

# Chemical Design, Inc. (CDI) of Lockport, NY joined the Zeton Group of Companies in 2019.

President Jim Ibaugh is in conversation with David Edwards



**Jim Ibaugh, President,**  
Chemical Design, Inc.

**David:** "Jim, how did the company get started?"

**Jim:** "The origin of CDI dates back to the invention of molecular sieves, or zeolites, by the Linde Division of Union Carbide in Tonawanda, New York in the late 1950's. Linde did a lot of research on how they worked, and how you can separate different molecules at the molecular level based on size. But Linde didn't want to sell complete plants, so Walter Schmid and Jim Meyers started Chemical Design, Inc. in 1959, and one of the main goals was to use these molecular sieves and other adsorbents to remove impurities on a commercial scale. Most of the early plants were new applications that advanced the state of the art to the current technology."

**David:** "What were some of the early challenges?"

**Jim:** "The goal was always to supply complete systems, but modular skidded systems were in their infancy in the late 50's, early 60's. So with new process technology, and a new project delivery approach, it took about 3 years for sales to finally take off. The first systems were built in an old cookie factory in Lockport, NY, and they had to be disassembled to get them out of the building."

**David:** "What were some of the first applications for molecular sieves?"

**Jim:** "Mr. Schmidt was very good at applying these molecular sieves and other adsorbents to new industries. In 1964, we were the first company to use molecular sieves to remove water and CO<sub>2</sub> from air for the air separation industry. Before that they used reversing heat exchangers, where one would freeze out water and CO<sub>2</sub> for four minutes while the other one was defrosting, and any hydrocarbons in the air would invariably end up concentrating in the liquid oxygen stream, a major safety issue. Molecular sieves solved this quite elegantly by removing the hydrocarbons along with the water and CO<sub>2</sub>. This approach is still the industry standard, and it is also used for removing water and CO<sub>2</sub> from natural gas before it is liquefied."

**David:** "Was CDI focused on Temperature Swing Adsorption (TSA) rather than Pressure Swing Adsorption (PSA)?"

**Jim:** "Yes, those early plants were always TSA. PSA is good for bulk removal of impurities down to 200 PPM (parts per million) or so. Below that, PSA can begin to slip. TSA allows you to get much lower, less than 1 PPM or even lower. In the electronics industry, they like to see less than 0.1 PPM of impurities, and for that you need TSA."

**David:** "What are some of the more recent innovations?"

**Jim:** "An important one would be cryogenic hydrogen purification. At very cold temperatures molecular sieves can remove just about anything from a hydrogen stream, which is very useful for the electronics industry."

"Secondly, we started adding catalyst beds in order to react some compounds out and then follow that with adsorbents to remove whatever products were formed in the reaction. An example is removing oxygen from argon by reacting the oxygen with hydrogen to make water and then use a dryer bed afterwards to remove the water."

"Thirdly, in the 1970's, CDI supplied the first polysilicon vent gas recovery units, to purify and recycle unreacted chemicals from the

silicon reactor vents using a combination of different technologies including adsorption, compression, absorption and distillation.

"Finally, we've been active in chlor-alkali electrolysis plants for many years, supplying H<sub>2</sub> deoxy dryers to remove anywhere from 200 vppm to 1.5 mol% O<sub>2</sub> from H<sub>2</sub> streams of 1,000 to 25,000 Nm<sup>3</sup>/hr.

"There are many other applications for our reaction and adsorption technologies, some of which involve the nuclear industry."

**David:** "What synergies do you see between CDI and Zeton?"

**Jim:** "We both have a similar product, completely assembled plants, shipped on skids, shipped directly to site and reassembled quickly. One difference is that CDI uses its own process know-how, and because of that we are finding that Zeton plants can often use CDI's purification technology. We are able to integrate these with the rest of the Zeton project, which is a benefit to the customer."

**David:** "CDI supplies fully-automated control systems with its plants. Why is that, and how has that changed?"

**Jim:** "From the very first plant we have supplied the control systems. The early units used timers, a series of relays, and something that looks like a player piano drum - a step drum it was called. I joined CDI in 1987 and was able to see the last of step drums go out, and the first projects where PLCs were used. In 62 years, you learn a few tricks about how to do things safely, and we've got interlocks and safety protocols that are programmed into the control logic, to ensure our plants operate safely."

**David:** "Most of CDI's employees live in the Lockport, NY area?"

**Jim:** "Yes, local people, with a short commute. As a small company with 15 employees, we have a design team that really knows what they're doing, and can do it quickly and efficiently. They are very capable at working around the edges of whatever is the highest priority each day." ■