

# Knit Goods Management Based on Visible Facts

Application Vital and Necessary in Manufacturing  
Knit Goods of All Kinds

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There are some interesting and amazing facts connected with modern industrial management. One of them is that the principle of fact recording, this most important phase of modern management, has remained unimproved, handed down from generation to generation, until the present times. It is true, we have ingenious mechanical devices like typewriters, calculating machines, and a great variety of modern filing systems. But they are only the instruments and not the principle—or the psychology of the activity.

The principle of fact recording in business activity, is a psycho-economic problem—a modern conception born only after psychology has been lifted from its musty, academic atmosphere and employed for practical purposes.

One of the greatest contributions of this science to business refers to the classification of the processes of the mind in assimilating information. It has been proven that the human mind conceives its impressions through mental pictures and reaches a conclusion by a comparison of such facts. According to this scientific but common sense explanation, the words and numerals which we use in recording our economic activities are only symbols which the subconscious mind must translate into magnitudes and determine the relation of such magnitudes through a visual mental process.

We also know that all such symbols are the result of an evolution of the picture writing of early human civilization, and that before man was capable of recording objects, through delineation he used the simple method of indentation, or recording events by notches.

Everybody is familiar with the modern

graphic chart used frequently in modern business for the presentation of facts. An effective and successful method, because it provides facts and their relations to each other without requiring the tiresome intermediate mental effort of translating symbols of the words and numerals into their right meaning. How much simpler and pleasanter it is for the human mind to assimilate facts directly than through the medium of words and figures is demonstrated by means of the Figs. 1, 2, 3, and 4, telling the story of a simple economic requirement. Men, horses, and weapons required for a hunt—and men, horses and weapons available.

Fig. No. 1 states the problem in the conventional manner with the symbols of words and numerals.

Fig. No. 2 illustrates this problem through the medium of picture writing used by mankind before the alphabet and numbers were invented.

Fig. No. 3 illustrates the problem by means of indentation or notches, also color variations as used by the pre-historic man.

Fig. No. 4 tells the facts through the most modern method—the graphic means.

The notches used by pre-historic men, and the newest, the graphic method used by the modern business man are the

simplest and most effective. Differentiation between the objects is obtained by colors, and the relations of the objects to each other by magnitude of the lines. This oldest and newest method, therefore, provides the direct mental picture without the necessity of the interpretation of complicated symbols, hence the most direct means for presenting facts.

The reason why this Graphic Means of

**FOR THE HUNT IT IS  
NECESSARY TO HAVE~**

**10 MEN  
10 HORSES  
10 SPEARS**

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**AVAILABLE ~**

**10 MEN  
6 HORSES  
7 SPEARS**

Fig. 1

Presentation of Facts has not yet supplanted the present method; using complicated records and the symbols of words and numerals, was due to the fact that up to recent times the available instruments for graphic presentation were primitive, unelastic, and the magnitudes were only approximations.

Recently, however, engineering science succeeded in refining the instruments used for the graphic means of recording facts and devised instruments, which without losing a single advantage of the graphic procedure make graphic control as elastic, simple and accurate in operation as the most modern loose leaf ledger or similar record system.

This invention opens a new field for executive control. Information essential for

licated control system and top heavy maintenance cost.

The first advantage of the Dynamic Graphic Instruments is, of course, that they do not bury the facts into records, but keep them constantly before the individuals entrusted with executive responsibilities.

The other advantage is, that facts are immediately available as soon as changes occur, and that discrepancies are automatically indicated. This means that an executive can find such facts before him instead of

depending upon clerical assistance for the notification of adverse conditions.

