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11 July 1977

TRANSLATIONS ON EASTERN EUROPE

SCIENTIFIC AFFAIRS

No. 551

EAST EUROPE

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CONTENTS PAGE

DESCRIPTION OF BULGARIAN-MADE TELEPHONE EQUIPMENT

Sofia IKONOMICHESKIY ZHIVOT in Bulgarian 27 Apr 77 p 15

[Article: "Belogradchik Telephone Plant"]

[Text] Telephones: Office--34-41
Director--34-60
Sales--35-79
Telex--36-506

Established in 1960 as an enterprise for the manufacture of telephone sets and signal equipment with an annual plan of 20,000 leva, in a short time it grew large and was approved as a plant--the only one in the country--for the manufacture of telephone equipment. Today the plant is fulfilling a plan several hundred times larger than that of 1960.

Main production:

Various models of telephone sets.

Director and secretarial office installations.

Home and office signal installations.

Light signal installations for hospitals and hotels.

Fire alarm, naval, and warning signal systems.

Radio earphones.

Automatic dials.

Signal equipment, and so on.

In 1976 the plant began to manufacture new telephone sets:

a) a TA-420 type telephone set with pushbutton dialing and a memory. It is hooked up to automatic telephone exchanges, for which no additional equipment is required. It is attractively designed. It is easy to work with, saving valuable time. Its advantages make it especially convenient in long-distance and international telephoning;

b) an Imefon automatic dial of the AN-10 type.

numbers: 222187040 - red
222187041 - reseda
222187042 - orange

The Imefon AN-10 automatic dial is a new, perfected type of telephone set with an electronic memory. It remembers and dials up to 30 seven-digit numbers. Any number can be dialed just by pushing one button.

By means of the pushbutton keyboard, which replaces the circular dial, it is possible to dial all subscribers by pressing the proper buttons having the same digits as the desired subscriber.

The Imefon AN-10 automatic dial is a valuable aid to modern man. It is attractive in appearance.

The Belogradchik Telephone Plant fulfilled its 1976 plan with respect to all indicators, both quantitative and qualitative. In 1976 its output rose by 54,000 units, and in 1977 it is anticipated that output will rise by more than 200,000 units.

Expansion of the plant will get underway this year. In spacious, sunlit rooms, workers and specialists are skilfully and lovingly building new, good-looking telephone sets which reflect credit on the Bulgarians' love of labor and sense of beauty all over the world. The bulk of the plant's output--60 percent--is destined for export. It is evaluated at "1." The USSR, Hungary, Czechoslovakia, Iran, Turkey, Greece, Yugoslavia, Egypt, Colombia, and other countries are enthusiastically receiving our telephone sets.

The plant takes part in all international expositions and fairs, both at home and abroad.

9078
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BULGARIA

CERTAIN FEATURES OF 'ROBOTRON EC1040' COMPUTER LISTED

Sofia IKONOMICHESKI ZHIVOT in Bulgarian 4 May 77 p 15

[Advertisement]

[Text] If you are going to choose Robotron EC1040, consider the advantages...

Whether you are adopting computer equipment in industry, sciences and technology, or the handling of business operations.

That's up to you.

Aside from that, we provide you with an electronic data processing system.

Robotron EC1040 is a device with truly numerous applications within a unified computer technology system--the Robotron; a computer of this type is suitable in all fields of the national economy. Robotron EC1040 is a data processing system which is adequate to the needs of modern technology and economic enterprise management. The powerful central unit is augmented by numerous peripheral devices, including remote data processing, monitor equipment, and microfilm equipment on a computer base.

DOS/YeS and [illegible] S/YeS system for enterprises, as well as problem-oriented software packages, will help you in preparing to apply and use the devices.

Our skills, service facilities, and consultation of design are at your disposal.

Take advantage of the advantages Robotron offers you.

The main part of the Robotron EC1040 is central unit EC2640.

Operational speed: 380,000 OP/S.

Capacity of operational memory: from 256 K bytes to 1,014 K bytes.

Number of instructions: 143.

Time of information access 450 ns.

9078
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BULGARIA

NEW ALL-PURPOSE MACHINE FOR SUBWAY TUNNEL CONSTRUCTION

Sofia NARODNA MLADEZH in Bulgarian 5 Jun 77 p 3

[Article by Elena Asenova: "All-Purpose Machine for Building Subways"]

[Text] While our press and various authorities have been debating the necessity of building a subway in Sofia, and its usefulness for us, one man has been building a machine to construct it. He is Dimitur Tsankov, an engineer and teacher in the Railroad Line Construction and Maintenance Department of the Todor Kableshkov Higher Railway Institute, located in the capital city.

What new features does his machine have? For one thing, it is all-purpose--or, more accurately, the mechanized shield that actually does the digging is an all-purpose shield. According to practice in different countries, a great many shields are designed to match natural conditions (with respect to rock types in the ground), and it is very difficult to design an all-purpose machine. The machine built by our countryman has two distinctive characteristics. It solves the problem of the hermetic sealing of the shield's cutting section. The machine uses truncated cone surfaces, with the broad base turned toward the work face, eliminating the necessity of operating under pressure when there is an abundant influx of water. This is achieved through a mechanical system consisting of two rotors, a basket hoist, and a belt conveyer. The design of the cutting section makes it possible to use a hydro-monitoring mechanism when digging through softer rock, and appropriately apply the electro-hydraulic method when digging through tougher rock. The problem of installing the part known as the tail is also solved. The tunnel revetment is pre-assembled, but each hoop consists of two elements, whereas the minimum number in general practice, is six. The use of two elements makes it possible not only to install the revetment more rapidly, but also to reduce the number of exposed hoops, which can also handle the load from the pistons of the hydraulic presses more efficiently. The two elements are delivered by special platform car, and installation itself is accomplished with a crane.

The scientific terminology, easily understandable to specialists, is hardly clear to all readers. The main point, however, is perfectly clear: a machine which can claim innovation on a world scale has been designed. It is quite natural, therefore, to ask engineer Dimitur Tsankov how he conceived the idea for such a machine, since we have never built subways.

"Naturally," he explains, "I am acquainted with world practices; otherwise, I would never have taken up the work. I teach a number of courses in the Railway Institute, one of which deals with tunnels. They involve a lot of work--all tunnels built prior to 1959 need to be rebuilt, and their dimensions have to be enlarged, in conjunction with the electrification of railroad lines. So the impetus for my ideas and work was the necessity of rebuilding the tunnels."

