

**William (Bill), R. Wheeler** is a co-founder and executive director of AWE Technologies LLC and provides invaluable mentoring guidance and support from his experience in growing his previous successful start-up company, CD-adapco. Prior to his retirement in 2016, he was the Vice President of CD-adapco and was one of its founding partners. CD-adapco began in 1980 as an engineering services firm that specialized in deploying computational simulations to address design and manufacturing issues in mechanical and industrial equipment. It was a pioneer in introducing this technology into industry, and particularly into the automotive, gas turbine, and energy markets. CD-adapco released its first commercial CFD code in 1987 and when it was sold to Siemens in 2016 (for \$970 Million: <https://www.arcweb.com/blog/siemens-acquire-simulation-software-supplier-cd-adapco> ), it was the largest privately held commercial CFD supplier in the world. At CD-adapco, he concentrated on the engineering services division of the business, and was the Co-manager/Director of the structural analysis and heat transfer group until 2008. After that, he was primarily involved in the business development activities of the company and concentrated on extending CD-adapco's software and services into the life sciences, oil and gas, chemical processing, electronics, and manufacturing markets.

Prior to founding CD-adapco, Bill was a structural engineer at General Dynamics in Fort Worth and at McDonnell Douglas in St. Louis and a nuclear heat transfer/stress engineer at Westinghouse in Pittsburgh and at EDS Nuclear in New York. He has a BS in Aerospace Engineering from Texas A&M University and a MS in Mechanical Engineering from Carnegie Mellon University. He is a member of AIAA, ASME, SAE, and ASM.

# CD-adapco ORIGINS: THE BIRTH OF adapco

[Stephen Ferguson](#)

CD-adapco



35 years ago, three young engineers started an engineering simulation business. Their intention was to apply the numerical simulation technology that was beginning to emerge from the nuclear industry to the wider set of engineering problems faced by industry as a whole. Those three engineers were Steve MacDonald, Bill Wheeler, and Marc Whittlesey and the company that they formed was adapco (a company that would eventually become CD-adapco). I recently met up with them at the company headquarters in New York, with the aim of discovering how the company got started.

## BEGINNINGS

adapco was born, almost fully formed, out of the Nuclear Industry, which in the late 60s had begun to employ numerical simulation as a tool for understanding some of the structural issues involved in designing nuclear power plants.

Of the three founders, Steve MacDonald was the first to immerse himself in this brave new world of simulation. Graduating in 1967 with a degree in Engineering Physics, from the Colorado School of Mines, he was originally employed by Bettis Atomic Power Laboratory, which was operated by Westinghouse for the Department of Defense, to perform physical testing.

"I was supposed to be working on the fatigue testing of materials, but the group that did that were also beginning to get their hands dirty with simulation, so pretty soon I ended up getting involved in that," recalls Steve MacDonald.

Immediately seeing the opportunity, Steve MacDonald enrolled himself in Carnegie Mellon University at night and began using FEA tools in his job - initially a 2D FEA code called "FEAT," and later 3D tools that were developed by his own lab. "I got involved in simulation early and did a lot of application development and I worked there for almost five years. I went to night school to get a masters degree. I did all my coursework for a PhD but didn't finish my thesis."

In the next few years, rather than pursuing a career in academia, Steve MacDonald began to use the tools at a succession of engineering companies around the Nuclear Industry, finally becoming an engineering supervisor for the FEA team at EDS Nuclear in Long Island, which he describes as "an extremely aggressive nuclear consulting company business that was entirely focused on generating profit."

Into this team, Steve MacDonald recruited two engineers. Texan Bill Wheeler, a graduate of Texas A&M and Carnegie Mellon, who had previously worked for McDonnell Douglas and Westinghouse, and Marc Whittlesey, a graduate of Iowa State University, who had worked with MacDonald for three years at Foster Wheeler. Almost immediately, MacDonald, Wheeler and Whittlesey began to increase the scope of the engineering simulation employed by EDS.

