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The feed forward neural network (FFNN) based model prediction of Molten Carbonate Fuel cells (MCFCs)

KEYWORDS: Modeling, MCFC, Simulation, Feed forward Neural Network

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ABSTRACT *The present analysis carried on data (Simulation & Optimization results) are collected using the developed mathematical model of the MCFC [1]. The collected data are arrange as n in put variables (i.e. temperature , pressure ,current.etc) and one output such as Voltage/ Power, get approximated model of fuel cell in term of feed forward neural network. The FFNN trained results are well compare to the simulated results. If the errors in output result is less than required criteria, now trained FFNN model used in the cell performance estimations.*

1. Introduction:
The feed forward neural network was the first and arguably simplest type of artificial neural network devised. In this network, the information moves in only one direction, forward, from the input nodes, through the hidden nodes (if any) and to the output nodes. A feed forward network is one who so topology has no closed paths. Its input nodes are the ones with no arcs to them, and its output nodes have no arcs away from them. All other nodes are hidden nodes .The operation of a feed forward network consists of calculating outputs given a set of inputs in this manner.

2. Simulated Results of single cell of MCFC:
In the fig 1 shown the simulated powers of the single cell of MCFC, at the different values of input variables, as load current & membrane thickness. In the figure 2 shown simulated voltage at the different values of input variables. Fig 3 shown optimized efficiency of the cell at the different values of input variables. These results have been obtained using the mathematical model of the single cell MCFC in previous work [1], here all the results are not includes.

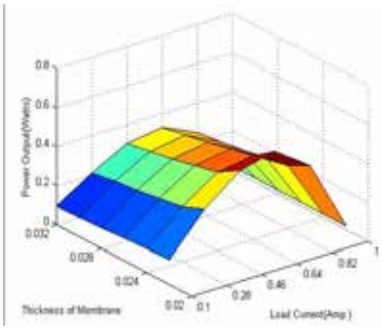

Fig. 1 Simulated power of different values of input variables, load current and membrane thickness of the cell.

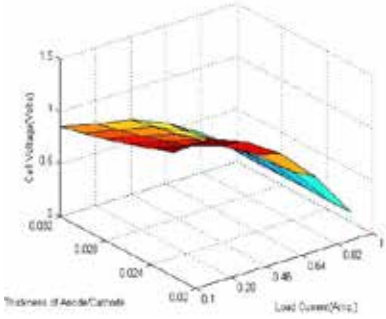

Figure 2 Shown optimized potential at the different values of input variables, as load current & electrodes area.

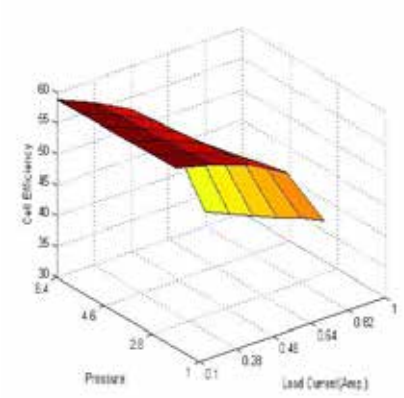

Figure 3 Shown optimized efficiency of the cell at the different values of input variables, as load current & pressure.

3. MCFC single Cell mathematical Model predicted results:
In the figures 4, 5 and 6 are shows are showing the comparative analysis voltage variation in single cell of MCFC for the three different methods used in the analysis. The results are well predicted to each other, that shows the feasibility of the work.

4. Methodology:
Methodology used in the analysis is explained in the flow charts.

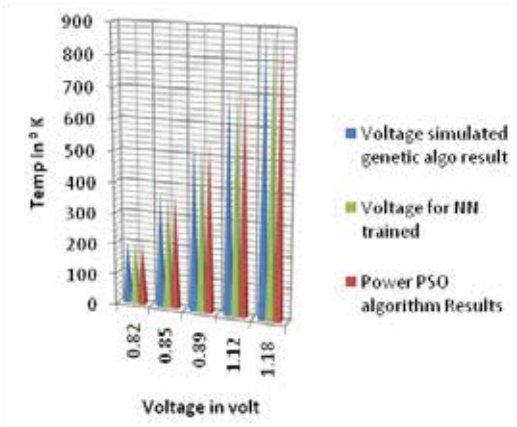

Figure:4 shown comparative analysis of voltage variation of the single cell of MCFC using the three different method of analysis.

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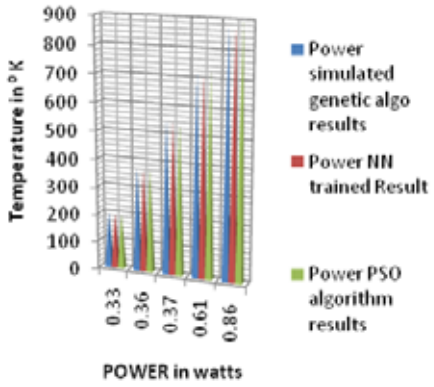


Figure:5 Shown comparative analysis of power variation of the single cell of MCFC.

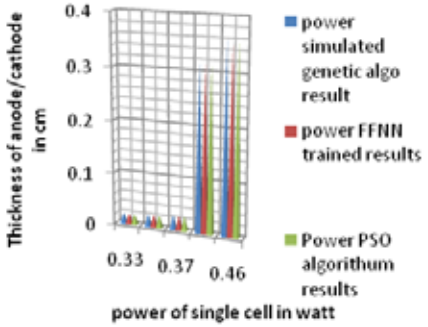
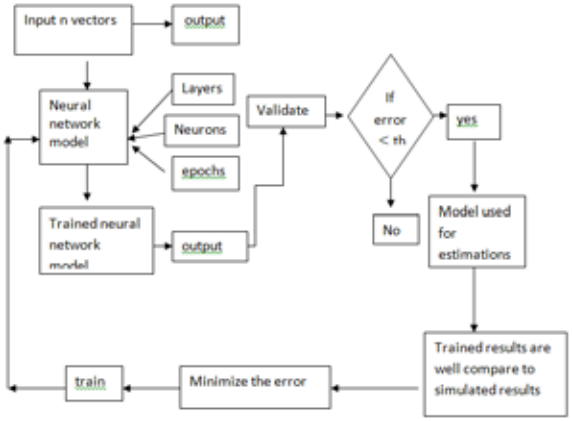


Figure: 6 shown comparative analysis of power variation of the single cell of MCFC using the three different method of analysis, at the input limits of the cell electrodes thickness.

Conclusion:

The molten carbonate fuel cell (MCFC) is a complex system, the solution of the mathematical models are very difficult. The feed forward Neural Network effective tool find the results without limitations of the input parameters and its values limits. In this paper simulated results are obtained using Mat-Lab software are ready published in the previous research paper [1], here they are present only the compare points of views

Flow- chart: Training process of an approximated neural network model of MCFC



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