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Information Flows in the Conditions of Electronic Processing of Material Recording Data (an Application in an Enterprise of the Chemical Industry)

Grant special attention to informatics staff for the achievement of the efficient information processing systems and of the files organizing mode!

1. INTRODUCTION

One who more carefully consulted the recent economic publications of speciality could note that a turning point has taken place in favour of the experimenting and implementation of the modern processing methods of economic information.

2. THE PRESENT RECORDS IN THE ENTERPRISES OF THE CHEMICAL INDUSTRY

In the technical-material supply, the records (just as in any other sector) have, of course, their importance. Their final goal is to ensure the efficient administration of materials and to substantiate the decisions on the supply of production (with necessary materials, in due time).

At present, the information necessary for a survey of the materials in the enterprises of the chemical industry,- generally*—, has its flow presented in figure 1 (in which the IBM methodology was used).

* In keeping with certain specific conditions, other variants also appear in certain enterprises, variants which, in essence, are part of this general scheme.

2.1. *Receipts*

The materials arrive at the enterprise accompanied by dispatch notes (001).** After the reception of these materials (01) (quantitatively and qualitatively) by a taking delivery commission, the documents called "Receipts-Taking Delivery Notes" (004) (NIR) are drawn up. These notes are registered in a NIR account book (003).

The materials refused on taking delivery (either for not corresponding from the qualitative point of view, or for the quantitaties mentioned in the dispatch notes having missing) are kept at the disposal of the suppliers concerned. Their delegates clear up the causes of the refusal and the materials are again submitted to taking delivery.

The dispatch notes accompanied by receipts — taking delivery notes are registered (at receipts) and in the primary survey of the storehouse (materials cards — 007), in the respective shelf cards (006), together with the warehousing of the received materials.

The supply compartment, based on documents 001 and 004 also operates in the records of materials on contracts or suppliers (005), for following the way in which the suppliers observe the date stated in the contract.

After these operations, documents 001 and 004 are registered in the docket of receipts (011) and afterwards are delivered (together with a copy of the docket) to the book-keeping department.

2.2. *Issues*

Parallel with the warehousing activity, an activity of productive consumption of the materials in the storehouses is taking place. The production compartment requests, based on the limit cards or materials vouchers and the storehouses prepare and deliver the requested materials. The documents appearing on this occasion (008) are registered in the storehouse cards (007), then they are docketed (010) and are delivered to the book-keeping department. On the delivery of the materials the respective reduction from the shelf card (006) is made.

Based on the information existing in the materials cards (007) various records are periodically drawn up (centralizer of the materials movements— 012, the APR situation — 013, etc.)

Based on the receipts-issue documents received from the supply department, the book-keeping department keeps another series of records similar to those of the supply department being completed with the values of the respective materials.

The settlement with the suppliers of materials is made by the book-keeping and financial departments, based on the invoices placed by the suppliers at the Bank of the Socialist Republic of Romania, after which a confrontation is made between the records of the supply (003) and the book-keeping departments.

** In figure 1, the dispatch note has the code 001 and the reception operation has code 01. This figure presents 4 operations and 13 documents.