"We were doing finite element analysis for the nuclear power industry," says Bill Wheeler. "That was the primary business of the company. They had their own piping stress code, and they were doing lots and lots of piping stress analysis, although we didn't get much involved with that. Steve had lots of connections from his previous jobs so we ended up working on steam generators, pressure vessels, and things like that. It was a fairly lucrative business because there was a federal law that said you had to do analysis of all the safety related equipment in a nuclear power plant. So, there was a lot of that kind of work being done, trying to show that components were going to hold up to all the postulated operating conditions and accidents without failing."



#### THREE MILE ISLAND

In 1979, the bottom fell out of the Nuclear Industry as a result of the "Three Mile Island" accident, in which one of the two Three Mile Island nuclear reactors in Dauphin County, Pennsylvania, suffered a partial meltdown. It was the worst accident in US commercial nuclear power plant history, and ultimately led to the cancellation of 51 US nuclear reactors that were planned to be built from 1980 to 1984.

"Steve and I were on a plane going to Pittsburgh to talk to some people at Westinghouse," recalls Bill Wheeler. "And when we landed, we heard about the Three Mile Island accident. And we both just said, 'That's going to burst this bubble we've been working in.'"

"Steve convinced the company we were working for, EDS Nuclear, that maybe they should broaden their horizons with the gloomy outlook of the nuclear power industry," continues Bill Wheeler. "EDS gave us a charter for about a year to try to work non-nuclear programs. Steve managed to somehow land us some contracts, with General Electric Aircraft Engines in particular, where we started working on fairly sophisticated three-dimensional finite element analysis of some bolted joints they were having problems with."

"We did that for about a year, which really taught us how to run a company," remembers Marc Whittlesey, "Steve, Bill and I had numerous discussions about doing exactly that, because we were doing budgets and planning and manpower and all this kind of stuff and so there was really very little about running a company that we didn't know how to do."

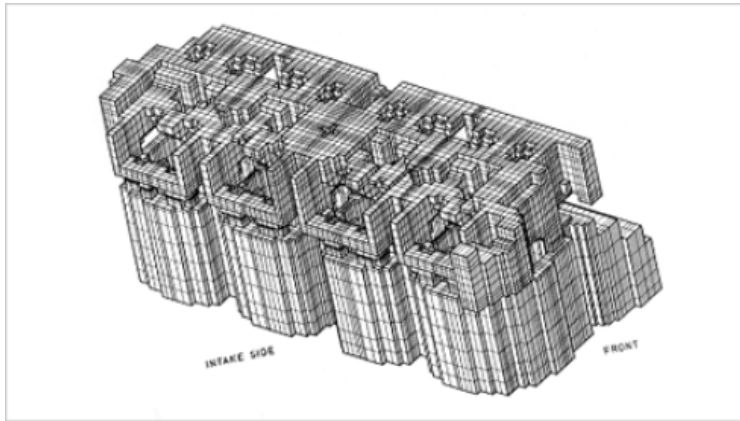


MacDonald, Wheeler and Whittlesey began formulating plans to start their own engineering services business sometime in 1981. However, they were forced to put those plans into action rather more quickly when the EDS management got wind of them.

"We formed our company, went down and took out the name and everything, so we actually had a company before we left," says Steve MacDonald. "And, of course, me being a person who tended to open his mouth too much, and still does, I'd talk about it to people. Word got back to the management of EDS Nuclear."

"The three of us were in Napa Valley at a training session for this large 1,000- man company, and we were terminated," continues Steve MacDonald. "Which was interesting because I had a wife and three kids and I had a mortgage, as did Marc and Bill, and so it was time for us to go to work. So we were pushed out maybe a little early. We were probably going to go anyway three months later."

"The thing that I remember is that when we left EDS Nuclear, they had about 900 people in the United States doing piping support stress analysis," says Bill Wheeler. "By 1982, they had zero. So, it wasn't that we were visionaries about forming a business. It was kind of a necessity. I think we all understood we had to do something because the nuclear bubble had burst. That was very obvious to all of us."

