IMSEC 2017

2nd International Mediterranean
SCIENCE AND ENGINEERING CONGRESS
OCTOBER 25-27, 2017
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2. Uluslararası Akdeniz
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Proceedings Book

Organizer of the Congress
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Bildiri Kitabı

Editörler
Doç. Dr. Mustafa Özcanlı
Doç. Dr. Hasan Serin
Yrd. Doç. Dr. Ahmet Çalık

http://www.imsec2017.org

2nd International Mediterranean Science and Engineering Congress (IMSEC 2017)
Çukurova University, Congress Center, October 25-27, 2017, Adana / TURKEY
Pages: 928

A study on optimum spacing between staggered metal hydride tanks in forced convection

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Abstract

The sufficient hydrogen flow for requirements depends not only on the quantity contained in the metal hydride tanks, but also on other dynamic factors such as the ambient conditions and metal hydride properties. This work investigates the effects of equilibrium pressure, ambient air temperature, and air velocity on optimum spacing between metal hydride (MH) Hydrogen storage tanks in fuel cell applications as theoretically and numerically by using Autodesk CFD Simulation software. The metal hydride chosen for the present study are LaNi5. A new approaching is presented for defining the optimum spacing between tanks according to different operating conditions. Analyses are carried out for various ambient temperatures (290 K, 300 K and 310 K), equilibrium pressures (60 kPa, 100 kPa and 120 kPa) and Reynolds Numbers (6000, 12000 and 30000). As a result, when Reynolds number increases, the optimum spacing will considerably decrease. Furthermore, by decreasing the equilibrium pressure and increasing ambient temperature optimal spacing will not change. The results show that there exists a spacing between the MH tanks for maximum heat transfer and it should be considered to size the MH-Fuel cell system without extra cost.

Keywords: Metal Hydride Storage, Optimization, Forced Convection, Numerical analysis

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