38,338,91		
65 CELL 6	Oct 2018			0.00	47.50	509.20	215.00	264.80	47.50	23.00	24.50		5,261,246,90	17.645.00		
66 Eksik	Nov2018	0%	0.00	0.00	47.50	233.80	194.40	99.30	47.50	23.00	24.50	7.50	0.00	14.359.41	-	
69 CELL6	Der 2018		0,00	0,00	0.00	0.00	0.00	0.00	,50	20,00	0.00	1,50	0,00	0.00		
72 CELL 6	bn 2019			0.00	0,00	757 30	338.00	195.40		9.4	0,00		5 753 267 52	26 634 22		
76 0000	Fab 2019			0,00	0,00	200 40	119 70	20.00			0,00		1 502 254 40	11 200 01		
77 Eleile	Mar 2019	0%	0.00	0.00	47.50	109.20	101 20	75.00	47.50	22.00	24 50	0.90	1.352.334,40	6 664 60	-	
70 CKSIR	Mai 2019	U%	0,00	0,00	47,50	108,50	101,20	75,90	47,50	23,00	24,50	9,00	0,00	6.651,52	-	
70 DRSIR	Abi 2019	U%	0,00	0,00	47,50				47,50	23,00	24,50		0,00	0,00	-	
79 Eksik	May 2019	U%	0,00	0,00	47,50				47,50	23,00	24,50		0,00	0,00		
80 Eksik	Jun 2019	0%	0,00	0,00	47,50				47,50	23,00	24,50	2	0,00	0,00	-	
81 Eksik	Jul 2019	0%	0,00	0,00	47,50	692,10	596,70	668,80	47,50	23,00	24,50	17,00	0,00	42.507,05	-	
82 Eksik	Aug 2019	0%	0,00	0,00	47,50				47,50	23,00	24,50		0,00	0,00	-	
85 CELL 6	Sep 2019				0,00	379,50	132,70	168,50			0,00	-	3.050.966,10	14.577,43	-	
86 CELL 6	Oct 2019	83%	5.650,00	0,00	28,41	999,20	221,70	269,30	47,50	23,00	24,50	1,40	5.048.953,00	36.704,74	1	HYDROMX
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Preparing the Heat Load summary file

All of the steps explained in previoue slides are applied for each Cell for each month.

Once the Q_{Material} and Q_{Cell} figures are calculated, these figures are used to prepare a summary, «Heat Load» file.

Heat Load file is used to create a pivot table for comparisons.