The principle of the Dynamic Graphic Control is the indication of magnitudes and their relations to each other by lines and colors. Each color representing a definite

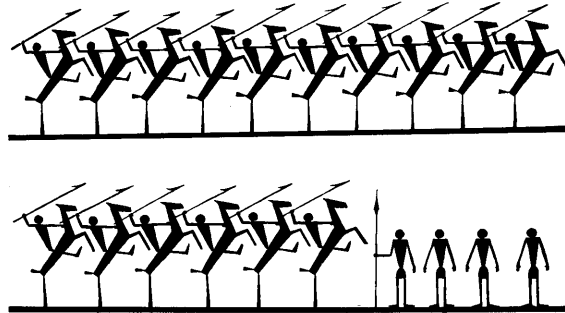


Fig. 2

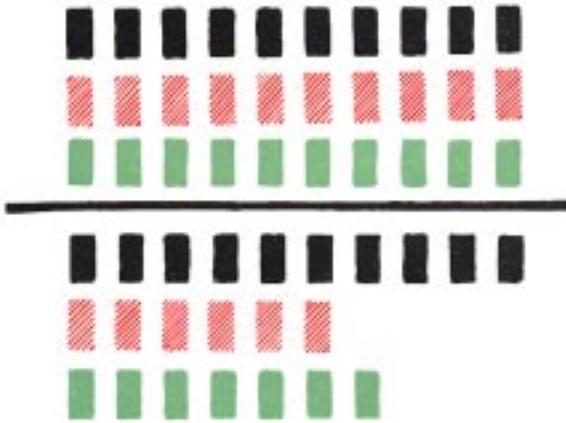


Fig. 3

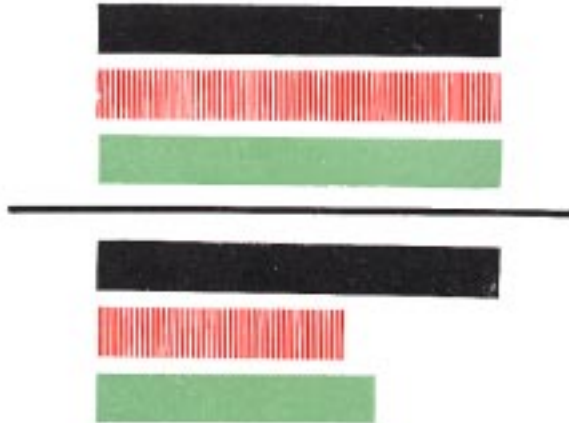


Fig. 4

efficient management, which heretofore could be obtained only by complicated and expensive clerical procedures, now can be accumulated by a simpler method. But this is not all. All the mental strain required for the interpretation of the old type record can now be visualized directly by the executives.

### Most Needed by Knitters

This new development, therefore, is of great importance to the textile industry, particularly to the knitting branch, because there a satisfactory control and the maintenance of records always has meant a com-

condition, object or other element of operation. A small unit of the Dynamic Graphic Control Instrument is illustrated in Figure No. 5. The instrument can be built to any practical length and in as many units as necessary. A unit can be removed from or added to the set as easily as a card may be added to or removed from a card system. The adjustments of the magnitudes are not approximations, but are numerically accurate. This means that a condition indicated by a graphic control can be expressed as accurately as through a written record. The elements indicating the magnitudes are self-adjusting, requiring neither pen,

pencil nor other means for the adjustment.

Another great advantage of the Dynamic Graphic Control over the conventional means of recording facts is due to an automatic danger signal which appears whenever an important factor of operation reaches a level inconsistent with safety. In such cases, the color of the indicator unit changes to another color, reporting such unfavorable condition to the management automatically. This danger signal cannot be removed until conditions have been changed and indicated as such through the graphic unit.

The best illustration for the operation of the instruments can be obtained by the consideration of actual conditions in the knitting industry.

The control of materials and supplies, for instance, are of vital importance in all the branches of the knitting industry. Stocks must be provided in proportion to the requirements, and too much material on hand, as well as a shortage, is equally detrimental to the profitable operation of the enterprise. According to the ordinary procedures of control, stock records are kept in the charge of a clerk and the executive has to depend upon the alertness of the employee for advising him of shortages and over-supplies. The maintenance of this record involves also complicated entries and endless opportunities for mistakes.

