

INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Production Control, Attendance Reporting, Operation Analysis Sheet Writing
Type of Industry	Instrument Manufacturer
Name of User	Taylor Instrument Companies Rochester, N. Y.
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Equipment Used	Friden Collectadata 30 Data Collection System
	Friden Flexowriter Programatic Writing Machines (three)
	Friden Selectadata Readers (three)
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Synopsis

Production of highly accurate recording and control equipment requires complex cost accounting and production control methods. To modernize their procedures in these areas, Taylor Instrument Companies, Rochester, N. Y., have installed a Friden Collectadata 30 data collection system. This system, made up of transmitters, receivers, and a control console, allows data to be transmitted from scattered production points to a central collection center to provide input for prompt machine preparation of detailed and accurate reports.

For Taylor's industrial data-handling activities, the most important procedure is the origination of operation analysis sheets. One of these is produced for each step in the manufacturing of new or customized products. The hand-written sheets are given to the operator of one of three Friden data origination systems. These systems, centered around a Flexowriter writing machine, produce a typed, three-part operation analysis sheet, a punched tape record of the document, and three types of punched tab cards.

The punched tape will later be used to prepare engineering changes. The punched cards (Operations, Tools, and Materials) provide travelers that accompany orders through the manufacturing process and provide data transmission input at each stage of completion.

The Collectadata system is also designed for attendance reporting. Four times a day, the transmitters automatically change to an attendance recording mode and employees insert their prepunched identifying badges into the badge readers to report in and out of work.

When it was established in 1851, in Rochester, N. Y., to make household barometers and thermometers, the partnership of Kendall and Taylor listed total assets of \$919, of which \$600 was for "knowledge of the business." Today, the tiny thermometer maker has become Taylor Instrument Companies, the largest instrument firm of its kind in the world. The nature of its assets has similarly changed. Yet, know-how still represents a major part of Taylor resources. This is because few other firms can claim to manufacture so varied a range of specialized, often complex instruments.

In its manufacturing operations, Taylor aims for the same characteristics that its instruments must possess -- maximum accuracy and precise control for prompt management review and decision. To do so, Taylor relies on a plant-wide Collectadata data collection system, Model 30 by Friden. It transmits data from each point of productivity to a central collection center where the information can be computer-developed into meaningful, timely and accurate reports.

Taylor Instrument Companies manufactures some 8,000 variations of its basic products. These products, instruments to indicate, record or control temperature, pressure, flow, force, liquid level and humidity, serve the home, the medical profession and industry. They are distributed all over the world through U. S. branch offices and manufacturing subsidiaries in Canada, England, Australia, Germany, France, India and Mexico. Taylor sales are approximately \$50 million a year.

The largest part of Taylor's business lies in the mechanical and electronic fields with companies engaged in fluid processing. To this end, Taylor develops, manufactures and sells indicating and recording instruments, and automatic control systems to the petroleum, chemical, rubber, plastic, film, food processing, paper and many other industries.

Taylor process control instruments were used in the gaseous diffusion plant of the atomic bomb project at Oak Ridge, Tenn. Similar instruments have also been supplied to other Atomic Energy Commission installations.

Operations Control at Taylor Instrument Companies

Headed by Thomas Mohr, manager of systems, Taylor analysts have strived to organize the prompt, automatic central collection of information covering all company operations. To do so, they have designed five separate data origination systems. All are designed to produce input for the Collectadata network. They have the following originating areas and applications:

- Industrial Engineering Dept. - Origination of operation analysis sheets.
- Personnel Processing System.
- Engineering Dept. - Bill of material writing.
- Purchasing Dept. - Purchase order writing.
- Sales Order Dept. - Order entry/invoicing system.

The Collectadata data collection, Model 30, system on which they are based is made up of three basic types of components: transmitters, receivers and a control console.

System input is provided by the transmitters. These compact units are located at various activity sites and serve to record constant and variable information for all plant-floor transactions. Variable data is entered through a series of dials on the front of the transmitters. Constant data comes from either tabulating cards and/or a coded plastic employe badge. The operation of the Model 30 transmitter requires very little training. Classes, held on a regular basis for orientation of new employes, include this instruction as part of the program.

The centrally located receivers are the system's output terminals. One receiver can service a large number of transmitters. The unit records transmission in punched tape, coded with the eight-channel system code. Punched tape can then be entered into the accounting system for further processing. Besides the necessary tape handling mechanism, receivers contain control logic and a regulated power supply.

The central control center is the control console, located adjacent to the receivers. This unit houses the central switch panel, time transmitter, and a standby time code emitter. The control console automatically adds a four-digit time code at the end of each transmission recorded by the receivers. The full application of Taylor's Collectadata network involves the use of seven receivers located in the Data Processing Dept., serving 38 transmitters in various plant areas. Of the latter units, six are located in the machine shop and nine in the assembly and finishing operations. Paper tapes punched by the receivers provide input to a data processing installation whose planning is centered around an IBM 360 Model 30 system.

