SUPPLYING AIRPORTS WITH WATER FROM ITS OWN RESOURCES AND WATER RECYCLATION POSSIBILITIES

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In the following article, the authors analyze the need for the water at airports, usual kinds of these water supplies,, and the ways how the airports utilize or process water. Respective options for waste water drainage are also analyzed, including the possibilities of the rainwater disposal. Every water supply option is described in detail, and essential component features of a safe and well-functioning water conduit are depicted.

K e y w o r d s: waste water, rain water, water supply

1. INTRODUCTION

Drinking water supplies are getting shorter every year, not only because of the mismanagement, but also due to pollution, increased evaporation etc. Almost 97% of total water supply contributes the seawater, which is salty and therefore useless for men or plants. Another roughly 3% reside in the icebergs, so only about 0.3% is available to human race or plants, however there is also the issue of quality and treatment. Attempts for the utilization of the rain water is therefore reasonable – it saves the drinking water and also the treatment costs.

At airports, in the industry,, but also in households, there are numerous opportunities how to utilize rain water or recycled water, which would save the drinking water. Worldwide, 3,940.7 km^3 of water is used annually, 22,77% of which is used in households, 18,98% in the industry, and 58,25% in the agriculture. If we were successful not only in Slovakia, but in the whole world in minimalizing the use of drinking water when it is not specifically required, it would help to improve the decline in natural resources on a large scale.

2. NECESSITY OF WATER

The necessity of water is an inevitable at airports, as well as any other public or industrial buildings. At an airport, water is used for safety and hygiene reasons. It serves as a water supply for the fire brigade as well as a supply for hydrants, airplanes´ own water supplies, washing, and also in the airport hall. In the latter case it is specifically drinking water used in kitchen, for cooking and washing dishes or for hot drinks. The biggest consumers of water in airport halls are washers, toilets, showers and kitchen.

3. WATER SUPPLIES

Recently the airport has two sources of water. The major source is the city water conduit, from which the water runs in pipes to the respective water inlets. The city water conduit´s water is classified as drinking water. There are restaurants at the airport for which this drinking water is essential. This drinking water is also used in the airplanes, exclusively for washing hands and flushing toilets. The other source of water at the airport are wells, which provide utility water. This is used by the fire brigade in cases of accidents and fire. The utility water from wells is also used for cooling of the concrete surfaces.

4. WASTE WATER

All the water that the airport used (and changed its quality or temperature) can be called waste water, and this is drained away from the airport either into the city sewer or (using stone drain[1]) soaks into the ground.

The airport drains the sewer water into the sewer which is paid for as a regular sewer payment. Another type of water that is drained is the rain water, which runs through sewer inlets and downpipes into the same city sewer and paid for. All the outdoor surfaces are reinforced and drained through gravity separators and oil separators, including runways and landing strips.

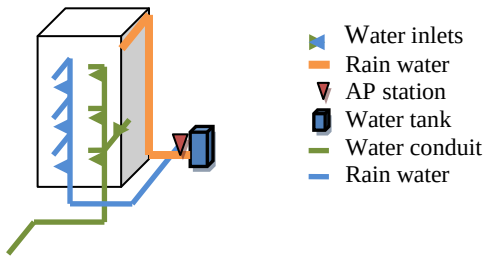
Rain water is drained from these surfaces through the mentioned separators into water courses. These oil and gravity separators are situated in the fuel storage warehouses, near the drainage of the north and south part of runway and landing strip of Košice airport. The preservation of surface and ground water is monitored using drill holes, situated around the airport. These are monitored daily and evaluated every two months, the results are then submitted to the government office responsible for environment.

5. COMBINATIONS OF WATER SOURCES

Water sources can be combined in any business where drinking and utility water is needed. However they must not be interconnected, so that the waters do not mix! The most important is the decision which source would supply the building. In case of supplying kitchen (or other site where drinking water is required) it is not possible to choose rain or recycled water, since it does not meet the requirements for drinking water.

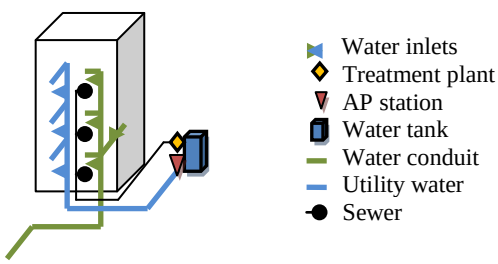
5.1 City water conduit and rain water

In case of a system designed for city water conduit and rain water, a double system of distribution pipes is preferred. One is for the rain water used only as utility water, and which can be heated and used as hot utility water. But it is not for drinking! The other is for the city water conduit water (city water), which has to be separated, and must not be interconnected with the rain water, otherwise a suck-back would cause contamination of the city water.. In case of insufficient rainfall, the city water can serve as utility water, to avoid loss caused by the shortage of utility water. The pipes however must be designed so that the drinking water will not get contaminated.