Graphically, the condition of the stocks can be maintained in a simple and forcible manner with mistakes practically eliminated. If the first element of the graphic unit, as shown by Fig. 5 represents stock on hand in black color, and the following unit, the immediate requirements for such stock in red color, a relation of these two magnitudes will tell the executive without further investigation whether he has sufficient stock on hand or not. If a third element represents the material purchased for immediate delivery in green color, and underneath a brown color represents assignments for immediate use after the available stock has been used up, the picture will immediately tell whether additional purchases should be made or not, and also to what extent. Since there is no limit to the size of a dynamic control installation, and the elements can be added or taken away, the method is suitable for large or small enterprises. The picture of the material requirements, whether for immediate or for future consumption, are placed in this manner before the eyes of the executive responsible for materials.

In the knitting branch of our industry, where sometimes a great variety of yarns are required, the application of the graphic principle is the best safeguard for the proper management of the material requirements.

For the control of production, this dynamic graphic instrument provides the executives with immediate and accurate facts just as simply and accurately as described for the materials.

The efficient utilization of the equipment through the series of operations is the foundation of the successful knitting mill management. In all the underwear, hosiery and outerwear branches, the manufacture of the predetermined assortment of sizes and colors absolutely is essential for balanced shipments, and the maintenance of such balanced production for a knitting plant is the most difficult problem of the management.

System after system has been experimented with in the effort to cope with the problem, but no matter what amount of ingenuity has been extended in the past in this direction, the control of production remained complicated, as a rule, prohibitively expensive, due to the great amount of clerical labor involved, yet seldom fulfilling the requirements of the plant. This difficulty can be appreciated if we realize that in a large sized hosiery or underwear plant the individual colors and sizes of garments required for the balanced shipment of the orders may run into thousands. Add to this the uncertainty of the seconds, and the factor of errors due to human carelessness, and the task of the management of a knitting plant is described well.

By the application of the Dynamic Graphic Control Principle, much of the difficulties can be eliminated because any tendency for overtaxing a department for a certain operating period can be immediately discovered, due to the visibility of the graphic records. These facts are visible as soon as production obligations are accepted, and not later when the production is disorganized due to such overloads. For this purpose, each operation from winding to the last inspection, has a graphic unit in the control system arranged in consecutive weeks as far ahead as production orders have been accepted. Each such unit represents the total machine or labor hour capacity of that particular operation, and for certain operations like body knitting, subdivided into dimensional sub-sections.

In an underwear plant, the different sizes of cylinders upon which the cloth is pro-

duced can be controlled separately. The same thing refers to such hosiery operations where the knitting machines are adjusted for one definite size of hose. Each such unit, when production has been assigned, indicates without further computa-

timely enough to make such adjustments as necessary for the maintenance of efficient production upon a pre-determined schedule.

The application of the Dynamic Graphic Principle for the control of production is, therefore, as suitable as for the material



Fig. 5

tions not only the magnitude of the work assigned to it, the number of machine units required for the completion of the tasks, but also the labor complement essential for the operations. This, of course, means that the magnitude of operations assigned for a period is visible, and finally if no more work can be assigned during normal operating hours, the indicator automatically changes its color to a warning signal, advising the management that for an operation and time

control as for production control, bringing about a radical cut in the cost of maintenance as compared with the ordinary recording procedures.

The next problem is the basic information essential for the development of such summaries. The maintenance of complete information upon conventional lines even with the assistance of adding, calculating machines and other labor saving devices, is such a tremendous task that only few organ-

