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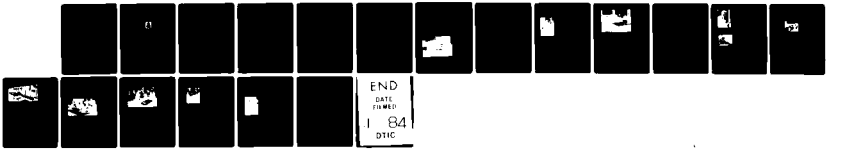

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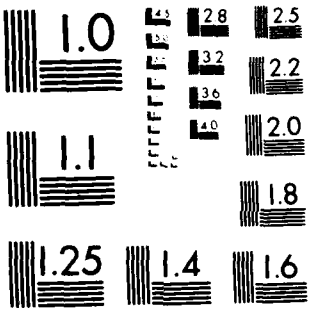

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FOREIGN TECHNOLOGY DIVISION

PETROINFORM: PRECURSOR OR PIONEER OF DATA TELETRANSMISSION IN POLAND?

by

K. Bernatowicz

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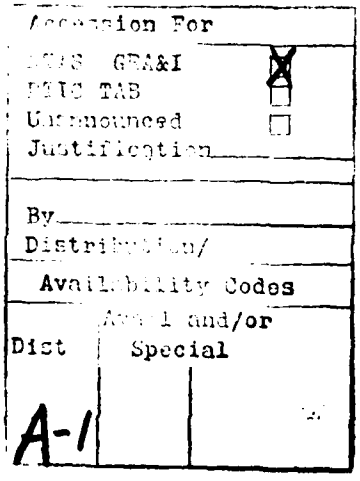


PETROINFORM: PRECURSOR OR PIONEER OF DATA TELETRANSMISSION IN POLAND?

Krystyn Bernatowicz

There is no lack of occasions for making a trip to Krakow. This is true as well for information scientists, but most of all, I recommend it to people who are involved in the argument about the sensibility of popularizing teletransmission as a method of transmitting data to be processed in computers. For as we know, in spite of the extensive use of this method in the world, in Poland, it is a question of the possibility and profitability of its creation - opinions have been divided for a long time. They have differed from the beginning of Polish computer science: they became polarized in the period of the design of INFOSTRADA, and through time they quieted down, just as opinions about teletransmission have begun to abate.

Without trying to rekindle the arguments, in the series of the presentation of centers, this time we are presenting PETROINFORM - the information center of the Union of the Refining and Petrochemical Industry, located in Krakow. This is - considering both the structure of the union, and the resulting sphere and type of jobs - a rather specific center. It is the most specific, but not with regard to what is done, but how it is done.

If, at one time, it had participated in the arguments about the possibility of teletransmission under Polish conditions, it might

have been rather appalled by the arguments of those who denied this possibility, and it would have been stripped of these specifics today. In particular, besides the ultimately accepted information model of the branch, two competing ones were considered. One of them ruled out teletransmission altogether, and part of the limitations were fully justified (among others, the antiquatedness and weakness of the telephone network).

Meanwhile, PETROINFORM proceeded to select an appropriate model without useless prejudices, and used the balance of requirements and costs instead of intuition.

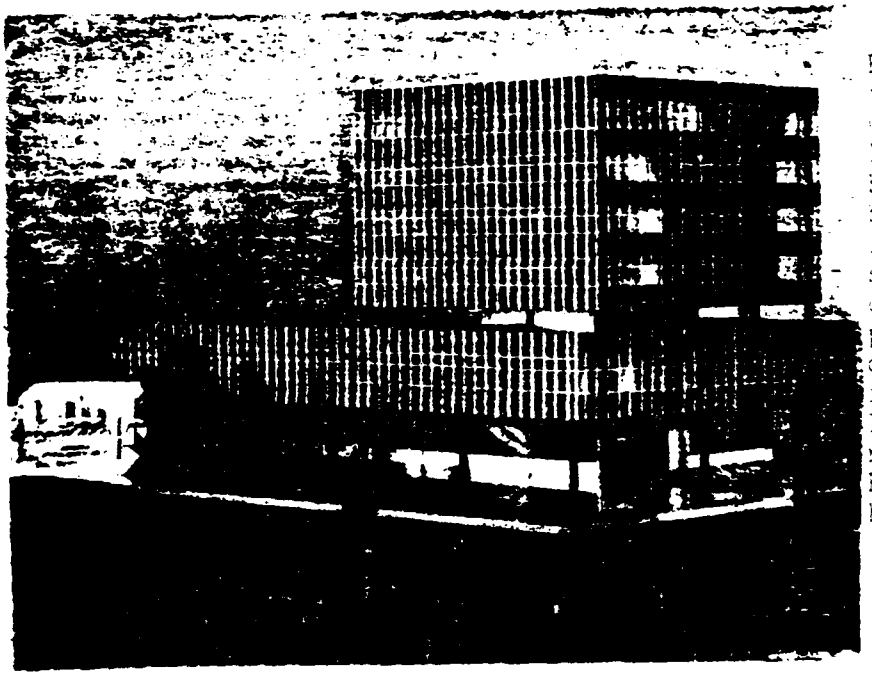
Three versions were considered:

- outfitting each of the twenty enterprises included in the Union with medium-capacity computers;
- outfitting each of the enterprises with data preparation terminals and equipment for their teletransmission to the center in Krakow, which would be equipped with 3-4 computers,
- outfitting each of the enterprises as above, but in addition, outfitting the eight biggest enterprises with computers, at the cost of limiting the number of computers at the Krakow center (one or two computers).

The third version was selected. It is not yet completely finished; before its realization was undertaken, PETROINFORM had its own history. It is appropriate to briefly describe it. In the beginning, it was connected with the existence of the Union of the Nitrogen Industry (the Center for the Automation of Management and Control was established there in 1970), but after the merger of the parent Union with the Union of the Refining Industry into the Union of the Refining and Petrochemical Industry, PETROINFORM was established in 1972.

Earlier, in April 1971, the third-generation Honeywell H-3200 computer was brought into operation there in the following configuration:

- central unit: working storage with 256 K characters (one character = 6 bits), storage cycle of 0.6 μs/s;
- external storage: 7 magnetic tape storage units, 6 magnetic disk storage units with 18.4 M characters each;
- input-output equipment: 5-8-track punched tape reader (2000 characters/s), card reader (750 cards/min.), card punch/reader, paper tape punch (120 characters/s), line printer (1100 lines/min. - 132 characters per line), line printer (650 lines/min. - 132 characters per line);
- operating system: OS 2000, capable of operating with multiprogramming processing, data transmission, and the translation of programs in the languages COBOL, FORTRAN IV, ICSL, EASYWRITER.



For the present, in the quarters of the hospitable AGROCHEM. Before long, the PETROINFORM Center will be housed in an impressive building. And high time for it, especially since the staff are working under very crowded conditions. Under present conditions, it is difficult to achieve satisfactory concentration. It is expected that in the new quarters, the PETROINFORM group will finally have good working conditions.

Since at that time, it was the only computer that the Union had at its disposal, and the distance between the enterprises belonging to it is sizeable, they remained equipped with teletype-writer terminals with a capability of data transmission at a rate of 110 bauds. This was obviously a transitional phase; PETROINFORM's intentions were much more ambitious.

At the beginning of 1974, PETROINFORM began processing data using teletransmission. The Nitrogen Works in Wloclawek were on the front line. A data transmission equipment assembly was installed at PETROINFORM. It consists of:

• communication processor DATANET 2000 (linked with the H-3200 computer) with memory of 32 K 16-bit words and a memory cycle of 375 μs.

The processor has 75 of its own basic operating instructions, independent of the main computer; it is adapted to asynchronous or synchronous (duplex or semi-duplex) transmission, and has a transmission rate range of 54.5-10,800 bits/s;

• link: telephone (leased from the postal service) tested at 1200 bauds, ITT modem with a speed of 600 or 1200 bauds;

• off-line transmission system: 2 systems for data preparation on mag tape type KEYTAPE for KEYTAPE communication. KEYTAPE with a rapid communication unit (600-1200 bauds); a system for data preparation on mag tape and their transmission, disk-tape CMC 105; terminals in the establishments with access to teletransmission - composed of a punched tape reader, printer, and KEYTAPE or CMC system (teletypewriters finally went out of service in mid-1975);

• on-line transmission system: 3 VIP-85 screen-type terminals with a screen capacity of 2024 characters. These terminals are connected to the DATANET communication processor, one of which is installed at the Center, and two in the Union.