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1	CELL NOIVIBER	Cells & Time Frames	(Ki)	(Kj)	IOTAL (N)			3 Row Labels 👻 Sum o	f Qmaterial Change(Kj) Su	m of Qair(Kj) Su	n of TOTAL (Kj)			
2	CELL1	Aug.18	2 709 502 07	7 300 15	2 716 802		Pivot lable	4	31.124.745	704.830	31.829.575			
158	CELL 10	Jul-19	7 096 471 20	47 350 94	7 14 822			5 BCELL 11	27.210.417	619.282	27.829.699			
159	CELL 10	Δυσ-19	7.438.922.40	72.858.26	7,511,781			6 €2018	11.309.658	267.932	11.577.590			
160	CELL 10	Sep-19	1.405.308.45	36,123,58	1.441.432			7 82019	15.900.759	351.349	16.252.109			
161	CELL 10	Oct-19	1.757.519.40	57.480.02	1.814.999			8 Jan	1.104.887	47.814	1.152.702			
162	CELL 10	Nov-19	2.394.681.38	48.881.54	2.443.563			9 Feb	893.329	28.962	922.291			
163	CELL 10	Dec-19	2.797.340.00	47.230.38	2.844.570			10 Ivio		21.1//	21.1//			
164	CELL 11	Aug-18	0,00	16.523,38	16.523			11 Apr 12 Mari	- U	2.757	2.737			
165	CELL 11	Sep-18	5.077.548,84	72.197,92	5.149.747			12 Iviay	0	6.291	6 291			
166	CELL 11	Oct-18	1.625.590,88	62.932,19	1.688.523			13 Jul	383 884	7 551	391.435			
167	CELL 11	Nov-18	2.045.221,36	65.287,01	2.110.508			15 Aug	7 127 366	63 758	7 191 123			
168	CELL 11	Dec-18	2.561.296,92	50.991,86	2.612.289			16 Sen	3.477.947	65,756	3.543.703			
169	CELL 11	Jan-19	1.104.887,42	47.814,18	1.152.702			17 Oct	1.645.335	50,107	1.695.442			
170	CELL 11	Feb-19	893.328,80	28.961,83	922.291			18 Nov	1.109.618	37.496	1,147,114			
171	CELL 11	Mar-19	0,00	21.177,01	21.177			19 Dec	158.395	16.342	174.737			
172	CELL 11	Apr-19	0,00	2.737,02	2.737			20 @ CELL 12	24.042.128	748.918	24.791.046			
173	CELL 11	May-19	0,00	3.358,44	3.358			21 @CELL 2	98.415.353	1.117.207	99.532.560			
174	CELL 11	Jun-19	0,00	6.290,96	6.291			22 @ CELL 4	139.024.069	476.687	139.500.756			
175	CELL 11	Jul-19	383.883,50	7.551,27	391.435			23 BCELL 5	4.995.587	741.905	5.737.492			
176	CELL 11	Aug-19	7.127.365,70	63.757,65	7.191.123			24 ECELL 6	34.182.933	249.429	34.432.362			
177	CELL 11	Sep-19	3.477.947,20	65.755,64	3.543.703			25 3 CELL 7	29.645.505	2.171.692	31.817.197			
178	CELL 11	Oct-19	1.645.334,60	50.107,18	1.695.442			26 @ CELL 8	36.448.779	2.374.217	38.822.996			
179	CELL 11	Nov-19	1.109.617,60	37.496,09	1.147.114			27 @ CELL 9	32.037.819	2.436.478	34.474.298			
180	CELL 11	Dec-19	158.394,60	16.342,08	174.737			28 @CELL1	101.402.271	1.081.003	102.483.274			
181	CELL 12	Aug-18	0,00	404,97	405			29 HCELL3	31.755.047	123.597	31.8/8.643			
182	CELL 12	Sep-18	2.513.498,81	52.447,32	2.565.946			30 Grand Total	590.284.654	12.845.246	603.129.900			
183	CELL 12	Oct-18	2.631.521,07	38.747,88	2.670.269			31						
184	CELL 12	Nov-18	1.175.313,23	38.813,42	1.214.127			32						
185	CELL 12	Dec-18	5.214.113,45	38.517,57	5.252.631			33						
186	CELL 12	Jan-19	1.152.615,10	54.210,88	1.206.826			04						
187	CELL 12	Feb-19	2.416.614,20	69.736,56	2.486.351			 Main File 	Interim_July2020 Interim_J	ug2020 Interim	Sep2020 Heat Loa	1_2019 Heat	oad_2020	Pivot_2019
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CoP Calculation

CoP= (Heat Load / Total Energy Consumed)_{July, August, September}

Date	Heat Load (Kj)	Power (kW)	CoP _{Hydromx}	COP Change
09.2020	95.619.230	21.919	4.362	65,3%
08.2020	118.941.397	24.077	4.940	65,3%
07.2020	62.993.854	17.135	3.676	64,2%
Date	Heat Load (Kj)	Power (kW)	COP _{water/glycol}	Amb Temp ∆ ≌c
09.2019	50.377.251	19.092	2.639	0,83
08.2019	85.549.861	28.626	2.989	1,60
07.2019	44.352.635	19.812	2.239	-1,80

	Raw Saving	Q Load	Amb Temp Δ
Sept	-15%	89,8%	0,83
Aug	16%	39,0%	1,60
Jul	14%	42,0%	-1,80