9078
CSO: 2202

BULGARIA

ADOPTION OF NEW VEGETABLE VARIETIES DELAYED

Sofia TEKHNICHESKO DELO in Bulgarian 14 Jun 77 pp 1-2

[Interview with scientists of the Experimental Station for Vegetable Crops by Iliya Monov: "The Familiar, Perennial Problem--Adoption"]

[Text] Is adequate attention being focused on the popularization of new varieties in vegetable production? The alternatives--complete the "research-production" cycle, or close the path to the new. This interview is addressed to the Ministry of Agriculture and Food Industry, the Sortovi Semena NPO [Scientific Production Trust], and the Bulgarplod DSO [State Economic Trust].

Our country has well-trained cadres for the selection of vegetable crops. We also have sufficient initial stock of indigenous and introduced varieties. Every year, new technology is introduced to meet the needs of present-day industry. All of this gives grounds for believing that selective breeding work in the field of vegetable production is at a high level.

In fact, this is so but only in the case of varieties development. As for adoption, let us find out the collective opinion of three scientists, selective breeding workers at the Experimental Station for Vegetable Crops in Gorna Oryakhovitsa.

Stefan Buchvarov: We are working on the development of varieties that produce high yields and are resistant to diseases. Every year we supply not only our own varieties, but we are also in a position to supply imported foreign samples that have been tested over a long period. We believe, however, that the effectiveness of our labor is not adequate because there is no reliable bridge between the development of varieties and their adoption and production. The primary cause, as we see it, is the fact that the State Varieties Commission and the Ministry of Agriculture and Food Industry are delaying in the expansion of variety lists. Generally, the position taken when judging a new variety is that it might be replaced with a variety that surpasses it in yield. But it is well known that present-day highly specialized varieties are not universal; they satisfy particular consumer needs, and possess additional qualities which cannot be measured by traditional evaluations. We cannot always expect them to simultaneously satisfy the consumers' need for fresh food, industrial requirements, and export needs. If some varieties are resistant to diseases, or if, for example, a variety of onion that has a high content of dry matter and stores well is developed, aren't these qualities sufficient for evaluating economic benefit? But at the present level of variety development, such an approach is doomed to failure. In my opinion, efforts must be focused on qualitative standards, and the adoption of varieties that will serve to resolve both economic and biological problems.

Tatyana Petkova: The variety is the dynamic part of production, and requirements imposed on it are changing rapidly. This means we must seek the most direct path in initiating production of newly developed varieties. One possibility is to shorten the time it takes to test them in the State Varieties Commission. What objection would there be, for example, to duplicating the most promising competitive experiments of the selective breeding establishments in a testing station during the last year of experimentation? Also advantageous to production practice would be the preliminary zoning of more varieties of a given type, naturally, having various qualities, and suited for particular applications--a way of incorporating them as rapidly as possible into the seed production system. The availability of as large a number of new varieties as possible will permit the broadest possible production testing and experimental adoption, which will create new possibilities, and speed up the final zoning process.

Petur Lozanov: As far as verification of experiments, it would seem that everything is fine. Although this is the case, the problem of adoption remains unresolved, because there are barriers against adoption of the new, and rather tough ones, too. First of all, it has not been established who is to carry out adoption. Many people think that it is the responsibility of selective breeders, which is erroneous. On the one hand, they have neither the funds nor the material base, and on the other hand, their highly-qualified labor would be dissipated in a totally unnecessary fashion. Consequently, a direct approach to adoption would require that Sortovi Semena act as a specialized organization, Bulgarplod as the marketing link determining the variety composition of purchased vegetables, and APK [agro-industrial complexes] and PAK [industrial-agrarian complexes] as producers.

[Question] What specific recommendation can be addressed to the Ministry of Agriculture and Food Industry, Sortovi Semena NPO, and Bulgarplod DSO?

[Answer] The Ministry should reexamine the criteria for evaluating new varieties and deciding on their adoption for production in the shortest amount of time possible. The three institutes should determine who is to publish catalogs and other printed materials for broad dissemination of information, and decide how to stop the customary practice of producing only seeds of varieties for which requests are received. Under existing conditions, for example, how would it be possible to order varieties which are unfamiliar? It is also necessary to decide how to overcome Sortovi Semena's refusal to disseminate new varieties, and how to overcome the unfounded fear within this system of overstocking seeds.

The problem is an important one. There are obvious shortcomings. A scientific effort progresses to a certain point and then fluctuates, due to a number of organizational weaknesses. The achievements of selective breeders can and must be utilized rationally; the national economy will only benefit from it. It is time that the Ministry of Agriculture and Food Industry and the organizations on which variety adoption depends develop an effective system for making the most rational use possible of selective breeding achievements, and complete the "research-adoption" cycle.

9087
CSO: 2202

EAST GERMANY

SOME PROBLEMS OF BASIC RESEARCH IN MICROBIOLOGY

East Berlin SPEKTRUM in German No 4, Apr 77, pp 18-21

[Article by Udo Taubeneck, Corresponding Member of the Academy of Sciences, Director of the Central Institute for Microbiology and Experimental Therapy]

[Text] Intensification of scientific work is an indispensable prerequisite to acceleration of scientific and technological progress and the effective utilization of its results in socialist practice. In the course of working through the materials of the Nineteenth Congress of the SED and the subsequent meetings of the central committee, numerous discussions were held for the purpose and corresponding measures were taken. In the institutes and installations of our academy a broad discussion began, which is concerned primarily with the rôle of basic research and its place in the general development of society. The president of our academy, Prof Dr Hermann Klare, made a fundamental pronouncement on this subject in the July issue of SPEKTRUM, immediately after the party congress. His words call particular attention to two important elements of the situation.

In defining the functions of basic research the following becomes clear: It must be carried on in various ways, and may include both the study of fundamental problems in order to gain new knowledge and also application-oriented research with the utilization of previous scientific progress. At the same time it is again emphasized that a socialist academy carries on no basic research that is without social effect, but orients its research toward those needs of the socialist society that are long-term in character.

On the basis of the specific example below, we should like to point out certain problems that arise from this justified demand for basic research in microbiology if its social relevance is to be adequately high. We start with the premise that a research strategy must be found that enables us to couple an adequately broad basic research to obtain new knowledge with the systematic treatment of practically relevant findings and their application.

Scientific microbiology has developed greatly in the last three decades. There are essentially two reasons for this. First, micro-organisms and viruses were found to be ideal subjects for study of the molecular basis of the life processes. The basic explanation of the inheritance process as well as many general laws of metabolism came to be known primarily through the study of microbiological subjects. Second, in rapid sequence countless microorganisms have been discovered which are capable of producing large amounts of important materials, of metabolizing substances harmful to the environment, or of carrying out other activities whose usefulness to society is of great interest both in the short term and in the long term. In all these cases, however, it is indispensable to optimize these microorganisms for practical applications through microbiological, physiological, and genetic treatment. This not only can cause a purely quantitative increase in a given capability of the microorganism, but can also induce qualitatively changed capabilities (structure-modified antibiotics, changed metabolic capabilities, etc.).