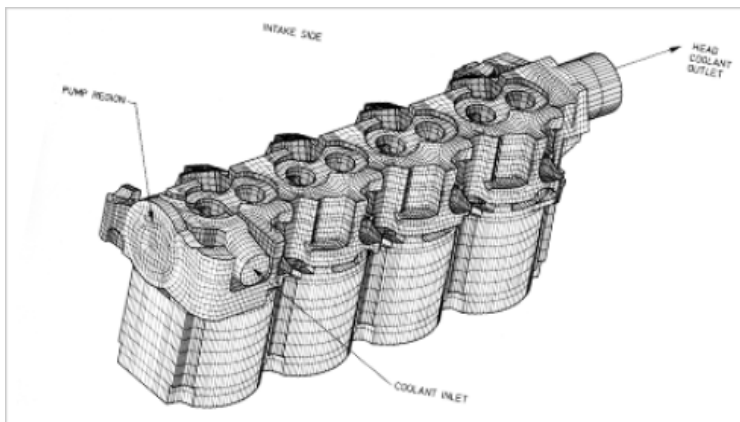


#### THE BIRTH OF adapco

So, from the embers of the Nuclear Industry, adapco was born, initially as a four-person outfit (the fourth person was Joe Sklarin, a minority shareholder in the original business) that operated out of Bill Wheeler's attic in Long Island.

"We actually incorporated a company in the late summer of 1980," remembers Bill Wheeler. "The company name, Analysis and Design Application Company, was about our fourth or fifth choice. I don't remember what the first few choices were. But the New York state government said they were too close to somebody else's name and wouldn't let us have that. So, we wound up using Analysis and Design Application Company Limited, and abbreviated to adapco. That's really where we got the name, it wasn't Steve's first choice."

"It was also obvious that there was only going to be one person who was electable as president. And that was Steve," says Bill Wheeler. "If anybody knew him, they would know instantly that he was the only choice. Steve is a natural leader, he had the unique ability to communicate and convince people to give him whatever he needed. That was his really strong point. He was also a very, very technically savvy engineer. But I'm not sure that he had the patience that Mark and I had to work a problem."



Steve MacDonald agrees: "Well, I always say that I wanted to be the president and I worked long enough to know that I would never make president in a highly structured company, so my solution to that was to go form my own company and appoint myself. That was the solution to my personal dislike of authority. Anyway, so I thought, well, I'll just start a company. That's how it happened. I did a lot of things that turned out to be good enough so that we didn't go out of business."

"The three of us had things that we each brought to the mix," says Marc Whittlesey. "Steve was the ideas guy, the guy that liked to meet with the customers, go out, sell the work, that became very apparent right from the get-go. Bill Wheeler was the ultimate technocrat, he was always looking for the best way to skin the cat and so forth, and I was kinda the do-er, the guy that was really good at getting simulations running, and the results out of the door."

"So, that mix tended to work fairly well and it kept us out of technical trouble," remembers Marc Whittlesey. "Of course Steve's focus was on getting the work and thinking of the new methods and of course that caused me a lot of consternation at times, when he would sell something based on a promise and we had no idea how to do this and it would drop on my desk. But that's what makes you smart, you know, it gives you a challenge. Something that you didn't know how to do at the time but you knew you had to get done in a limited amount of time and that 'Necessity really is the mother of invention.'"

#### PHILOSOPHY OF SUCCESS

This "pushing the boundaries" is a common theme. A large part of adapco's (and later CD-adapco's) success is based upon the principle that, right from the very beginning, Steve MacDonald realized the solution of real world engineering problems, which usually involve the interaction of many different physical phenomena, would ultimately require simulation tools that spanned a range of engineering disciplines.

"When performing numerical simulation you need boundary conditions," says Steve MacDonald. "If you get your boundary conditions wrong, then you're in trouble. So if you take an isolated component or area, let's say, the problem is that you are very dependent upon having exactly the right boundary conditions there or you're not going to get the right answers from your simulation."

So my philosophy from the beginning was to model as far away from the object as I could get practically because then, even though I may not know the boundary conditions perfectly, I have a chance for the boundary conditions to adjust to a degree, some of them anyway, before the solution had propagated to the component that I was looking at."