Thus, up to now, two on-line systems have been developed at PETROINFORM:

• an information system for the Union management with regard to the basic technico-economic indices of the branch - VADEMECUM, based on the principle of the data bank which was created without the use of teletransmission;

• the system GIELDA MATERIALOWA, which informs the Union management about the size of the supplies of particular ranges of products and where they are stored; the data bank is created automatically by data coming from the banks of another system (management of the materials administration). In both cases, access to the data is provided by two display terminals installed at the union, both of which are based on the dialog principle. The lion's share of the work is done in the off-line system, however.

Since the beginning of 1974, Dr.-Engr. Kazimierz Kolarzyk - alumnus (and presently docent) of the AGH [Academy of Mining and Metallurgy], as well as the WSE [College of Economics] - has been the director of PETROINFORM. He has worked his way through almost all the ranks of his profession - from master to deputy director of the Union of the Refining Industry, being in the chemistry field for 16 years.

In keeping with the plan for the Complex Data Processing System for the establishments belonging to the PETROCHEMIA Union, the individual ZOETO are equipped with data systems using the telephone lines. These systems are based on recording information on mag tape in formats which are compatible with the HONEYWELL-3200 computer at the PETROINFORM Center - to be more precise, the station which receives the data and transmits the results of the computations.

This station is called the Central Teletransmission Station; however, these stations are installed in other establishments of the PETROCHEMIA Union;

- Local Transmission Stations. The Local Transmission Stations which have been put into service up to now are equipped with:

- the KEYTAPE system (or CMC) for recording data on mag tape;
- line printers type 112;
- some stations with punched tape readers type 6010, or card readers.

The H-3200 computer room isn't overly spatious, either, especially since the room shown in operation was not designed for this purpose. The second Honeywell, which Krakow counted on obtaining, would certainly not be installed there.

By the end of 1975, 14 local stations were cooperating with the Central Transmission Station.

The information is recorded on magnetic tape and transmitted according to needs - in three basic formats:

- Paper Tape Format: recording with a punched tape reader and KEYTAPE, code ASCII, blocks with a length of 400 characters;
- Card Image Tape (CIT): recording with the KEYTAPE keyboard or a card punch with subsequent conversion, code HONEYWELL-SPECIAL, blocks with a length of 80 characters;
- Compressed Print Format: the tape is recorded on an H-3200 computer using the COMPRES program and adapted to printing on printer type 112, code HONEYWELL-SPECIAL with control characters, blocks with a length of 400 characters.

PETROINFORM uses off-line teletransmission for the transmission of data and the results of calculations, as well as for remote batch processing off-line.

The transmission of data and processing results involves

sending data and batch processing results over the transmission line between the Local Transmission Station and the Central Transmission Station. The processing process itself is handled under the supervision of a system operator designated for this purpose. The operator is responsible for all of the processing done at the PETROINFORM Center, and among other things, for supplying the appropriate control and parameter cards, as well as filling out the forms correctly.

There are three standard versions of the instruction card for the program for the transmission of data and calculation results:

1. Sending data in paper tape format;
2. Sending data in card image form (CIT);
3. Returning calculation results.

The process of sending data in paper tape format consists of the following operations:

at the Local Transmission Station:

- preparing data on KOD equipment in code USCII;
- conversion: paper tape - mag tape in the paper tape format using a punched tape reader (type 5010);
- sending information from mag tape in the paper tape format on the KEYTAPE device through the data transmission line to the Central Transmission Station.

at the Central Transmission Station:

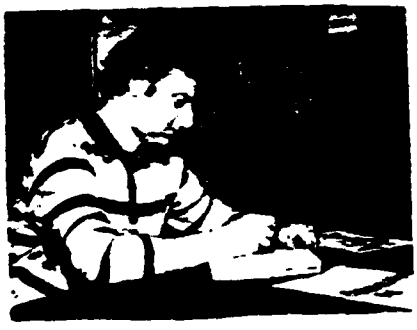
- receiving information from the data transmission line on the KEYTAPE device;
- using the mag tape sent in paper tape format as the input information for the H-3200 computer.

The process of sending data in card image form (CIT) consists of the following operations:

at the Local Transmission Station:

- preparing data in card format using the keyboard of the

The close-knit management staff of PETROINFORM also includes Deputy Director Dr. Andrzej Pyzik (above) and Chief Analyst, Mgr. engineer Jerzy Matysiak (below).



