Bad design costs manufacturing companies big money. Is there a way to get things right the first time?

Back to the (electronic) drawing board

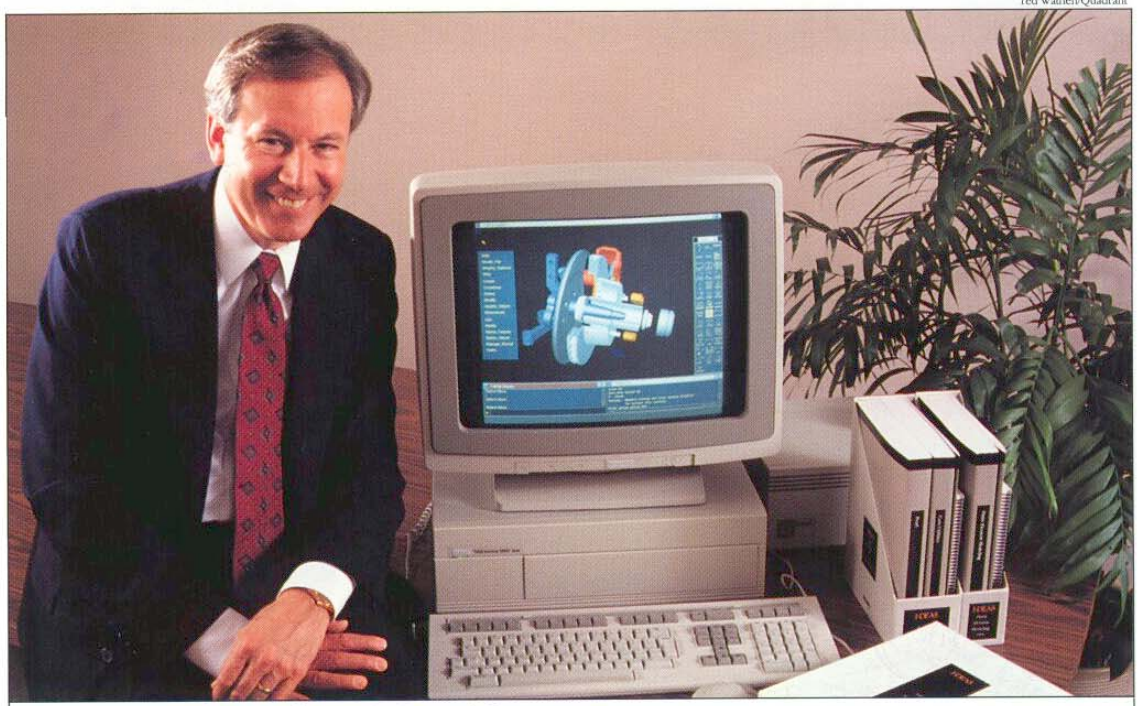
By Kathleen K. Wiegner

THE FIRST TIME Procter & Gamble introduced its Crest toothpaste in a pump dispenser, in the summer of 1985, it found itself with an expensive marketing disaster. Customers complained that the pump was messy and hard to use; P&G's suppliers complained that the pump was causing their expensive injection molds to fail.

Bad design can always be fixed—but at a steep price, as P&G learned the hard way. In the end, Cincinnati-based P&G reached out to a neighbor for help—a little software and engineering services outfit called Structural Dynamics Research Corp., in nearby Milford, Ohio. Using its own software, Structural Dynamics, which goes by SDRC, created a precise computer model of the pump that became the electronic blueprint for tooling the pump mold. SDRC's engineers also did a computer simulation of the plastic injection molding process to ensure the computer-designed parts would fill evenly and produce high-quality components. The redesigned pump went back on the shelves in 1986 and has been a success since.

So why doesn't every mechanical engineer have a computer to design his parts for him? Two reasons. One is that mechanical engineering is just not as sexy as electronic engineering, which has attracted the lion's share of design automation software. Some mechanical engineers design rockets and turbines, but a lot of them spend their lives turning out such things as brake systems and clutch plates. Thus, designers of semiconductor chips have a wealth of software to choose from, and vendors such as Mentor Graphics, Cadence Design Systems, Valid Logic and Daisy Systems do several billion dollars a year in sales supplying the designers'

Ted Wathen/Quadrant



Ronald Friedsam of Structural Dynamics Research Corp.
Mechanical engineering just isn't as sexy as electronic engineering.

needs. The market for mechanical engineering software is not expected to reach $1 billion until next year.

