

**CASE STUDY**

## ENEA, Italy, and Cardiff University, UK, working towards the development of new fuels from unconventional processes



Nadia Cerone of ENEA in Italy visited the Gas Turbine Research Centre at Cardiff University, UK via BRISK Transnational Access.

Below is an account of her experience of the BRISK process and the value of the collaboration made possible by her visit.

When I started looking for BRISK opportunities, I was surprised to find that there were so many state-of-the-art facilities that would allow researchers to share not only equipment, but also a great variety of expertise through the common goal of demonstrating the potential of biofuels for power generation. One of the main areas of interest for energy producers is how to improve flexibility in their systems. However, here at ENEA we never thought that our proposal could lead to a project that would involve a multi-disciplinary team working together on flexibility in systems such as gas turbines to improve their efficiency and reduce emissions.

Here at ENEA, we have a reactor that through gasification produces several syngas compositions based on the raw material that we can use. In order to improve the process and remove undesirable compounds such as tars, the

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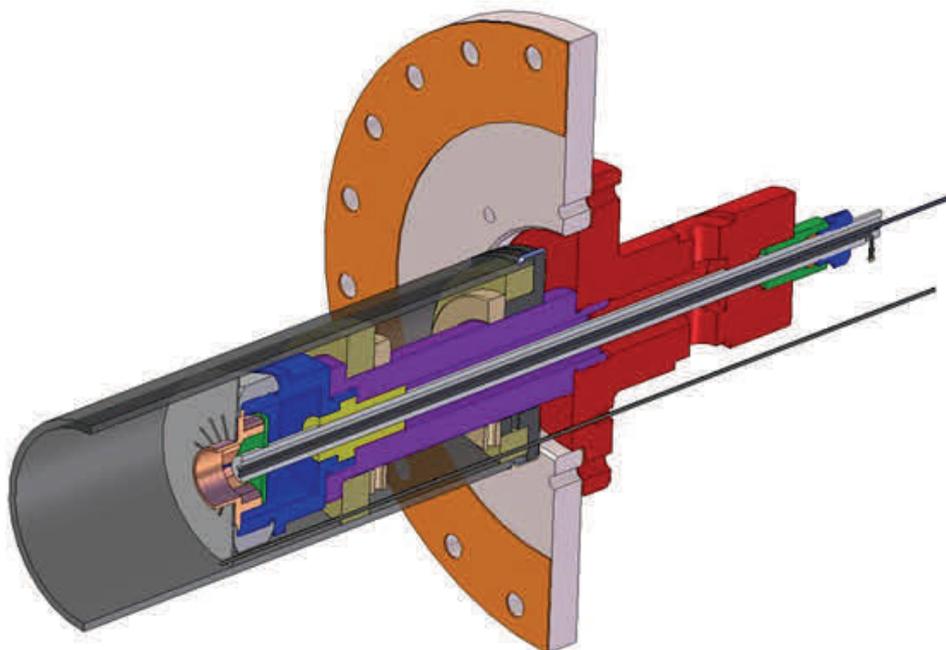


Figure 1: Generic Swirl Burner used at the Gas Turbine Research Centre.

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system is scrubbed using biodiesel. The by-product is a saturated blend that we thought would be interesting to test as a backup fuel, thus increasing the efficiency of the system and reducing any waste treatment. My plan was to use it in a high power facility, but here at ENEA it was quite difficult to find a device that would not only demonstrate the concept of burning this saturated biodiesel, but would also demonstrate a high stability with an accurate measurement of emissions, thus making feasible further studies to implement this saturated blend as fuel. Cardiff University, with their Gas Turbine Research Centre, was the solution to my problem.

The application for a Transnational BRISK project was quite easy and simple, with Cardiff University always keen to help. Although there were some delays due to Health and Safety improvements at their facilities, we always kept in contact and continued working on delivery of the raw material to ensure a fast set of experiments and reliable analyses. Once we started the project, it was fascinating to be able to visualise the flame under different pressures utilising a great variety of fuels to compare with our saturated biodiesel. Surprisingly, the saturated biodiesel showed excellent trends and potential as a substitute for conventional fuels for gas turbine devices. Emissions were low, although it is well known that high equivalence ratios would lead to high amounts of soot. This was expected, and now recommendations are in place to continue with the works, allowing me to use most of these trials for further studies in our system for industrial scalability.

I was also fascinated with Cardiff University, being a vibrant place in the heart of a lovely city. Staff at the university were always friendly, making this a great experience that I will always cherish. The exchange programme has not only allowed me to substantially progress with my own research, but has also given me the opportunity to work with a multi-disciplinary centre which I believe will be a great partner for ENEA in the near future.



Figure 2: Combustion tests using the saturated biodiesel in the High Pressure Optical Combustor.

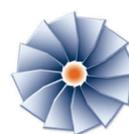


Figure 3: The team at the Gas Turbine Research Centre.

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