BIOGRAPHICAL SKETCH

TODD WILKE- PH.D.

Carbon Engineering Ltd. | British Columbia, Canada

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I was so fortunate to have the opportunity to do an information interview with Todd and explore his insightful professional career journey. You will get the impression from the very first beginning of talking with Todd that he is well-experienced, humble, and respectful highly educated person. Holder of a bachelor's degree in chemical engineering from the university of Minnesota and PhD in chemical engineering from Purdue university, he believes that chemical engineering is a kind of engineering that you can transfer to almost other engineering within the first few years. His experience over years says: "… in university, there is an answer. Everything they give you is designed for you to get into an answer that can be used to give you a grade. Whereas when you are practicing, it is not black and white. Every decision you make, the answer could be anywhere."

Todd brings more than 25 years of technology development and commercialization experience to Carbon Engineering's team, stemming from previous roles in semiconductor manufacturing, fuel cells and industrial sensors sectors. Todd previously held the positions of VP of Technology for Photon Control R&D where he led the development of optical measurement products, and R&D manager for Ballard Power where he developed and executed fuel cell technology development programs. Todd began his career in technology development at Intel.

I would highly recommend reading through this insightful information interview between me and Todd. Hope you enjoy it!

- *To start us off, would you please tell me a bit about your background, education, and your job, your responsibilities, and duties?*
I have a bachelor's degree in chemical engineering from the university of Minnesota and PhD in chemical engineering from Purdue university. My thesis was both theoretical and experimental, essentially CFD. I had to set up my own methods at the time and I had to write my own codes to do it. At the time, there weren't commercial packages, so I had to write the codes for, let's say, methane and others. The focus of my work was working on catalytic reactions. After that, I went to work at Intel in the technology development section. At the time there were not semiconductor engineers. It was a unique experience on seeing how things are going from research and development to the manufacturing. we were continually working to improve methods. After I left Intel, I went to work for a start-up for hydrogen fuel cells. And then I learned that not all companies were as assistant as Intel in terms of personnel and managing priorities and alignments. At Intel if there was a problem, or if a

technology didn't succeed, that was because of a technical problem, not because of a wrong priority or we missed something. Afterwards, I worked in two other projects, one was a hydrogen sensor, and the other was fiber optic sensors. Working in start-ups also allowed me to develop some organizational skills by having various meetings including venture capitalist as well. Then, I came to Carbon Engineering. It was close to me; 35 minutes and I have been there for three years as of today. Here I had to build a team. There were three people when I joined and now there are sixteen people by getting the right skills and what the company needs.

- *Just as a curiosity, if you don't mind asking, why you left Intel?*
Oh, I tell you why. It was a 7/24 job. We ran development 7/24. I get call in the middle of the night, on weekends and we had to respond. I got married and the situations was different. ==The job was really rewarding but at the same time it was very restricting, and I thought it was time to change.== At that time, it was just like re-doing things over and over the things we have done before, and I didn't have a clear vision of how my job might change.

- *Does your work relate to any experiences or studies you had in university*?
I mentioned that I've done CFD modeling, and it was a simplified version of what we are doing today. I've had two people working for me, both in this job and the previous job. In terms of modeling, I have the skills and the ability to talk with these people with the same language and guide them to have a valid model at the end. On the experimental side, usually it's about characterizing materials and addressing the problems.

- *How did this type of work interest you and how did you get started?*
Because we are an engineer. ==Chemical engineering is a kind of engineering that you can transfer to almost other engineering within the first few years.== Chemical engineering was migrating at the time. At that time, it was like working for a specific company. But now it's becoming like working for other types of process companies like environmental, medical or others. You know, Intel even didn't exist. Not in anybody's radar. Even when I told my parents I am going to work for a company called Intel across country. They were horrified until when I got the phone call from my mom that saw an ad in Times magazine and realized it was a real company. And then how I got here is basically in management that I recognized that was unique about me or I excel that relative to other people and so ==when people ask me what I do I say my unique skill is that I am able to translate and talk to highly technical people and I am able to talk to businesspeople.==

- *How did you get your job? What jobs and experiences have led you to your present position?*
Hiring anybody is a like you know there is a job listing and you have those featured skills, relevant experiences. Having worked at intel, that often opens a door, makes my resume comes to the top. And really the experiences in working with start-up environment is important and the experience of both business and technical side. The roles I've had in the last half of my career have all been both technical and business. So ==being able to align the technology with the business is really a key part.==

- *You mentioned about some people that are working for you and your team, so how do you choose people when it come to hiring a new team member?*
I'll say there is three kinds of things. First, you're looking at the team, second, what is the role that needs to be filled, and what kind of experience level needed. The last one is really based on interviews. Usually, you receive results and you come up with a short list. Then I interview all the short listed and then have my team interview the best two or three. And what I'm looking for here is having them describe something is in the resume and dealing with solving a problem. Recently I hired someone that was working for years while at university as a waiter. It was a positive thing because you had to deal with a lot of things and that is about teamwork which is a really important issue as well. At the end, I rely on my team. They talk about the final candidates, and we end up with the best one.