"That was our philosophy," agrees Wheeler. "We're going to use as big a computing system as we could possibly find or afford. And we're going to put as much detail and not make assumptions any more than we absolutely had to. That was the guiding principle from the day we started the company. I think that's probably still reflective of the company overall today. We were not trying to use our experience to make the analysis tell us what our experience says. We were trying to get the analysis to tell us what was really happening and use our experience to try to debug our analysis work."

"One of the first jobs was from Solar Turbines," remembers Steve MacDonald. "Another was from General Electric, Lynn, which was the small aircraft engine division of GE. We got a remote job entry terminal, which was a card reader and a printer, and we prepared our problems."



Then a little bit later, we bought a computer, which was about the size of a washing machine, it was a VAX 750, and we used that along with some discs. And, again, we were doing stress and thermal analysis, mainly, and a lot of it was on gas turbines, things that had thermal stress in them and were important."

"And we moved into this building, we went from working in Bill Wheeler's attic for a very short period of time to renting one-half of the bottom floor of this building at that time, and then we rented the whole bottom floor and then we rented the first floor. Eventually we ended up buying the whole thing. We just kept growing," says Steve MacDonald.

#### FROM STRESS TO CFD

Up until this point, adapco had been almost entirely involved with Finite Element Analysis of thermal and mechanical stress. However, Steve MacDonald's vision of "pushing the boundary conditions as far away as possible from the region of interest," began to necessitate the use of other simulation tools.

"I remember Steve coming back from some of the meetings he was having with Ford where we were doing some heat transfer analysis," says Bill Wheeler. "We didn't know what the heat transfer coefficients were, but they could tell us how much the total heat rejection rate was. So, we would just say, 'Okay, we're going to put one heat transfer coefficient in the whole water jacket. And we're going to tune that based upon the heat rejection.' So that's what we were doing. He was getting a lot of criticism saying, 'Aw, you can't, that's not right. It's not constant everywhere.' So we put our heads together and kept saying, 'What are we gonna do? What are we gonna do? What are we gonna do?'"

"I stuck my hand up and I said, 'I think we could probably use CFD to get us some heat transfer coefficients that are not uniform,' and so we started trying to do that," says Bill Wheeler. "We did get some heat transfer coefficients out of those early CFD simulations. I don't think they were very good but they were not uniform. We applied those to the stress model. Again, we tuned them up and down until we got the right heat rejection and kind of satisfied that. But in the interim, the people in the car companies, especially Ford, go, 'Oh, wow. You can actually see where the flow is,' which they were having a hard time visualizing back in the early '80s. This was probably 1983, we were doing this.



And they started giving us contracts just to run the flow solutions without doing the heat transfer stuff in the blocks and stuff. And that's really where adapco started doing CFD on an engineering services business, it was one of the first computer aided design tools that I think was universally adopted by an entire industry."

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## Press Release

**Munich, Germany, January 25, 2016**

### Siemens to Acquire Simulation Software Supplier CD-adapco

- Siemens expands portfolio for industry software
- CD-adapco a leader in computational fluid dynamics (CFD) simulation
- Purchase price of \$970 million

Siemens and CD-adapco have entered into a stock purchase agreement for the acquisition of CD-adapco by Siemens. The purchase price is \$970 million. CD-adapco is a global engineering simulation company with software solutions covering a wide range of engineering disciplines including Fluid Dynamics (CFD), Solid Mechanics (CSM), heat transfer, particle dynamics, reactant flow, electrochemistry, acoustics and rheology. Last fiscal year, CD-adapco had over 900 employees and revenue of close to \$200 million with software-typical double digit margins. On average, CD-adapco increased its revenue at constant currencies by more than 12 percent annually over the past three fiscal years. Siemens expects this business to continue to experience strong growth in the future.

“As part of its Vision 2020, Siemens is acquiring CD-adapco and sharpening its focus on growth in digital business and expanding its portfolio in the area of industry software. Simulation software is key to enabling customers to bring better products to the market faster and at less cost. With CD-adapco, we’re acquiring an established technology leader that will allow us to supplement our world-class industry software portfolio and deliver on our strategy to further expand our digital enterprise portfolio,” said Klaus Helmrich, member of the Managing Board of Siemens.