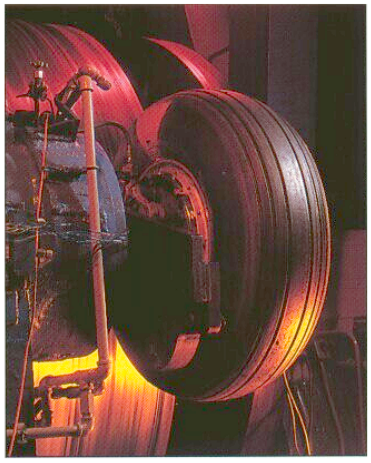
The other reason for the scarcity of mechanical engineering software is that the design of airplane brakes, for all their seeming banality, needs an awful lot of computing power. Creating the complex three-dimensional models mechanical engineers use requires up to four times as much computing power as the two-dimensional graphics needed to design layouts for integrated circuits or circuit boards. Until recently, when workstations with mainframe-like power became affordable for engineers, manufacturers just couldn't give their mechanical engineers much in the way of computing power. If they spent money automating design, they spent it to make production drawings and instruction sets for the numerically controlled machine tools on the factory floor.

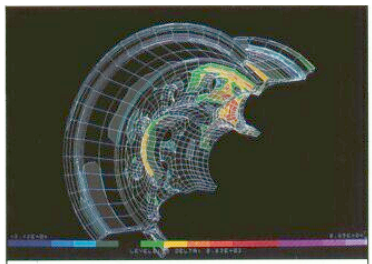
Enter SDRC. Started in 1967 by six engineering professors and students of mechanical engineering at the University of Cincinnati, SDRC plodded along for years largely as an engineering consulting company. More by technical than managerial brilliance, it became the leader in software that helps mechanical engineers design their parts. And now it is lucratively entrenched in this end of the computer-aided-design business.

Software from SDRC sells for up to $54,000 for a total system and runs on a variety of popular Unix workstations, including those of Sun Microsystems, Silicon Graphics, Digital Equipment and Hewlett-Packard's Apollo line. Selling software at prices like that is nice work if you can get it.

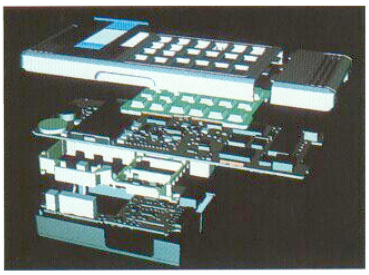
Alas, getting the work means spending millions on programmers and salesmen. By 1986 SDRC had severe cash problems. The board brought in Ronald J. Friedsam, 46, an up-and-coming Unisys marketing vice president, to get SDRC headed in the right direction. "It had brilliant technology, but marketing was a bunch of engineers talking to engineers," says Friedsam, now chief executive.

As the leading exponent of mechanical computer-aided engineering, today Friedsam is riding a wave of acceptance. Hughes Aircraft and Boeing are big users of SDRC's software. IBM, which accounted for 15% of 1989 software revenues, remarkets SDRC's design software under its own brand name, CAEDS. Digital Equipment Corp. remarkets it under SDRC's label. In 1989 SDRC earned $9.8 million on sales of $93.6 million. This year SDRC will likely earn over $12 million on sales of $116 million. Since the company went public in 1987, adjusted for a recent 2-for-1 split, the stock price has nearly quadrupled.





B.F. Goodrich wheel and brake assembly and software model (above); cellular phone and exploded view (below)



Those fat profits are beginning to interest some computer-aided-design companies whose markets are hurting. But with over $100 million in research and development spending invested in its I-Deas software, and over 20,000 users, SDRC has created a formidable barrier to entry.

Here's Friedsam's selling proposition: Decisions made early in a product's design cycle set the direction for the majority of a product's total costs. If a change at the drawing-board stage of a product costs about $1, in final production that same change costs $10,000, and after a field failure, $100,000 or more, according to recent data from British Aerospace. These costs arise because the analysis and testing that flag design problems do not come until late in the process.

Becton Dickinson, for example, cut manufacturing and design costs for its plastic disposable products by using the software. The hospital supplier eliminated one prototype stage for a hypodermic syringe it designed by modeling the syringe molds on a computer screen and simulating the flow of plastic into the injection molds to test for potential problems early in the design cycle.

"Our products are aimed where little investment has been made but will be in the future," says Friedsam. "Mechanical engineers have been more conservative, more skeptical than electronic engineers."

But Friedsam is finding that manufacturers in Europe and the Far East, particularly Japan, are greeting his technology with more enthusiasm than the metal-benders back home. In 1989 over half SDRC's sales (and 76% of operating income) came from overseas. Structural Dynamics' analysis software was used by Mazda to analyze its popular new Miata sports car's performance in the development stage. Early last year SDRC joined with Japanese automaker Nissan Motor Co. to provide engineering consulting services in the Far East.

Despite all the TV commercials featuring engineers designing cars on computers, the use of mechanical computer-aided engineering tools is gaining popularity faster overseas, according to the market research firm Dataquest.

"We really created this industry from nothing," says Friedsam, whose stake in SDRC is worth $5.1 million on paper. There's no guarantee that any computer can help a mechanical engineer turn out an automobile as elegant as the Miata. But Friedsam's software will make it harder to produce a clunker. ■