

Preparing a Saltbrine

Liquid brining is one of several methods used to prepare fish for the smoking process (details of salt use are discussed in the **Fish Safety Notes** entitled "Salting Fish").

Making A Brine

An easy way to prepare a brine solution of any given strength is to refer to the Sodium Chloride Brine Table (see next page) and then add the prescribed amount of salt per gallon (or litre) of water. For example, assume a particular quantity of salmon being prepared for smoking will require about 15 gallons (~68L) of brine with 15.8% salt (or 60°SAL) concentration. Simply find 15.8% salt in Column 2 and note that 1.882 pounds of salt/gallon of water is needed. Put 15 gallons of water in a tank and dissolve 28.23 pounds of salt (15 gallons X 1.882 pounds salt/gallon of water, or 187.8g/L X 68L = 12.8 kg salt).

The result will be a solution which has exactly 15.8% salt by weight. The volume has increased slightly, but this increase is usually insignificant for most applications. Note: adding other components to a brine solution (like sugar) may also affect the final concentration.

Measuring Salt Solutions

Salometer degree (°SAL) is a useful way of describing and measuring brines. This can be used to check brine preparations.

A salometer (also known as a hydrometer) is an inexpensive device that measures brine density saturation on a convenient scale of 0 to 100. Each °SAL represents about 0.26% salt by weight.

Fully saturated brine contains about 26.4% salt.



Salometer (hydrometer) in graduated cylinder with salt solution

To read a salometer, place it in a see-through container which holds a sample of the solution being measured. The depth at which it floats measures the brine concentration. Readings are taken by noting the point on the scale where the salometer emerges from the surface of the brine solution. These readings in °SAL can then be used with the table to obtain the per cent salt by weight, specific gravity, and the amount of salt dissolved in each gallon of solution.



This salt solution measures 60°SAL

The exact °SAL reading is temperature dependent therefore the temperature of the brine should also be taken. If the temperature varies more than a few degrees from 15.6°C (60°F), then a correction factor should be used for accurate work.

A rule of thumb states that for every 5.6°C (10°F) the brine is above 15.6°C (60°F), one degree salometer should be added to the observed reading. For each 5.6°C (10°F) the brine is below 15.6°C (60°F), one degree salometer should be subtracted from the observed salometer reading.

Noteworthy Points

Use Food Grade Salt: Road salt and sea-water are not acceptable sources for use in brines.

Dissolving Salt: It is important that all salt added is dissolved if a solution is to have the proper strength. Finely ground salt, such as canner's salt or table salt, dissolves much faster than coarsely ground salt (rock salt). Hot water and agitation of a solution will also increase the dissolving action. Salt, however, will dissolve much slower as the salt concentration increases. The last bit of salt in a 90°SAL solution may take a long time to dissolve.

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In summary, try to dissolve salt in a warm, well agitated tank and make sure it is all dissolved before using it or measuring its concentration.

Adding Salt to Existing Brines: If you want to increase the concentration of salt in a salt water solution, be sure to measure its strength and estimate its volume first. Then use the data in Table 1 to calculate how much more salt needs to be added (i.e. subtract the total amount of salt required in the final solution from the total amount of salt measured in the existing solution.)

Moisture Removal: Brines greater than 60° SAL (15.8% by weight) tend to remove significant moisture from the fish. Removal of water is important in limiting bacterial growth and enzyme activity. (Liquid brine concentrations with a salt content below 8% by weight will actually cause water absorption and swelling). For smoked fish, a salt brine solution of 60° SAL will generally result in 3.5% water-phase-salt (WPS) – read about WPS in the Fish Safety note – *Salting Fish*.

References

¹. Hilderbrand, Jr., K. S. Preparation of Salt Brines for the Fishing Industry. Accessed from <http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h99002.pdf>

Updated: Nov 2013

Sodium Chloride Brine Table

1	2	3	4	5
Salometer Degrees	% Sodium Chloride by Weight	Lb Salt per Imp Gallon of Water (1 g=4.54 L)	Grams Salt per L Water	Specific Gravity
0	0	0	0.0	1
2	0.528	0.053	5.3	1.004
4	1.056	0.107	10.7	1.007
6	1.586	0.161	16.1	1.011
8	2.112	0.215	21.5	1.015
10	2.640	0.271	27.0	1.019
12	3.167	0.328	32.7	1.023
14*	3.695	0.384	38.3	1.026
16	4.223	0.44	43.9	1.030
18	4.751	0.498	49.7	1.034
20	5.279	0.557	55.6	1.038
22	5.807	0.614	61.3	1.042
24	6.335	0.676	67.4	1.046
26	6.863	0.737	73.5	1.050
28	7.391	0.798	79.6	1.054
30	7.919	0.859	85.7	1.058
32	8.446	0.922	92.0	1.062
34	8.974	0.985	98.3	1.066
36	9.502	1.05	104.8	1.070
38	10.030	1.114	111.2	1.074
40	10.558	1.180	117.7	1.078
42	11.086	1.247	124.4	1.082
44	11.614	1.313	131.0	1.086
46	12.142	1.381	137.8	1.090
48	12.670	1.450	144.7	1.094
50	13.198	1.519	151.6	1.098
52	13.725	1.59	158.6	1.102
54	14.253	1.662	165.8	1.106
56	14.781	1.733	172.9	1.110
58	15.309	1.806	180.2	1.114
60	15.837	1.882	187.8	1.118
62	16.365	1.955	195.1	1.122
64	16.893	2.030	202.5	1.126
66	17.421	2.107	210.2	1.130
68	17.949	2.186	218.1	1.135
70	18.477	2.266	226.1	1.139
72	19.004	2.345	234.0	1.143
74	19.532	2.426	242.1	1.147
76	20.060	2.509	250.3	1.152
78	20.588	2.591	258.5	1.156
80	21.116	2.675	266.9	1.160
82	21.644	2.760	275.4	1.164
84	22.172	2.846	284.0	1.169
86	22.700	2.935	292.8	1.173
88	23.338	3.024	301.7	1.178
90	23.755	3.113	310.6	1.182
92	24.283	3.204	319.7	1.186
94	24.811	3.294	328.7	1.191
95	25.075	3.344	333.7	1.193
96	25.339	3.392	338.4	1.195
97	25.603	3.438	343.0	1.197
98	25.867	3.487	347.9	1.200
99	26.131	3.536	352.8	1.202
100**	26.395	3.584	357.6	1.204

* salinity range for sea-water ** saturated brine at 15.6°C (60°F)