

Laboratory Name: Sustainable Propulsion and Power Technologies Laboratory

Company: General Electric Marmara Technology Research Center

Laboratory Manager: Dr. Ahmet Z. Özbilen

Laboratory Manager Short Biography: Dr. Özbilen serves as the Laboratory Manager for the Sustainable Propulsion and Power Technologies program at the GE Marmara Technology Center. Since his inception in 2014 as a Thermal System Design Engineer, he has actively contributed to the developmental endeavors of cutting-edge engines such as GE9X, LEAP, and Passport 20. His responsibilities encompass thermal design intricacies associated with the production and field issues of both jet and aeroderivative engines, as well as design initiatives tailored for additive manufacturing processes. Moreover, Dr. Özbilen undertakes the pivotal role of imparting knowledge and expertise on fluid dynamics and knowledge transfer to newly onboarded engineers at GE Marmara Technology Center.

He graduated from the Department of Mechanical Engineering at Middle East Technical University in 2009. From 2009 to 2013, he pursued his master's and doctoral degrees, at Ontario Tech University in Canada. His research focus centered on the thermodynamic efficiency, economic viability, and environmental impacts of thermochemical hydrogen production. Dr. Özbilen's scholarly contributions within the realm of hydrogen production studies extend to the authorship of 11 peer-reviewed articles and 3 book chapters, enhancing the discourse and advancement of this critical field.

Reserach Area:

Sustainable Propulsion and Power Technologies Laboratory focuses on research and development in the following areas:

- Exploration and Development of Advanced Heat Management Technologies
- Exploration and Development of Clean Combustion Technologies (utilizing hydrogen, SAF, etc.)
- Exploration and Development of Hybrid Electric Applications

Industries reliant on propulsion and power, such as energy and transportation, predominantly operate through the combustion of hydrocarbon-based fuels. However, the carbon products emitted as a result of combustion, particularly CO₂, directly contribute to global warming.

Around 41.7% of global CO₂ emissions originate from the energy sector, with 16.2% coming from the transportation sector. Aviation, the fastest-growing mode of transportation, currently accounts for approximately 2% of the world's total CO₂ emissions. Without technological advancements, it is projected that by 2050, this impact will triple compared to pre-COVID-19 air traffic levels.

In 2020, GE Aerospace invested \$1.8 billion in technology development in collaboration with its customers. On June 14, 2021, CFM International, a partnership between GE and SAFRAN, announced the CFM RISE (Revolutionary Innovation for Sustainable Engines) program aimed at developing future aviation technologies. The program targets a 20% reduction in CO₂ emissions compared to current technologies, with a focus on demonstrating the applicability of open fan architecture, hybrid electric systems, and advanced heat management systems. Additionally, efforts will be directed towards further reducing net CO₂ emissions and exploring the use of Sustainable Aviation Fuels and hydrogen as aviation fuels.

The "Sustainable Propulsion and Power Technologies" laboratory, where General Electric (GE) can leverage its expertise, resources, share knowledge, and transfer R&D culture to Turkish engineers, will play a significant role in Turkey's energy transition by fostering the development of skilled professionals.