KEYTAPE equipment or with card punches with subsequent punched card - magnetic tape conversion;

- sending information from the KEYTAPE device over the transmission line to the Central Transmission Station.

at the Central Transmission Station:

- receiving information from the transmission line on mag tape using the KEYTAPE equipment;

- using the mag tape received as the input information for the program on the H-3200 computer. e CIT mag tape is processed here as ard input.

The process of returning the computation results from the Central Transmission Station to the Local Transmission station consists of the following operations:

at the Central Transmission Station:

- recording the results on SPR mag tape in the form of a printed image;
- conversion of the SPR mag tape into mag tape in compressed printed form using the H-3200 computer with the COMPRES program;
- sending information from the KEYTAPE equipment over the data transmission line to the Local Transmission Station.

at the Local Transmission Station:

- receiving the information sent on mag tape using the KEYTAPE equipment;
- printout of information from mag tape in compressed printed format on printer type 112. These operations (at the Local Transmission Station) can be carried out simultaneously.

Remote off-line batch processing involves sending job control cards (ICL) [sic], the source program, and the data and results of the calculations over the transmission line between the Local Transmission Station and the Central Transmission Station. The programmer from the Local Transmission Station is responsible for providing the correct control and parameter cards, as well as the correct preparation of the "Program Operation Card" form.

Modern CMC data teletransmission equipment is gradually taking the place of the worthy KEYTAPE equipment.

The control cards, as well as the source programs, should be prepared in accordance with the content of the following Honeywell manuals:

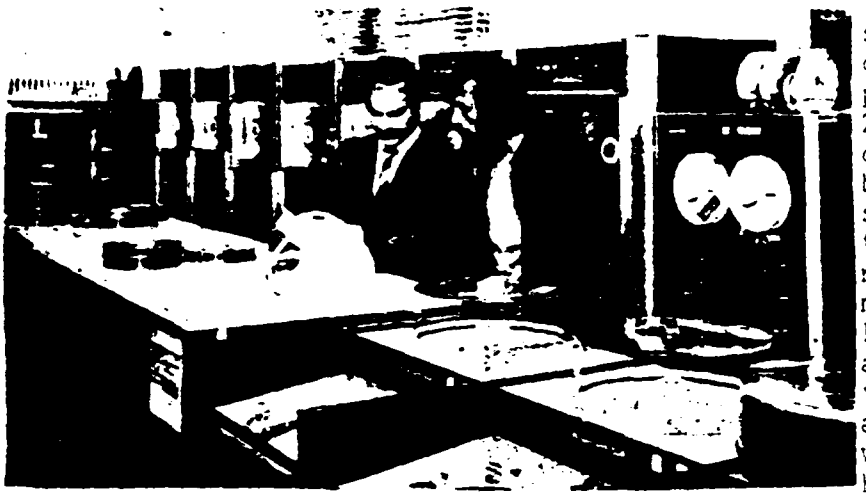
- OS/2000 SUPERVISORY COMPONENTS
- OS/2000 FORTRAN COMPILER
- OS/2000 ANS COBOL COMPILER
- OS/2000 DISK DATA MANAGEMENT
- OS/2000 SORT PROGRAMS
- OS/2000 UTILITY PROGRAMS
- OS/2000 EASYWRITER SUBSYSTEM

Remote off-line batch processing takes place in the following stages:

at the Local Transmission Station:

- the preparation of information constituting a complete description of the job (JOB) on mag tape in the CIT format. The control cards should be prepared according to the description in the manual: OS/2000 SUPERVISORY COMPONENTS.

The format of the CIT tape for the basic processes connected



The WOG PETROCHEMIA, starting with the above center, is consistently providing the remaining ZOETC with Honeywell-Bull computers. Against a background of external storage units (disk and tape), the author of the report is talking with manager, engineer Jack Pasnik, who once worked at the Warsaw IMM [Institute for Marine Medicine], and who has been connected with PETROINFORM, where his work has been honored with well-earned recognition, for five years.

with debugging COBOL and FORTRAN programs is described in Appendices A and B of the manual.

- sending information from CIT mag tape on KEYTAPE equipment over the data transmission line to the Central Transmission Station;

at the Central Transmission Station:

- receiving information on CIT mag tape on KEYTAPE equipment;
- inputting the job which was sent on mag tape in CIT form into the queue of the JIP disk storage using the INPUT-READER program;
- executing the individual job programs with the results recorded on SPR mag tape in printed form;
- converting SPR mag tape into mag tape in compressed printed form using the COMPRES program;
- sending the results from mag tape in compressed printed form from the KEYTAPE device over the transmission line to the Local Transmission Station.

