Dr. W. Edwards Deming, Father of Statistical Quality Control and how Chuck Holland began QualPro

(As published in The Oak Ridger's Historically Speaking column the week of February 10, 2025)

As the last few months have progressed and my relationship with Chuck Holland has grown, we have enjoyed exchanging experiences at Y-12 over the years. I well remember Chuck in staff meetings with his three-piece suit vest unbuttoned and him exclaiming the virtues of the quality program at Y-12.

He spoke then of the tremendous accomplishments made there and even today still holds that those early days at Y-12 during the Cold War were where the very first real progressive steps in quality were ahead of many other industries. That quality movement that soon took the nations and even the world may well have been implemented early on at Y-12.

I have asked Chuck to tell how QualPro got started and to share his experiences with Dr. Deming. Enjoy learning about this unique East Tennessee organization that has and still is impacting industry, government, and education quality around the nation and the world.

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In June 1980, NBC aired the White Paper "If Japan Can, Why Can't We." The program featured the highly respected statistician Dr. W. Edwards Deming and detailed how, with Deming's guidance, Japan had taken the quality of their manufactured products from the worst to the best in the world. The White Paper instantly propelled Dr. Deming to celebrity status. CEO's from large companies—including Ford, General Motors, and Proctor and Gamble—began to contact Dr. Deming asking him to share how he helped the Japanese achieve such dramatic improvement in their manufacturing processes.

At this time, I was quality division director for Union Carbide's Nuclear Division Y-12 Plant. Art Hammer was a 23-year-old over achiever who reported to me in the quality division. In the fall of 1980, I sent Hammer to Dr. Deming's four-day seminar in San Diego. While there, Art invited Dr. Deming to dinner. The president of Gould Electronics witnessed Hammer dining with Deming; and the following day, Gould Electronics interviewed Hammer. Gould went on to offer Hammer the job of corporate quality improvement manager at more than twice his Oak Ridge salary. Hammer accepted the Gould offer and submitted his resignation notice to Y-12.

In January 1982, I attended Deming's four-day seminar in Manchester, New Hampshire. Over dinner, I shocked Deming by claiming that the Y-12 plant made the best quality products in the world—exceeding even the Japanese quality. Deming challenged me on that contention, stating "That seems a little extreme. On what do you base that contention?" I had come prepared. I first showed him the carbon foam technical paper:

> **Date of Issue: July 10, 1978, Report Number: Y/DA-7776 *CARBON FOAM PREPARATION AND PROPERTIES*, V. B. Campbell Z. L. Ardary Y-12 Development Division**
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> 1.0 ABSTRACT Carbon foam was developed at the Y-12 Plant for high-temperature insulation applications requiring a high strength-to-weight ratio. The glassy Carbon foam, having a cellular structure similar to urethane foam, provides structural support and insulation in densities of 0.0U gm/cc to 0.70 gm/cc with corresponding compressive strengths of 110 to 12000 psi and nonoxidizing temperature capabilities to 3000°C. Material formulations and fabrication techniques have teen developed. Property characterizations for a number of densities have teen compiled.
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> 2.0 SUMMARY. Carbon foam is a cellular, glassy Carbon structure produced ty the controlled pyrolysis of a rigid urethane foam containing partially polymerized furfuryl alcohol resin as a Carbon precursor. The urethane foam system is a polyester polyol resin reacted with a polyarylisocyanate. The partially polymerized furfuryl alcohol is blended with the polyester resin prior to foaming and is, therefore, dispersed in the foamed urethane. Most urethane foams alone have greatly reduced strength and are thermoplastic above 300°C. The role of the furfuryl alcohol is, therefore, to thermoset and retain the cellular structure above the softening point of the urethane resin, to serve as the precursor, and to be replicated in carbon in the final carbonized

> product. The furfuryl alcohol thermoset resin preserves cellular uniformity during carbonization to 10^0°C despite shrinkage to a 33% volume yield and a k0% weight yield. The polyester resin, cell regulator, and tertiary amine catalyst are premixed with the furfuryl alcohol resin prior to mixing with the isocyanate component of the urethane. The free-rise density will normally be about 0.50 gm/cc. Water can be added to react with the isocyanate and form additional carbon dioxide blowing agent if a lower density is desired. Particulate materials can be added or moisture removed from the raw materials to achieve densities higher than 0.50. Additionally, the quantity of furfuryl alcohol resin can be varied from 30 to 60 wt % of the total mix to alter properties and densities. The total range over which carbon foam has been produced ranges from 0.03 gm/cc to 0.8 gm/cc.