At first glance it would seem quite feasible to apply the knowledge of heredity and metabolism of the "microorganisms," which has been developed to a high degree, consistently for the most effective possible use of the manifold microbial activities in social practice. In reality, however, that is only possible within severe limitations. That forces us to develop a research strategy that guarantees the optimal application of the available potential, and that of course takes into account the relatively narrow limits which exist for basic research when a specific goal has already been set.

Let us explain further. The great successes of molecular biology, and particularly molecular genetics, have been possible primarily because of the conscious limitation to study of very few microorganisms. At the same time it is generally known that by far the greatest advances have been achieved through the study of the bacterium *Escherichia coli* and a few viruses to which this bacterium is sensitive.

The choice of subjects was originally the result of a series of fortuitous circumstances. Today *E. coli* is the most thoroughly researched organism. Genetics has had the lion's share in this. The genetic material of *E. coli* has been successfully described through an almost inconceivable number of mutations, and structural and functional analysis has been added to that. The strains of bacteria which carry these mutations, i.e. the *E. cali* mutants, represent a gigantic foundation, which has had to be developed at great expense of theory and time, to be sure, but which is now increasingly effectively applicable.

For example, it is now possible to use mutants as probes for the causal analysis of certain morphogenetic processes which were first isolated in quite a different context (as through study of protein synthesis). While the advance of *E. coli* itself accelerates increasingly in this way, data about other bacteria are far from being available to the same extent. We know considerably less about the genetic constitution of other bacteria commonly dealt with, such as *Salmonella typhimurium* and *Bacillus subtilis*, and have only very spotty knowledge about certain genetic aspects, some of them rather specific, of certain other bacteria (*Proteus*, *Pseudomonas*, *Streptomyces*, *Streptococcus*, and *Rhizobium*).

Increasingly developing microbiological practice today, however, requires scientific bases for mastering the processes of technical microbiology, of environmental control, and of agriculture, which are often based upon microorganisms or mixed microbial populations that either have not been dealt with to date or have been dealt with most inadequately. And for reasons of current urgency there are numerous problems within this field of applications whose solution cannot be postponed indefinitely.

If we now create an important tasking assignment within the biosciences program carried out by the academy and the institutes of the university system based on the formula "Create Scientific Pilot Programs for the Industries Which Use Microorganisms in Production," that will cover a tremendous field, and the question of the most effective use of the data already available, particularly the spectacular microbial genetic results, will then acquire special timeliness. It is immediately obvious, however, where the limitations of which we have already spoken lie.

The organisms with which technical microbiology is carried on today and undoubtedly will be carried on during the next few years are not the ones in which the great theoretical possibilities of genetic manipulation have been demonstrated. Since, on the other hand, as mentioned above, in most cases the microorganisms used industrially must be optimized with regard to their performance parameters and the path of genetic optimization is certainly the one with the broadest possibilities, we must make every effort to advance in that field.

All experience of recent years, our own and that of other groups, clearly shows that in this field it is possible to apply the information derived from standard subjects such as *E. coli* only to a limited extent. Naturally the universality of the genetic code, for example, has general validity, and it is quite certain that the same principles of structural organization and of the function of the genetic material also apply to the *Procaryontes*. But in questions of the regulation of the gene expression (particularly if microorganisms with extensive differentiation phenomena such as the *Streptomycetes* are being dealt with) and also in certain requirements for mutagenesis, in the transfer mechanisms for genetic materials, etc., there are big differences. The most significant result of this is that methods that work particularly well with *E. coli* fail with other bacteria. The unarguable "model character" of studies on well-defined material is therefore not to be equated without qualification with "multivalence" in the sense of direct applicability of such results or of the methods by which they were achieved.

My impression is that in the past an overstressing of a falsely understood multivalence has led to making many mistakes, either knowingly or probably much more often unknowingly, which in turn has led to a certain skepticism on the part of many of the practical partners of the basic research institutions concerning the effectiveness of that basic research.

Thus, if we wish to apply the genetic possibilities which exist in principle for the optimization of certain microbial capabilities -- and only in this way can methodical procedures, absolutely necessary for the future, replace the empiricism that has prevailed heretofore -- then it must be clear to us that at the present state of development we still need basic research to that end, -- long-term research carried out by groups of the proper size. The relevance of this research will be highest if it is carried out on subjects that are of real significance for future applications.

In practice this means that in the initial study of a microorganism with the objective of a causally based optimization of certain capability parameters it is necessary to determine its genetic composition, at least in broad outline, and to cause directed characteristic changes, to name just two important requirements. This requires a great expenditure of work, because a large number of different mutations must be created, so that characterization of the genetic material can become the basis of each genetic treatment. Two things are result from such work. The first is that experience and methodological capacities are accumulated (techniques of mutagenisis, selection systems, stability of mutations, etc.) that we can apply generally or at least to related subjects, and thus in another connection. On this basis, optimization strategies will be developed for quite specific purposes, which are much more effective than the traditional empirical procedures. The second result of these lavish experiments is a large number of mutations. Among these will be the desired high-output strain, but the vast majority will represent a necessary byproduct which we shall only be able to use rationally if the particular microorganism is further dealt with. With each change of subject this byproduct becomes useless for the new task.

Our limited research capability therefore forces us to limit the number of subjects to be dealt with. We therefore need well-founded prognostic evaluations, particularly in this area, which cannot be based solely on purely scientific considerations. From the start the potential users of the results and their long-term development plans must be included in these evaluations. With these objects in view, we have restricted the work of our institution on genetic problems to three subjects or groups of subjects with which we are convinced that important basic and practical results can be attained.

The first group comprises the *Streptomycetes*. As producers of important products such as antibiotics and many technically interesting enzymes, they will still play an important part for decades to come. The work has been concentrated on very few examples of the family *Streptomycetes*, and the successes of the past 2 years seem to indicate that within the foreseeable future results are to be expected which will serve, among other things, as a general basis for genetic optimization strategies to a certain extent within the *Streptomycetes* and therefore also for other antibiotic production, enzyme formation processes, etc.

The other groups are the *Streptococci*, the comprehensive study of which at the institute is being expanded to include study of certain of its genetic problems, and the yeasts, particularly those which are important to microbial biological mass production or product synthesis.

