
 scientific research / terrasol



Mathilde Vernay,
Engineer and doctoral graduate

After my diploma in civil engineering from Polytech Clermont-Ferrand, I worked on my doctoral thesis at Institut Pascal in Clermont-Ferrand, focusing on an experimental study of the influence of the degree of saturation on the liquefaction behavior of sand. As a PhD/Engineer at **terrasol** since January 2018, I'm discovering an applied, practical dimension to my field, as well as another way of using my skills. Thanks to my PhD, I've acquired knowledge and a different vision of the issues. I chose to join **terrasol** rather than launch an academic career so I could put into practice the different skills I acquired during my studies. At **terrasol**, it's possible to reconcile these two aspects, scientific research and practical applications.

Combining a theoretical approach with the practical needs of companies

Supporting scientific research for innovation and progress is in the group's DNA. The benefit for research engineers is the ability to break down the barriers between theory and practice by being confronted with reality, while **setec** gains an opportunity to inject new technologies into its projects and make them workable for the company.

A good example is **terrasol**, which currently has a number of PhDs and CIFRE PhD students in its teams.



Fahd Cuirra,
Scientific director

We encourage engineers to put their research findings into practice and use them day to day, especially in association with our software activity. Currently, we have in our staff two CIFRE PhD students and eight PhDs, some of whom prepared their PhD at **terrasol**. We also maintain close ties with engineering schools through research and teaching (initial and life-long education programs). In total, we are active in around 20 schools. This enables us to train young engineers, familiarize them with our software, recruit them, as well as build links with future partners and clients.



Khadija Nejjar,
CIFRE PhD student

“As engineers, we need to adapt the ‘ideal’ model of scientific research to a complex reality.”

I am a graduate of Mines Nancy and I chose geotechnics since it's the first step in any civil engineering project, as well as the main source of uncertainty impacting design. During my third year, I did a MSc in geotechnics at École des Ponts, and worked my final internship at **terrasol** on irreversible post-seismic displacements. I jumped at the opportunity to carry out a CIFRE PhD at **terrasol** on the behavior of retaining structures for deep excavations, applied to the Grand Paris Express project (excavations to a depth of 60 m). The objective is to compare the finite element calculation method to the usual subgrade reaction coefficient method, in order to make the design of such retaining structures more reliable. My thesis also aims to provide valuable feedback on these excavations at an unprecedented scale. We have set up full monitoring equipment at the Fort d'Issy-Vanves-Clamart station (the first to undergo construction). I hope to pursue my career at **terrasol** and soon use the escalators of this Grand Paris station!



Jean-Pierre Janin,
Engineer and PhD

As part of my studies at the Polytechnic University of Turin, I spent my fifth year on an Erasmus program at INSA Lyon. After obtaining my diploma in Italy, I was contacted by my professors in Lyon. They proposed a CIFRE PhD at **terrasol**, focusing on the construction of the second Toulon tunnel. The aim of my thesis was to predict the subsidence generated by the tunnels excavated using the traditional method, taking into account the support. I defended my thesis in 2012. It was an applied thesis that led to publications in scientific journals and I used this work later on other projects. I stayed at **terrasol** and specialized in tunnels engineering. I also keep in touch with academia by teaching classes. I continue to write articles on the practical impact of my doctoral work and this approach won me the Kérisel prize in 2016, which is awarded biannually to young professionals or researchers who have made a significant contribution to improving geotechnical analysis methods.

CIFRE PhDs: creating links between academia, scientific research and companies

The French government's CIFRE PhD program provides companies with funding to recruit young researchers working on a thesis supervised by a public research laboratory. The aim is threefold: to reinforce exchanges between public research laboratories and businesses, encourage companies to recruit doctoral graduates and promote corporate innovation.



Jesús Pérez Herreros,
CIFRE PhD student

After graduating from École des Ponts in 2013, I worked as an engineer in a consulting company specialized in seismic design before being put in touch with an IFSTTAR researcher and a professor from Centrale Nantes who were setting up a PhD on soil-structure interaction in dynamic conditions. **terrasol** wanted to invest in seismic design research and was immediately interested in the project. The aim of the thesis is to study seismic soil-structure interaction in the case of a structure supported by a group of deep foundations. The thesis considers a coupled numerical and experimental approach, with numerical simulations and scale-model centrifuge testing.

A CIFRE thesis offers major benefits for students: supervised by Fahd Cuirra at **terrasol**, as well as the engineering school and the laboratory, I have access to Centrale Nantes' calculation and library resources, as well as to the geotechnical centrifuge at IFSTTAR Nantes. This means three different ways of approaching the same topic and sometimes a need to make compromises! Academics think in terms of an ideal model. As engineers, we need to adapt this model to a complex reality. **terrasol** was prepared to accept the approach from a scientific standpoint. This is the company's philosophy and one of its strong points.