

GE TIME-SHARING SERVICE MAKES NEWS

in
The Field of Manufacturing



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In Time-Sharing
Service

IRON AGE

**Time Sharing Makes NC Capability
as Near as a Telephone**



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GENERAL  ELECTRIC

Time Sharing Makes NC Capability as Near as a Telephone

Small-Shop NC via Teletypewriter

■ "Of course time-sharing works for small companies."

The company president backs up this positive statement with a 50 pct increase in output.

H. H. Hansen, president and treasurer of Hansen Engineering and Manufacturing Co., Inc., Lynn, Mass., affirms that General Electric Co.'s time-sharing computer system assures his company maximum, efficient use of NC machine tools.

"They were an improvement over the old ways," he says, "even when we were programming them by hand. But this really gives us a quantum jump in utility."

The firm, which produces some \$2.5 million worth of jet engine components, had its own computer for payroll accounting, keeping track of work orders and assigning charges to the right jobs. But it was basically an office system setup.

It wasn't powerful enough to perform the mathematical and

geometrical calculations required for complex machining problems, and an 80-employee firm just couldn't afford its own computer for that kind of work.

Time-sharing gives the company a piece of that kind of computer.

It takes skilled men and first rate equipment to turn out consistently, to rigid specifications, rotating parts up to 24 in. diam that are perfectly balanced, within a few tenths of thousandths of tolerance. Add to these specifications, complex configurations, thin wall thicknesses, and materials such as Waspaloy, titanium and Inconel, and a company needs technological sophistication.

But sophistication costs money. During the sixties, numerical-control of machine tools created a real advance. But such an advance comes at great capital cost—far beyond the means of a small company.

"We had been following and evaluating NC for some time,"

said Mr. Hansen, "but the cost was prohibitive and we just didn't have the confidence that the machines could do the type of work we were engaged in.

"Five years ago, we did buy a numerical input lathe. It had a lot of dials on it that you preset to the job, but it just wasn't flexible enough. It's gone now.

"Then in 1968, we finally bought our first punched tape input NC machine—a vertical miller of Japanese make. In 1969, we added two NC lathes of German make," he continued.

NC machines need programs. As with any logic operation, programs were worked out item by item and punched into the tape. The program was tried on the machine. If it wasn't right, then it was literally back to the old drawing board until the bugs were ironed out.

Hansen Engineering needed a better way.

The company looked outside for programming help. At first Hansen did work with two con-



H. H. Hansen, president, (left) and E. S. Fanjoy, machinist-turned-programmer, praise time sharing.

cerns specializing in NC programs. Both provided a library of programs which could be tailored to the customer's needs.

But, both provided a batch-type service for which the customer had to wait in line. If debugging was necessary, it was back to the end of the line. Clearly this arrangement was still too slow.

The time-sharing facility of General Electric Corp. seemed the answer. It offered a selection of program capability, including capability to handle the foreign milling machine with a unique tape format.

And, best of all, it made available to a small company, the complete facilities of a giant computer in Teaneck, N.J., accessed through a local Lynn telephone number, completely at its service for the time it wanted it, when it wanted it.

The Hansen operator could process his part program, have the computer catch and inform him of errors which he could correct immediately by typing in corrections. This would be by "conversational mode" between the operator and the computer through the teletype terminal and the phone lines.

Further modifications to the program during tape debugging

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Hansen Engineering and Machinery Co., Inc.

needed only be entered through the terminal and the computer automatically redoes the entire job.

"We immediately saw the advantages of the GE system," emphasizes Mr. Hansen.

But the company didn't just take the GE man at his word. They put him to work on the toughest problem they had in the house: A blade shroud for a Pratt & Whitney jet engine.

By hand, the machine—a lathe—had been programmed to yield nine of these complex pieces from a single cylindrical forging about 1 ft long and 22 in. diam.

On the first try, a program produced with the aid of the time-sharing computer yielded 10 pieces. Further refinement of the program increased the yield to 11.

The time required to make one item dropped from 2½ hours to 18 minutes.

And that's not all. At first, the program tape had to be changed after six items were run. That was improved so that eight items

were run off the first reel of program tape and three off a second.

Further editing with the computer's assistance put all 11 pieces on a single reel, eliminating machine downtime to reset the program. The number of operations required per item has now dropped from between 15 to 18 to 7.

The experience of Hansen Engineering points up an interesting sidelight on the use of computers in general, and time-sharing computers in particular. Much of the programming done by the company is done by a machinist trained to use the computer, rather than a programmer trained to use machine tools.

E. S. Fanjoy uses his many years as a journeyman machinist, his knowledge of what a machine will and will not do, his familiarity with the machining qualities of many different materials and with the peculiarities of tools to determine what can and cannot be done.

There is no use writing a program to drive a tool faster than it can cut, or one that fails to account for heating the piece as it is worked. A program will fail if it does not recognize the ease with which thin walls can be torn, or that forgets the different properties of the same material in large and small sections.

Mr. Fanjoy's intimate, practical knowledge of machine tools and machining enables him to program into his punched tape the deft touch of the skilled machinist.

And the shared-time terminal gives him the immediate feedback that any skilled artisan needs to guide his work. But users cannot afford to forget people make NC work. ■



NC program, prepared on remote computer through time-sharing terminal, operates numerically-controlled lathe and gives small shop, big-shop capability.

GENERAL ELECTRIC COMPANY, INFORMATION SERVICES DIVISION
7735 OLD GEORGETOWN RD., BETHESDA, MD. 20014
(301) 654-9360

