

Supplementary Materials: Nomenclature

Subscript		$s_{max}^{down}/s_{max}^{up}$	maximum amount of switches in pumping power in upper and lower direction [-]
<i>el</i>	electrical	$\dot{V}_{max}^{in}/\dot{V}_{max}^{out}$	Maximum inflow outflow of storage [m ³ /h]
<i>i, j</i>	row and column of matrix A	t_{ret}	retention time [h]
<i>Loss</i>	water loss	V_{dead}	dead volume [m ³]
<i>max/min</i>	maximum/minimum	$\Delta V_{min}/\Delta V_{max}$	minimum/maximum flow rate change [m ³ /h]
<i>ret</i>	retention time	Variables	
<i>t</i>	timestep	CF_{el}^n	conversion factor describing the ratio between the consumed power and the volume flow rate [-]
Superscript		$P_{t,n}^{spot}$	power consumption of plant components [MW]
<i>clean</i>	clean water storage	P_t^{plant}	power consumption of entire plant [MW]
<i>demand</i>	hourly water demand	s_t^{on}	binary variable defining state of power consumption point [0/1]
<i>down</i>	shutdown procedure	s^{up}/s^{down}	binary variable defining start-up and shutdown procedure [0/1]
<i>in/out</i>	inflow/outflow	$s^{up,n}/s^{down,n}$	binary variable defining start-up and shutdown procedure of the nth power consumption point [0/1]
<i>MP1/MP2</i>	main pipe 1/2	s_t^{on}	binary variable defining state of power consumption point [0/1]
<i>n</i>	number of units	\dot{V}_{Loss}	water loss [m ³ /h]
<i>net</i>	net storage	\dot{V}_t	volume flow [m ³ /h]
<i>on</i>	operating status	\dot{V}_t^n	volume flow corresponding to the nth power consumption point [m ³ /h]
<i>plant</i>	concerning whole plant	\dot{V}_t^{range}	Range between minimum and current volume flow [m ³ /h]
<i>range</i>	difference of current and minimum flow	\dot{V}_t^{demand}	drinking water demand [m ³ /h]
<i>react</i>	reaction storage	$\dot{V}_t^{in}/\dot{V}_t^{out}$	inflow/outflow of storage [m ³ /h]
<i>res</i>	reserve	\dot{V}_t^{MP1}	flow through main pipe one [m ³ /h]
<i>up</i>	start-up procedure	V_t^{react}	storage level of reaction reservoir [m ³]
Parameters		V_t^{clean}	storage level of clean water reservoir [m ³]
c_j	coefficient	\dot{V}_t^{net}	water discharge to distribution net [m ³ /h]
MP_t^{spot}	spot market price [€/MW]	PCP_t^n	power consumption point of pump [MW]
P_{min}/P_{max}	minimum/maximum power of pump [MW]	a_{ij}	matrix of coefficients

P_t	pumping power [MW]	b_i	coefficient
P_t^n	pumping power of the nth power consumption point [MW]	x_{ij}	variable
P_{max}^{plant}	maximum power consumption of plant[MW]	z	objective function