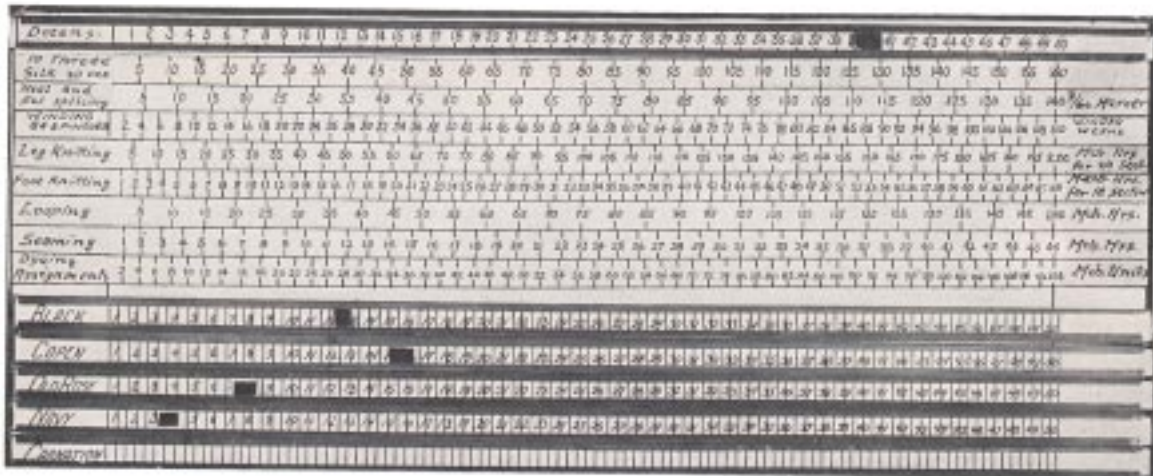


Fig. 6

period overtime will be necessary for the completion of the task. This fact is given to a numerical accuracy, and if no more work, either regular or overtime can be assigned, the graphic unit changes the color again as a warning.

It is self-evident that in this manner, the management is constantly forewarned of the probable difficulties of the future operations

in the knitting industry have dared to undertake it.

The clerical cost for the maintenance of such information is in most instances, prohibitive, and the chances for errors great. By applying the graphic principle in this direction, much of the difficulties of the past can be overcome. The first task is the elimination of the multitude of clerical labor, and

the second the reduction of the mistakes to a minimum. For this purpose, a Graphic Calculator has been devised which permits the determination of all the material and production requirements for an article without further mathematical computation.

Such a Calculator is provided for each article and arranged in a system following the principles of a card index record. The Graphic Calculator for a style of hosiery is given in Fig. No. 6. The principle employed in the construction of this instrument follows a slide-rule construction. The fundamentals for such Graphic Calculators are the standards of the material requirements and of the operations. The top line of each such calculator has an insert with graduations for quantitative assignments. This insert is provided with a movable indicator. Below it are the graphic divisions, indicating the relations of the materials and production factors to the finished product required for a definite delivery date. The material requirements are indicated in pounds, and represent not only the actual material in the finished product, but also, waste, shrinkage, and an allowance for seconds. The production requirements are expressed as machine or labor hours for each operation. Below the material and production data, there are additional inserts, indicating the color assignments, or, in other words, the production tasks of the dyehouse, and, finally, an auxiliary indicator, placed behind the instrument indicates the size assortments of the booked orders. In this manner the material and production requirements of the orders received are obtained for each delivery date. While the Graphic Calculator itself provides the general production data—the details of size and assortments are obtained from the Auxiliary

Calculator—this means complete information of all essential management factors. The procedure of operation is, that, as soon as the orders are forwarded to the employees responsible for this task, the orders are sorted according to delivery dates for each such delivery group, item by item,

the quantities on order with all details are registered upon the respective Graphic Calculator units representing the particular styles. This clerical task is simple, consisting of merely moving the indicator from a position into the next position representing the additional quantities ordered. When all

orders have been analyzed in such a manner, the corresponding graphic divisions of the material and production requirements will automatically yield the total requirements of all the materials essential for the completion of the orders. In the same manner the equipment and labor requirements are obtained. With this Graphic Calculator, at the end of each day, all delivery responsibilities contracted for during the day, are recorded together with effect upon the future operation of the plant. These responsibilities being immediately converted into the elements of the operation, such as materials, equipment, labor and time, the new obligations of the management are known.

These new elements now are simply added to the balances upon the Dynamic Graphic Control System, and the new relations of the available and contracted materials, and the requirements, are visible to the management—the following day. The same thing holds true for the production obligations. In this manner, the facts essential for management become an animated picture, instead of just so many words and figures buried into the records.

For the co-ordination of the processes a production "Time Table" is provided. This indicates how far ahead of a certain delivery date an operation has to be performed to assure the completion of the product on the required date. For instance, if an order requires deliveries in six weeks from the date of receipt and the production timetable indicates that the cycle necessary for the completion is five weeks, it is self-evident that the winding must be assigned for the following week's schedule, hence, the yarns necessary must be taken from available stock—the knitting operations assigned



Fig. 7

*The darker shadings show the different colored paper stock used to represent graphically the schedule times of the production assignments.*

to the week following the winding—and so forth.