In this way, accurate and detailed reports are promptly produced for management review. These reports fall into the following categories:

- Payroll
- Production and Inventory
- Cost Accounting
- Sales Analysis, Purchasing, and Sales Statistics

Operation Analysis Sheet Writing

For Taylor's industrial activities, the most important data-handling procedure is the origination of operation analysis sheets. When new or customized products are to be built, specifications drawings and parts lists are released to the Industrial Engineering Dept. This department evaluates the project in terms of tool design, time standards, operations, procedures, and finally a cost estimate. A handwritten operation analysis sheet is then prepared for each step in the manufacturing process.

The sheets are then given to the operator of one of the three data-origination systems by Friden in the Industrial Engineering Dept. Each system consists of cable-connected business machines, all of which can be simultaneously operated by a single typist.

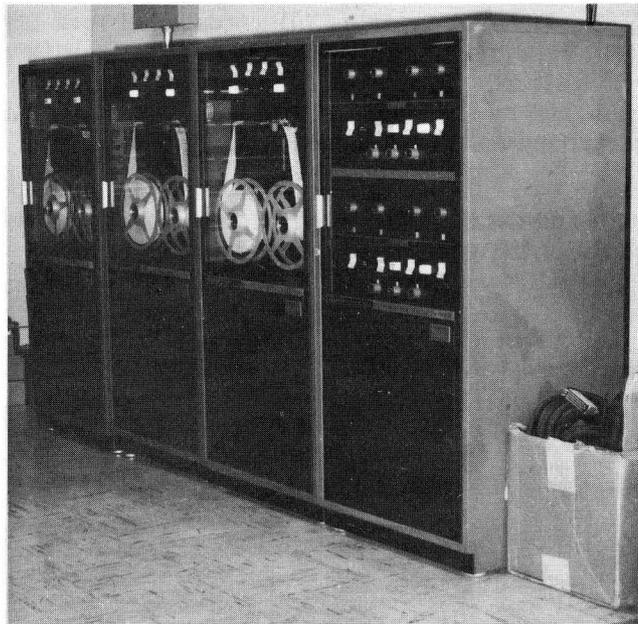
The basic unit is a Friden Flexowriter automatic writing machine with integral punch and reader. It produces both a typewritten document and punches all or selected parts of the document's information into paper tape.

Connected to the Flexowriter writing machine is a Friden Model TCPC (Tab Card Punch Control) which links it to an IBM 026 keypunch. This permits operation analysis data to be automatically punched into tab cards while the system operator types the information on the Flexowriter, writing machine.

Control of the system is semi-automatic. Also linked to the writing machine is a Friden Selectadata selective tape reader. This unit provides the system with all horizontal and vertical spacings. It also provides automatic control of the writing machine tape punch and the connected keypunch. The reader is controlled by closed-loop punched program tape.

As operations analysis sheet forms are continuous, the typist need only touch a switch after she has entered a block of data. From the typing operation, three categories of documents are produced:

- Three-part operation analysis sheet
- Punched tape record of the document
- Three types of punched tab cards



FRIDEN SELECTADATA 30 RECEIVERS (three shown) receive through CONTROL CONSOLE (at right) data transmitted from scattered production points.

After typing, the three-part operations analysis sheet is separated into three copies. One copy is filed in the manufacturing department where the part is to be made; another copy remains in the Industrial Engineering Dept.; and the third is filed with the punched tape record.

This filed tape is later used to prepare engineering changes. It is read into the Flexowriter reader, and all unaltered information is automatically typed on the new operations analysis sheet. The changes are then entered, and the tape's old and incorrect information is bypassed. From this typing, a new document, new cards and an updated punched tape are quickly, easily and accurately prepared.

By-product production of punched cards has several advantages. No lag is caused by key-punching after completion of the document, and errors are immediately corrected at the source before they can enter the system. The cards keypunched as by-products of the typing of the operation analysis sheet fall into three categories:

- Operation Card - bearing identifying and descriptive information.
- Tool Card(s) - for tools made for this particular operation.
- Material Card(s) - listing the kind and quantity of raw material needed.

The information contained in these tabs is processed in Data Processing for industrial and managerial use.

The operation card is reproduced into a different format and duplicated for the master files. One file contains cards in the sequence of department number, machine code and part number. This file is used both by Production Planning and Industrial Engineering to create machine loading reports and forecasting production figures.



FRIDEN FLEXOWRITER PROGRAMATIC automatic writing machine is the basic unit of the data-origination systems used to produce operation analysis sheets, punched tape records and punched card production travelers.

The other master file contains cards in the sequence of part number and operation number. It is used for reference and preparation of the planned operation list (shop order) from operation and material cards.

