Intani, P.\(^a\), Buttapeng, C.\(^b\), Sasaki, T.\(^a\), Kikuchi, T.\(^a\), Harada, N.\(^a\)

Fundamental of an AC MHD generation with single-side exciting winding

DOI: 10.1541/ieeepes.131.463

\(^a\) Nagaoka University of Technology, 1603-1, Kamitomioka, Nagaoka 940-2188, Japan
\(^b\) University of the Thai Chamber of Commerce, 126/1 Vibhavadee-Rangsit Road, Dindaeng, Bangkok 10400, Thailand

Abstract

This paper presents the possibility to generate the alternating current (AC) electrical power by using a linear MHD generator. The single-sided exciting winding of the generator is considered. Its structure consists of a channel, an insulator and stators. The channel type is a flat rectangular and the liquid flows along the channel as a conductor. The channel wall acted as an insulator separates the metal fluid and stator coil. The top stator winding of the generator is connected to polyphase systems. Under this condition, it can produce a magnetic field by means of time harmonics function in the same direction of the metal fluid. Energy in the channel is extracted by inductive coils at the bottom stator. An interaction between traveling wave and metal fluid is explained by finite element technique. The distributions of magnetic vector potential and magnetic field throughout channel are evidently shown in xy-plane. Power flow in an AC MHD generator is reported with magnetic Reynolds number and slip value. The optimized value of active power is suggested by small slip value as s < 0 and small magnetic Reynolds number. © 2011 The Institute of Electrical Engineers of Japan.

Author Keywords

AC MHD generation; Linear generator; Magnetohydrodynamic; MHD generator; MHD induction generator; Plasma application

References

- Ishikawa, M., Steinberg, M.  
  MHD power systems for reduction of CO\(_2\) emission  
  PII S0196890497000496

- Harada, N.  
  Magnetohydrodynamics for advanced power generation system  

- Jackson, W.D., Pierson, E.S.  
  Operating characteristics of the m.p.d. induction generator  

- Jackson, W.D., Pierson, E.S., Porter, R.P.  
  Design considerations for MHD induction generators  
  Paris: Organization for Economic Cooperation and Development, European Nuclear Energy Agency

- Wang, T.C., Dudzinsky, S.J.  
  Theoretical and experimental study of a liquid metal MHD induction generator  

- Wang, T.C., Dudzinsky, S.J.  
  Comparison of MHD induction generator analyses  

- Dudzinsky, S.J., Wang, T.C.  
  MHD induction generator

- Jackson, W.D.  
  (1962) *Classical Electrodynamics*,

- Pedro, J., Bastos, A., Sadowski, N.  

- Pierson, E.S., Hanitsch, R., Hihns, T., Mosebach, H.  
  **Predicted and measurement finite-width effects in linear induction machines**  

- Lessmann, R.C.  
  **Elimination of end losses in an MHD induction generator**  