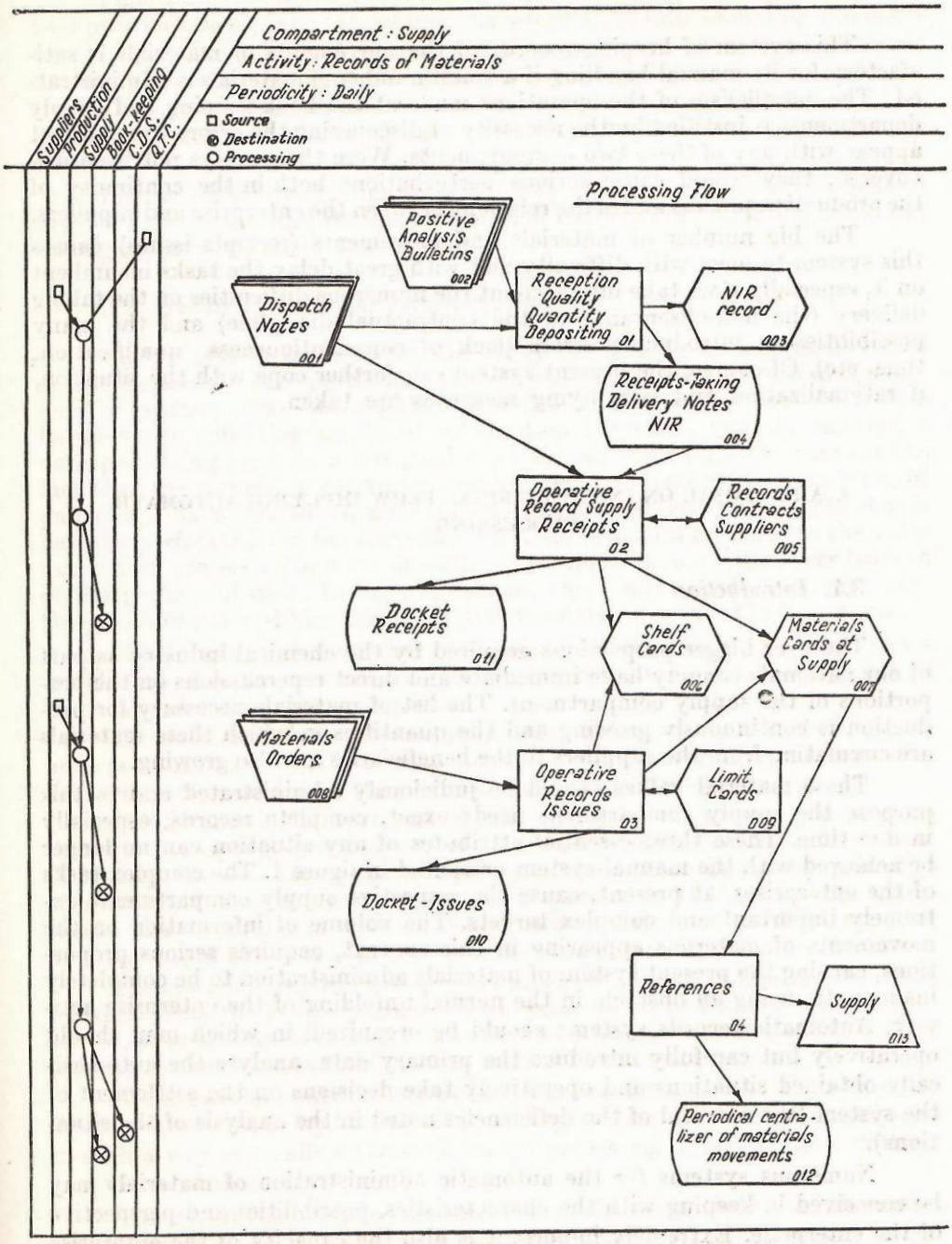

Compartment : Supply
Activity : Records of Materials
Periodicity : Daily
Source
Destination
Processing
Suppliers
production
Supply
Book-keeping
C.D.S.
A.T.C.
Processing Flow
Positive Analysis Bulletins 002
Dispatch Notes 001
Reception Quality Quantity Depositing 01
NIR record 003
Receipts-Taking Delivery Notes NIR 004
Operative Record Supply Receipts 02
Records Contracts Suppliers 005
Docket Receipts 011
Shelf Cards 006
Materials Cards at Supply 007
Materials Orders 008
Operative Records Issues 03
Limit Cards 009
Docket-Issues 010
References 04
Supply 013
Periodical centralizer of materials movements 012

Fig. 1

2.3. *Conclusions*

This system of keeping records of the movements of materials is satisfactory for its manual handling if a small number of materials is administrated. The parallelism of the operations made at the book-keeping and supply departments is justified by the necessity of discovering the errors which might appear with any of these two compartments. Were these errors not been discovered, they would cause serious perturbations both in the continuity of the production process and in the relations between the enterprise and suppliers.

The big number of materials and movements (receipts-issues) causes this system to meet with difficulty and with great delay the tasks incumbent on it, especially if we take into account the numerous difficulties on the taking delivery (the non-observance of the contractual discipline) and the many possibilities of introducing errors (lack of conscientiousness, qualification, time, etc). Of course, the present system can further cope with the situation, if rationalization and simplifying measures are taken.

3. A PROPOSAL ON INFORMATIONAL FLOW IMPLYING AUTOMATIC PROCESSING

3.1. *Introduction*

The ever bigger proportions acquired by the chemical industry as part of our national economy have immediate and direct repercussions on the proportions of the supply compartment. The list of materials necessary for production is continuously growing and the quantities in which these materials are circulating from the suppliers to the beneficiaries are also growing.

These material values should be judiciously administrated and to this purpose the supply compartment needs exact, complete records, especially in due time. These three essential attributes of any situation can no longer be achieved with the manual system presented in figure 1. The complex tasks of the enterprises, at present, cause the respective supply compartments extremely important and complex targets. The volume of information on the movements of materials appearing in this context, acquires serious proportions, causing the present system of materials administration to be completely inadequate, being an obstacle in the normal unfolding of the enterprise activity. Automatic records systems should be organized, in which man should operatively but carefully introduce the primary data, analyse the automatically obtained situations and operatively take decisions on the settlement of the system (the removal of the deficiencies noted in the analysis of the situations).

Numerous systems for the automatic administration of materials may be conceived in keeping with the characteristics, possibilities and perspective of the enterprise. Extremely important is also the capacity of the enterprise personnel to conceive the most adequate system.