Dr. Deming thumbed through the paper, asked a few questions, and said "That's impressive." I told him that Y-12 had used process-improvement teams in every manufacturing area since 1962. The teams started in a single machining area and, under my oversight, spread into the remaining machining areas, metal preparation areas and assembly areas. The two-member teams consisted of a process engineer and a statistician. The teams were charged with keeping control charts on all important quality characteristics in the metal preparation, machining, and assembly areas. They used statistical process control techniques combined with screening experimentation. Their metal preparation efforts were especially impressive. Working with R&D and metal preparation personnel, the teams were able to design and develop a process to produce new products in less than one year. (Heretofore, production of a new product could take up to ten years.) Their machining tolerances were an order of magnitude tighter than anybody else's in the country. I pointed out that NASA recognized Y-12's competency and chose Y-12 to manufacture the Moonbox, which was used to gather samples from the first landing on the moon.

I shared several other aspects of the Y-12 quality program with Dr. Deming:

- Y-12 had great management support.
- Under my direction, Y-12 established a laboratory measurement control program, where blind samples are routinely submitted to the laboratory.
- Y-12 had a gage laboratory with the best standards in the world. In fact, Y-12's offer to present at the 1974 ASQC Chemical-Division National Convention was accepted, and Y-12 charged me with delivering our presentation, "The Operation of a Laboratory Measurement Control Program," to the convention attendees.
- Y-12 had been using "pride circles," a forum for local workforce to contribute ideas for changes to improve manufacturing processes.

After hearing all these things, Deming concluded that perhaps Y-12 might indeed be making the best products in the world. Deming agreed to go with me to dinner a second time. Deming told me at the very beginning that I needed to get involved in the effort to assist the American auto industry. When I responded that I considered my work at Y-12, ensuring that weapons were fit for their intended use, to be vitally important, Deming countered by reminding me that the Y-12 work is all classified and, as such, could not be shared with the entire country. He added that the automotive industry is the most visible industry in the country, and if we can make better automobiles than the Japanese make, we can change the American style of management.

After these discussions and at Deming's recommendation, I took off several weeks of accumulated vacation and personal time to teach a "Statistical Thinking" course to Ford managers and suppliers in Detroit. I also began moonlighting quality improvement seminars for my long-time friend Pete DeBusk, owner of DeRoyal Industries. Pete encouraged me to leave my Oak Ridge job and start a quality-improvement company. In December 1982, I founded QualPro. In March 1983, I resigned my position at Y-12 to devote full attention to QualPro.

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In May 1983, U.T. statistics professor Dr. David Chambers, who was a long-time mutual friend of mine and Dr. Deming, and I visited Deming at his home in Washington D.C. While there, Deming reviewed the proposed material that would be used in QualPro's first seven seminars. Deming approved all the materials except the material related to experimental design, which he indicated I should simplify. In late June 1983, I took the revised experimental design back to Deming, and Deming approved of the revised, simplified version of the material. Deming shared that he considered his job to be the transformation of the American style of management and felt that my job was to teach my methodology and help clients improve their processes.

Early in our relationship, Deming graciously committed to hold a four-day seminar in Knoxville. And in July 1983, Deming held his first 4-day seminar at the Hyatt Regency Hotel in Knoxville. The seminar had over 600 attendees. Tennessee governor Lamar Alexander agreed to hold a press conference to award Deming for his world-wide contribution to quality and productivity improvement. I persuaded Deming to attend the press conference. Deming loved the Knoxville experience. I took him three nights to the Catfish Cabin. He said it was the best catfish he'd ever eaten.

In early 1984, I hired additional professionals including Art Hammer. Deming, meanwhile, was encouraging attendees in his four-day seminars to go to Knoxville and learn techniques from Charlie Holland and the QualPro people. His referrals were important to QualPro's initial success. In fact, in the summer of 1984, 90 percent of the 150 attendees at my seminar in the ball room of the Hyatt Regency were Deming referrals.
From 1983-1992, I assisted Deming at thirteen of his four-day seminars, and I have many photos of working with Deming at these seminars. I was very fortunate to have his endorsement. At these seminars Deming often said "There are many charlatans and hacks, but few masters. You can count the masters in the whole world on your fingers." He would then bellow "Charlie Holland is a master!"

In addition to assisting in the seminars, Deming invited me to visit him on many occasions, including several visits to his home, meetings at the Cosmos Club in DC (where he always insisted on picking up the tab), several meetings in Detroit, one meeting in Minneapolis (where Deming made a television appearance), when several other locations when our respective schedules coincided.