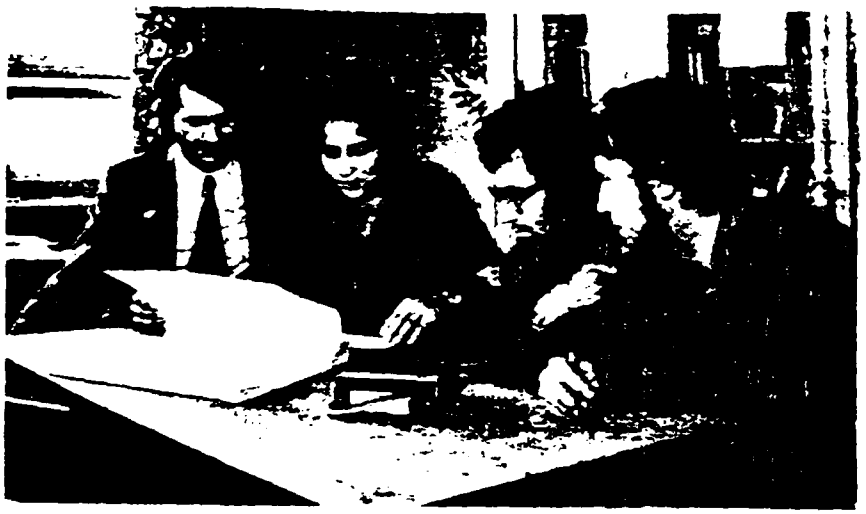
at the Local Transmission Station:

- receiving information from the transmission line on line printer type 112.

The above procedure permits remote processing of any jobs,

in particular:

- compiling remotely transmitted source programs written in FORTRAN and COBOL;
- debugging programs;
- placing programs in the system library of binary programs;
- executing binary programs of the user which were previously placed in the system library of binary programs.



Under the provisional title GDANSK, the team composed of, from the left, mgr. engr. Jan Kostecki, mgr. engr. Irena Bondel, mgr. engr. Jerzy Mis, mgr. engr. Lucjan Wladarek has an important job to do: to develop a production control system in the Nitrogen Works in Gdansk based on two Honeywell 716 computers. The work is important and urgent; the team working in Gdansk is not yet very experienced; thus, PETROINFORM's help is indispensable.

The procedure for remote batch processing is based on the feature of the OS/2000 operating system which makes it possible to rewrite the SIU card set and SPR printed set on mag tape. In connection with this, remote batch processing can be realized the most completely if the processed programs receive only data in CIT card format and generate the results in SPR printed format. Nevertheless, all other jobs can also be processed as long as other data sets (on magnetic media or paper tape) are also still supplied to the PETROINFORM Center.

The expanded network of Local Transmission Stations permits the rapid and efficient transmission of data to PETROINFORM. Thus, the Union management uses current information in the required time frames. And it is not the only one which takes advantage of this. For, as was mentioned earlier, the majority of the establishments do

not have computers; they can quickly and efficiently send data to the computer in Krakow,, and receive valuable results in the same manner.

Another system which renders invaluable services is the Asset Exploitation System, which was developed and implemented by the following team (from the left): mgr. Danuta Nowak-Golec; mgr., engr. Jozef Kocnal; mgr. Jerzy Bednarz, Bernadetta Griesgraber, Janina Wronarowicz, mgr. Mieczyslaw Dobija.

To be sure, the number of computers installed at the enterprises belonging to the Union will increase through time; even in the event of the ultimate conversion to local processing, teletransmission will be, as before, an indispensable means of efficiently informing the Union about the situation in the branch.

It is anticipated that by 1980, eight establishments will be equipped with computers. As of now, the following establishments have them: the Nitrogen Works in Wloclawek (R-20), the Mazovian Refining and Petrochemical Works in Plock (Honeywell 2040), the Nitrogen Works in Tarnow (Honeywell 2040), and the Nitrogen Works in Gdansk (two Honeywell 716 computers). The next establishment in line to be allocated a computer (H 2040) is the ZOETO in Pulawy. The increased processing potential of the satellite establishments does not make it unnecessary to complete the equipment of PETROINFORM; on the contrary, it is proposed that another Honeywell be installed there. This is in connection with the anticipated progress in the realization of the complex data processing system for WOG PETROCHEMIA, the final implementation of which is expected in 1980. Half of the work has been completed up to now. The progress here is evident, for while a total of 9

modules were in operation in 1971, there were already 160 in 1975 (the product of the number of modules and the establishments operating them).

