Procedure for Estimating Performance of the Aquapak

The following procedure will help the user answer the following questions:

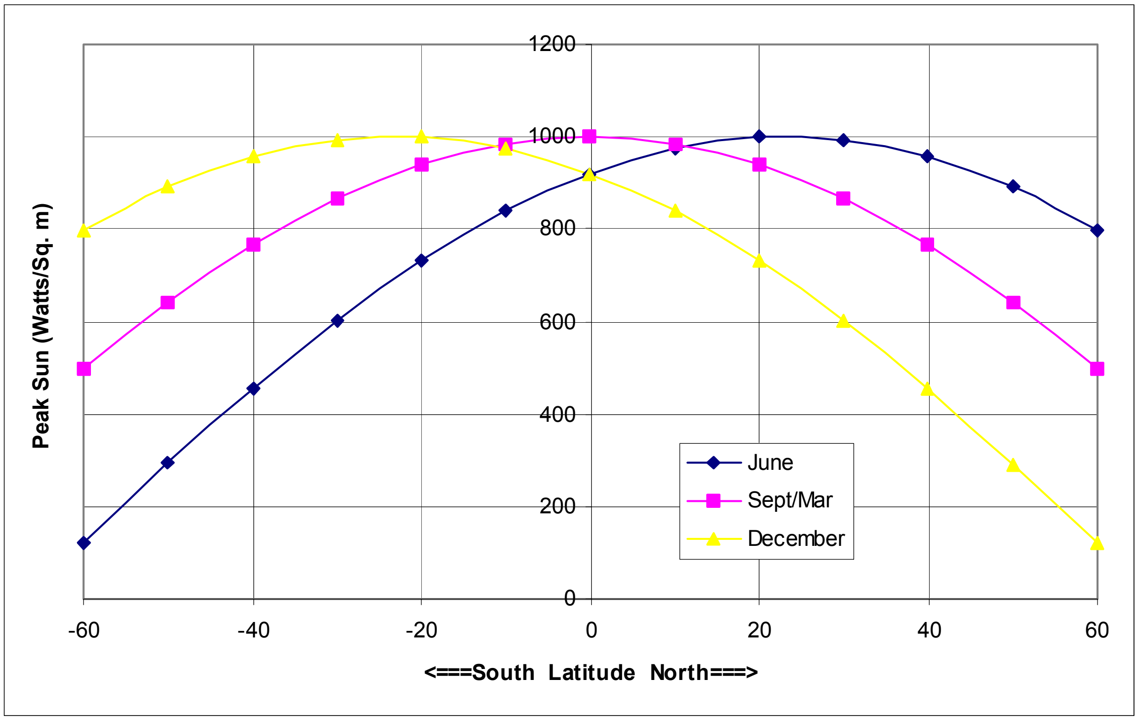
Will the Aquapak work, given my weather conditions and latitude?
How much water should I put in the Aquapak?
How long will it take to pasteurize the water?

The most important variable is the amount of sun present. Begin by using your latitude and the time of the year to estimate the peak sun strength (at noon) assuming clear weather. You may either go to the table below or to the graph below.

The table has latitude in the left column. For your latitude, go to the right to the appropriate column for that month, and read the peak sun strength. This assumes a very clear sky. The units for the numbers below are Watts per Sq. meter. If the sky is a little hazy, reduce this number by 10%. If it is a little cloudy, reduce this by 20 or 30%. If the sky is half cloudy or more, pasteurization usually will not work.

Latitude	June	July/May	Aug/April	Sept/Mar	Oct/Feb	Nov/Jan	Dec.
50 N	891	865	783	643	478	344	292
45 N	927	906	834	708	552	424	375
40 N	956	939	879	766	623	502	454
35 N	978	966	917	819	689	575	530
30 N	993	985	948	866	749	644	602
25 N	999	996	972	907	804	708	669
20 N	999	1000	989	940	853	767	731
15 N	990	996	998	966	895	820	788
10 N	974	985	1000	985	931	867	839
5 N	951	966	994	996	959	907	883
0	921	940	980	1000	980	940	920
5 S	883	907	959	996	994	966	951
10 S	839	867	930	985	1000	985	974
15 S	788	820	895	966	998	996	990
20 S	731	767	852	940	989	1000	999
25 S	669	708	804	906	972	996	999
30 S	602	644	749	866	948	985	993
35 S	530	575	688	819	917	965	978
40 S	454	501	622	766	879	939	956
45 S	375	424	552	707	834	906	927
50 S	293	343	477	642	782	865	891

To use the graph below go vertically from your latitude to the curve for the appropriate month. You may have to estimate between months, for example, if it is July imagine a curve in between the curve for June and the curve for September, but closer to June. As described above, if the sky is not perfectly clear, reduce the peak sun strength accordingly.