- *I see that you are working in the Carbon Capture company. Is that the only company in the world doing so?*

Both yes and no. we are the primary company. Not to say there aren't other people but for the most part if they are in this particular area, they are small scale with few people. But ==we are looking at liquid-based sorbents and large-scale capture, whereas the other players are using solid sorbents.==

- *So, I believe there should be a lot of intellectual property and patents behind the scene?*

==Like most of the other companies' patents are mostly defensive.== I mean, the patent is like putting a fence in front of other companies not to get into that part. That's what a patent really does. But most of the core is basically trade secrets. Only the people who need to know. Looking at the patents of a company, it doesn't really tell you what and how they are doing it necessarily. And you have to go through all their developments they did to figure out how to utilize that patent in a productive way.

- *Coming back to your career life, I think everybody might have some failures or mistakes in their professional life, is there any such experience in your professional like that you might be willing to share?*

I was lucky starting my career at Intel because ==failures were not necessarily accepted, but they were expected.== They had a vision of reviewing the reasons for failures, the learnings, and how it is not going to happen again. So, it was not a black mark on your record. Also, the ==people that were taking the most risks that were out in the front line of solving the problems are the ones that have mistakes.== I've always had that view that you do the right thing and there would be times that you don't understand and address everything and there is a failure. But you need to do your best to try to get different views and assessments and scenarios, trying to make it fairly not to get a failure, not to be fatal and destroying the company.

- *For the current company that you are working, it relates to the environment and there is a technology in behind, where the money comes from?*

You'll find the most companies having a mix. Startup's will usually have private investors and government wants to have start-ups to attract high skilled people to their communities. So typically, you'll apply for some governmental funding federal or provincial. And typically, government becomes less and less of your commercialization. And the other side of it is how you are going to make money. If you are making computers, it is not government policies that are doing that. People, companies, everybody likes computers. So, you need to be the best in the market and reasonably priced. Whereas something like this, for instance, if the government has a tax credit to reduce carbon, it is a value for our product. In a nutshell, the amount of revenue coming to the company should be higher than what you spend. Some of it coming from possibly what you are able to sell in the market, some of it might come from government policies, or other resources. I mean it depends. So as a example in automobile industry, by having policies about the zero emission cars, those companies with less electric cars should buy credit from companies like tesla an that is a source of income from government policies.

- *If you could do things all over again, would you choose the same path for yourself? What would you change?*

I say one thing that I think about when I look back is when I left Intel. It was my first job and I really did not have an understanding of the value of employees and the potential in the company to move, change and having the company address your concerns. And it is very typical with early career people. It's hard to go to your boss an say you know I am not happy, and I am thinking about leaving because … How they are going to react? Are they going to say I cannot trust you anymore or they are going to try to listen an address your problems? It is hard to manage but, I was totally unaware of that. And to know that ==as an employee in a company you hold a lot more power than you realize.==

- *Let me ask a question about chemical engineering specifically for students who are lookin to enter the market and choose their career. What would be the best skillset of a chemical engineer coming out of the university, I mean those must-have skills?*

There are definitely specifics. What course do you take at which level or what was your research? But as a chemical engineer, you should get interview, its being able to show you are able to consider a balance and how complex processes are all of the factors that need to be considered in control. And I think chemical engineering is a discipline that has a lot of external factors actually to worry about and we tend to think a little broader than some other disciplines.

- *Early in this meeting you mentioned that you studied and University of Minessota and Purdu university. How did you come up with these universities?*

Minnesota was easy, it was 30 minutes from my home. And it had the best chemical engineering program in the country. For graduate studies, it is a combination of professors you met, graduate students you met, the location, and a feeling.

- *And besides this, what were your extra-curriculum activities, I mean what id you do besides your PhD and research?*

I was really lucky, not every class has this. But the group that I came in with, we all did things together. So, when we started together, we started having Saturday movie nights, getting together in somebodies house, drink and watch movies. We had a volleyball team, we played basketball on Thursdays before the department seminars. You know we did things together.

- *Do you have any advice for someone interested in this field/job? Are there any written materials you suggest I read? Which professional journals and organizations would help me learn more about this field?*

If you have the opportunity to go to the AIChE meetings, there you really see the full breadth of what chemical engineers do. If it is possible to do an internship, that would be great. In Canada it is more common than US, but it is fantastic, you start to see the other side of it. In university, there is an answer. Everything they give you is designed for you to get into an answer that can be used to give you a grade. Whereas when you are practicing, it is not black and white. Every decision you make, the answer could be anywhere. So doing an internship will help you to really see the difference in practice than what you are doing in the university.

- *Is there anything I haven't asked you that you think I should ask?*

I just want to say one more thing about when you leave school and go to the workplace. You know I joke about it with managers when you get graduates, you let them work and play with other kids. Because in university you have to do everything, you need to do calculations, you need to do lab experiments, you need to write the reports, and when you get out into a company, there are specialties for that. So you are not going to be doing analysis on sample. That's going to go to a lab and there is a highly skilled person that can manage all of the equipment and do analysis. Learning to with other people or through other people is a key thing.