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Efficient Use of Geothermal Energy in Spas - Call for Improvements

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In Central Europe, the Pannonian Basin and adjacent areas are holding some of the most attractive geothermal energy resources available from subsurface hot water reservoirs. In fact, utilization of geothermal energy has a long-standing tradition in the region, mainly for thermal and medicinal bathing. Nevertheless, putting to use the extractable heat in a technical and economical optimum manner, and integrating the various energy flows (heating, cooling, vitiated air, etc.) in the application system as well as returning the cooled effluent (excluding used bath water) back to the reservoir, has not found general acceptance to date. This is regrettable not least because thermal spas can be regarded as virtually ideal objects for an integrated management of energy flows on a low temperature level. Hardly any other facilities are in nearly constant, year-round need of heat at a low temperature, as is actually delivered by most thermal aquifers. Also, waste heat and solar energy can be added without much inconvenience, and if hotels and/or therapeutic facilities are to be supplied, there will be cooling demand as well.

Many spas in the region are about to update their technology. Complementing this development by an initiative for an integrated and therefore economical use of all the heat sinks and sources that may be present was the main objective of the "network project" PANTHERM (www.pantherm.eu) designed at the University of Applied Life Sciences and Natural Resources, Vienna, in cooperation with four Austrian and ten Hungarian, Slovak and Slovenian partners, and funded by the Austrian Research Promotion Agency, Vienna. In the course of a technical feasibility study it was dealt with the problem, and – by example of the spa of Sárvár in Hungary – demonstrated also, in which way the given mass and energy flows need to be interconnected in order to achieve an optimum energy yield, always with an eye on cost-effectiveness and sustainability. The other Eastern European partners contributed to the attempt to develop the energy flow calculation model designed for said spa into a numerical planning tool with broad applicability to other technical boundary conditions. This aim could not yet be fully achieved with the given means, by virtue of the fact that huge differences exist among spas, regarding technical design (sometimes accumulations of ad-hoc solutions to past technical problems) as well as characteristic energy demand of the various functional units of the investigated facilities. What could be achieved, though, was a better understanding how the communication between clients and consultants shall be conducted and what steps have to be taken in order to reach the original goal in a subsequent project. Furthermore, it was the ideational aim of our work to set up a network of established players, capable of influencing national developments, and make it a proponent of the envisaged improvements in their home countries and beyond.

Among the recommended measures to improve on the energy management of existing thermal spas, on the one hand, there are those that only specialized knowledge can reveal or the proper application of which only painstaking monitoring and calculation can ascertain and which, therefore, will not easily be at the hand of many planners. These include, for example, combining geothermal heat with advanced heating technology (gas condensing boiler, cogeneration plant) for peak load conditions, deciding on the kind of advanced technology to be used (condensing boiler or cogeneration plus heat pump), making consistent said technology with the temperature control system (e.g. substitution of bypass design of heat exchanger control by volume flow control); introducing solar energy, in particular, has to be carefully designed. On the other hand, there are some improvements to be called for, which are meaningful and applicable even as belated additions, and in cases would, on top of this, be obvious to most non-specialists, for example, permanent insulation or temporary insulating cover for hot water facilities, especially outdoor (but also indoor) pools, as well as volume flow control of thermal wells, instead of extracting a constant flow rate and discharging the surplus (which, in fact, is not uncommon).

Naturally, within the bounds of limited resources the urgent task for spa managers mostly is to be found in laying out and refashioning the publicly accessible areas and services in a way that will meet the increasing demands of the clients and keep up with current trends. However, the frequent lack of obviously and also economically sensible energy saving arrangements, even in newly built thermal spas, can be seen as indicating that issues pertaining to an efficient energy management often have to compete with many other questions of detail in the planning stage and finally get lost, because they were not included in the design specifications. Accordingly, operators and financial backers and planners even more than managers of spas are to be addressed if the abovementioned shortcomings shall be remedied in the future.