The second variable that is important is the temperature. Decide on an average temperature. This is the average of the initial water temperature and the average air temperature during the day. As one would expect, if you start out with warm water and if the air temperature is very high, pasteurization will be easier.

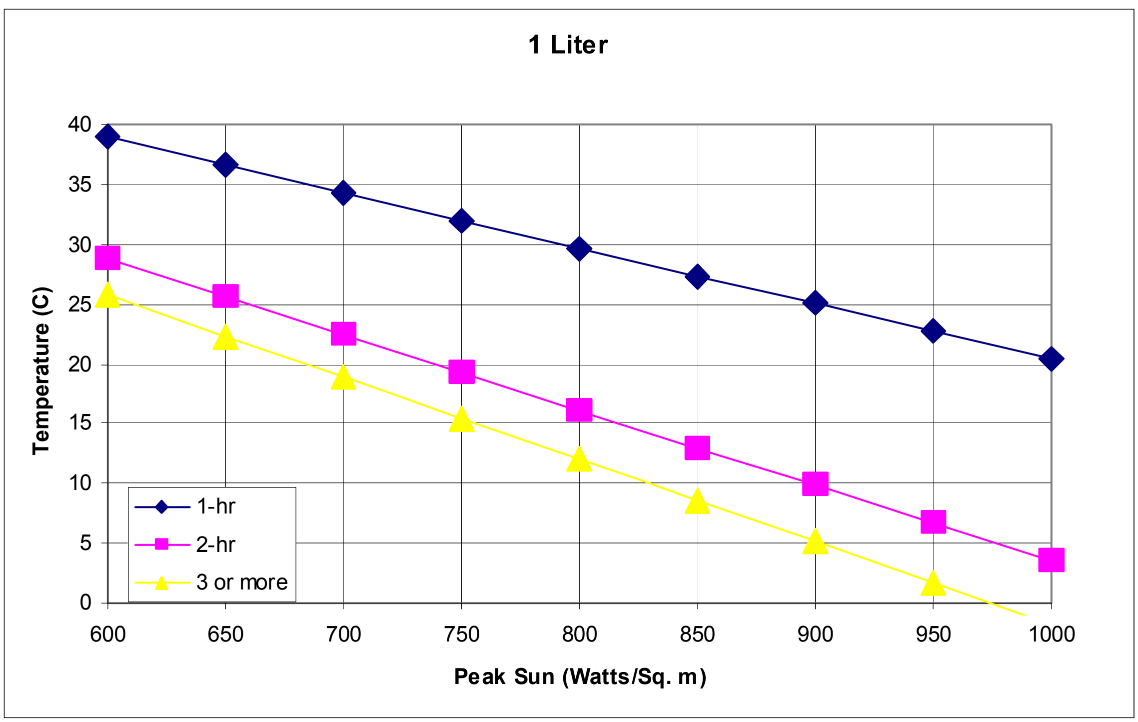
Next decide how much water you want to try to pasteurize, and go to the appropriate graph below. Use the peak sun strength and the average temperature to estimate how long it will take to pasteurize that amount of water. For example, suppose you want to pasteurize 2 liters of water, the peak sun is 850 Watts/Sq. m and the temperature is 20° C. You would go to the chart for 2 liters, find the intersection of 850 on the horizontal axis and 20 on the vertical axis, and find that this point is between the 2-hour line and the 3-hour line but close to the 3-hour line. It would therefore take about 3 hours to pasteurize the water.

