Case Studies

Frank Rausche's graduate studies in the United States helped develop the Case Method used all over the world

By Frank Rausche, GRL Engineers, Inc.

My parents wanted me to be a dentist, my grandfather would have been happy had I opted to work in the family business, dental supply. My godfather suggested electrical engineering, but I wanted to be involved in building and rebuilding. Being a war child in Germany, I saw how war-damaged structures were demolished and rebuilt in the terribly bombed-out city of Stuttgart. That is where I was born, went to elementary school and then to Karlsgymnasium in Munich, a high school where studying Latin for nine years and seven years of English was necessary, and five years of

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Frank Rausche at the PDPI Reunion during IFCEE 2015 in March

Greek desirable (I opted for French).

Not long before finishing high school, I had an opportunity to listen to the late Professor Leonhardt give a talk on his worldwide consulting and designs. He was well known for his post-tensioned bridge and tower designs and his book on pre-stressed and post-tensioned concrete technology. After listening to him, there was no doubt in my mind that I wanted to be a structural engineer, so I studied civil engineering at the Stuttgart Technische Hochschule (TH), with emphasis on bridge design.

Being accepted to civil engineering studies in 1960 required a half-year internship on a construction site. Besides shoveling trenches, tying rebar, laying bricks and helping build concrete forms for walls and columns, I also assisted in making forms and reinforcement cages for about one-foot square, 20 feet long, regularly reinforced concrete piles which were cast on site with concrete mixed right there. In the middle of the city and right next to a building, a DELMAG D-12 on a skid had to drive those piles by a man black with diesel oil. Alas, they seemed to be getting damaged, because many people with grave demeanor were standing around that site, testing the strength of the concrete with Schmitt hammers. This was my first encounter with driven piling. Of course, this problem was eventually resolved.

After almost five-plus years of studying, I could have settled down in an engineering or contractors office as a "Diplom-Ingenieur" and built things. But first, I wanted to travel and, in particular, visit the United States. As luck had it, Professor G.G. Goble, who had been a Fulbright Scholar at the TH Stuttgart, now associate professor of civil engineering at Case Institute of Technology in Cleveland, Ohio, had sent a flier about graduate

study opportunities at Case to his former colleagues in Stuttgart. So I applied, thinking that Ph.D. studies in structural engineering for one year wouldn't be a bad thing. Well, George had different plans – first of all, he told me it would take at least five years. And then he needed someone to do field measurements on driven model piles and on the real thing on construction sites. This work involved actual pile driving so that we could collect the necessary static and dynamic load test data, instrumenting special load test piles along their length.

The goal of the research, funded by the Ohio Department of Transportation, was the development of a system that could easily be used in the field to measure hammer blow force and velocity and, at the same time, calculate the pile bearing capacity. In a way, every hammer blow was considered a quick load test. To accomplish this goal we developed dynamic pile top load cells, strain

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transducers, rugged accelerometer attachment systems and, last but not least, what was then called a pile capacity computer.

The graduate education and the facilities at Case were ideal for such experimental and analytical work. Besides Professor Goble, many faculty members gave analytical advice helping me derive the closed form "Case Method" which is now used all over the world. Also helpful was that in the 1960s, both measurement technology and electronic computing rapidly evolved and allowed for the first Pile Driving Analyzer® to be built by two graduate students in computer science. The civil engineering graduate student (me) had to provide the real-time signals from a pile-impacted hammer. Case also provided the necessary computer facilities for a first CAPWAP® program version while at the same time, with the help of Case's outstanding faculty, I was able to derive the Case Method formula, now used worldwide as a first estimate of bearing capacity from dynamic records.

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After concluding my studies and additional research and teaching time at Case, I took a break from driven piles, working for Johann Keller in Germany as a foundation engineer. I learned about other new and advanced special foundation technologies being rapidly developed in Europe at that time. However, I missed the ringing sound of the hammer driving a pile and when George Goble made the offer to build up a PDA business together, I accepted and returned to Cleveland. One of my first tasks was writing the GRLWEAP program under sponsorship of the Federal Highway Administration. This program simulates the pile driving process and helps engineers and contractors design piling projects by optimizing the pile installation process.

The new companies, Pile Dynamics, the manufacturer of pile testing equipment and what is now GRL Engineers, a consulting firm, didn't have it easy in the beginning. However, perseverance of the partners, enthusiastic clients, time and the ever-improving software and hardware eventually got the dynamic pile testing methods accepted worldwide as a reliable, economical and viable alternative to traditional methods. We tested (and so did PDI's customers) segmental concrete piles in Europe, Australia, Asia and South-America; offshore pipe piles in most oil fields of the world; H-piles everywhere and timber and pre-stressed concrete piles within and along the U.S. coastlines. Oftentimes we lent our support to special projects including mandrel driven piles or cast-in-place piles, which required driving to be tested, just to mention a few.

Other capable and hardworking engineers joined our firms and they contributed greatly to our growth. I should mention at least Mohamad Hussein, Pat Hannigan and George Piscsalko, who took over the management of the firms. I am still trying to support them as much as possible and it is rewarding that their dedication to the "tested pile" is maintaining continuity of excellent support and service to the driven pile industry.

Thankfully, PDCA and its various programs are greatly helping in this endeavor. Also more and more "high-tech" is being developed and implemented in the construction industry, and the pile driving industry has to participate in this development. It can only grow and be competitive by increasing efficiency, which means using tools, material and labor as optimally as possible. I believe that the dynamic testing and analysis methods which I have been working on, already have contributed to and will further will help in the future in this innovation process. ▼