The same Graphic Calculator serves also as a basis for the preparation of the actual production orders, which gives to the production department in detail the tasks assigned to them.

The instrument designed for this purpose also follows the graphic principle and is known as the Graphic Planner, shown by Fig. No. 7. This instrument is constructed in panel units to which individual production records can be added or removed from without leaving a gap between them. In these panels, only the guide information is visible to the eye, but any detail may be obtained and the whole record exposed through a simple movement of the hand. The Planning and Production control records are maintained in detail, but, due to the

operation, and for each week, a Control Card is inserted, numbered with the identification number of the week. To make such identification as simple as possible, colored cards are used for each week of the cycle. For instance: if the complete production cycle of a knitting plant is six weeks, or, in other words, within such time an order must be completed from the first operation to the last one, the color scheme will contain six colors, in which each color represents a definite position in that cycle. From the Graphic Calculators, the production requirements according to the production calendar, are recorded into the corresponding Graphic Planning Records. Right here is another important point of control where in most systems of management control and administration is overburdened with details. The reason was the old-fashioned mistaken

Name	Order No.	Style	Material	Warnings	6	6 1/2	7	7 1/2	8	8 1/2
Brown-John	6740	Y-55	20-2/20-2	100 900	100 900 900	63	64	65	66	67
Black-Shell	3423	A-110	20-2/20-2	100 900	100 900 900	25	26	27	28	29
Chambers	4910	C-220	13-2/20-2	100 900	100 900 900	49	50	51	52	53
Yellowhead	7006	Y-44	20-2/20-2	100 900	100 900 900	20	21	22	23	24
G.Hunt	5517	C-240	20-2/20-2	100 900	100 900 900	26	27	28	29	30
Delaney	4320	Y-38	13-2/20-2	100 900	100 900 900	47	48	49	50	51
Grace	8174	A-120	20-2/20-2	100 900	100 900 900	20	21	22	23	24
Mill	5960	A-130	20-2/20-2	100 900	100 900 900	16	17	18	19	20
Pellier	5140	C-250	22-2/20-2	100 900	100 900 900	22	23	24	25	26
Smith	7136	Y-66	20-2/20-2	100 900	100 900 900	26	27	28	29	30
Phillips	7777	A-140	13-2/20-2	100 900	100 900 900	14	15	16	17	18

Fig. 8

construction of this instrument, clerical labor is reduced to minimum, and the control of the operations follows the graphic visible principle.

The aim of the graphic principle is simplification with accuracy, visible information without unnecessary details. It has been found that identification of time by recording months and days can be simplified to an advantage. Hence, a year is divided into fifty-two weeks and each week is identified by the corresponding number. So an order received on February 6th will be no longer identified as such, but as 7-6, indicating that it was the seventh week of the year and the sixth day. If the delivery is requested by April 15th, this is known as 13-15, hence the completion of the order must be assigned to the production cycle which will end on the fourteenth week.

In the Graphic Planning Unit, for each

conception that a record should have as complete information as possible. So far this is correct, but in most instances this meant recording everything an ambitious systematizer could think of. It should be borne in mind, that the greater the number of information on a record, the greater the opportunities for mistakes—and mistakes are costly.

It is a definitely established fact that the identification of the individual orders during processing is not necessary. According to this graphic principle, orders are grouped in dates of completion, and all orders of a certain style for a certain date completion are recorded for each operation for the corresponding week—in total—and not in detail—and identified through the processes by the "week-symbol" when it should be completed. This cuts out the maze of order numbers and dates—the bane to the exist-