CD-adapco is a global engineering simulation company with a unique vision for Multidisciplinary Design eXploration (MDX). Engineering simulation provides the most reliable flow of information into the design process, which drives innovation and lowers product development costs. CD-adapco simulation tools, led by the flagship product STAR-CCM+, allow engineers to discover better designs, faster. CD-adapco now has over 3,200 customers worldwide. Its software is currently used by 14 of the 15 largest carmakers, by all of the top ten suppliers to the aerospace industry and by nine of the ten largest manufacturers in the energy and marine sectors.

CD-adapco CEO and President Sharron MacDonald said, “I am pleased for both the employees and the customers of CD-adapco. The opportunities that come with the acquisition by Siemens are endless. The vision of our founders will be realized in the integration of these world-class engineering and manufacturing technologies and a business strategy that will allow engineering simulation to impact more products and companies than ever before.”

CD-adapco is headquartered in Melville, New York, U.S., and has 40 locations worldwide. Siemens expects synergy impact on EBIT to be in the mid-double-digit million range within five years of closing, mainly from revenue. Closing of the transaction is subject to customary conditions and is expected in the second half of fiscal year 2016.

CD-adapco will be integrated into the PLM software business of Siemens’ Digital Factory (DF) Division. DF is the industry leader in automation technology and a leading provider of Product Lifecycle Management (PLM) software. “By adding advanced engineering simulation tools such as CFD to our portfolio and experienced experts in the field to our organization, we’re greatly enhancing our

core competencies for model-based simulation that creates a very precise digital twin of the product,” said Anton Huber, CEO of the Digital Factory Division.

The Digital Factory Division bundles all Siemens’ businesses serving the discrete manufacturing sectors – for example, car and aircraft construction, machine construction and electronics. Its portfolio includes high-performance, fully integrated software and hardware technologies for implementing seamless data-technical links between development, production and suppliers. Siemens is currently the only company offering technologies that comprehensively merge the virtual world of product development and the real world of manufacturing. New products can be designed, tested and optimized on the computer, while the corresponding production processes are already being planned and implemented. As a result, customers profit from enhanced efficiency, greater flexibility and faster market readiness.

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Siemens AG (Berlin and Munich) is a global technology powerhouse that has stood for engineering excellence, innovation, quality, reliability and internationality for more than 165 years. The company is active in more than 200 countries, focusing on the areas of electrification, automation and digitalization. One of the world’s largest producers of energy-efficient, resource-saving technologies, Siemens is No. 1 in offshore wind turbine construction, a leading supplier of gas and steam turbines for power generation, a major provider of power transmission solutions and a pioneer in infrastructure solutions as well as automation, drive and software solutions for industry. The company is also a leading provider of medical imaging equipment – such as computed tomography and magnetic resonance imaging systems – and a leader in laboratory diagnostics as well as clinical IT. In fiscal 2015, which ended on September 30, 2015, Siemens generated revenue of €75.6 billion and net income of €7.4 billion. At the end of September 2015, the company had around 348,000 employees worldwide. Further information is available on the Internet at [www.siemens.com](http://www.siemens.com) (<http://www.siemens.com>).

CD-adapco (<http://www.cd-adapco.com> (<http://www.cd-adapco.com>)) is a global engineering simulation company with a unique vision for Multidisciplinary Design eXploration (MDX). Engineering simulation provides the most reliable flow of information into the design process, which drives innovation and lowers product development costs. The simulation tools of CD-adapco, led by the flagship product STAR-CCM+®, allow customers to discover better designs, faster. The company’s solutions cover a wide range of engineering disciplines including Computational Fluid Dynamics (CFD), Computational Solid Mechanics (CSM), heat transfer, particle dynamics, reactant flow, electrochemistry, acoustics and rheology. On average, CD-adapco increased its revenue at constant currencies by more than 12 percent annually over the past three fiscal years. CD-adapco employs over 900 talented individuals, working at 40 strategic locations across the globe.

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