Computer planning unsnarls the job shop

Fairfield Mfg., with 1,000 machine tools handling many small orders, has found a way to create assembly-line efficiencies. The results could have far-reaching effects.

"Two years ago, I was so upset I was going to quit. Now I sleep beautifully," says Henry Kuebler, a foreman at Fairfield Mfg. Co., a job-shop gear producer in Lafayette, Ind.

Kuebler is much more relaxed—and happier—these days because a computer has taken over his biggest problem, scheduling shop orders through his department. It has, in fact, taken over scheduling throughout the factory.

In pre-computer days, Kuebler had to make decisions on which he had little or no information. Often he had to stick his neck out and promise on deliveries. Sometimes he would face conflicting demands from salesmen, other departments, and machine operators angling for choice jobs that came under high incentive-plan pay. Even worse, Kuebler's decisions could throw off another department, and delays in schedules might pyramid throughout the plant.

His situation was similar to that of Fairfield's 26 other work supervisors; thousands of other foremen in job shops all over the country are in similar ulcer-producing binds.

Smooth sailing. Today, the computer and its program are controlling manufacturing on Fairfield's 1,000 machine tools down to the hour, and the entire plant runs smoothly, almost like one large continuous assembly line.

The Fairfield operation, in its second year, is believed to be the only one of its kind, according to specialists in production management, and they think it could point the way to higher efficiency for many other shops.

The program, at least for Fairfield, has cut idle machine time and brought an increase in production with the same tools, says President Virgil C. Drake. He attributes a 5% to 10% gain in output to "the computer alone." Lead time, on average, is now five months. It would be seven or eight months without the computer system, remarks Charles E. Kramer, vice-president for manufacturing. Most important, Fairfield climbed from 60% on-time deliveries early in 1965 to 78% by yearend.

Looking ahead. Fairfield's system is a set of operations research programs and four subsystem files. These monitor order status, planned and promised shipping dates, shop scheduling, and production and schedule control. The system was worked out over a two-year period by Stanley Reiter, professor of mathematics and economics at Purdue University, and William K. Hol-

Co-inventor of new system, Stanley Reiter (left), explains plan to Fairfield executives Charles Kramer (center) and Virgil Drake (right).
stein, now an assistant professor at Harvard Business School.

So far, the very complexity of job shops has kept them from full computer control. By definition, a job shop handles great numbers of small orders, often for all types of customers. Most suffer from bottlenecks, idle machines, and excessive overtime—Reiter calls them "semi-organized chaos."

However, the Fairfield system "routinizes everything essential that can be routinized," says Reiter. Conventional methods won't bring efficiency into job shops, which is why so many are plagued by inefficiencies even though they can control some operations.

**Details.** The heart of the Fairfield system is the shop schedule—a detailed analysis of every operation that each work center is to perform to the nearest hour, and the computer printout serves as the work sheet for foremen. Every three days, as priorities and slack situations arise, the entire schedule is revised for six days ahead.

The printout identifies the job at each work center by part number, shop order, sequence number, lot size, quantity ordered, and customer. It also shows projected start and finish time for each lot, as well as the preceding and next work-center locations.

"It is gospel," says one foreman. Reiter calls it "non-discriminatory," meaning that foremen know they cannot alter the sequences and are freed from pressures put on them by colleagues. Instead they can concentrate on quality control, training, and troubleshooting.

Since the shop schedule determines the sequence of operations for each machine, it also determines set-up costs. And by controlling timing at each processing stage, it determines in-process inventory costs. The system also can predict shop loads a year ahead, and thus is useful in planning purchases of new machines.

**Roses.** In the pre-computer days, "we weren't in control," says Drake. "Now we are."

Oberves Kramer: "Reports were out of date by the time we got them." We would get equipment nine months after a crisis had ended. And some jobs would just get lost out in the plant—out of sight, out of mind.

Drake sees "substantial savings" because there is less idle machine time, although under the old system, idle time wasn't measured. The yearly cost of the IBM 360 computer has been "easily saved in cutting excess overtime," he says.