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THE USE OF THERMAL WATER IN SPAS

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Abstract

Hungary is very rich in thermal and mineral waters. There are more than 1000 thermal wells in the country. 28 percent of the thermal water are used in spas. The treatment of mineral waters causes several problems such as disinfection, precipitation, etc. The medical effect of thermal water can be increased by treatment of the thermal water.

Keywords: : thermal water, spa.

Introduction

The purpose of usage and the quantities of thermal water in Hungary can be seen on the *Table 1*. It shows that a great amount of thermal water is used in spas.

Table 1
The use of thermal water

Purpose of use	Q (m^3/min)	%	number
Spa	284.97	28	279
Drinking water	216.69	22	230
Agriculture	242.43	24	229
Communal use	31.76	3	22
Industry	68.70	7	67
Other	76.51	8	156
Closed	80.99	8	138
Total	1002.05	100	1121

Water Treatment of Hot Thermal Spas

Spas operate usually without water treatment. The fresh water flows into the basin and decreases the concentration of contamination. Then it flows out from the basin to the sewerage. In this case the fresh water quantity must be so high that the water quality of the basin can not reach the limit of the bacteriological parameters. Disinfection is also used, but there are often difficulties with the most commonly used chlorine. The by products and derivatives from the reaction of chlorine and ammonia, humic and fulvic acids, etc., sometimes make greater problem than without chlorine. Because of the dissolved organic substances disinfection with chlorine is often not useful, there is no residual chlorine. The chlorinated by-products are often dangerous to health. Therefore, in most cases fresh water is used without adding chlorine. The treatment of thermal and mineral waters means that the dissolved minerals like sulphur, ammonia, etc. must be removed. After the treatment it can happen that the originally thermal and mineral waters are not mineral water any more.

Low Load Through-Flow System Basins

Most of the hot thermal spas in Hungary operate in through-flow system. If there is no water treatment and no chlorination, the importance of basin hydraulic is enhanced. The leading of fresh thermal water into the basin and the transport of contaminated water to channel must be steady. The recircling and treatment of thermal water results in a decreasing medical effect, comparing to through-flow system. Therefore, therapeutic basins use untreated fresh thermal water. The hygienic circumstances can only be satisfied — in that case there is no disinfection — with the reduction of the load basin. It means the dividing of open-air bath and the thearapeutic basins. This decision must be made for patients, using the basins only by medical care.

Temperature Problem of Thermal Water in Spas

The use of thermal water in spas provides several problems. One of these problems is the high temperature. Sometimes the water temperature is so high that it can not be led directly into the basin. The required temperature can be reached by cooling the hot water or mixing it with cold water (*Fig. 2.*). It means that the thermal water containing high proportion of minerals is mixed with drinking water. This results in problems of sedi-