Figure 2 presents such a system which though not being perhaps the best possible one gives an idea of how the information flow should be organized for the operative and exact obtaining of information on the flow of materials necessary for the respective enterprise.

The system presented in figure 2 is entirely part of the informational-decisional system on the technical-material supply compartment of the enterprise.

Figure 3 which will be presented widely another time presents a general view of this system and its links with some elements of the informatics and management system of the enterprise.

3.2. *Requirements of the proposed system*

Such a system implies that the enterprise wishing to implement it has or has decided to procure an automatic installation of collection and conveyance of primary data, an installation which should make the connection between the collecting points of information (deposits) and the automatic data processing unit. As a less good solution, one may take into account the fact that the respective enterprise should possess several cards— punches, or paper tape on which the documents referring to material movements should be daily perforated. On the same day, these cards should be taken to the automatic data processing unit for processing, but not before a minute verification of the perforated data. In both situations, the respective devices must give the possibility of verifying and correcting the data introduced in the system.

The technical characteristics of this data collecting and conveyance installation should necessarily be correlated with those of the equipment of the automatic data processing unit.

The automatic data processing unit may belong to the respective enterprise (a situation to which we must tend), or (for the beginning), a computation centre entrusted with the processing of data of the enterprises.

The automatic data processing unit must have the necessary configuration for preserving, processing and imprinting the necessary information. Obviously, the necessary quantities are established according to the quantities of information circulating in the system. Expressed in IBM units, such a unit should also be equipped with 4—6 disk storage drives of the 2311 type (or 2—3 records of the 3241 type), 4—6 units of magnetic tape and 1—3 printers.

The system in figure 2 also implies an exemplary discipline and conscientiousness from the people feeding it with data. As far as these people are concerned, of great importance (for ensuring the efficiency of the system) is their training for knowing in detail how to work with the installation.

A substantial contribution to ensuring the efficiency of the system in figure 2 is also made by the materials coding system which must be sellected in such a way as to allow the most varied processing of information, without any waste of memory.

This system also implies the existence in the enterprise of an informatics compartment within which at least one analyst and 2—3 programmers should deal with the exploitation and continuous improvement of the system.

