CYBERNETICS

on the production line

by Carl Behrens

The computer revolution is automating bookkeeping, liberating science from arithmetic bondage, invading the classroom and restructuring the dissemination of information.

All these advances will have a profound effect on the social and personal life of people living in the computer age, and all of them have been widely discussed.

But another, and possibly equally significant advance quietly going on in the computer world is encoded in the letters DDC: Direct Digital Control of industrial processes. Because it is in automatic control of complex operations that the lightning computing ability of the machines is least held up by delays in getting information in and getting results out.

Input and output delays have always been a major problem with computer systems, since the handling of cards and the printing of results is inevitably slower than the actual computing.

This is true in computer control systems too; but the delays are cut down. Instruments on the line measure key variables and send them directly to the computer. The values are entered into a pre-set formula, settings for various valves and controls are computed, and orders are again directly sent from the computer to the line. No one has to read the dials, feed the computer, get the answers, or set the switches.

Automatic control doesn't necessarily require a computer, of course. For years simple controls have operated everything from a house furnace to a flying airplane.

But computer control does more than monitor a single stage in a process. It can collect hundreds of measurements, compute what effect each will have on the final output, and set the controls to get the best results.

This precision has advantages in the maintenance field as well. "With computer control," says Edward R. Sczesny of Ford Motor Company's Glass Division, where a new computer system has recently begun operating, "less strain is placed on furnaces and other equipment . . . Temperatures in the 2,000 degree F. range can be controlled to within one degree, and pressures in the furnace can be held to within two thousandths of an inch of mercury. These tolerances are up to five times tighter than in the past."

There's also nothing to keep the plant manager from bringing in outside factors to help decide where to set his controls. At Mobil Oil Corp.'s Paulsboro, N.J., refinery, for example, current prices and inventories for different petroleum products are fed into the computer, which produces recommendations on the proportion of diesel fuel, high octane gasoline, kerosene, etc., to be made for the most profit.

Buying an expensive computer to run a production line may seem like a big capital investment. But as General Electric's R. C. Berendsen, manager of the Process Computer Business Section, pointed out last month at a Washington seminar, it can be cheaper than other methods, even discounting the advantages of greater efficiency.

"If you have a process that needs control of a thousand valves or flows," he says, "you can control each one separately by its own automatic system. But these analog controllers run from $750 to $1,000 each. That means you have to install $750,000 worth of equipment, while you can get a DDC computer installation for $200,000 to $300,000."

Computer systems have some disadvantages besides cost, however.

One of the most important is the question of backup in case the computer breaks down. Since there will inevitably be some times when the computer can't be working, the system has to include means of running the plant when that happens.

In non-critical areas, the procedure can be just to leave the settings where they were when the computer stopped functioning. But some settings have to be adjusted continually, and this means putting in conventional controllers to take over. If the number of critical settings is high enough, then the question is, why not use conventional controllers all the time, and avoid the expense of direct computer control?

Another question, of course, is the size and complexity of the operation. If instant response to a large number of variables doesn't improve output much over the slower and easier supervisory control, then there isn't much sense in going to the more expensive lengths of direct control.

But the chances are that more and more industries will move into the DDC camp. Sophisticated control and fine adjustment are always desirable, and the temptation is to install the computer system and then see just how sophisticated and precise one can get. ◈