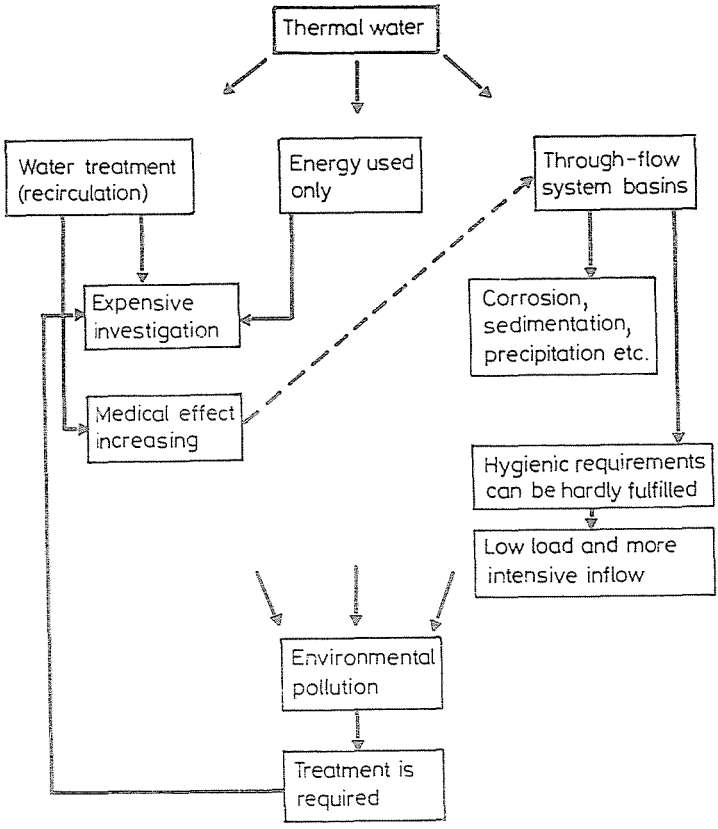

Fig. 1.

mentation, precipitation, etc. It is a better solution when cooled thermal water is used with similar mineral content and similar chemical parameters. Sedimentation and oxidation can also occur, but the balneological effect is better in this situation.

The Environmental Problems of Thermal Waters

The use of thermal water means economic and environmental problems as well. The quantity of dissolved substances and the temperature are high. If this water is led to natural surface water biological and chemical problems can be caused . The rise of temperature in natural surface water is unusual for the flora and fauna, and may overturn the natural equilibrium. Thermal water can also be toxic. In the sulphate contained water toxic

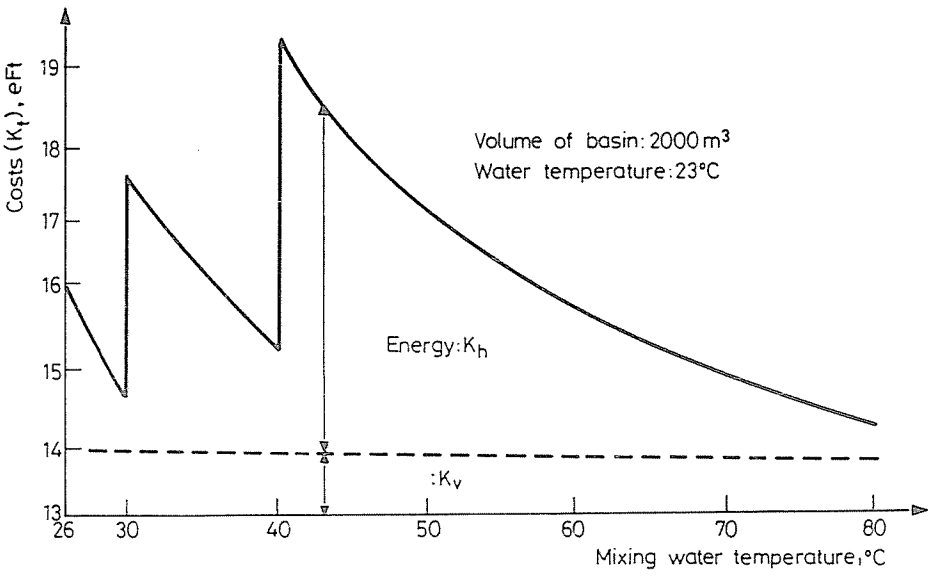

Fig. 2. Cooling of Thermal Water

carbon hydroxide can be formed after the activation of sulphate reducing bacterium. High sodium concentration is dangerous for water used for irrigation purposes, because soil can be desiccated.

The technical solutions for draining of the used up thermal water are the following:

a) Direct leading into stream
   The effect of thermal water on the stream must be examined.
b) Leading into inland drainage
   Problem of desiccation may take place after irrigation.
c) Desiccating
   Dangerous to soil and to the water resources.
d) Temporary storage
   Solves the cooling and sedimentation problem of thermal water only.
e) Leading into still water
   The natural equilibrium changes near the draining.
f) Pressing back to underground
   It needs water treatment before pressing. The ground water can be contaminated. The cost of this system is very high.
   The protection of nature is important, but economic point of view must be considered.

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