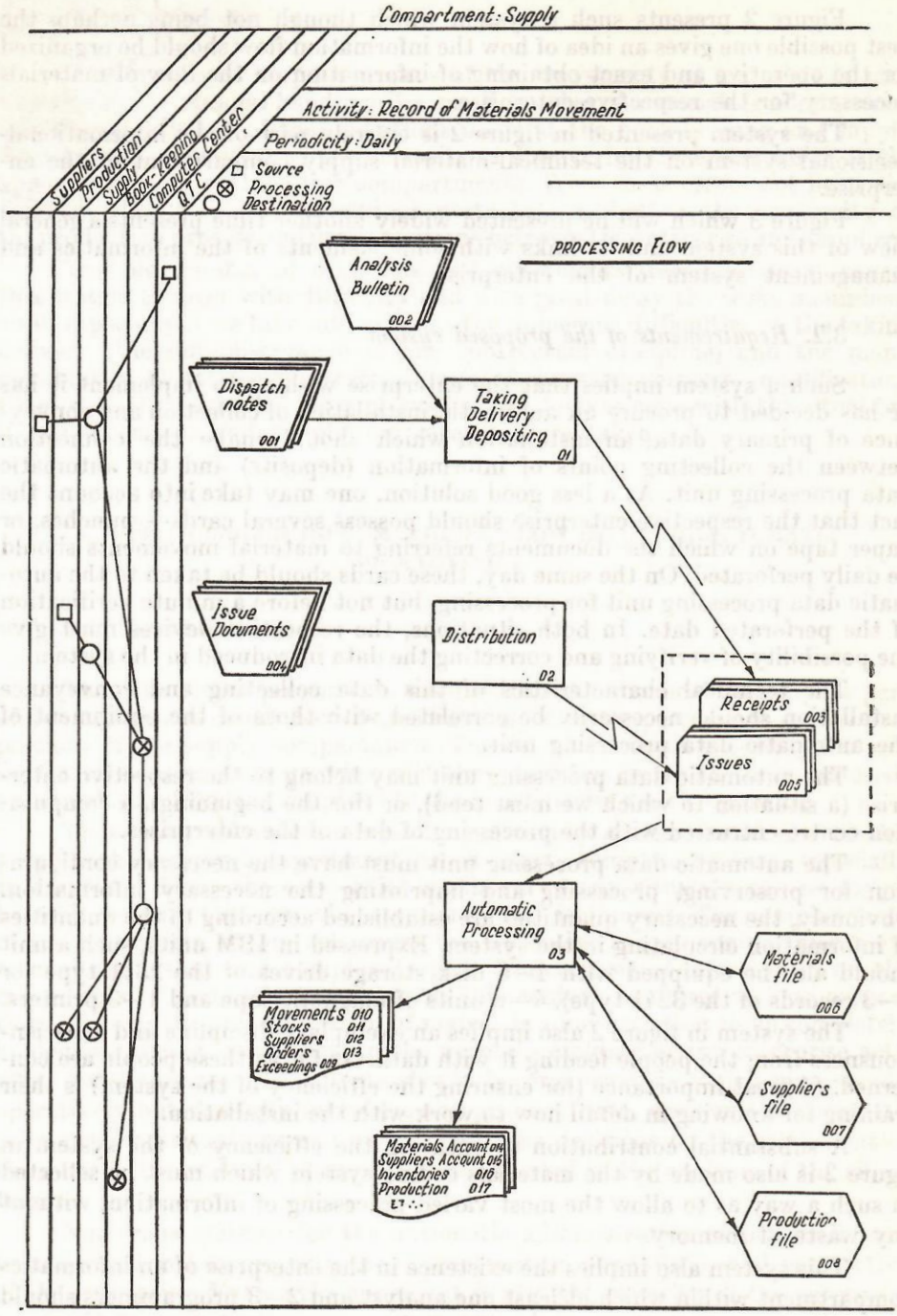

Compartment: Supply
Activity: Record of Materials Movement
Periodicity: Daily
Suppliers
Production Supply
Book-keeping
Computer Center
O.T.C.
Source
Processing
Destination
PROCESSING FLOW
Analysis Bulletin 002
Dispatch notes 001
Taking Delivery Depositing 01
Issue Documents 004
Distribution 02
Receipts 003
Issues 005
Automatic Processing 03
Movements 010
Stocks 011
Suppliers Orders 012
Exceedings 013
009
Materials Account 014
Suppliers Account 015
Inventories 016
Production 017
Materials file 006
Suppliers file 007
Production file 008