The problems described here incline us to the conclusion that it would be wrong to assign short-term tasks to microbiological genetic research. Given the facts of the modus operandi of genetics, short-term changes of subject produce noticeable loss of efficiency. It is therefore all the more important to undertake in common with the eventual users a continuous, responsible, and critical analysis of the situation and trends in the relevant scientific bodies, so that under appropriate circumstances it will be possible to make a prospective change in the area of operation which has been determined to be necessary without too much loss of efficiency. An important part can be played here by appropriate ecological research, which would locate microbial activities that have developed under natural conditions and are important either theoretically or practically somewhat in advance of the genetic research institute, isolate the microorganism responsible, and in this way provide a substratum from which specific subjects could then be selected for microbiological genetic research.

The rapid development of social needs in numerous fields of applied microbiology requires us to coordinate the available potential for basic microbiological research with these requirements. Only in this way can we ensure that a big increase in our knowledge will also be highly relevant. Moreover, it will be possible to orient a sufficiently broad-based research early enough to subjects whose potential practical importance has been guaranteed by responsible prognostic studies. Not least important is that in this way international cooperation with regard to division of labor within the framework of socialist economic cooperation is attaining an ever larger place. This applies to bilateral cooperation, which we are developing to an ever greater extent primarily with the institutes of the Soviet Academy of Sciences, and also to multilateral cooperation, which is just now becoming increasingly acute in the fields of microbiology, molecular biology, and molecular genetics.

5588
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POLAND

NEW RADAR SIGNAL PROCESSOR DESCRIBED

Warsaw WOJSKOWY PRZEGLAD TECHNICZNY in Polish No 2, Feb 77 pp 17-18

[Article by Col Engr Tadeusz Kulesza; "The AC-BOS-102 Unit"]

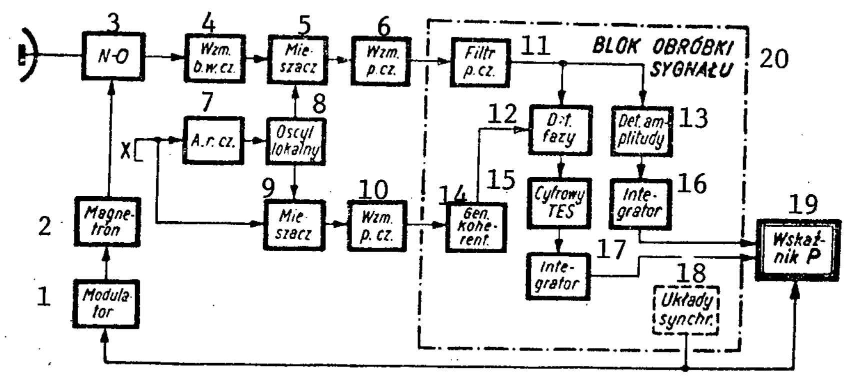
[Text] Due to utilization of digital technology, radar signal processing equipment has improved dramatically over the past 10 years. It has become possible to apply the theory of optimal signal detection in a noisy environment to the detection of radar echoes, which has substantially increased the immunity of radar stations to active as well as passive interference sources. Particularly in the case of passive interference, an efficiency of target detection that was not possible to realize with the use of analog systems alone has been achieved.

In Poland, the development of the AC-BOS-102 analog-to-digital radar signal processing unit has incorporated the most modern scientific and technological achievements. Among other innovations, the following were utilized: medium frequency (MF) filtering (not video frequency filtering, as was used in the past, digital circuits for the suppression of constant echoes (CTES); analog-to-digital converters, and MOS semiconductor memories. Eight different configurations of this unit are being produced, for military as well as civil radar stations. There is also a great deal of interest in this unit outside of Poland; it is already being exported. In 1976, the group of people who developed the unit were honored by the Ministry of Science, Higher Education and Technology.

The AC-BOS-102 is designed for use with coherent pulse radars (synchronized with sounding pulses); using a sounding pulse with a small execution factor. It is designed to operate with a magnetron transmitter which generates 1.2-5 microsecond pulses, and contains 30 MHz MF preamplification. The unit can be used with either single- or multi-channel radars.

All of the AC-BOS-102 circuits are housed in a cabinet with a pull-out chassis, in which five frames containing a maximum of 27 standard packs measuring 140 x 150 x 15 mm are installed. The MF circuits are housed in shielded cases located on an inclined chassis in the upper part of the unit.

Also, there are three analog-to-digital (A/D) converters that form a separate group. All operational and control switches are located on the front panel. A transistorized synchroscope is located in the upper portion of the block and is used to check unit operation and monitor the unit's basic parameters. The circuits are cooled by air flowing from the bottom to the top of the cabinet. The air flow is provided by three ventilating fans located on the bottom of the pull-out chassis.

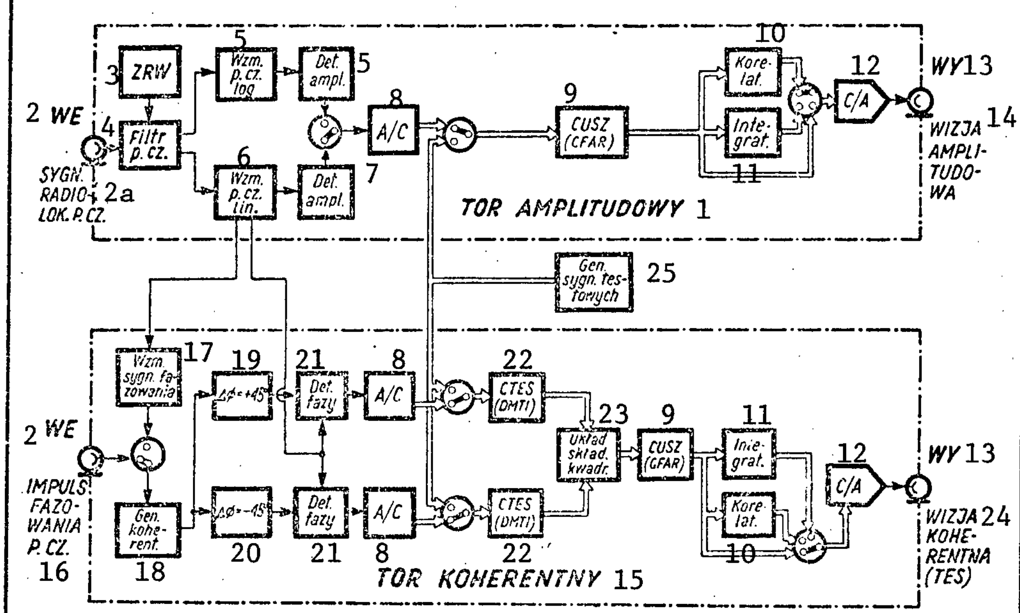


Rys. 1. Schemat blokowy stacji radiolokacyjnej z urządzeniem AC-BOS-102

Figure 1. Block Diagram of a Radar Station With an AC-BOS-102 **Unit**

Key:

1. Modulator
2. Magnetron
3. N-O [expansion unknown]
4. VHF amplifier
5. Mixer
6. MF amplifier
7. Ar [expansion unknown] frequency
8. Local oscillator
9. Mixer
10. MF amplifier
11. MF filter
12. Phase detector
13. Amplitude detector
14. Coherent oscillator
15. Digital constant echo suppression system
16. Integrator
17. Integrator
18. Synchronization circuits
19. P [?] display
20. Signal processing unit



Rys. 2. Schemat funkcjonalny układów obróbki AC-BOS-102

Figure 2. Functional Diagram of the AC-BOS-102 Processor Circuits

Key:

1. Amplitude circuit
2. Input
2a. MF radar signal
3. ZRW [expansion unknown]
4. MF filter
5. MF log amplifier
6. MF line amplifier
7. Amplitude detector
8. A/D converter
9. Digital false-alarm-level stabilization circuit
10. Correlator
11. Integrator
12. D/A converter
13. Output
14. Amplitude display
15. Coherent circuit
16. MF phasing pulse
17. Signal phasing amplifier
18. Coherent generator
19. $\Delta\phi$ = +45 deg
20. $\Delta\phi$ = -45 deg
21. Phase detector
22. Digital constant echo suppression system
23. Quadrature storing circuit
24. Coherent display (constant echo suppression)
25. Test signal generator

As shown in the functional diagram (Fig 2), the digital constant echo suppression system is the basic circuit in the AC-BOS-102 unit. This circuit is standard equipment in many modern radar stations, especially in air traffic control radar facilities.

In the CTES circuit, information in the form of multi-bit, binary words is obtained from a fast-acting A/D converter. Each bit corresponds to the potential possibility of suppressing a constant echo by approximately 6 dB. An extra bit designates the sign of the signal. The CTES circuit in the AC-BOS-102 unit operates like a filter with delay lines (it removes signals). The semiconductor memory (shift registers on MOS integrated circuits) functions as a delay line. In order to improve the detection characteristics of the targets, quadrature CTES circuits (with integrator circuits) are used. The CTES circuits also simplify the programming of variable repetition rates, which is essential in order to eliminate so-called blind velocities. In such target velocities, the Doppler frequency equals a multiple of the repetition rate of the sounding pulses.

With regard to signal type processing, two types of circuits are used and differentiated in the AC-BOS-102 unit (Fig 2): the amplitude circuit and the coherent circuit. The MF signal is fed into an amplifier with volume control. The output of this amplifier is fed into two amplifiers--a line amplifier and a log amplifier. A unipolar video signal from the amplitude detector is fed into an A/D converter. In the converter, the signal amplitude is converted into a 6-bit word. The output signal of the converter is fed into a binary integrator or directly into a 4-bit digital-to-analog (D/A) converter via a digital false-alarm-level stabilization circuit.

In the coherent processing circuit, the quadrature components of the signal are fed from the phase detector to two A/D converters operating for a minimum sampling period of 1/2 microsecond. The reference signal for the phase detectors is produced by a generator with a given initial phase, which is initiated by the MF phase pulse, or the radar signal. The digital signals are then fed into a periodic filter (CTES) with double attenuation and a transmission characteristic that is affected by feedback.

After passing through the digital filters, signals are segregated into quadrature approximations, and then fed to the digital false-alarm-level stabilization circuit. As in the amplitude circuit, it is possible to connect the integrator while the signal from the integrator output is fed into the A/D converter that converts the 4-bit word into an analogous voltage.

The most important kind of operation for the AC-BOS-102 unit is operation with external or internal phasing. In operating with external phasing, the 30 MHz coherent generator is phased by means of the sounding pulse from the transmitter. This mode of operation achieves good compensation for constant echoes reflected from the earth's surface. On the other hand, with internal phasing, in which the coherent generator is phased by a radar signal (reflected), it is possible to detect moving targets against a background of strong echoes with Doppler shifts (for example, strong echoes from clouds) by connecting the CTES system into the circuit. In the AC-BOS-102 unit, the following types of synchronizations are provided for: the simultaneous functioning of two AC-BOS-102 units in a two-channel radar with frequency spacing; synchronization with a central radar synchronization system in a designated repetition rate interval; and internal synchronization with a built-in commutability program generator. The AC-BOS-102 unit is also equipped with circuits that enable rapid control of parameters and the monitoring of operations. It contains the following monitoring systems: signal light indicators, visual displays, and a synchroscope. The signal light indicators reveal a loss of any of the regulated voltages or malfunctioning of the A/D converters. The visual displays permit the correction of noise levels at the outputs of the coherent (constant echo suppression) and amplitude circuits. The synchroscope permits selection and display of any one of the many signals within the unit; it also permits stability measurements of the 30 MHz coherent generator and the coefficient of constant echo compensation.

TECHNICAL DATA ON THE AC-BOS-102

Input Signals:

frequency--30 MHz
effective voltage noise--50-100 microvolts/75 ohms
volume range--greater than or equal to dB
pulse width--2 microseconds
amplitude of locking pulse--equal to or greater than 0.5 V/50 ohms

Output Signals:

maximum amplitude of the normal display and suppression of constant echoes--4 V/75 ohms
level of the normal or suppression of constant echoes' black-and-white display--bit 0/4 V

Suppression of Constant Echo Parameters:

constant echo compensation coefficient--greater than or equal to 36 dB
range--approximately 105 km
signal sampling period--1.2 microseconds
number of selected transmission characteristics--3

Power Supply:

voltage--3x380 V, 200 V
frequency--50 Hz
power consumption--approximately 600 VA

Dimension--410x700x1,557
Weight--approximately 190 k
Operating temperature--+5°C-+50°C

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POSSIBILITIES OF SOLAR ENERGY USE IN YUGOSLAVIA DISCUSSED

Maribor 7D in Slovenian 21 Apr 77 pp 28, 37

[Report by Smail Festic, including comments by Prof Branislav Lalovic, Djuro Iljevic, Rade Ivancevic and Dr Ales Bebler]

[Text] What are the possibilities for practical use of solar energy in Yugoslavia? Experts say that utilization of solar energy will become reality by the turn of the century. Solar energy will drive machinery, dry wheat and fruit, and supply power for households. This will occur because solar energy is very cheap and its utilization so "simple" that our metal-working industry will soon begin manufacturing equipment for collecting solar energy. Do-it-yourself kits are also being planned. However, it is a fact that in contrast with other countries, Yugoslavia is very much behind in the field of solar energy utilization.