ence of the average mill employee—the main source of errors and excuses. With a simple “week-symbol” plus the color differentiations—how much simpler it is to move production according to schedule, than by the complicated order, date—and what not. Into these production orders, therefore, the completion dates and quantities are only recorded, and this process is repeated until the total production capacity for an operation for a week has been exhausted, in which case the record is removed from the panel, indicating that no more assignment can be made for that week. In this manner, the management not only knows through the Dynamic Graphic Control when the limit has been reached for an operation assignment, but the planning department also has this information. As a result, corrective action is bound to follow before further orders are accepted for a certain delivery date already filled for a particular operation. Overtime operations may be arranged, additional units of equipment, or additional labor may be secured, or production may be assigned to previous cycles where this particular operation does not happen to be over-loaded, and the semi-finished product side-tracked until such a time when the other operations are capable of absorbing it. Hence, the graphic control, with its coordinated elements, provides an absolute control, simple and accurate—which is scientific management.

Whether this graphic principle is used by the mill, or the other kind, the preparation of individual identification tags, which travel with the goods, remains the same, but, the control of production in the individual departments follows this graphic principle.

The value of this graphic planning board will be best demonstrated by following the actual procedure, in other words, what happens in the operating department of a knitting plant. There are bundles upon bundles in each department, and unless they are moved consistently, in the relation of the ultimate requirements of the shipping department, the plant will never be able to make complete deliveries, hence, this graphic planning principle, with its color scheme, is extended to the detailed control of the operations. Whether the unit is one bundle or a dozen, the original color scheme of six weeks cycle, as explained above, will work surprisingly well. For the average knitting plant, a dividing line in weekly units is sufficient, which means that the production assigned to a department to be

completed within the week, will carry the indicating color of the week. This can be obtained either by printing the records on the different colored stock or using the spot method according to which the indicating color of the week is pasted upon the tags.

The orders assigned to the various departments are arranged in the Graphic Planning Boards according to such color scheme and it is self-evident that without much difficulty the proper selection of assignments to the machines or to the operators can be made, and the executive of the department, without delving into details, by a glance upon the planning boards can determine to what an extent the work is given out by the responsible employees in accordance with the schedules.

In instances where such weekly units are not close enough, the records are provided with divisions indicating the days of the week, and the day when a certain unit order should pass from the department is simply indicated with a blue line made upon the symbol of the day. For such purpose, this control is absolute, because upon the planning board now an executive can determine at a glance whether the orders are processed according to the schedules or not. To-day is Wednesday, and the planning board shows the presence of production orders marked for Monday and Tuesday. Without other records the fact is known that the department is behind schedule. The number of such delayed orders will also tell, without further investigation, the extent that a department is behind schedule and corresponding corrective measures can be provided. The very fact that all such information is visible and available without further mental effort has a psychological effect upon all responsible for the proper management of a department. The secret of it is that information is available without looking for it. Such information is just as convenient to the executive as it is to an overseer. Hence, an employee responsible will make every effort to correct conditions detrimental to his ability, because there is no way to hide his inefficiency or incompetence. A management control, organized according to the principles of the Dynamic Graphic procedure, lives psychologically in a glass house.

For mills where it is desirable to follow minutely the progress of production a Graphic Locator can be provided. This instrument shown by Fig. No. 8 consists of panels located in the office, each panel holding approximately 100 unit inserts. While

the Graphic Planner indicates to what extent a department operates according to schedule and provides the management with the picture of departmental operation—the Graphic Locator tells for each production order whether it is completed on schedule—or not. For a Group Control, as described in this article, whenever a production order is prepared, a strip for the insert of the Locator is also prepared, placed into the panel in the order of the scheduled completion dates; sub-arranged according to styles, sizes and color. The strips have for each operation a section, into which the schedules of completion in that operation are recorded. When a process on a unit product has been completed the processing record is returned into the office and from this record the Graphic Locator is corrected by moving the

indicating signal to the next operation on the order—and inserting the date of completion for the previous operation. This provides another visible picture for the management. The executive has before him the activity of the plant. Style by style, size by size, color by color, he sees the movement of the product—bring about constructive action on such units, which indicate by their position upon the control board that unless extra effort is extended, the assortment of the product will be incomplete for a delivery date—and this means—as every executive in the knitting industry knows—substitution—back orders—late deliveries—added expense and dissatisfaction—and everything else management wishes to avert.