Fig. 2

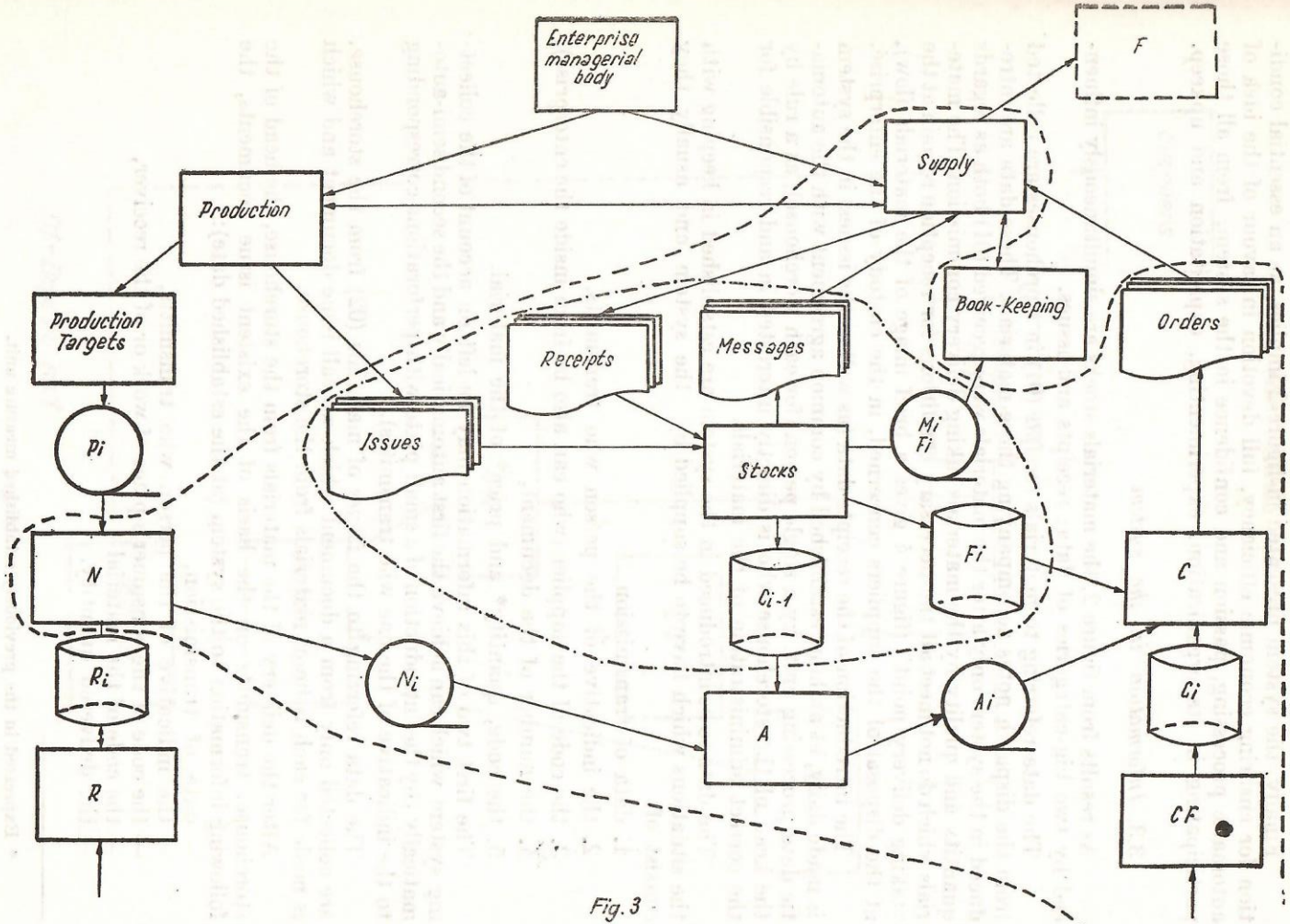


Fig. 3

Flow chart of information processing and management system for the compartment of technical-material supply within an enterprise

Finally, the system presented in figure 2 implies, as an essential condition for ensuring economic efficiency, full devotion in favour of the idea of automatic processing, passion and confidence in the system, from all those participating in its organization, experimenting, exploitation and upkeep.

3.3. *Information in the system*

As results from figure 2, the materials stocks are simultaneously influenced by two big categories of data: receipts and issues.

The data referring to materials *receipts* (01) in storehouses are collected from the dispatch notes accompanying these materials. These data are introduced in the system only after the materials were received (01) both as regards quantity and quality by the materials taking delivery commission. The materials which do not meet all the necessary conditions for reception remain at the "taking delivery point" (figure 4 gives a brief image of the materials flow), at the disposal of the suppliers concerned, in the custody of the enterprise.

The introduction of the receipts data (as well as the issues) in the system is made daily, at an hour established by common agreement with the automatic data processing unit, by a single person (for each storehouse), as a rule by the head of the storehouse who is directly interested in and responsible for the correct administration of the materials.

The data to be introduced in the system are established in keeping with the situations which have to be supplied by the system and usually they consist of:

1. data of transmission,
2. the indicative of the person who transmitts,
3. the code of the supplier (who can also be from inside the enterprise),
4. the number of the document,
5. the code, quantity* and price* of the material.

The first two of this information may be left on account of the collecting system which can achieve the first automatically and the second semi-automatically (by the introduction of a small plate with perforations corresponding to the indicative of the one who transmitts).

The data referring to the *issues* of materials (02) from the storehouse, are collected only from a document which we call issue document and which is made for each issue of materials from the storehouse.

After the delivery of the materials from the storehouse, the head of the storehouse, transmitts on the basis of the existent issue documents, the following information to the system (at the established date):

— date of transmission,
— the indicative of the person who transmitts,
— the code of the consumer's place of work or of the receiver,
— the code of the material
— the delivered quantity.

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* Expressed in the previously established measure unit.

