

Interview with CO2OLHEAT partners

Ambra Giovannelli, Assistant Professor of Fluid Machinery and Energy Conversion Systems (Roma Tre University) and **Matteo Baggiani**, Business Unit Manager (SimeROM)



What is your role in the project?

Ambra: ROMA3 covers the modelling activities related to the CEMEX demo plant in Prachovice in the Czech Republic. This means a definition of the overall waste heat recovery system layout and its integration in the existing cement plant facility. It also includes the demo cycle modelling and optimisation from the thermodynamic and economic point of view. There are also other partners involved in this work package because we need many diverse skills to manage all the activities.

Matteo: SimeROM is an engineering and construction company. Its role in the project will be to prefabricate Power-Cycle Independent Modules in our workshops, assemble, and install them in the CEMEX demonstration plant in Prachovice. This is an essential task in the project as the modules represent a full-scale prototype. To have it installed and make it work in a real industrial plant environment is a big challenge but also a huge advantage of this project. We are not talking here only about R&D, but about an actual demonstration.



What is the biggest added value of your organisation and your major takeaway from the project?

Ambra: Our research group has been applying thermodynamic and economic models in innovative power systems for almost 15 years. We have also been focusing on storage (e.g. compressed air) systems in the last years too. Additionally, the group has been involved in several national and European projects dealing with innovative gas turbines (rich hydrogen gases, solar turbines), as well as with supercritical and trans-critical CO₂ cycles. Therefore, we are very well equipped to provide a valuable theoretical contribution. This project will allow us to “jump” to another level of understanding the behaviour of the whole innovative sCO₂ system, and specifically, of the individual components. This novel technology is a major step forward and new to all of us.

Matteo: As we are a modular Engineering, Procurement & Construction (EPC) company, we have to ensure that the CO2OLHEAT plant can be easily replicable. Making it modular means to make it flexible in terms of installation and to have it installed fast – like a “plug-and-play” system. This is what we will bring to the project. At the same time, we will greatly benefit from the opportunity to be able to actually use the supercritical CO₂ and do it economically. This will give us a competitive advantage. Having the sCO₂-related competencies is a must for an EPC contractor of our type. Receiving the opportunity to work in this new field is priceless.



How could you describe the impact of the project for the future?

Ambra: CO2OLHEAT can be a breakthrough, very relevant in the power energy sector. The sCO₂ systems are expected to be efficient, flexible, and perhaps less costly than some other conventional waste heat recovery plants. For example, traditional WHR systems based on Organic Rankine Cycle (ORC) technology are rather costly, having a long pay-back period. Thus, their exploitation is quite limited in Europe and the US, and therefore are mostly deployed in Asia, where the manufacturing costs are lower. The high price tag of ORC WHR systems represents a serious bottleneck that can provide an opportunity for the sCO₂ WHR systems, as they could mitigate this obstacle.

Matteo: Allow me to be a bit philosophical on this question. I believe that recently, the human community have had a couple of important enemies. One of them is Covid-19. The other one is waste – carbon dioxide emissions, to be specific. This is currently the biggest enemy of the climate and human beings. I think that the only way to beat it is finding means to give importance to the waste, by the employment of new technologies. This project will be crucial in this respect because it provides a potential use of carbon dioxide. Obviously, we will not use a lot of it in our project (laughs). Anyway, we will use the CO₂ as a working fluid (note that this is a very peculiar molecule, moreover in its supercritical state) and we will also recover the waste heat – and as a matter of fact, this is also CO₂. Having said all this, my answer is clear: we will use the waste to recover the waste. Isn't this fascinating?

How do you perceive the very high expectations from the CO2OLHEAT project and the fact that it is in the spotlight of the whole sCO₂ community? Does it give you extra energy into your work?

Ambra: There are other projects at high Technology Readiness Level (TRL), not only in Europe but also in the US and China. They are all expected to boost the introduction of this novel technology in the market in a short time and help the energy sector to become more environment friendly. If this project is successful, it will open the way for the sCO₂ technology in so many other sectors and could provide a great contribution to a green power sector. I find this absolutely exciting!

Matteo: This field has already been explored before. However, we are doing a full-scale prototype using many new technologies. It is not merely about using the sCO₂. It is also redesigning all the equipment. We must also consider the nature of the cement-production environment – a very tough one. Being the center of attention in this EU-funded project and cooperating with other partners, active also in other European projects, bring shared discoveries. Being in this spotlight enables us to find better and faster the right technology and progress to have the plant ready. We are a mixed Romanian-Italian team, with a similar temperament; together, we are very passionate about what we are doing.