At the recent conference on utilization of solar energy in Belgrade, experts agreed that in the future they will give priority to development of solar installations and that provision for their application will be included in the research and development plans of Yugoslav institutes and enterprises which, too, should begin production of low cost water and space heating solar equipment as soon as possible. The Belgrade conference was attended by more than 300 experts and scientists from this country as well as from abroad. More than 80 papers were read at that conference. It was emphasized that the world energy reserves would last at best for only another 150 to 200 years, whereupon utilization of solar energy will become inevitable.

The first step toward the discovery of new energy resources in our geographical latitudes has already been taken. A few months ago the scientific community of the Serbian Socialist Republic, at long last, approved 300,000 dinars for construction of the first Yugoslav project--"Solar Energy." Groups of experts from institutes Kirilo Savic of Belgrade, Boris Kidric of Vinca, Institute for Chemical and Metallurgic Research, and the Hydrometeorological Institute of Serbia began work on this enormous project in the hope that they will soon bring to light the technological feasibility of utilizing solar energy, and, on the basis of this, stimulate the interest of the economy and other potential users. The awarded funds represent only a token support. Nevertheless, it is expected that the research will bring results because Yugoslavia belongs among the countries with outstanding possibilities for technological utilization of solar energy. Experts say that solar radiation power falling on our territory is 1,000 times greater than the power of all energy sources we are using today. In this respect our country is in a much better position than, for instance, West Germany, Sweden, Great Britain, the Soviet Union, and other northern countries where large-scale application of solar energy is already under way. The number of solar hours in Yugoslavia ranges from 1,800 to 3,000 while in West Germany, for example, the sun shines only 1,300 to 2,200 hours per year.

"If solar energy is being utilized for space heating in countries that have much poorer possibilities, opportunity [exist for us] to do likewise," says Professor Branislav Lalovic, a senior professional consultant of the institute at Vinca and designer of solar energy collectors. "Our per capita energy reserves are 5 times smaller than the world average, by 25 percent smaller than the European average, and twice smaller than the average of the developing countries. Our country has a rather meager potential of primary energy resources, hence it will be necessary to approach the utilization of solar energy with great care, understanding, and of course, better funding. This is particularly important because we are expecting in the near future much more rapid advances in utilization of solar energy for water and space heating and, in the long run, also for the needs of the economy."

Fruit Ripening in January

According to Lalovic solar energy collectors are essentially metal plates in contact with tubing through which water or air is circulated. To avoid heat losses the top side of the collectors is covered by one or two panes of glass while the bottom side is insulated. Collectors will be installed on the roofs, walls, or simply on the ground. They must be installed at an angle of 45 to 60 degress. As a rule, they must be turned to the south in order to collect the maximal amount of solar energy.

"Collectors are connected by tubing with the heated bodies. Circulation of the heated water or air is accomplished either in the natural way or by pumps. When there is not enough solar radiation, storage plates will be used. A 100 square meter apartment needs a collector with an area of 40 to 45 square meters. The heater will be on the roof. In winter, when there is not enough solar energy, heat pumps will be used to increase the temperature of air and water. These pumps will be used primarily in the northern parts of the country," explains Professor Lalovic, adding that we also may soon expect application of solar energy in agriculture.

It will be possible to use solar energy for the drying of cereals, lumber, fruit, and produce. It is possible that fruit will ripen as early as in January and that the yield will be greater than in June.

Calculations by experts working on this project show that we shall by the end of this decade achieve substantial advances in utilization of solar energy. Instead of the present 500 buildings in the entire world that use solar energy this number will be at least ten times greater by the end of the decade. In Yugoslavia, too, every new building should be equipped with solar heating. If we implement these plans we shall save more than 50 million tons of coal by the turn of the century.

Step Forward

In contrast with Australia, the United States, Israel, USSR, and other countries where considerable use of solar energy is made, we have barely begun to fund research projects in this area. The above-mentioned countries are planning to make substantial investments in this kind of energy. In the United States, for example, it is expected that 3 billion dollars will be expended by the end of 1999 for research and production of collectors. In the same period Japan will spend 4 billion dollars in solar energy while France and the Federal Republic of Germany will each spend 10 million dollars annually. The Italians, our neighbors, too, have prepared a five-year plan in which they have earmarked 70 million dollars for solar energy research.

"The reserves of classical energy sources are being depleted in proportion with the growth of consumption. It is clear that we are becoming poorer from day to day with respect to the energy sources that are completely used up in certain technological processes. It is precisely for these reasons that scientists throughout the world began to look for processes which would replace, to the greatest extent possible, the irreversible energy processes with new reversible methods," said Djuro Iljevic, chairman of the Federal Energetics and Industry Committee at the Belgrade conference. "Despite considerable energy resources, Yugoslavia belongs to the group of states whose potential in classical energy is relatively small. According to recent data which, however, differ in various respects, the percentages of Yugoslavia's energy resources are as follows: coal 76.7 percent, oil 3.2 percent, natural gas 1.3 percent, hydraulic energy 11.0 percent, nuclear fuel 5.5 percent and bituminous shale 2.0 percent."

Dusan Ilijevic emphasized that in view of the depletion of fossil fuel resources in Yugoslavia it is not possible to expect substantial discoveries of new classical energy resources:

"In general we are making our estimates on the basis of what we have already discovered. The exception is liquid and gaseous fuels, the search for which will continue, particularly under the sea on the Adriatic coast along the Dinara mountain range. Our expectations are based on the geological structures of this region. We have acquired special equipment for oil prospecting under the Adriatic sea. It is estimated that between 1976 and 1980 the total energy consumption will grow at an average rate of 9.5 percent. This rate of growth will be fastest for natural gas where it will amount to approximately 30 percent.

"Such rate of growth of natural gas consumption is expected because of the changes in the energy consumption within urban settlements and because of the efforts to protect man's environment from further pollution."

Sun Against Destruction

To stimulate all scientific, political, economic and technical forces in Yugoslavia and to bring about utilization of solar energy in the technology at the earliest possible time, the Yugoslav League for Protection and Improvement of Man's Environment in cooperation with the Yugoslav Committee of the Federal Energy Conference organized the Belgrade meeting on solar energy.

"No one expected that so many professionals and scientists from this country would respond at a time when we are beginning to pay more attention to solar energy," says Rade Ivancevic, counsellor the Yugoslav League for Protection and Improvement of Man's Environment. "We are no longer alone now that we have been joined by the economy, the entire society, industry, in brief, everybody who is of any consequence in this country. This will be of great importance for the future of the protection of man's environment for, after all, it was high time to put an end to the poisoning of nature."