MATERIALS FLOW

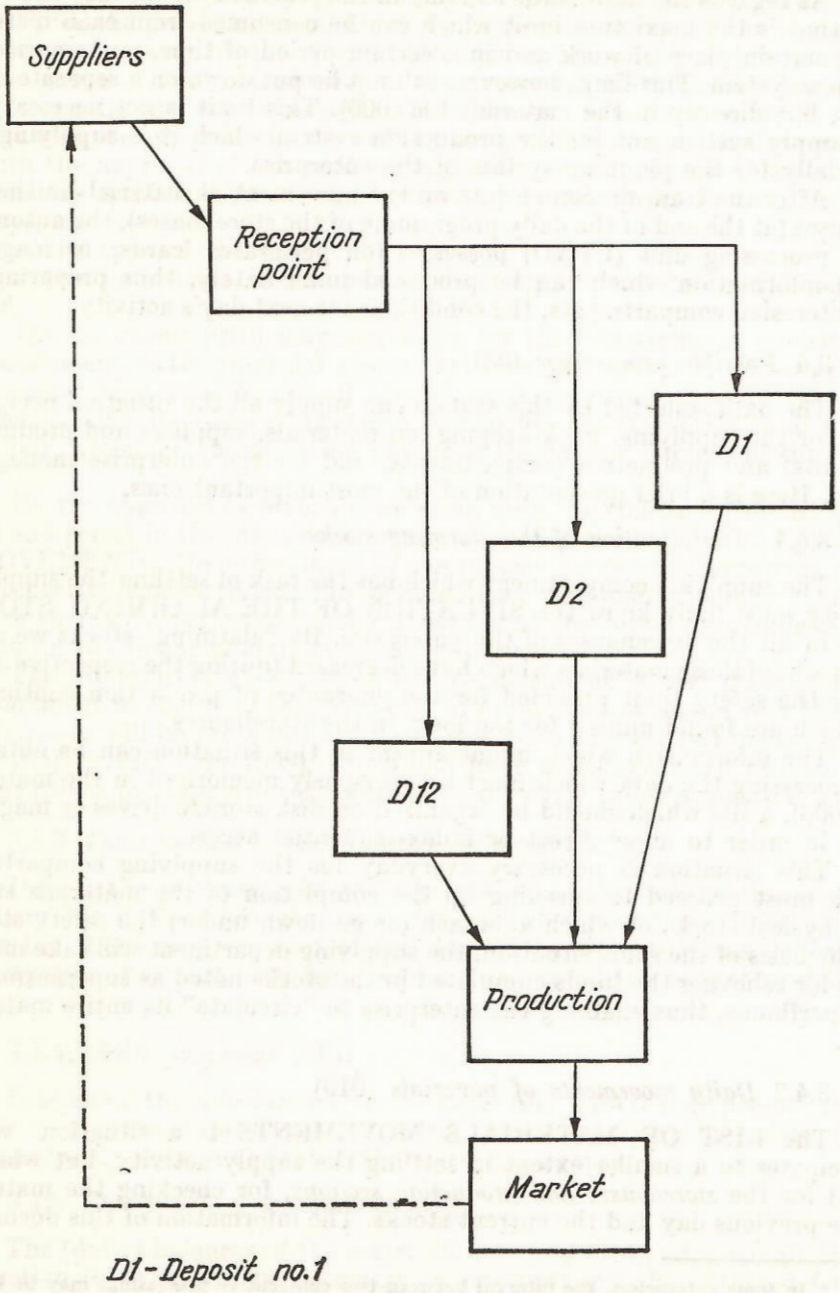


Fig. 4

It is supposed that at each place of work, a single person has the right to receive materials from the storehouses.

As regards the limit cards existing in the present system, only the essential, that is the maximum limit which can be consumed from each material, for a certain place of work and in a certain period of time, is memorized in the new system. This limit, however, will not be put down on a separate document, but directly in the materials file (006). This limit is not necessary for the supply system but for the production system which it is supplying and especially for the planning system of the enterprise.

After the transmission of data on the movement of materials in the storehouses (at the end of the daily programme of the storehouses), the automatic data processing unit (UPAD) possesses (on perforated cards, or magnetic tape) information which can be processed immediately, thus preparing for the interested compartments, the conditions for next day's activity.

3.4 *Possible processings* (03)

The data collected by this system can supply all the situation necessary both for the supplying, book-keeping (on materials, suppliers and production accounts) and production compartments, and for the enterprise managerial board. Here is a brief presentation of the most important ones.

3.4.1. *The situation of the alarming stocks*

The supplying compartment which has the task of settling the supplying activity must daily know the SITUATION OF THE ALARMING STOCKS (011) in all the storehouses of the enterprise. By "alarming" stocks we mean the stocks of those materials which have decreased (during the respective day*) under the safety limit provided for the guarantee of production continuity, or which are found unused for too long, in the storehouses.

The information which might appear in this situation can be obtained by processing the data which must be previously memorized in the materials file (006), a file which should be organized on disk storage drives or magnetic cells, in order to allow direct or index-sequential access.

This situation is necessary everyday for the supplying compartment which must proceed to speeding up the completion of the materials stocks the physical stocks of which approach (or go down under) the safety stocks. On the basis of the same situation, the supplying department will take measusures for relieving the funds cumulated in the stocks noted as supernormative or superfluous, thus enabling the enterprise to "circulate" its entire materials fund.

3.4.2 *Daily movements of materials* (010)

The LIST OF MATERIALS MOVEMENTS is a situation which participates to a smaller extent in settling the supply activity, but which is useful for the *storehouses and production sections*, for checking the materials of the previous day and the current stocks. The information of this document

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* In some enterprises, the interval between two consecutive processings may be less or more than one day.

may be grouped on "receipts" and "issues" and groups of storehouses, suppliers, production sections, etc. may appear within these groups, according to wish.

This document is playing the role of a *control document* of the UPAD activity for the previous period (day). Consequently, it must be in the attention of those concerned (the chiefs of storehouses and of the people in charge of the places of work), immediately after receiving them having the obligation to modify the errors noticed. These changes will be introduced in the system with the approval of the supplying compartment (especially for receipts) or with the approval of the production section (for issues). In this case, the information specific of the change (receipts or issues), should be introduced in the system, to which

— the type of the change,

— the indicatives of the person deciding the change should also be added.

The document (010) may also serve for the compartment in charge of the settlement of the financial aspects between the enterprise and suppliers, either consulting it on the arrival of invoices for approval, or asking the Bank of the Socialist Republic of Romania to transfer the respective sums to the suppliers accounts, the following day after the taking delivery of the materials.