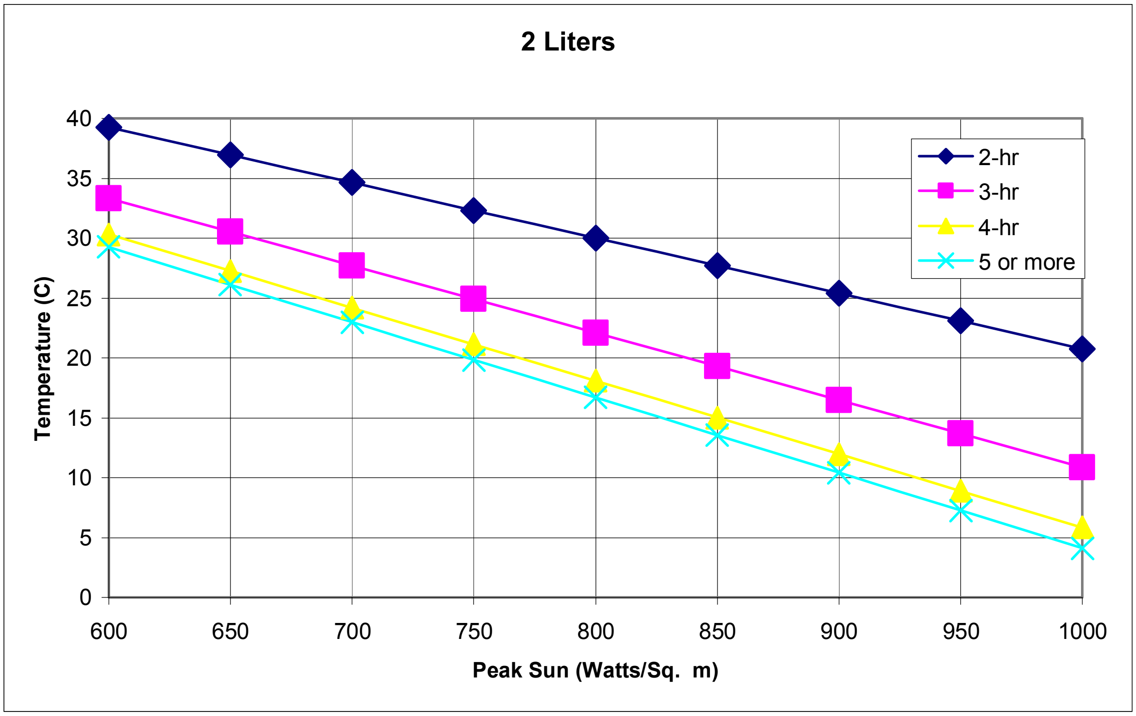
This analysis assumes that you use the peak sun strength, around noon when the sun is highest in the sky. By "noon" we really mean solar noon, the time when the sun is highest in the sky. If you are in daylight savings time, solar noon will be closer to 1 PM. Depending on where you are in your time zone, solar noon may be a little before or after actual noon (or 1 PM). For the example above, you would put the Aquapak out in the sun about 1 ½ hours before solar noon, and it would be done by about 1 ½ hours after solar noon.

This assumes that the sky is clear all day. If the sky is cloudier in the afternoon, put the water out earlier and reduce the amount of water. When starting out be conservative, use less water than predicted by the graph, get some practice with successfully pasteurizing the water, then increase the amount if your experience says that you can. It's better to pasteurize a small amount of water than to fail to pasteurize a large amount of water.

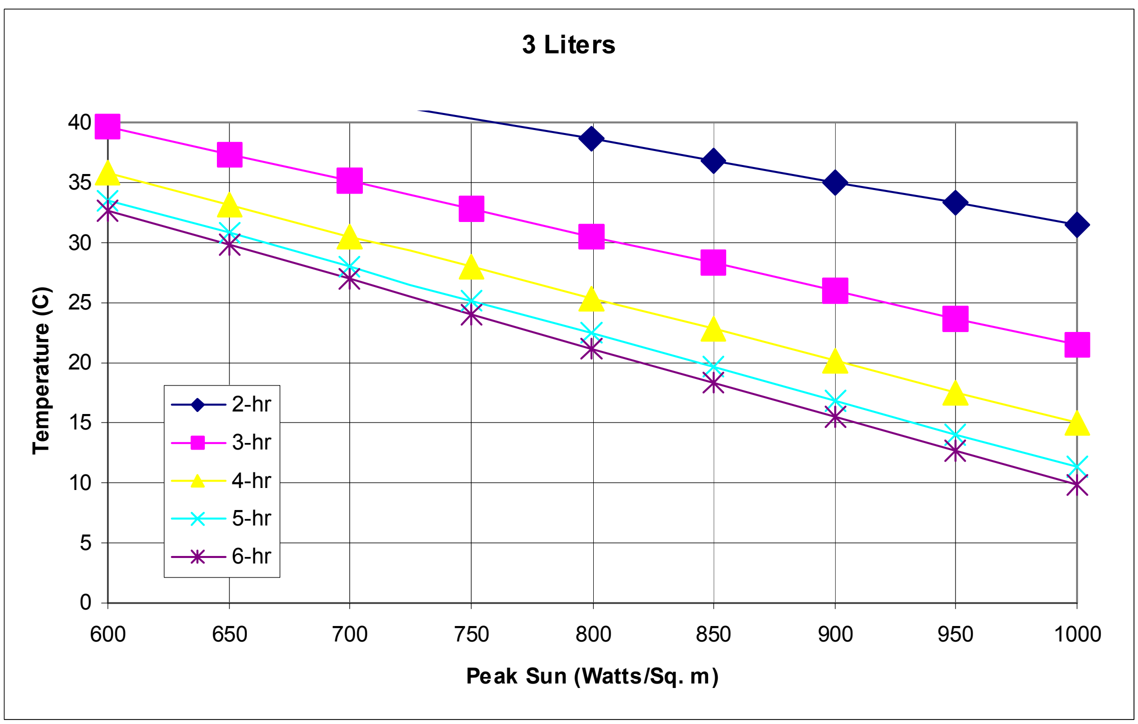
As a second example, if you wanted to pasteurize 2 liters and the temperature were 20° C, but the peak sun strength were only 700, you would find that the intersection point between 700 Watts/Sq. m and 20° C is well below the line for 5 or more hours. In this case, pasteurization is not likely to be achievable with 2 liters. You could then go to the 1 Liter graph and see that pasteurization should be achievable in about 3 hours with 1 liter.