Upon consideration of the Belgrade conference Dr Ales Bebler, president of the Yugoslav League for Protection and Improvement of Man's Environment, made the following statement.

One needs not lose many words about the success of this conference. No one expected such a large turnout. More than 300 of us have sat around the same table exchanging opinions and setting work objectives which should lead to a gradual transition from classical to solar energy. Frankly, even after this conference we expect no great changes to occur within a year or two. We do not expect that Djerdap, Krsko, and Jablanica power plants will become unnecessary because solar energy will replace all present energy sources. Nevertheless, it is certainly important that we have begun to think more seriously about solar energy and to prepare tangible plans. We shall utilize only one percent of the solar energy at first and then gradually expand its use. This is in fact the only way to overcome the present poisoning of man's living and working environment. The purest and inexhaustible source of energy--the sun--must replace all the present polluters of nature that are harmful to human well-being."

Hotels Heated by Solar Energy

Dr Ales Bebler is convinced that a league of energy experts will soon be established in Yugoslavia. This organization will transmit and disseminate foreign advances in solar energy to our country.

"It is a shame that resort hotels on the Adriatic coast are still being built in the traditional way without making use of the large number of sunny days which are a true blessing to our country and something that is lacking in the north. Along with the utilization of solar energy, Yugoslav scientists also must initiate work on methods for harnessing secondary energy, that is, utilization of wind power for power generating purposes. The ancient Egyptians already had windmills; they used the energy of the wind, but we in the 20th century have not yet accomplished a thing in this field," explains Dr Ales Bebler, adding that the harnessing of strong winds such as, for example, the kosava in Panonia and burja in the maritime provinces, has so far brought no results because no one attempted to use this kind of energy. However, conversion of the energy of these winds to electrical energy could be very useful indeed for the overcoming of the energy crisis which has been with us for several years.

Dr Bebler, the noted Yugoslav expert and champion of environmental protection, is convinced that all resistance to utilization of solar energy will shortly be overcome. The doubting Thomases already have recognized the importance of its utilization. At the same time this breakthrough will bring salvation to our environment. We shall be able to devote more attention to this new way of energy conversion, which is not associated with smoke, gases, soot and other pollutants, because in the future the sun will have to replace all the "poisoners" of rivers, forests and the marvelous countryside, of which so much has already been destroyed or even become a threat to man's health and well-being.

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DEVELOPMENT OF MICROELECTRONICS IN YUGOSLAVIA

Ljubljana DELO in Slovenian 7 May 77 p 29

[Article by Zdravko Stefancic including interview sections with Prof Dr Lojze Trontelj, head of the Electronics Research Laboratory of the Electrical Engineering Faculty; Prof Dr Mirjan Gruden, dean of the Faculty of Engineering; Dr Draga Kolar, head of the Department of Refractory Materials at the Joseph Stefan Institute; and Eng Dusan Pirc, head of the microelectronics project of Iskra; time and place of interviews not given]

[Text] Introduction of microelectronics represents--according to the experts--the third technological revolution in the electronics industry, which will not only influence its development but will also decisively intervene in the development of numerous other fields of the economy and outside of it. The advent of microelectronics overturned the former classical division of electronic industry into the manufacture of parts and production of final electronic products, equipment, or systems.

The technology of microelectronic circuits combines the simultaneous production and functional integration of up to several thousand electronic elements--capacitors, resistors, transistors, and diodes--on a single supporting chip with a surface of only a few square millimeters which can constitute an entire electronic system capable of performing the function of a calculator, electronic clock, or some other electronic product or apparatus. While manufacture of such products according to classical methods required a host of operations--ranging from the production of individual elements, their functional connection into individual constituent parts or circuits, the assembly of these into a specified system and their installation in an appropriate housing--the present day integrated microelectronic circuits, produced in a single process, need only be built into a suitable housing. An electronics industry without its own microelectronic production will, in the future, be left with no other function than installation of integrated microelectronic circuits into their housings, which is an unimportant, second rate task--performed under technical, economic and marketing conditions dictated by the manufacturers of these circuits. An industry with such limitations will necessarily have to give up any tendencies and desires to develop, in the future, the manufacture of new, original electronic products and equipment which would contain increasingly more of technical expertise and less manual labor. It will remain without the "infrastructure" which could ensure continued and successful growth of its production and development.

Microelectronics does not represent the absolutely necessary infrastructure for the electronic industry only. It also is indispensable for a more rapid and successful development of a series of social activities and social services in which it will, because of its basic advantages, begin to assert itself even more rapidly and on a larger scale. The three basic advantages of microelectronic circuits are: extremely small size, extraordinarily reliable operation, and extraordinarily low use of energy. If we add to this the fact that microelectronic circuits can, because of the smaller requirements of raw materials and energy and mass production technology, be produced at a much lower cost, it is clear that development and introduction of microelectronic circuits belongs among the priority developmental programs in our republic. Precisely for this reason the intermediate range development plan of the Socialist Republic of Slovenia designated the development of microelectronics as one of the most important of the priority developmental goals and objectives.

Although we have been for some time coming across microelectronics and its advances at the annual electronics show in Ljubljana and elsewhere, this field is still an unknown to a wide circle of our citizens. Accordingly, it will not be amiss if we present a short introduction by Professor Dr Lojze Trontelj, Head of the Electronics Research Laboratory of the Electrical Engineering Faculty:

"Microelectronics represents implementation of a concept of simultaneous manufacture and interconnection according to a prescribed design specification of a host of electronic elements, that is, capacitors, resistors, transistors and diodes on a supporting chip of an area of only a few square millimeters. In this way integrated microelectronic circuits are obtained. These circuits can be of two kind: monolithic and hybrid.

"Monolithic integrated circuits have as a base a wafer, cut from silicone crystal, on which is deposited--by a series of technological processes: photolithography, diffusion, epitaxal growth, and so on--a multilayered relief of special semiconducting layers which constitute the circuitry, including the elements and the wiring connections. The manufacturing of full scale electronic equipment often requires association of several monolithic integrated circuits in a small space. In this way we obtain thick or thin layered hybrid circuits. Thick layered circuits have printed connecting wiring while thin layered circuits have connecting wiring deposited by evaporation. Hybrid circuits are used mostly where a relatively higher power is required, hence they represent a necessary supplement to monolithic circuits.

"Microelectronic circuits have greater operational reliability than systems manufactured with the classical technology. Because the processes for manufacturing of microelectronic circuits are so arranged that many of these circuits can be produced simultaneously, considerable savings in raw materials, energy, and production expenses can be achieved. Their use can also considerably reduce the dimensions of electronic products and equipment. All these advantages are one of the basic reasons for the extremely rapid expansion of microelectronic technology applications in the world."