By the approval of invoices, we mean only the comparing of the quantities and prices in the invoices for approval with those found in the situation of MOVEMENTS, the other parts of the invoice going to be approved of by the respective compartment. The details of an "automatic" approval of the invoice should be perfected on the designing of the informational-decisional system on the financial activity of the enterprise.

The information at the basis of this document is also useful for the compartment in charge of the price cost of production, a reason why the materials issues will be processed also from this point of view and memorized in the PRODUCTION file (008), which will have to be organized also on disk storage drives or magnetic cells also for a direct or index-sequential access.

3.4.3 *The situation of the suppliers in arrear* (012)

During the processing of the receipts data, the information on the suppliers' file (007) is brought up to date, which allows the extraction from it of a list of the suppliers who do not observe the delivery terms. To extract this situation, we must obviously have in this file all the respective delivery terms.

3.4.4. *Order proposals* (013)

Processing the information on the same file, UPAD may present to the supply compartment proposals for orders, for re-supplying materials. After their analysis, they can be sent to the respective suppliers.

3.4.5 *The situation for book-keeping*

The (daily) balances of the materials accounts (014), suppliers (015) and production (017) on all the necessary subaccounts may be obtained for the book-keeping compartment.

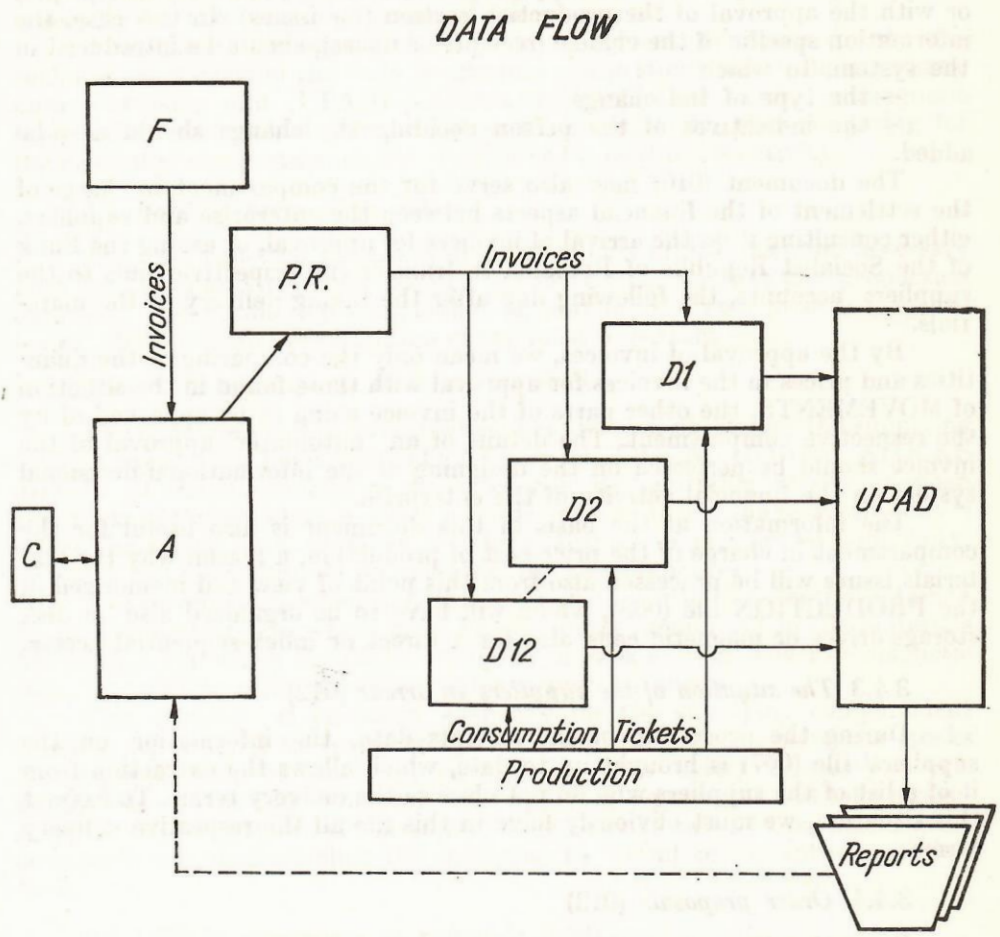

DATA FLOW
F
Invoices
P.R.
Invoices
D1
D2
UPAD
C
A
D12
Consumption Tickets
Production
Reports

Fig. 5

This possibility allows the elimination of the present situation requiring the keeping of a double record for materials movements.

Also for book-keeping, the INVENTORIES (016) on storehouses which will be at the basis of the verification of the respective administrations may be drawn up periodically. The dissimilarities noted on the occasion of the confrontation of the inventories with the real situation in the storehouses will be introduced in the system in the same way as the changes asked by the storehouses or the production sections, on the basis of the document 010.