The material cards are then collated with cards for the Friden Collectadata network. The number of input cards produced varies with the number and sequence of manufacturing operations. There are usually five to seven cards for any one part, but the number can run as high as 100.

At this point, Industrial Engineering collects Model 30 input cards, the planned operation list, blue prints, and, if called for, a parts list. These materials for each part to be manufactured are combined into a plastic envelope and routed to Production Control where the envelope is filed until ready for release.

4. Run Only
5. Burden
6. Stock Received
7. Factory Order (special parts manufacturing to meet customer requirements)

To make a transmission, the operator first turns the program selector knob to the type of transaction to be recorded. When the program is selected, all information needed to make this transmission is visible through the program windows and the variable dial windows.

Thus, if a transaction is "Set Up and Run," the program windows will show that both a badge and a card are needed. Also, the operation is on white backing so the operator uses the white tab card from the plastic envelope. Cards and programs are color-coded so the operator does not have to read the tab card. He only matches the color of the card with the color showing through the program windows. The variable dial windows, one for each of the 10 dials, tell him to dial the following information from left to right:

1. Not Used
2. Set Up - One digit from 10 percent to 100 percent (1-9, 0)
3. Rate Type - Code digit from 1 through 9
4. - 8. Quantity - Five digits
9. Last Job (of the shift) - Set "Yes" or "No"
10. Operation Complete - Set "Yes" or "No"

The operator must fulfill all of these conditions before he can press the switch which allows the transmission to be made. Upon its completion, the tab card is ejected at the bottom of the unit, and the badge can be removed.

Other integral checking devices are incorporated into the transmitter to assure that the correct transmission procedures are followed:

- After each transmission, all dials automatically return to the blank position. This prevents carry-over of data from the previous transmission.
- Any specific dial or dials required by a particular transaction must be moved from the blank position before transmission can be accomplished.
- If both a card and a badge are necessary for a particular transmission, the transmitter is equipped with internal checks to verify their presence and correct insertion.

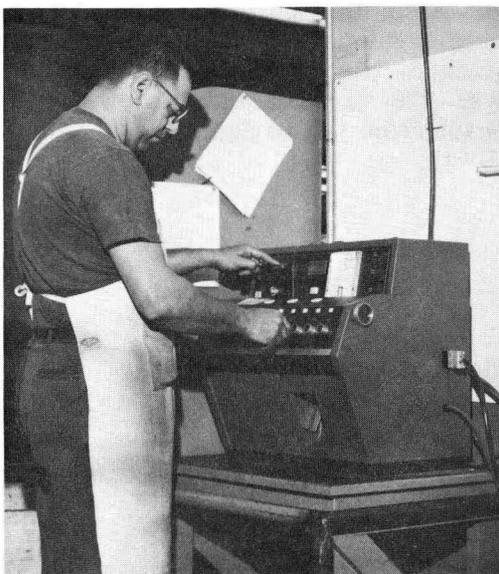
If any of these conditions is not fulfilled when the operator presses the START switch, an alarm buzzer sounds and a light glows. The light indicates whether the error is a dial error or a card (and/or) badge error.

If the conditions have been met, the IN PROCESS light glows throughout the transmission. During transmission, card, badge and dials are located into the transmitter.

Attendance Recording

Taylor's Collectadata network is also designed for attendance recording. Four times a day the transmitters automatically change to an attendance recording mode. At this time, the program selection and variable dials are inoperable, and only the badge reader on the transmitter is used. Employees then use their badges to register in and out of work.

An important feature of this system is a data storage and lockout device which insures that correct transmission is made at all times. Reading into the data storage takes about one tenth of a second. If data from the badge has not yet been transmitted from the storage at the time a new badge is inserted, the badge is locked into place until this occurs, usually within a few seconds. This insures both accuracy and a minimum of lag time as employees register on and off their jobs.



COLLECTADATA 30 TRANSMITTERS are used to transmit production data from plant floor and for attendance reporting.

Results

From data origination through to management reporting, the present information-handling procedures have had a significant impact on the operations of Taylor Instrument Companies. Commenting on this impact, Mohr says, "We have the means of capturing the necessary data at its inception in machine readable form. The Collectadata network transfers this information rapidly, accurately and economically to the data processing center. This provides the bridge from the data source to its application."

Among the benefits which Taylor has thus received, Mohr lists tighter management control in manufacturing, inventory and employe output. Tools for accurate forecasting have thus become available.

Similarly, there has been a significant increase of accuracy in the area of job-time reporting and in data origination. Since both the original document and cards are produced from the same operation, there can be no discrepancy between the two records. Job reporting is now an automatic instead of a manual function.

In addition, this has created economies in the number of non-productive clerical employees. Increased accuracy in data created, immediacy of reporting, and simplification of the entire recording and reporting system result in savings in both time and overhead.