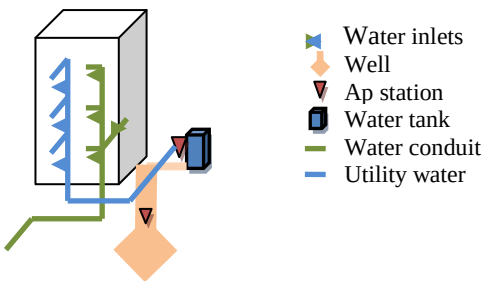
5.2 City water conduit and recycled sewer water

In case of combining city water conduit and recycled sewer water a double system is preferred as well, however there is a small difference. Recycled sewer water is not suitable for washing, but it can be used for toilets and cooling the concrete or watering grass. In this case, the city water is used in all other water inlets and also heats up to be used as hot utility water. Recycled water has its own separate distribution, with only water inlets being at toilets. The recycled water is stored in the tank. In case of shortage of recycled water, the tank with utility water is filled with drinking water. Since these two systems are interconnected, it is necessary to solve the question of possible contamination of drinking water.



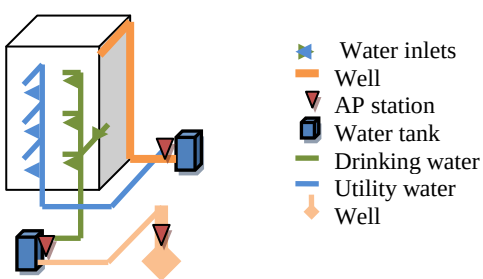
5.3 City water conduit and a well

First condition for combining well with a city water conduit (where the water from well is used as utility water) is the well efficiency, so that the well can provide enough water. Similarly to previous cases, double system is implemented for respective water supplies. These systems are not interconnected, so there is no worry about the contamination of the drinking water.



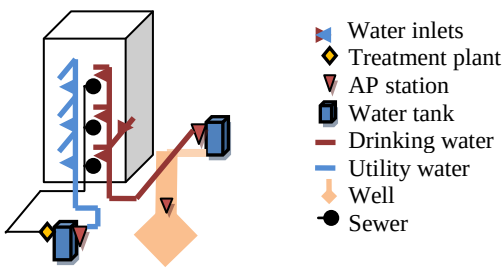
5.4 Well and rain water

This combination again requires double system of distribution, where one systems is used only for one type of water. An advantage of this combination is that the object becomes energetically independent. A disadvantage of this model is that it becomes necessary to use different source of drinking water in case when the well becomes contaminated. If it is not required that the objects must have a drinking water supply, there is no need for a backup source.



5.5 Well and recycled water

This combination as well utilizes the double system for water distribution, as all the previous ones. In itself it is exactly the same as the well-rain water system, in which the water from well is used as drinking water, and the recycled water is used as utility water. Recycled water is stored in water tanks, which may be filled with drinking water when needed. As well there is the condition of ensuring that the drinking water will not get contaminated. In case of contamination of the well water, it is inevitable to supply the building with drinking water from another source.



6. CONCLUSION

Recently, the question of saving, recycling and using rain water became popular also in Slovakia. **System allowing for repeated use of rain and treated water is an important safety factor.** It provides for back up and independence in case of city water conduit breakdowns or in case of its limitations. A building with the system designed to use water repeatedly can work even in emergency conditions, while other buildings would be cut-off in such situations. An airport can not afford risking such a paralysis, therefore it is necessary to provide for a backup water supply.

An ideal situation is when both the main and the backup source can provide for drinking water supply. If we were to choose from the options described in the previous chapter, it would be exclusively the city water conduit/well

combination (considered that the well is a drinking water supply). Since the airport´s major water consumption facilities use utility water, the most suitable source would be rain water. Treatment of rain water is one of the most simple, since it is merely a mechanic filtration and there is no need for further treatment. The costs for obtaining a double system of distribution for the rain water/city water conduit combination are essentially the same as in case of a simple system, and the same as the costs for every other combination. The costs for respective combinations differ in the maintenance and obtaining.

The most expensive solution when obtaining and constructing is the treatment of the waste water. For this system to work, it is necessary to have the waste water treatment plant, the water tank, the pump and the pipes themselves. Another condition rising from the technical requirements of waste water treatment plants is the continuous flow of new water. It means it is impossible to create a „closed system“ with a given volume of water that would continuously get treated. Therefore another system is needed, to provide fo this water supply.

From all the systems we have discussed so far, the least expensive are the the systems of rain water and city water conduit, and of rain water and a well. Wells or city conduit in this case provide for drinking water. The rain water is used as utility water. Since we are talking about an airport, where water is a must either in safety issues or maintenance, it is inevitable to design and count on a backup water supply. In case when an airport is supplied with a well and rain water, it is suggested to use city water conduit as a backup supply. Reasons for backup sources are possible threats to the drinking or utility water, such as contamination of ground waters in case of disasters, pumping problems, water tanks, or their maintenance. In the case of combining city water conduit with rain water, it is suggested to use wells as a drinking water source, since it is the only drinking water supply.

If we take into consideration the maintenance costs, recycling of water is the most economically efficient, since there are no sewer payments (which is 69.7%) when recycling water and draining via stone drains. Remaining 30,3% is the water price. If the airport used recycled and well water, it could considerably reduce the expenses. In the ideal case, it would be energetically independent.

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