Profiles of Chemical Engineers

James Murphy

Process Engineer
Chevron Research & Technology Company
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Education:
B.S. - Chemical Engineering, University of California, Davis

Job Description:
Chemical engineer working as a process design engineer

Advice to Students:
"I would advise any student going into chemical engineering that it's definitely worth it. It's a fun, exciting field."

Video Transcript:
"I work on a lube oil hydrocracking plant. My typical day starts off about 7:00 in the morning. We have computer screens that we can pull up information about how the plants are performing. We use information that we learned in school to try to figure out if there are opportunities to optimize the process, either increasing pressures and temperatures or lowering pressure and temperatures, just try to make more lube oil. After looking at data on a computer, we then usually go down to the control room where the operators sit. Usually discuss with them any opportunities that we've seen that might be available to optimize lube oil production. If we feel that after discussing it with the operators that it's a good thing to do, then we go ahead and try it."

Interview:

Murphy: My name's James Murphy. I'm a chemical engineer. I work as a process design engineer for the Richmond refinery. I work on a lube oil hydrocracking plant.

Q: What's your typical day like?

Murphy: My typical day starts off about 7:00 in the morning. We have computer screens where we can pull-up information about how the plants are performing. We use information that we learned in school to try to figure out if there are opportunities to optimize the process, either increasing pressures and temperatures or lowering pressure and temperatures, to make more lube oil. We usually look at it from an economic point of view. We're aware of which products

make the most money for the refinery and we try to optimize those products. After looking at data on a computer, we then go down to the control room where the operators sit. Those are the people that are running the plant every day. We discuss any opportunities that we've seen that might be available to optimize lube oil production. If we feel that, after discussing it with the operators, it's a good thing to do, then we go ahead and try it. We track the response, see if lube oil production actually increased and, if it did, then we try to document why it worked and how we should be operating the plant so that the next operating crew that comes on carries that idea forward and keeps the optimization process going.

Q: How do you keep optimizing this stuff?

Murphy: You'd think that refineries have been around for so long that they're just perfect, there is nothing else you could do to a refinery. Our refinery has been around for almost 100 years but it's almost a completely different refinery now than it was just 25 or 30 years ago. Some of the oldest equipment is only 25 years old. So most of it is newer, modern, most of the areas of opportunity are applying new technology that we learn in school into the refinery today. Most of the optimization opportunities come about because from day-to-day everything is different in the refinery. One day we might not have enough hydrogen for all the plants in the refinery so we try to optimize the use of hydrogen. And then, two days later, we might have too much fuel gas in the system and we can't handle that much excess gas so now we have to re-optimize to minimize the gas and still make the most money we can. So it's really an optimization process responding to the day-to-day difficulties that the refinery has. There might be a power outage on one day in a section of the refinery and now we have to reconfigure our plant to deal with that until the area that's shut down or without power gets power back and returns to normal operation.

Q: When you wake up in the morning, do you have any idea what you're going to be doing that day?

Murphy: In a refinery, every day is really different. It's almost like no two days are the same. It seems like when you come in at 7:00 in the morning you could find the plant running really well and you have an opportunity to work on something that's not a crisis situation or it's not a short-term view. You can try to make a long-term improvement to a project, make progress on a project that's longer term. But, most mornings, there's some problem going on that we try to address. The biggest thing I've learned is really an approach to solving problems. Engineers, by nature, are problem solvers. School really helped me develop a systematic approach to solving problems. Using the data that's available on the computer, data that's available in the field, talking with the people operating the equipment, we try to assimilate all that information into discovering what the problem is, and use some of the technical information we learned in class to solve the problem and fix it, or optimize around it and move on.

Q: Is the work you are doing now, what you thought it would be like when you were in college?

Murphy: I didn't know what to expect when I was in school. Even when I was in college, we had classes where engineers came and told you what they did on a daily basis. And I still didn't have a good feel for what a process engineer did in a refinery on a daily basis. I think the best place I got a feel for what a process engineer did each and every day was during a summer

internship. I had a summer internship in a refinery where, for three months, I was exposed to what all the engineers around me did. That really helped me zero in on process engineering in a refinery. Without that internship, it would have been very difficult to really narrow the field down to the oil industry versus the electronics industry or something like that.

Q: After you found you might have an interest in petrochemicals, how did you go about getting your job?

Murphy: Well, after having a summer position where I worked in a refinery, during my senior year in college when I was interviewing for jobs, I pretty much targeted the oil industry. When I interviewed with Chevron, they presented the various jobs that chemical engineers can work in and, through discussions with them about the opportunities, when they described what their process engineers did, I felt that was something that was most interesting to me. And a lot of the interest was because it is a blend of field work, where you are out in the processing plants making lube oil or making gasoline, versus spending your time in an office for most of the day.

Q: Did you take any courses that were particularly relevant to your field?

Murphy: Some of the classes that were the most helpful in dealing with the types of questions we're asked in a refinery environment were the process design classes. Senior year, we had a huge design class where we had to design a big plant and look at the big picture-from the economics of the products you're going to make, to how much it's going to cost to turn your raw materials into final products. So, it gives you a good overview but it also gives you a lot of the skills for evaluating equipment. A lot of the techniques we use in the refinery are evaluating if the equipment is performing as we would expect it to.

Q: Were there other courses that helped prepare you for what you're doing now?

Murphy: I would have to recommend that students take more classes in technical writing and public speaking. No matter what ideas we come up with to improve a process or any kind of problems that we have, if we figure out how to solve them, almost all the communication occurs through writing memos and documenting it in writing. So anything to improve technical writing will really help students as they move into a refinery or industrial environment. Public speaking definitely helps you communicate your ideas to other people in a clear and efficient manner so that they are willing to implement your ideas. So, you can actually see something happen.

Q: Were there other college experiences that helped along the way?

Murphy: One of the real advantages in college that really helped was the teamwork environment. Chemical engineering, in the college that I went to, was a smaller department. There were probably only around 35 students graduating every year. It caused us to form a very tight bond with each other. I think the relationships that were developed in college, where you're training yourself early to work closely with other people and really develop a teamwork type environment, were very helpful.

Q: How are chemical engineers used in the oil industry?

Murphy: Chemical engineers are used very heavily in the refining industry. Refineries are almost built specifically for chemical engineers. The types of equipment in a refinery are reactors, distillation columns, heat exchangers, all the equipment that chemical engineers are specifically trained how to evaluate, design, and use in their chemical engineering classes.

Q: What role is technology playing in your work environment?

Murphy: We're starting to find a lot more use. Large companies are developing intranets, which link all of their sites together. We're staring to get to a point where we can easily pass information back and forth from our refineries, from one end of the country to the other. We're also starting to pass monitoring information. If someone in our Mississippi refinery can't quite figure out what's wrong with the reactor, then, in a different location here in California, we can look at the data with them over the computer and help them analyze what might be going wrong with the reactor, and help fix it.

Q: What advice would you offer to a person interested in pursing a career in chemical engineering?

Murphy: I would advise any student going into chemical engineering that it's definitely worth it. It's a fun, exciting field. It challenges you in your problem solving, it allows you to be creative and come up with creative solutions to problems, you get to have a real impact, and you actually get to see changes in equipment in a refinery. For example, because of things that you've done, you're making more money for a company or you can see an actual improvement. That's a very rewarding feeling. I would highly recommend that students pursue chemical engineering, and not get frustrated with the long classes and the late nights of homework. I'd encourage them to build the friendships and the teamwork that the college environment promotes.