

## Controller design using coefficient diagram methods for matrix converter based unified power flow controllers

### ABSTRACT

This paper presents a new controller design method using the coefficient diagram method (CDM) for matrix converters (MCs). MCs are able to convert AC to AC power directly without DC link capacitors. In this paper MCs are used in unified power flow controllers (UPFCs), which is one of the flexible AC transmission system (FACTS) devices located in the transmission line. The CDM is an effective method for designing adequate gains in a PID controller but is not convenient for solving the complex characteristic polynomials of non-standard systems such as the multiplication of controller gains or multi-input-multi-output systems. We propose to combine CDMs with Particle Swarm Optimization (PSO). PSO is employed for searching the near optimal diagram. Our proposed method is applied to a simple transmission line and the validity of the proposed method is shown using MATLAB/Simulink simulation.

**Keyword:** Matrix converter; Unified power flow controller; Particle Swarm Optimization (PSO); Coefficient Diagram Method (CDM)