I consider it a great honor to have known and been mentored by Dr. Deming, and I treasure the thick folder of hand-written letters from him—the last written nine days before his death on December 20, 1993. I consider Dr. Deming to have been the world's foremost quality guru. He was a visionary who transformed the Japanese into major competitors on the world stage, and he orchestrated the transformation of American management style across all business sectors. Dr. Deming's admiration for the high quality of work accomplished at Y-12 was the springboard for QualPro's success and, consequently, the success of many of QualPro's clients.

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Thank you, Chuck! What a tremendous story of entrepreneurship and a how a genuine friendship developed between you and the world-famous Dr. W. Edwards Deming.

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Dr. Deming and Chuck Holland became good friends

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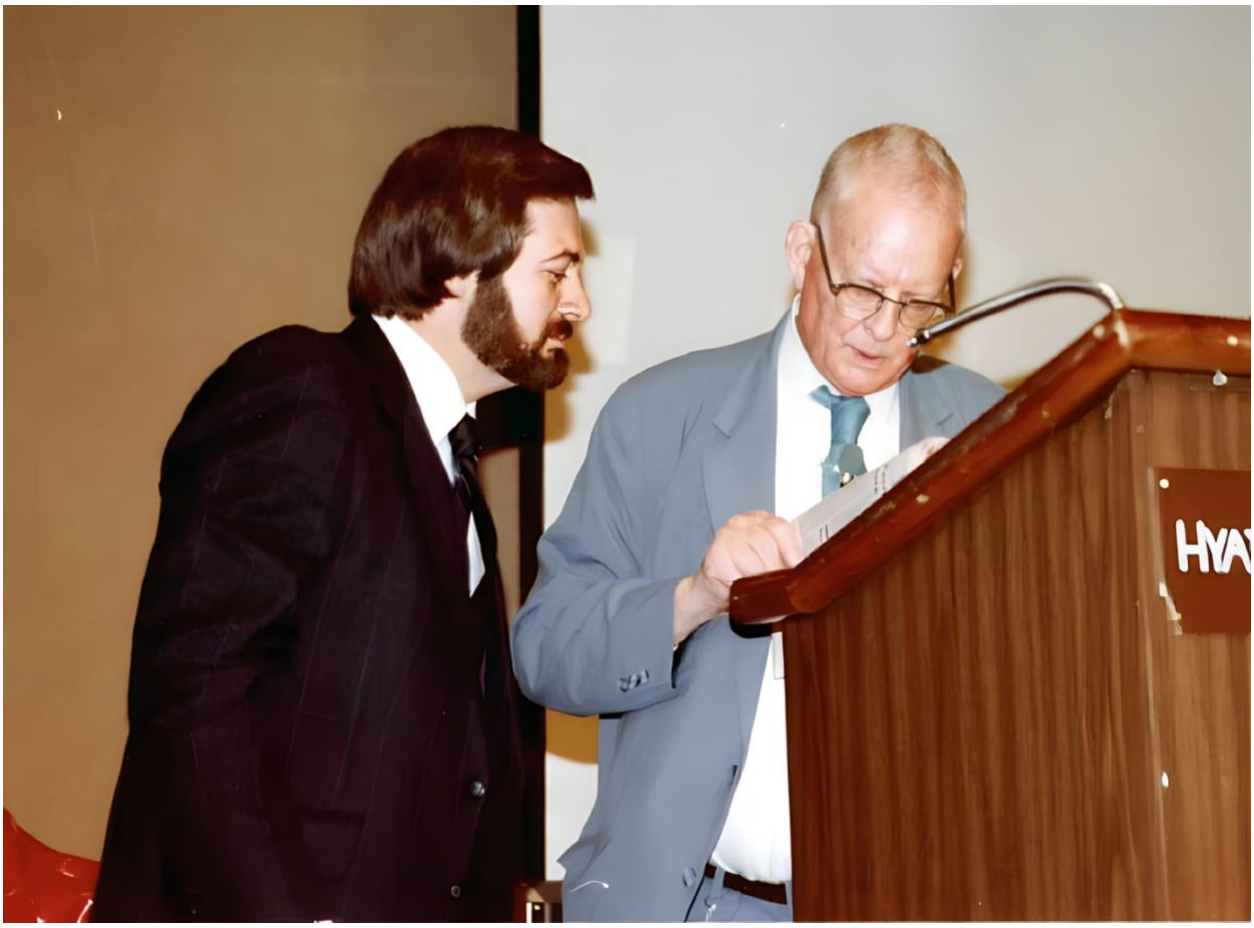

Chuck looks on as Dr. Deming prepares for a lecture on Statistical Quality Control