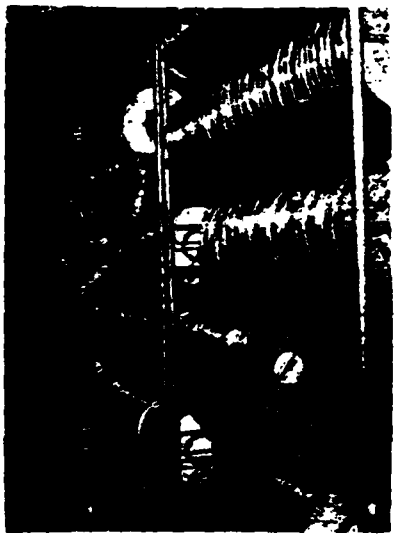
The writers of one of the two on-line systems (called GIELDA MATERIALOWA [Materials Exchange]) are shown, from the left: mgr. Wladyslaw Koscielniak, mgr. Maria Szczygielska, Tadeusz Piotrowski, and Stanislaw Mrozowski. The effect of the implementation of this system is the saving of millions that might have been lost if there had been a shortage of parts for the production installation.

The selling price of services has has also risen rapidly: in 1971, it was 13 billion zlotys, and in 1975 - 42 billion. Here one should add that although the load on the PETROINFORM computer for the Union's requirements is heavy (three full shifts), one can only speak of a maximum in the reporting periods.

During the remaining periods, there is enough time for taking orders from outside users. In all, around one third of the working time of the computer is devoted to completing orders from institutions such as: Miraculum, Farmacja [Pharmaceutics], the Centralny Osrodek Chlodnistwa [Central Refrigeration Engineering Center], numerous design offices, and formerly, the Institute of Nuclear Technology UJ (which recently changed to CYFRONET).

The efficient operation of the Center is being ensured by everyone. At the end of 1975, PETROINFORM employed 203 persons (51 designers, 27 programmers, 19 operators, 15 punchers, 13 maintenance technicians, and 22 implementation and operation workers). The core of the staff does not change, and this is probably due to the atmosphere which prevails at the Center. After all, unlike in many other cities, personnel problems are not experienced in Krakow - so PETROINFORM, which is concerned with finding the best, can allow itself to be selective, even in the recruiting stage. The Numerical Method Institution UJ is a strong personnel base. The systematic training of personnel is a constant concern of the PETROINFORM management.

For this purpose, it takes advantage of every opportunity - from permanent instruction at the site to numerous training trips to the manufacturer of the installed computers. When the opportunity presented itself, PETROINFORM trained workers from satellite ZOETO, and also provides training for various Union services, with the intention of informing workers about the capabilities created by automatic data processing. Recently, a 24-hour information course was organized for 30 individuals at the expressed request of the Union management.



The mag tape library shown above is more evidence of the difficult conditions at PETROINFORM. It is maintained by Halina Godzik.

At this point, it should be mentioned that PETROINFORM is a multipurpose center, and its structure includes the whole range of Union services, for which computer science is the basic working tool (e.g., the Technicoeconomic Information Institution, the Work Study Institution, the Information and Patent Protection Institution, the Personnel and Publishing Advancement Institution).

Of course, no rose is without a thorn. Like many other centers in Poland, PETROINFORM is a subtenant crowded together in rooms leased from AGROCHEM. Even if it were possible to deal with another problem - to obtain the other Honeywell they need - the crowded conditions would be even worse - there wouldn't be anywhere to put it. Fortunately, they are to be given their own building in the spring. Maybe there will even be a Honeywell ...

Presenting a center which is atypical for Polish conditions in this essay, I ask the following question in the title: Pioneer or precursor? The first would mean that the positive experiences of PETROINFORM in the area of teletransmission were the result of the rapid growth of interest in this means of transmitting data over a long distance. The Tractor Factories Union is taking a similar approach to this method. Here we can express the reservation that

the possibility of the effective use of this method is limited by the state of telephone communications in the country, and if other unions were to follow PETROCHEMIA's example, soon there would not be enough lines. If this concern were to spread, PETROINFORM would only be a precursor, a chance forerunner, which was not taken advantage of.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