2014 43rd Turbomachinery Symposium - Short Course

GAS BEARINGS AND MAGNETIC BEARINGS FOR OIL-FREE ROTATING MACHINERY

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Gas bearings (GBs) are an efficient alternative for load support of high speed microturbomachinery (< 400 kW, +1000°F, +3M DN). These bearings are compliant surface hydrodynamic bearings using ambient air as the working fluid media. Oil-free systems have lesser part count, footprint and weight and are environmentally friendly and (nearly) maintenance free, thus saving costs and resources. Current commercial applications include air cycle machines, cryogenic turbo expanders and micro gas turbines. Other upcoming applications include auxiliary power units, automotive turbochargers and aircraft gas turbine engines for regional jets.

The short course provides practicing engineers with a comprehensive review of existing gas bearing technologies including their principle of operation, analysis and experimental verification, comparison amongst other gas bearing types, as well as the integration of gas bearings, foil bearings in particular, into actual rotor-bearing systems (hot and cold). The course also includes an introduction to magnetic bearings and their applications in oil-free microturbomachinery.

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Luis San Andrés is a renowned analyst and experimentalist in the fields of fluid film lubrication and rotordynamics. Since 2000, Dr. San Andrés has performed research on the analysis and experimental verification of gas foil bearing performance for high temperature oil free turbomachinery and squeeze film dampers for aircraft jet engines. His computational codes, benchmarked against test data, are standards in the rotating machinery industry. Dr. San Andrés and his students have published over 150 papers and participate actively in international conferences and journal editorial boards. Learn more about his work at http://rotorlab.tamu.edu.
Prof. San Andrés is an ASME Fellow and STLE Fellow and a member of the Advisory Committee for the Houston-Turbomachinery Symposium and Middle Eastern-Turbomachinery Symposium. He presently coordinates the organization of the 2016 Asia Turbomachinery Symposium in Singapore.

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Daniel Lubell has over 15 years of oil-free turbomachinery experience. Most recently, Daniel joined Calnetix in 2012 as part of the turbomachinery team. This role includes managing a small group of turbomachinery and electronics engineers and specialists in the development and commercial support of advanced oil-free turbomachinery with magnetic bearings and oil lubricated turbomachinery. Previously, Daniel was with Capstone Turbine in the oil-free foil bearing group. His roles included Manager of Turbomachinery Rotating Systems and Principal Engineer of Oil-Free Bearing Technology as part of a company focus on advancing foil bearing technology. His responsibilities included bearing and rotordynamic design integration and testing for all Capstone products as well technical and commercial lead for all outside foil bearing programs. Prior small turbomachinery experience includes APU's and small thrust jets with Hamilton Sundstrand (now part of Pratt and Whitney). Daniel has a Master of Science degree in Mechanical Engineering which he earned at the Texas A&M University Turbo Lab in College Station, Texas. Prior to that, he earned a Bachelor in Engineering Science degree from Trinity University in San Antonio, Texas. Daniel is an ASME member and active participant in conferences and journals and has published papers on squeeze film dampers and foil bearing developments for micro gas turbines.