[Question] How is the development of microelectronics advancing in Yugoslavia?

[Answer] "As early as 10 years ago we became convinced that we must introduce and master microelectronics. At that time it was clear to us that we had neither sufficient funds nor enough experts and knowledge to begin developing from scratch a new microelectronics technology, which was already well developed elsewhere in the world. Accordingly, we initially decided to set as our goal the mastery of the technological developments achieved elsewhere, which was to be pursued with all resources that were available to us. When this goal was accomplished, we would work out a plan for which microelectronics technologies we would develop further and introduce in our production.

"The first important step toward the implementation of this task was the agreement concluded a few years ago between Iskra and the Faculty of Electronics. We agreed on the pooling of our work and resources for the mastery and development of microelectronics, that is, for a joint effort of the experts at the Microelectronics Research Laboratory of the Faculty of Engineering and the experts in industry and for the commitment of society's resources. Thus we successfully began to carry out the project for acquiring expertise in the microelectronics developments and, in the process, produced some results which are important even on the world wide scale of things," says Professor Dr Mirjan Gruden, who, as dean of the Faculty of Electrical Engineering for several terms, had strongly advocated that the agreement for acquiring expertise in microelectronics through the pooling of knowledge and resources be concluded.

"On the basis of this agreement we prepared a detailed plan of microelectronics development which involved collaboration of the Microelectronics Research Laboratory at the Faculty of Electrical Engineering, the Jozef Stefan Institute, High Vacuum Technique Laboratory and Iskra. Two goals were set with this plan: first, a joint effort for educating the necessary personnel in the state of art in microelectronic technology system design and in development work on the technological processes themselves and, second, the acquisition of expertise in producing modern microelectronic systems in pilot runs of monolithic and hybrid integrated circuits through a concentration of experts and equipment in the Microelectronics Research Laboratory of the Electrical Engineering Faculty and the Refractory Materials Department of the Jozef Stefan Institute."

"These goals were successfully achieved. The results of the project are best illustrated by the first complex monolithic circuitry that was designed and produced in Yugoslavia. This circuitry contains more than 2,300 integrated transistors on a silicone chip 2 by 3 millimeters in size. Thus far we have successfully carried out 70 hybrid thin film technology projects, 20 of which have already been or are being applied in Iskra's industrial production. By ourselves, without the benefit of foreign licenses of any kind, we have developed the technology of thin film hybrid integral circuits to a level where they are now being introduced in the industrial production. This technology is particularly suitable and important for production of equipment needed for defense purposes," says Professor Dr Lojze Trontelj.

"With the agreement, the Jozef Stefan Institute assumed, among other things, the task of developing the thick film circuitry technology. The importance of this technology is particularly in the relative facility with which it can be readily applied with our existing expertise without requiring extremely expensive equipment. We have made profitable use of this advantage. On the basis of development work at the Jozef Stefan Institute and Iskra's electronic components industry, a pilot production of individual electronic thick film electronic components, such as potentiometers on a ceramic base, was with relatively small investments put in operation at Iskra's TOZD Upori [Resistors] in St Jernej as early as 2 years ago. The joint development laboratory organized by Iskra and the Jozef Stefan Institute also began developing prototypes of thick film hybrid integrated circuits and, within 2 years, developed more than 20 different circuits to meet the needs of Iskra and some of its customers. Preparations are under way to start regular production of the successfully developed prototypes. Because these are accomplishments of an entirely domestic development, the Research Community of Slovenia offered assistance: Its Commission on Innovations approved a loan for financing the translation of these results into practice, which will make possible regular production of these circuits in Iskra," says Dr Drago Kolar, head of the Department of Refractory Materials at the Jozef Stefan Institute.

"In 1970 products of the electronics industry containing built-in monolithic circuits began to appear on the market. Since 1973 these circuits also were built in consumer articles. At Iskra we realized that without our own production of monolithic circuits we would not be able to keep our products up to date and remain competitive on the world market. At the same time, we also were aware that we could not undertake an entirely independent development of the integrated circuits production technology because this would be too time consuming and expensive. Because we have already acquired, in cooperation with the Microelectronics Research Laboratory, the expertise necessary for introducing this technology to production, we decided to purchase a license for computerized design, assembly and testing of specialized monolithic circuits. Thus we purchased from the California firm AMI part of the technology necessary for the establishing of industrial production of monolithic circuits."

"Instruction of personnel in computerized design of MOS microelectronic circuits was carried out on three practical examples of specific monolithic circuits. One of these projects was very demanding--a minicomputer on a silicon chip 5 by 5 millimeters in size with all the necessary computer circuitry including the memory. With this Iskra placed itself among the 10 manufacturers in the world who offer this type of minicomputer of their own design.

"On the basis of expected future needs Iskra worked out a plan for development of microelectronics which has been incorporated in the intermediate development plan of the Socialist Republic of Slovenia. With the implementation of this plan Iskra will obtain microelectronic circuits for modernization of manufacture of almost all of its products from automotive and telecommunications circuits through instrumentation, consumer articles and calculator systems.

"Because development of microelectronics represents an infrastructure for the development of all the rest of Iskra's production, its 50 constituent organizations of associated labor adopted and signed a self-managing agreement on pooling the resources for implementing the program of microelectronics technology development. The preparations for this purpose have already advanced so far that we shall already in this year begin construction of a monolithic circuits production plant in Stegne. The trial production runs in this plant are expected to begin in the middle of 1978," predicts Professional Engineer Dusan Pirc, head of the microelectronics project in the United Enterprise Iskra.

Preparations for starting the manufacture of monolithic circuits require an even closer and in-depth cooperation between the Microelectronics Research Laboratory at the Faculty of Electrical Engineering and Iskra. For this purpose an effective system of continued and supplementary education will be developed. At the same time the laboratory will continue to develop the microelectronics program, that is, the gradual mastery and application of other areas of monolithic circuits technology for the needs of manufacturing programs of Iskra and other manufacturers with whom Iskra intends to cooperate in the future.

The results obtained primarily because of the pooling of work and close, long-term cooperation between scientific research and development organizations and the direct manufacturers in the application of microelectronics are already apparent and tangible. They constitute a convincing proof that the pooling of all available know-how, material resources, and creative team work, which frequently required subordination of personal interests to the common good, can and does result in the accomplishment of even the most demanding objectives including achievements that are important on the world-wide scale. These results are an important contribution to the successful implementation of key goals and objectives which we have set for ourselves in the intermediate range development plan.

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