As regards the inventory, one may act inversely. At the storehouse, the existing quantities are inventoried, they are introduced in the system by the book-keeping department, then the LIST OF DIFFERENCES appearing on the inventory is asked for, on the basis of which decisions on the respective administration are taken.

THE SITUATION OF EXCEEDINGS for consumption (008) on materials and places of work may be obtained for the production and planning compartments. This situation allows the respective compartments to analyse the causes of the exceedings and to settle future consumptions. The file 0.08 is thus a point of contact between "the supply" and "production" systems.

The list of "the situations" which can be supplied by this system (figure 2) may be extended according to the specific character and (the permanent or provisional) necessities of each enterprise, the above-mentioned situations satisfying the necessary minimum.

4. COMPARISON

Comparing the two systems presented here, the following aspects should be underlined:

4.1. *Documents left out*

The system proposed in figure 2 no longer needs the following documents included in figure 1 : the receipts — taking delivery notes, the records book of these notes, the limit cards, the dockets and summaries.

The records on contracts and suppliers can be taken out, upon request, from the file 007, so that the supply compartment will no longer keep these records separately.

One can also renounce the materials cards (of the storehouses and book-keeping department) as well as the shelf cards which are no longer necessary, since the materials file contains the necessary information for obtaining with no difficulty the current materials stocks.

The book-keeping department and storehouse, having a copy of the situation of daily movements each, may know both the existing stocks of each material and all its movements in a period of time.

4.2 *Efficiency*

The system proposed in figure 2 is entirely superior to that in figure 1 which cannot supply periodically or by request all the situations presented above, only with a reduced personnel and not without avoiding certain errors.

Initially, the proposed system will appear entirely inefficient (big investment, the appearance of errors from ignorance, etc.). The efficiency of the system will appear after a certain period of time, when it will become a habit in the life of the people feeding, upkeeping and exploiting it. It will result from the ensurance of a better continuity of production, from the increase in the speed of circulation of the material assets. The efficiency of this system will be felt in the main indicators of the enterprise which will certainly be much superior to those of the period in which the system in figure 1 was used, especially if an integrated informatics and management system is introduced in the enterprise.

5. CONCLUSIONS

The system presented here, with nonessential modifications may satisfy the requirements of a more varied range of enterprises, as regards the administration of materials.

The necessity of an analyst and of 2—3 programmers whose concern should be the organization, experimenting, exploitation and improvement of this system is once more underlined in this connection.

In conclusion, attention is drawn to the fact that this system (figure 2), by establishing the alarming stocks and working out the orders, is taking over (as an everyday routine) the responsibility of the resupplying decisions, enabling the supply compartment to deal, at length, with the possibilities offered by the market to the enterprise, contacting the most adequate suppliers who offer the best (qualitatively) and cheapest materials.

But, attention to the upkeep of the files and to the supplying informaticians of the enterprise, the soul of the entire system.

LES FLUX D'INFORMATIONS DANS LES CONDITIONS DU TRAITEMENT PAR CALCULATEUR DES DONNEES D'ENREGISTREMENT DES MATERIAUX

(applications dans une entreprise de l'industrie chimique)

L'article présente, dans sa première partie, la situation actuelle rencontrée par l'auteur dans certaines entreprises de l'industrie chimique, au point de vue du système des informations concernant les valeurs des matériaux.

La fig. 1 reproduit, en grand, le système actuel des informations de ces entreprises, en ce qui concerne les matériaux.

Après avoir exprimé quelques appréciations sur la situation actuelle, on fait par la suite une proposition de flux d'informations, qui suppose le traitement automatique des informations concernant les valeurs matérielles d'une telle entreprise.

Le système proposé est representé par la fig. 2.

Dans la partie finale on fait la comparaison des deux systèmes et on tire les conclusions nécessaires.

ИНФОРМАЦИОННЫЕ ПОТОКИ В УСЛОВИЯХ ЭЛЕКТРОННОЙ ПЕРЕРАБОТКИ ДАННЫХ УЧЕТА МАТЕРИАЛОВ (ПРИМЕНЕНИЕ НА ПРЕДПРИЯТИЯХ ХИМИЧЕСКОЙ ПРОМЫШЛЕННОСТИ)

В первой части статьи указывается существующее положение, отмечаемое автором на некоторых предприятиях химической промышленности, в отношении информационной системы о материальных ценностях.

Рис. 1 показывает в общих чертах нынешнюю информационную систему на указанных предприятиях, касающуюся этих материалов.

После того, как приводятся некоторые оценки существующего положения, предлагается информационный поток, предполагающий автоматическую переработку информации о материальных ценностях такого предприятия.

Предлагаемая система указывается на рис. 2.

В заключение производится сравнение обеих систем и делаются необходимые выводы.