

**OPEN LOOP HYBRID CIRCULATORY MODEL:  
THE EFFECT OF THE ARTERIAL LUMPED PARAMETER LOADING  
STRUCTURE ON SELECTED VENTRICULAR AND CIRCULATORY VARIABLES**

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Different combinations of the artero-ventricular coupling design (numerical, physical and hybrid) and the arterial system structure (four-element standard, simplified, modified and three-element three-lump "ladder" Windkessel) have been applied in an open loop circulatory model to test their influence on selected ventricular and circulatory variables.

Numerical investigations have shown that a four-element Windkessel with an introduced in series lumped inertance can evoke some numerical problems e.g. when combined with the simplified ventricular model containing "ideal" zero switching time heart valves' or constant valve resistance during opening.

The four-element Windkessel structure modification i.e. replacing the in series inertance by the parallel one, considerably improves the network match. Also the three-element three-lump "ladder" Windkessel has been found very useful in the blood circulation modelling thanks to relatively small input inertance and high input capacitance of its first lump.

Keywords: hybrid numerical-physical model, lumped parameter model, Windkessel model, ventricular loading