Finally, one might ask if you want to pasteurize 4 liters, is it best to do it in 1 large batch or 2 batches of 2 liters? In theory, it will take the same time regardless of which way you pasteurize the 4 liters, but practical considerations apply. If you use 2 batches, you must empty the first batch soon after the first batch is pasteurized, otherwise you will waste the peak solar energy near the middle of the day. If you pasteurize in smaller batches and the sky unexpectedly turns cloudy after the first batch is done, then you at least have 2 liters of water, while if you had used a single batch, you'd have 4 liters of warm but unpasteurized water.

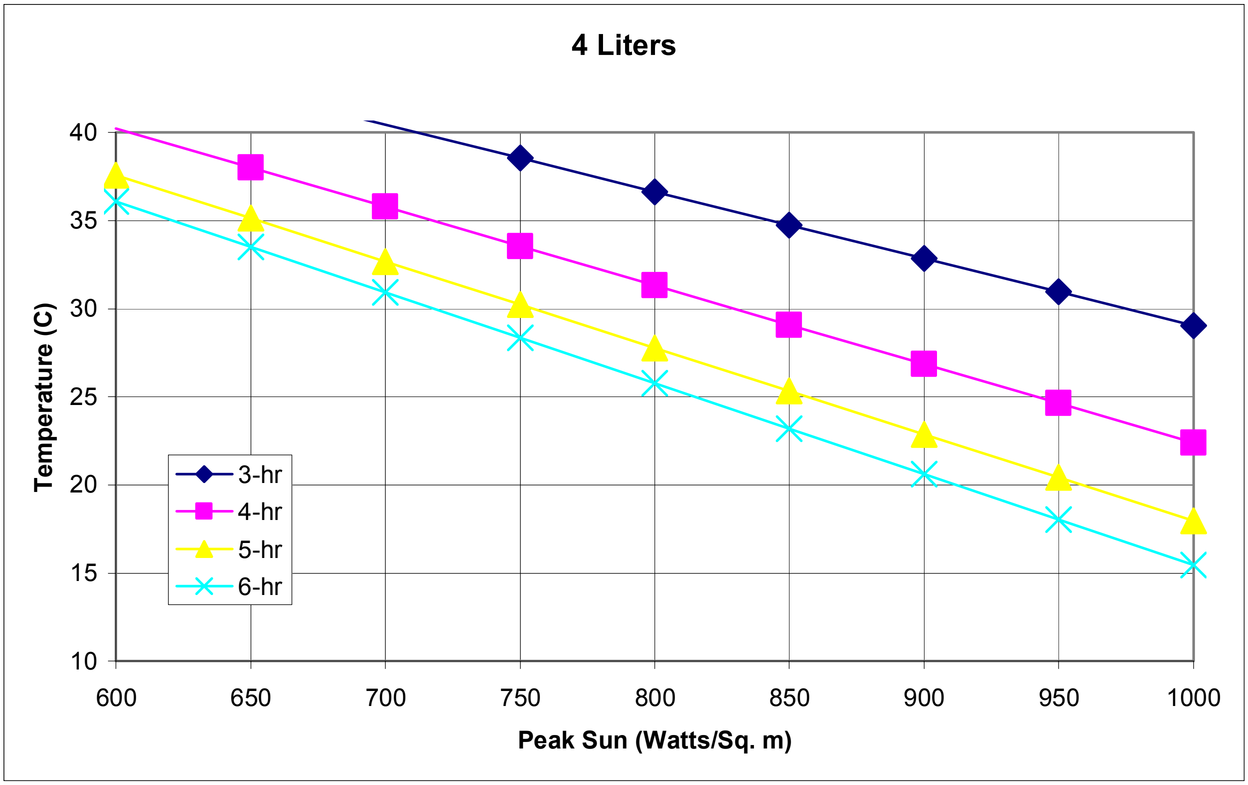




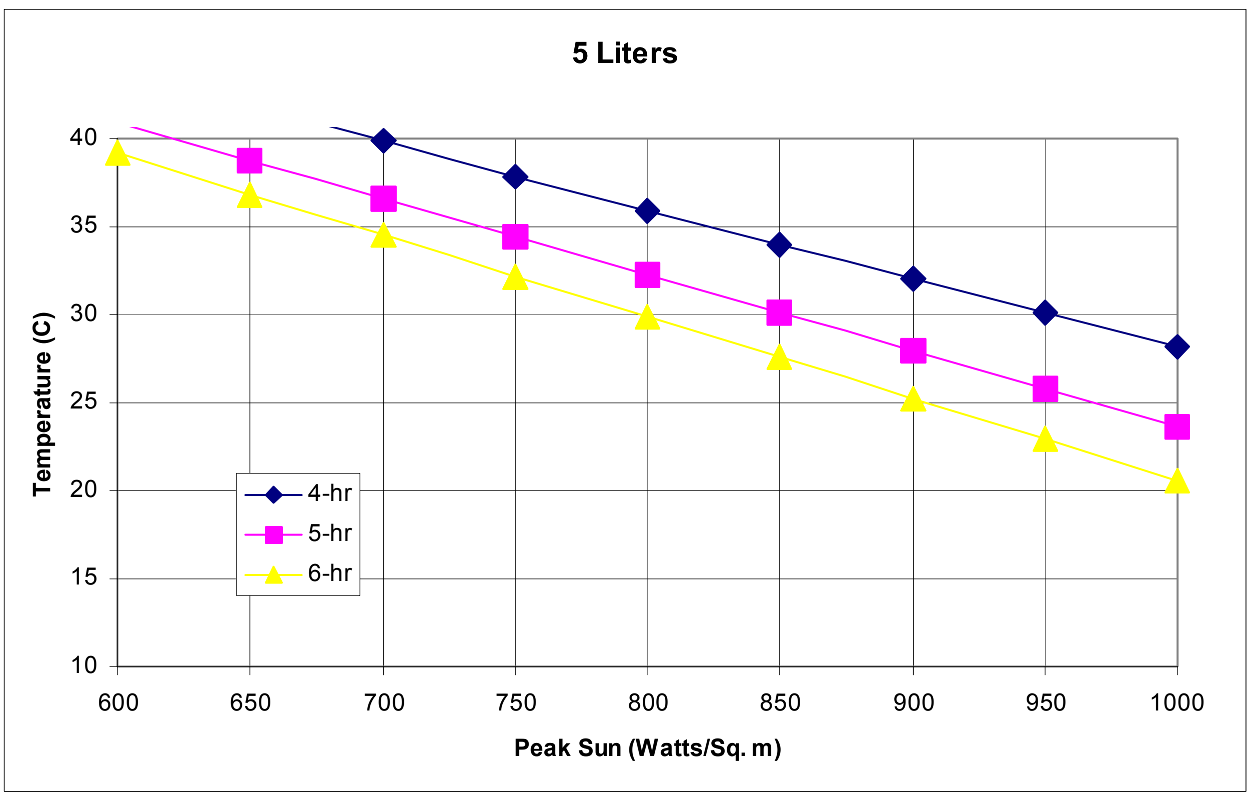
2 Liters
40
35
30
25
20
15
10
5
0
600
650
700
750
800
850
900
950
1000
Temperature (C)
Peak Sun (Watts/Sq. m)
2-hr
3-hr
4-hr
5 or more



3 Liters
40
35
30
25
20
15
10
5
0
600
650
700
750
800
850
900
950
1000
Temperature (C)
Peak Sun (Watts/Sq. m)
2-hr
3-hr
4-hr
5-hr
6-hr



4 Liters
Temperature (C)
40
35
30
25
20
15
10
600
650
700
750
800
850
900
950
1000
Peak Sun (Watts/Sq. m)
3-hr
4-hr
5-hr
6-hr



5 Liters
Temperature (C)
40
35
30
25
20
15
10
600
650
700
750
800
850
900
950
1000
Peak Sun (Watts/Sq. m)
4-hr
5-hr
6-hr